Measuring the Company's Capabilities and Assessing their Impact on its Economic Results: Analytic Tools

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ABSTRACT

With the increasing uncertainty of the external environment, the capabilities of companies become the driving force behind their operations and development, making the management of these capabilities an important task for management. **The aim of the research** is to develop a toolkit for measuring a company's capabilities, assessing their condition, and evaluating their impact on productivity. The author's concept is presented, according to which the final results of the company's activity are formed through the mechanism of interaction of the company's organizational capability with acquired resources, the formation of resource capabilities (production, financial, labor, and market) and their transformation into tangible and intangible products. Based on this model, methodological guidelines have been developed for measuring the capabilities of organizations and assessing their impact on the final results, a value-functional approach to selecting appropriate indicators, and analytical tools. The following **methods** have been substantiated: modeling, the indicator method, data convolution, scaling, and statistical methods. To measure capabilities, it is proposed to use indicators aggregated into composite indices through a developed algorithm. The use of sales growth rate, market capitalization, profit before taxes, and net cash flow as the final results of the company (productivity indicators) has been justified. To solve analytical tasks at different levels of management, combinations of methods, tools and indicators called "research formats" (detailed, diagnostic, express diagnostic analysis) were developed. The results of the empirical testing of the author's research are presented: through detailed analysis, the validity of the proposed approach and tools has been established, and through diagnostic analysis, the stability of the selected indicators and constructed mathematical models beyond the observation period was identified. **The result** is a toolkit for researching crucial company's capabilities, enabling management to analyze and monitor these capabilities, assess their productivity, make forecasts of productivity indicators, and develop a system for managing the organization's capabilities.

Keywords: organizational capability; resource capabilities; key values; value functional approach; indicators; productivity; research format; detailed analysis; diagnostic analysis; express diagnostic analysis

INTRODUCTION

The active spread of fundamentally new production technologies, natural disasters and global competition, as well as the blurring of boundaries between industries, the shortening of the life cycle of organizations [1–3], universal informatization and its consequences form a list of the main factors causing uncertainty and high volatility of the external environment. Some companies respond to these challenges by updating products, models of profit creation, forms of business organization [4, 5]; others copy successful experience, improve product quality, strengthen external relations. In any case, the driving force of successful functioning and development of firms becomes their capabilities, the management of which turns into one of the important tasks of management.

In this regard, there is a growing stream of scientific publications devoted to the study of the properties, micro foundations of organizational capabilities, conditions of their formation, as well as the creation of methods for identifying capabilities, etc. [6–9]. Empirical studies conducted on large samples of subjects from different industries have proved the influence of abilities on the results of companies' activities [10–12]; at the same time, the primary focus in the literature is on dynamic capabilities, although the current results are directly determined by the operational ones.

It should be noted that the study of organizational capabilities was carried out long before the concept of dynamic capabilities and the resource approach were created. In the Soviet and Russian economic science, the concepts of 'capability' and 'potential' were equated, and the identification of potentials: production, financial, labour, scientific and technical, etc., was carried out by types of companies' activities [13, 14]. At present, the study of capabilities and potentials is carried out in parallel. This may be due to the outdated but still prevalent interpretation of potential as a set of resources. However, modern organizations often build successful businesses based on resources that are not owned by them. This means that the set of resources no longer characterises the potential (from Latin potentia — strength, power) of a company. The power and strength of companies, as modern scientists believe, lie in their capabilities [13–15].

Russian researchers have developed scientific and practical frameworks for studying potentials as the capabilities of companies, so it is reasonable to integrate and develop the achievements of Russian and global science in this area to create a modern theoretical and methodological foundation for managing organizational capabilities.

Therefore, the aim of the article is to develop a toolkit for measuring and assessing the state of company's capabilities and their impact on productivity, based on the author's idea of the mechanism of formation and application of capabilities.

THEORETICAL PROVISIONS

The theoretical framework proposed by the authors regarding company's capabilities and the mechanism of their impact on outcomes can be summarised as follows. Any firm is initially endowed with organizational capability, which is expressed in the combination of relevant material, property, financial, human and external information resources for functioning aimed at the strategic priorities or key values of the company: market, economic and organizational (external and internal). The first two mean, respectively, orientation towards external environment conditions and profit. Organizational values are priorities in the management of attracted resources and building external relations, which should support the maintenance of market and economic values.

The organizational capability of a company represents a combination of interacting complementary organizational resources grouped as follows: structural and process resources (organizational and management structure, principles, methods, and management technologies); intellectual property assets; corporate culture; information technology; external relations [16].

The purpose of organizational capability is to engage the acquired resources into the business operations, therefore, the process of its interaction with resources can be called 'the process of functioning of organizational capability'. The interaction leads to the structuring of resources and the formation of resource capabilities (i.e., resource application capabilities), which include financial, production, labour, market, formed by the structuring of financial, material, human and external information resources, respectively. The subsequent interaction of resource abilities and structured resources forms material and intangible products.

The authors' proposed model of capability formation and its impact on the company's final outcomes responds to its properties, including intangibility, organizational nature, duration of maturation, specificity, ability to reproduce, intermediate position between resources and the company's final results. [10, 17].

METHODOLOGICAL PROVISIONS

Based on the above-mentioned theoretical provisions, an original toolkit [18] has been developed, presented in *Table 1*.

The questionnaire used is based on the recommendations of T.G. Dolgopiatova [19] and is aimed at identifying organizational values of the company and actual functions of organizational capability by groups of organizational resources.

The company's capabilities are proposed to be measured by composite indices, for the calculation and evaluation of which the following algorithm has been developed:

1) identification of the company's key organizational values;

2) identification of the main and auxiliary functions of organizational resources relevant to the key organizational values;

3) determination of ways and means of fulfilment of the allocated functions;

4) identification of performance criteria for the fulfilment of functions;

5) formulating requirements for indicators;

6) compilation of a general list of measures for organizational and resource capabilities of the company;

7) selection of indicators that have a statistically significant relationship with the main productivity indicator, taking into account the lag;

8) normalisation of the selected capability indicators;

9) selection of indicators by developing regression models of the main productivity indicator from normalised capability indicators and excluding multicollinearity;

10) calculation of summary indices of organizational and resource capabilities of the company by additive or multiplicative convolution methods;

11) assessment of the level of capabilities according to the Harrington scale.

For the composite index of organizational capability, relative indicators reflecting the means of performing allocated functions are used, and for the composite indices of resource capability, those expressing the company's ability to apply the relevant resources to support organizational values are used.

Normalised indices are calculated as the ratio of actual values to baseline values (i.e., the best values for the period of observation), which aligns with the concept of capabilities.

The use of indicators for determining summary ability indices is conditioned by their specific advantages: they allow to take into account the links between all selected indicators, reduce their number, and ensure the manufacturability of measurements. The requirements to the indicators are formulated, including statistically significant relationship with the main productivity indicator.

Productivity should characterise the final useful result generated by capabilities. To assess it, different sets of indicators are considered in the literature [10, 12]. The authors of this article propose to express productivity by market and economic outcome indicators, which reflect the

Table 1

The toolkit for researching a company's capabilities and assessing their impact on final outcomes

Proposed aspects of the research	Proposed research methods	Developed tools and suggested indicators
Key organizational values	Interview with the head of the company (or deputy on key issues)	Tools: analytical questionnaire
Organizational capability (state, level, variability, dynamics)	Modelling of organizational capability functions, value-functional selection of indicators, normalisation of indicators, indicator method, indicator convolution, scaling, statistical methods (regression, correlation, lag analysis, variability measurement)	Tools: organizational capability function tree, algorithm of formation, measurement, and evaluation of the composite index of organizational capability. Indicators: measures and indicators of organizational capability, composite index of organizational capability, coefficient of variation
Resource capabilities (state, level, variability, dynamics)	Value-functional selection of indicators, normalisation of indicators, indicator method, indicator collation, scaling, statistical methods (regression, correlation, lag analysis, variability measurement)	Tools: an algorithm for education, measurement, and evaluation of composite indicators of resource capabilities. Indicators: parameters and indicators of resource capabilities, summary indices of resource capabilities, coefficients of variation
Productivity (state, dynamics, variability), impact on productivity of organizational and resource capabilities	Statistical methods (regression, correlation, lag analysis, variability estimation), control chart method	Indicators: sales growth ratio, market capitalisation, profit before tax, net cash flow, correlation, determination, and variation coefficients

Source: developed by the authors.

maintenance of relevant core values. The market result should characterise the reaction of customers and investors to the company's actions in the market — for this purpose, the sales growth ratio (SGR) and market capitalisation (MC) are proposed, respectively. The economic result serves to characterise the company's ability to transform the demand for products into corresponding final indicators, such as profit before tax and net cash flow. The sales growth ratio is proposed as the main productivity indicator because it is commonly used to assess the company's prospects [20, 21] and to develop financial plans [22]. At the same time, sales growth should be balanced

in order to maintain profitability and financial policy of the organization without depleting its financial resources [21, 23].

The level of stability of composite capability indices and productivity indicators can be measured using the coefficient of variation and assessed on an annual stability scale [22]: the level is considered high if the coefficient of variation is 10% or less; the level is considered medium if the value of this coefficient is between 10 and 25%; and the level is considered low if its value is above 25%.

Taking into account the impact of capabilities on the company's final outcomes and the

Table 2

Research formats for assessing the state and productivity of a company's capabilities

Research characteristics	Detailed analysis	Diagnostic analysis	Express diagnostic analysis
Task level	Strategic	Tactical	Operational
Purpose	In-depth research with construction of regression models	A brief study involving the persistence control of regression models	Productivity monitoring, deviation control
Aspects of the study	All aspects (Table 1)	Condition, dynamics, capability variation; productivity; control of basic regression models	Productivity (state, dynamics, variability)
Indicators used	Capability indicators and measures; composite ability indices; productivity indicators; statistical indicators (correlation coefficients, determination coefficients, variation coefficients)	Summary ability indices; productivity indices; statistical indices (correlation coefficients, determination coefficients, variation coefficients)	Productivity indicators, coefficients of variation of productivity indicators

Source: developed by the authors.

dynamism of the business environment, it can be concluded that the status and productivity of abilities should be determined within the framework of strategic, tactical and operational management. Taking into account the difference between the tasks of different management levels in terms of the required depth of analysis and the urgency of obtaining measurement results, it is proposed to apply different combinations of analytical methods, tools and indicators, which are called 'research formats' by the authors of the article (*Table 2*).

Let us highlight the features of diagnostic and express-diagnostic analyses. The first one allows us to identify changes in the state of capabilities, their productivity and make timely decisions to adjust their management [16]. Express-diagnostic analysis is proposed for continuous monitoring of productivity in order to control its deviations from the set level. The frequency of studies of different formats

should depend on the dynamics of external and internal processes.

APPROBATION OF THE AUTHOR'S TOOLKIT

The author's toolkit was tested in several companies. The article presents the results obtained in PJSC Chelyabinsk Zinc Plant (PJSC CZP, now JSC CZP) — a large organization that produces zinc and zinc-based alloys.[1]

In the course of the work, it was required to obtain mathematically justified answers to the main research questions:

1. Does organizational capability affect the resource capabilities of the firm?

2. Do organizational capability and resource capability affect the productivity performance of a company?

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[1] Chelyabinsk Zinc Plant (official site). URL: http://www.zinc.ru (accessed on 05.03.2020).

3. Do organizational capability indicators retain relevance beyond the observation period?

4. Is it possible to use the regression models constructed for the purpose of predicting the company's productivity indicators?

The first stage (2011–2015) was planned to answer the first two questions. Given the limited format of the article, only the main results are presented below. All indicators are given in quarterly breakdown.

First of all, the company's key organizational values were identified by interviewing one of its leading managers: external — product unification; internal — cost efficiency. Next, its organizational capability indicators were selected according to the proposed algorithm (*Table 3*).

Table 3

Selection of organizational capability indicators (fragment)

Objects of intellectual property	Structural and process resources	Information technologies
Primary function		
Establishing the scientific and technical basis for product development	Ensuring internal order to maintain key organizational values	Maintaining an information environment to preserve core organizational values
Auxiliary functions		
1. Ensuring the productivity of fixed assets in the production of mastered products. 2. Ensuring cost efficiency for the production of new products. 3. Improvement of production technologies of mastered products	1. Formalisation of basic business processes. 2. Organization of production of unified products. 3. Control of activities. 4. Formalisation of employees' behaviour by administrative methods. 5. Formalisation of workers' behaviour by economic methods. 6. Creation of incentive conditions for key employees	1. Providing the company with professional reference information. 2. Ensuring the quality of management decisions. 3. Ensuring the productivity of management processes. 4. Ensuring productivity of manufacturing processes
Means of performing functions		
Own technological division; orientation of developments towards efficient use of material and property resources	Providing production with high-performance equipment; organizing and stimulating high-performance work	Application of automated production and management systems
Relevant proposed indicators		
Share of intangible assets in the total value of assets	Management workload	Engineering centre maintenance burden
Research burden	Capital-labour ratio	Share of IT development costs in the total amount of investments
Share of expenditures on development and improvement of production technologies in the total amount of investments	Average monthly salary related to the minimum subsistence level	
	Ratio of average monthly wages — in the company and in the region	Techno-information capacity of specialists and managers

Source: developed by the authors.

Table 4

Indicators of capabilities of CZP, PJSC

Organizational capability	Production capability	Labor capability	Financial capability	Market capability
Engineering centre maintenance burden (lag 5)	Share of material and energy costs in the cost structure (lag 1)	Labour productivity (lag 0)	Turnover of current assets (lag 0)	Co-operation ratio (lag 5)
Average monthly salary related to the minimum subsistence level (lag 6)	–	Wage output (lag 0)	Turnover of current assets (lag 2)	Increase in trade receivables (lag 1)
–	–	Wage output (lag 1)	–	–

Source: developed by the authors.

Table 5

Regression models of composite resource capability indices based on the composite organizational capability index

Regression model	Multiple correlation coefficient	Coefficient of determination	F-test	Significance of F
Production Capability (PC)				
$PC_i = -0.27OC_{(i-1)} + 1.12$[a]	0.89	0.65	16.37	0.0029
Labour Capability (LC)				
$LC_i = 1.12OC_i - 0.03$[b]	0.95	0.89	83.72	3.57×10^{-6}
Financial Capability (FC)				
$FC_i = 0.91OC_i + 0.15$[c]	0.85	0.73	26.73	0.0004
Market Capability (MC)				
$MC_i = 0.98OC_i + 0.10$[d]	0.73	0.53	11.36	0.0071

Source: developed by the authors.

Note: a — PC — production capability; OC — organizational capability; *b* — LC —labor capability; *c* — FC — financial capability; *d* — MC – – market capability.

Table 6

Regression models of productivity indicators based on composite capability indices

Regression model	Multiple correlation coefficient	Coefficient of determination	F-test	Significance of F
Impact on Organizational Capability (OC) productivity				
$SGR_i = 1.50OC_i + 0.17$[a]	0.76	0.58	13.74	0,0041
$MCap_i = 53\,227.10OC_{(i-1)} - 21510.10$[b]	0.78	0.61	13.94	0,0047
$PBT_i = 3859.73OC_i - 1883.86$[c]	0.78	0.61	15.41	0.0028
$NCF_i = 3134.99OC_i - 1411.12$[d]	0.77	0.60	14.79	0.0032
Impact on Production Capability (PC) productivity				
$SGR_i = 3.42PC_i - 2.28$[e]	0.53	0.28	5.93	0.0279
$MCap_i = 237\,827.30PC_i - 224\,015.00$	0.56	0.31	6.33	0.0247
PBT has the best connection with PC at lag 1	0.42	The linear model is statistically insignificant		
$NCF_i = 28\,181.70PC_{(i-1)} - 22915.90$	0.54	0.29	5.78	0.0306
Impact on Labour Capability (LC) productivity				
$SGR_i = 1.42LC_i + 0.23$[f]	0.79	0.63	25.08	0.0002
$MCap_i = 37\,476.12LC_i + 51\,841.56\,LC_{(i-1)} - 42\,553.90$	0.96	0.93	80.89	4.61×10^{-5}
$PBT_i = 3888.91LC_i - 1845.08$	0.86	0.73	40.86	1.21×10^{-5}
$NCF_i = 5638.15LC_i + 1375.57$	0.68	0.46	12.61	0.0029
Impact on Financial Capability (FC) productivity				
$SGR_i = 1.50FC_i + 0.09$g	0.76	0.58	19.51	0.0006
$MCap_i = 54\,204.30FC_{(i-1)} + 24\,256.90FC_i - 40\,734.30$	0.94	0.88	40.86	8.1×10^{-6}
$PBT_i = 3978.83\,FC_{(i-2)} + 3868.93\,FC_i - 4535.37$	0.88	0.77	16.54	0.0007
$NCF_i = 5433.80\,FC_i + 7433.54\,FC_{(i-2)} - 3225.53$	0.85	0.73	14.66	0.0008

Table 6 (continued)

Regression model	Multiple correlation coefficient	Coefficient of determination	F-test	Significance of F
Impact on Market Capability (MC) productivity				
$SGR_i = 1.28MC_i + 0.26h$	0.81	0.65	20.77	0.0008
MCap has the best connection with MC at lag 1	0.53	The linear model is statistically insignificant		
$PBT_i = 2438.16MC_i - 1141.92$	0.60	0.36	6.31	0.0289
NCF has the best connection with MC at lag 6	0.64	The linear model is statistically insignificant		

Source: developed by the authors.

Note: a − SGR − sales growth rate; OC − organizational capability; *b* − MCap − market capitalization; *c* − PBT − profit before taxes; *d* − NCF − net cash flow; *e* − PC − production capability; *f* − LC − labor capability; *g* − FC − financial capability; *h* − MC − market capability.

Research load is calculated as the ratio of expenses on research and development to the average number of employees; management load is calculated as the ratio of total management expenses to the average number of employees; engineering centre maintenance load is calculated as the ratio of the engineering center's budget to the average number of employees. Other indicators are determined using standard methods.

Further, by means of the proposed algorithm the capability indicators of PJSC CZP are identified (*Table 4*).

All the above calculations were performed using the SPSS software by means of stepwise selection method. The *F*-test (Fisher's criterion) was used to test the adequacy of regression models, and the *t*-test was used to assess the significance of the explanatory variable. Composite indices were obtained by the method of multiplicative convolution of indicators.

Composite capability indices were calculated and regression models of resource capabilities from organizational capability were built. (*Table 5*).

High statistical significance of the models provides a positive answer to the first question (see above).

The regression models of productivity indicators from the composite indices of organizational and resource capabilities also showed high statistical significance (*Table 6*). Therefore, the answer to the second question is also positive.

Thus, the obtained results confirm the validity of the toolkit proposed for the study of the company's capabilities.

To address the third and fourth questions, the second stage of the research was conducted, which showed that, in the subsequent period (2015–2018) the set of organizational capability indicators remained the same. This indicates a positive answer to question 3.

The stability of the sales growth rate (SGR) model based on the composite index of organizational capability (OC) was determined by comparing actual and calculated values of the sales growth rate (*Table 7*).

The calculations show that 95% of the deviations of the actual values from the estimated val-

Table 7

Validation of the regression model of the sales growth coefficient based on the composite organizational capability index

Year	Quarter	OC / Organizational capability	Actual sales growth coefficient	Calculated Sales Growth Coefficient	Deviation
2015	3	0.6348	1.1954	1.1213	0.0741
	4	0.6056	0.8085	1.0776	−0.2691
2016	1	0.6605	1.1624	1.1597	0.0027
	2	0.5211	1.0823	0.9513	0.1310
	3	0.6031	1.2284	1.0739	0.1545
	4	0.6794	1.0475	1.1880	−0.1405
2017	1	0.5407	0.9605	0.9806	−0.0201
	2	0.6173	1.1243	1.0951	0.0292
	3	0.6868	1.0482	1.1990	−0.1508
	4	0.6290	1.0580	1.1126	−0.0546
2018	1	0.6295	1.0394	1.1134	−0.0740
	2	0.5244	1.0718	0.9562	0.1156
	3	0.6563	0.8302	1.1534	−0.3232
	4	0.6391	1.1638	1.1277	0.0361

Source: developed by the authors.

ues correspond to the statistically defined interval $(\pm 2S)$[2]; there are no patterns in the deviations, hence, the regression model provides a meaningful estimate of the sales growth rate until the end of 2018, which is a positive answer to question 4.

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[2] 2S = 0,2988.

CONCLUSIONS

The authors of this study have developed methodological provisions and toolkit for measuring and assessing organizational and resource capabilities of a company. Approbation of the toolkit allows us to state the following:

1. The state of organizational capability, measured by the composite index, determines the company's resource capabilities (production, labour, financial, market).

2. Organizational and resource capabilities of a company have a significant impact on productivity indicators.

3. Organizational capability indicators can remain relevant for several quarters after the end of the observation period.

4. The mathematical model of the dependence of the sales growth ratio on the composite index of organizational capability can be used for preliminary estimation (forecasting) of sales growth within the limits of regression analysis capabilities. In this case, the required ratio of the periods of prospection and retrospection should be observed.

Thus, the validity of the proposed toolkit for measuring and assessing the company's capabilities and their impact on the organization's productivity can be considered proven. The toolkit (as demonstrated by a specific example) allows to:

• measure and assess the company's capabilities, and monitor them;

• evaluate their impact on the firm's final indicators (productivity indicators);

• conduct preliminary assessment of productivity indicators on the basis of composite capability indices;

• orient management towards maintaining long-term values;

• develop a set of measures to maintain the company's capabilities at an acceptable level and create a capability management system focused on key values.

In the course of further research, it is planned to create a model for integrating the proposed analytical toolkit into the balanced scorecard (BSC) of R. S. Kaplan and D. P. Norton. This will make it possible to supplement the description of companies adopted in the BSC by including capability indicators, thus increasing the flexibility of the BSC and adapting its toolkit to the conditions of increasing variability and uncertainty of the external environment.

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