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THE VIEW OF CONSTRUCTION COMPANIES' MANAGERS ON THE IMPACT OF ECONOMIC, ENVIRONMENTAL AND LEGAL POLICIES ON INVESTMENT PROCESS MANAGEMENT

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This article discusses the impact of economic, environmental and legal policies on management of the companies involved in investment projects in the area of industrial construction in Poland. Our empirical research relied on conducting a survey in a group of construction managers and experts. The survey involved 158 Polish companies from the SME sector dealing from the industrial construction. The questionnaire responses were thoroughly analysed and interpreted with the use of a method called exploratory factor analysis (EFA). The results provide an insight into successful management of investment processes realised by construction companies implementing projects in the area of industrial construction. The most important factors identified with the use of this research method turned out to be the availability of technology in a stable political system, stability of economic and tax systems, stable social policy, stability and transparency of the legal system and well-targeted environmental policies. In general, it can be stated that the effective management of industrial construction projects is influenced by the economic, environmental and legal policies of the state.

Keywords: management of construction companies; construction processes; policies of the state.

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1. Introduction and Knowledge Gap

The management of investment processes in the construction industry is an exceptionally complex undertaking. It is a unique venture and therefore requires an individual approach. Efficient and effective management of an investment process requires taking into account many conditions and factors that determine its effectiveness and the way of its implementation in a timely manner. Scientists from all over the world have been exploring this topic for years [9][12]14][17]. Of particular importance here is the issue of properly implemented state policies towards SME companies from the construction sector. Efficient and well thought-out economic, environmental and legal policies have a significant impact on effective management of investment processes. However, Poland lacks a well-considered and properly implemented state policies in the area of managing industrial construction projects. Therefore, it seems important for the functioning of construction companies to assess the impact of economic, environmental and legal policies on the quality and effectiveness of investment project management in order to fill the gaps and deficiencies in the state system, as well as to indicate corrective actions in the analysed area.

This paper contributes to the literature on investment project management in two fundamental ways. Firstly, it provides a thorough review of the literature with regards to construction project management. Secondly, it gives an answer to the question as to what the effective management of such projects depends on. We include variables that, although theoretically considered, have never been put into practice before. Previous studies address more specific variables which are not necessarily related to economic, legal and environmental specificities. We introduce a set of variables that measure management performance in the above mentioned domains. In this regard, previous studies have covered only a few aspects and very selectively. Our work consists of 8 basic questions characterised by 122 variables and 5 metric questions. We use the Exploratory Factor Analysis technique, which allows to reduce the number of variables and is focused on key factors influencing the effectiveness of industrial construction project management.

2. Theoretical Background

Scientists for a long time have been trying to identify factors determining success of a construction project. However, it is difficult for them to reach a certain consensus. As a general rule, different authors highlighted five main groups of independent variables, namely project-related

factors [1][5][9][10][11][25][26][42], procurement-related factors [20][26][36][37][45][46], project management activities [5][10][19][21][46], personnel factors [4][7][9][10][11][18][42] and the external environment [1][10][21][39][46], and have attributed them a key role in project management.

When it comes to industrial construction sector, there are countless examples of the impact of a dynamically changing environment and its influence on construction processes [16][22][28][33]. One of its elements is the economy and more specifically the economic policies implemented by the state, therefore it is worth taking a closer look into them. Both analyses of individual processes and entire projects show that changes in economic policy may significantly impede the implementation of investment projects or lead to a significant delay in their completion. In some cases, it might result in a lengthening of projects' implementation time schedules by as much as 30-100 percent. One example of such an extension of the project's time schedule is the flagship project implemented by the Polish state in the field of energy construction, namely the construction of a terminal for the off-take of liquefied natural gas (LNG) in Świnoujście [31][35].

The vast majority of errors during the implementation of investment projects could be avoided (or at least the impact of errors on the whole process could be significantly reduced) if there was applied an appropriate methodology of investment implementation. Many situations that may occur during the implementation of investment projects can be predicted and prevented accordingly, e.g. by foreseeing and securing additional time for their resolution or by effectively managing the risks in time schedules and cost projections. It is also worth considering the use of good and proven solutions applied in other countries. These include a long and very thorough preparation of investment projects, development of contingency plans for their implementation, as well as the introduction of the standardisation of engineering documentation, e.g. FIDIC [24]. The most appropriate methodology is adapted to changing environmental conditions. It has to be as flexible as possible due to an extremely frequent reorientation of the legal, environmental and economic policies of the state. Such an approach manifests itself in the ability of anticipating changes and taking appropriate measures to mitigate the impact of risks and by promoting the use of potential opportunities. It is also important to have a well-drafted characterisation of a given task carried out under specific conditions, which determines the intensity of the impact of various factors and the so-called non-controlled variables. In the industrial construction sector, countless examples can be found of the impact of a dynamically changing environment on construction processes [27].

Both analyses of individual processes and entire projects show that changes in the environment may lead to difficulties in the realisation of investment projects, e.g. legal problems, quality deterioration, budget overruns, failures of entire projects, and significant delays in their completions

[27]. It should also be stressed that construction is a special sector of the national economy in which, due to a very dynamic environment and the lack of control over many factors, it is virtually impossible to precisely plan only one singular implementation scenario. Therefore, the only effective style of management implies the assumption that frequent implementation changes undertaken during project realisations are sort of a natural phenomenon, and that any actions taken by management staff implementing such projects should be adequate to the interactions between the environment and the construction companies themselves. Thus, as stated by J. Pasławski and T. Jastrząb and separately by flexibility must be the basis of any efficient management model [34]. When analysing investment processes, most authors address disturbances that slow down construction works due to external and operational factors. For example, J. Drzewiecka and J. Pasławski refer to two specific cases, i.e. the construction of the Northern Bridge Route in Warsaw and the construction of a water supply system in rural areas, and indicate the high water levels of the Vistula and high groundwater table as important reasons for disturbances in construction processes in the case of these projects [13]. In turn, A. Dziadosz and M. Rejment describe the course of construction processes of one specific, multifunction object, i.e. the commercial-service-office in Poznań [15]. Each project has its own unique implementation conditions which only occur in a specific case, and which are determined by many different factors, and these, in turn, may untimely affect the completion of the project by a contractor, resulting in a decrease in its quality or leading to its budget overrun. Delays in the realisation of construction works and lengthening of investment time schedules are very common phenomenon these days, despite the existence of modern technologies and tools that at least theoretically should support investment processes [27]. The vast majority of scientists who deal with this problem as a source of all difficulties accompanying investment processes distinguishes non-systemic reasons, e.g. human factors or those related to contract terms and unpredictable factors [27][34]. Although A. Leśniak and A. Plebankiewicz indicate a group of political or economic factors (classifying them as local ones), they do not devote much attention to them [27]. Meanwhile, it is exactly this group of factors that deserves an in-depth discussion, because their knowledge and the ability to cope with them allows for avoiding negative consequences of a systemic nature, especially on the Polish industrial construction market. For example, G. Sweis and others indicate three groups of factors responsible for disturbances in investment processes, namely the entry factors (e.g. human work, material, equipment and devices, etc.), internal environmental factors (e.g. investor, contractor, designer, consultants, etc.) and unpredictable or uncontrollable factors (e.g. weather conditions, legal regulations, etc.) [43]. In other words, success or failure of investment projects depend on individual parameters of each project and its complexity or are related to local factors (e.g. climate conditions,

etc.). This is, of course, true but so far not too many authors have tried to investigate the systemic reasons of projects' failures, e.g. how legal, environmental or economic aspects (i.e. external environment) make it difficult or even impossible for construction companies to implement their investment processes in an efficient and timely manner. In this paper, an attempt is made to explore this difficult issue.

Generally speaking, the growing uncertainty that accompanies new technologies, budgets and development processes of construction companies makes the whole sector and its changes very dynamic. A.P. Chan and others noted that construction projects with each passing day become more and more complex and difficult [9]. We pretty much share the same insights, when it comes to the projects implemented in Poland, regardless of their nature, i.e. residential or industrial construction, etc. This puts project teams often faced with very difficult tasks of adapting to unprecedented changes.

C.K. Wing, and later Li and others made comprehensive overviews of the literature on the subject, relying on similar methodologies for assessment of construction projects (including partnership projects), and trying to evaluate their implementations in terms of successes/effectiveness, and taking into account critical success factors (CSFs) and their determinants [28][47].

A.P Chan and others showed that by studying CSFs and drawing conclusions from them, it is possible to significantly improve the effectiveness of implemented projects. However, success is often defined very heterogeneously in the minds of construction industry experts. In other words, even scientists have problems with establishing a general list of the factors determining projects' success, since their attempts to come up with specific CSFs for construction projects so far have given different results. Although some of the proposed variables are repeated in different studies, there is no generalisation in this respect. There is also the lack of a comprehensive study that would cover many construction companies and assess opinions of construction managers at many different levels, including economic, environmental and legal policies.

The term CSF or CPSF (Critical Project Success Factors) was first introduced by J.F. Rockart in the early 1980s and in essence, it refers to the factors determining projects' success [38]. The topic was later addressed by a number scientists who studied construction sector [3][30][40][44]. In general, the most important CPSFs are those related to people/individuals working on projects' preparation and implementation (e.g. site manager, project manager, site supervisor etc.), factors related to projects' procedures, project management with all related activities, and all factors related to the external environment [2][9]. The latter category includes economic, political, legal, technological and environmental factors.

A number of scientists pointed to factors which relate to projects' scope [11][26][32][41][42][46]. The scope manifests itself as a predictor of the time required to complete a construction project. To assess the scope of a project, A.P. Chan and others suggest that we have to consider its nature, type, size, and complexity [9][41]. Other important factors identified by the scientists are those related to procurement issues [45][46], public procurement issues and tender procedures, including the criteria for selecting successful bidders (a very sensitive and important issue in Poland and often having a political context), and main contractors [11].

E.J. Jaselskis and D.B. Ashley highlighted the role of project managers in successful completion of a project [21]. In terms of essential management activities, D.G. Hubbard point to proper communication, feedback from subordinate employees, proper organisational structure, implementation of appropriate control mechanisms, security measures, proper dealing with time schedules, problem-solving skills, decision-making skills and the ability to coordinate various activities and other management activities [19]. The important issue of controlling subcontractors or other stakeholders should not be forgotten either. According to A. Belout, previous experience in project implementation is also a must [5]. The pivotal role of experience is also strongly highlighted by D.W. Chan and M.M. Kumaraswamy [7].

Success is often determined by the key players on whom the project depends, i.e. project manager, client, contractor, consultants, subcontractors, suppliers, and producers [10]. In turn, D.H. Walker points to the role of the client and his representatives as an important factor determining the effectiveness and efficiency of construction projects [45]. According to A.D. Songer and K.R. Molenaar, client-related factors are pivotal, therefore it is necessary to know well clients' profiles before construction works even begin [42]. Above all, trust must be created between the client and construction teams. Success is also dependent on such aspects as familiarity with the organisation behind the construction project, project financing, and risk management issues.

D.W. Chan and M.M. Kumaraswamy and later also S.M. Dissanayaka and M.M. Kumaraswamy pointed to factors related to contractors and subcontractors, emphasizing the importance of their experience for successful project implementation; they concentrated not only on construction management itself but also on such issues as the involvement of subcontractors, construction supervision, flows of contractor funds, competitiveness, cost control and the speed of information flow, etc. In the era of rapidly developing technologies and the growing importance of information (as a resource category), the latter issue may turn out to be invaluable. Moreover, D.K. Chua and others highlight the importance of skills and relevant qualities of project managers, their authority and involvement [10]. That is to say, everything that concerns project teams and their

adaptability and working relationships among project team leaders and their subordinates, including the support of project team leaders provided by parent companies.

Also, A.Q. Hassan argued that successful implementation of a project is sort of a synergy at the level of cooperation between all involved stakeholders, i.e. investor, contractor, architect, site manager, and subcontractors [18]. A.O. Akinsola and others pointed to external factors, i.e. social, political and technical systems [1]. This category addresses economic, political, legal and social environment, industrial relations and new technologies. These aspects have also been studied in detail by A.D. Songer and K.R. Molenaar and later by D.H. Walker and M.W. Vines [42][45]. There is no new, more up-to-date view on these issues and in this paper, we want to cover this gap.

3. Methodology

We study the influence of economic, environmental and legal policies on investment process management in the Polish industrial construction sector. In order to ensure as much representativeness of the targeted sample as possible and its adequacy in relation to the studied phenomenon, reliable surveys were conducted among 158 representatives of the management staff of the SME engaged in the industrial construction sector in Poland. However, several questionnaires were rejected due to the lack of some data/information in the questionnaires. Only 141 correctly filled in questionnaires were accepted for further analysis.

3.1. Study Sample And Data Collection

The empirical survey was conducted between January and July 2018. The structure of the research sample was made up of respondents that were selected in view of the number of completed investment projects in the industrial construction sector. The most numerous were the group of companies which completed up to 15 investment projects during the whole period of their activity. These companies accounted for 58% of all surveyed entities (82 companies in total). Over 18% (26 companies) of the studied sample constituted companies which implemented between 16 and 30 investment projects. The least numerous group were the companies, which completed over a hundred investment projects (i.e. 3.55%). The obtained research sample consisted of respondents from companies from all over the country. However, a significant over-representation is attributed to the group of companies operating in the Mazowieckie Voivodeship (central part of Poland). In total, in the survey took part 69 companies from the Mazowieckie Voivodeship, which accounted for 48.94%

of all studied companies. Over 8% of the sample constituted companies from the Wielkopolskie voivodeship, over 7% from the Łódzkie region and over 6% were companies from the Dolnośląskie voivodeship. The least numerously represented was the Podkarpackie region (0.71%). The structure of the conducted research sample by the size of employment is showed in Table 1.

Table 1. The employment structure in the analysed companies

Number of employees	1 – 10	11 – 50	51 - 250	over 250	Total
Number of companies (%)	29 (20,57%)	53 (37,59%)	46 (32,63%)	13 (9,22%)	141 (100%)

Table 1 shows differences in terms of the number of people employed in the surveyed companies. Most of them were small companies (with 11 to 50 employees), constituting 37.59% of the surveyed sample, and medium-sized companies (with 51 to 250 employees) - constituting 32.63% of the surveyed sample.

3.2. Variables and Data Analysis

An appropriate course of any research study to a large extent depends on an adequately selected research methodology and data. This study relies on a questionnaire survey conducted among business owners and representatives of the highest management of SME companies operating on the Polish industrial construction market, and responsible for making strategic decisions, shaping and managing the investment processes within their companies. All respondents were assumed to have an appropriate level of knowledge in the area of economic, environmental and legal policies of the state. The selection of companies for the survey was carried out on the basis of a targeted sample, using a telephone interview method. The questionnaire formed the basis for posterior quantitative analysis and included a metric and a list of relevant questions. It consisted of 8 basic questions characterised by 122 variables and 5 metric questions. We studied the degree of agreement or disagreement with each question by applying a five-point Likert scale (1= strongly disagree, 5= strongly agree). Respondents were asked to tick off their answers in one of the categories. The survey was anonymous and impersonal.

4. Results

The results of the questionnaire survey were verified with the EFA method. Typically, this statistical method is employed to investigate internal relationships between a large number of

distinguished variables so as to describe these variables with a reduced number of hidden factors. The examined factors are initially unknown, and they are identified through analysis of the values of random variables. The analysis of the questionnaire results aims at determining which variables form such a hidden data structure and can be described with a relatively simple mathematical model. In our study, all statistical calculations were performed with the use of SPSS package.

As a first step, we checked the mutual correlation of the survey variables. As part of the EFA method, we applied a technique known as the Principal Axis Factor (PAF), and verified the results, with the use of the centroid method of factor extraction. The difference between these two methods is subtle, and it boils down to small differences in the values of individual factor loadings. To optimise the loadings we used the Varimax rotation.

As a next step, we verified reliability of the adopted scale of the survey results with the use of the alpha Cronbach index. Moreover, the knowledge of control indicators (KMO and Bartlett's) give us an important information on the quality of the data extracted from the analysed questionnaires. In this way, we check whether respondents' answers form a normal distribution and the correlation matrix for variables meets the criteria for the use of the EFA method. With the α-Cronbach index, it is possible to exclude those results that underestimate the reliability of the whole analysis. It is assumed that values above 0.7 indicate correct reliability of the scale (the higher the value the greater the reliability of the scale.). On the other hand, the results above 0.9 suggest some redundancy (i.e. repeatability) of the designed questions. The overall score of 0.914 indicates only a small degree of the repetitiveness of subsequent questions in the designed questionnaire. Analysis of the assigned Cronbach's alphas (for subsequent questions) gives us an answer as to whether it is necessary to modify the survey and exclude some of the designed questions. Since the variability of the Cronbach's alpha is small, there was no need to exclude any of the questions from the designed questionnaire. We employ the Bartlet's sphericity test and the Kaiser-Meier-Olkin (KMO) measure, which both indicate that EFA is in fact a justifiable method of the analysis in our case (see Table 2).

Table 2. Values of the Bartlett's and KMO test indices for all variables

Bartlett's test of sphericity	Chi-square	15597,115
	Degrees of freedom	7381
	Significance	0,000
KMO		0,537

On the other hand, in the case of EFA method, which is assumed to employ a larger set of general data than necessary, the link between the results is less pronounced. The Bartlett's test measures the value of the chi-square statistics and compares it with the top critical value for a given number of degrees of freedom. The null hypothesis is rejected if the chi-square is greater than the

critical value. In this case, Bartlett's test is rounded to the nearest 0.000 and is smaller than critical (0.050), meaning that EFA can be performed as a valid method of analysis (for our data).

The next step is a determination of eigenvalues. There should be as many of them as statistical variables (i.e. questionnaire questions). Unfortunately, due to singularity of the correlation matrix, meaning that its determinant is very small (i.e. of the order of 1e-40), it is necessary to apply certain measures to improve the situation. This can be achieved by adding a small value to the main diagonal and then by standardisation of the correlation matrix so that the values of the main diagonal are constantly equal to 1. However, such modification of the matrix worsens the accuracy of calculations. With the use of the principal factor analysis (PFA), however, we manage to obtain 22 non-negative eigenvalues (Table 3).

Table 3. Eigenvalues of the correlation matrix

		Eigenvalues		
		Method: Principal Factor Analysis		
	Eigenvalue	% of the total variance	Cumulative eigenvalue	Cumulative % of variance
1	21,06584	17,26708	21,06584	17,26708
2	7,08507	5,80743	28,15091	23,07451
3	5,33493	4,37289	33,48584	27,44741
4	3,85514	3,15995	37,34098	30,60736
5	3,44964	2,82757	40,79062	33,43493
6	3,24054	2,65618	44,03115	36,09111
7	2,68240	2,19869	46,71356	38,28980
8	2,37718	1,94850	49,09073	40,23830
9	2,15878	1,76949	51,24951	42,00779
10	1,99471	1,63501	53,24421	43,64280
11	1,86492	1,52862	55,10913	45,17142
12	1,74043	1,42658	56,84956	46,59800
13	1,66813	1,36732	58,51769	47,96532
14	1,60462	1,31526	60,12231	49,28058
15	1,52384	1,24905	61,64615	50,52963
16	1,49113	1,22224	63,13728	51,75187
17	1,33078	1,09080	64,46806	52,84267
18	1,28965	1,05709	65,75771	53,89976
19	1,25614	1,02962	67,01385	54,92938
20	1,14595	0,93930	68,11677	55,83341
21	1,07226	0,87890	69,18903	56,71232
22	1,04798	0,85900	70,23701	57,57132

The number of eigenvalues determines the maximum number of revealed factors in the analysis. As we can see in Table 3, the first factor is definitely dominant and explains more than 17% of the variance, the second only 6% and the third one 4%, respectively. Eigenvalues smaller than 1, i.e. those that describe at most one variable, are not taken into account. When selecting the number of

factors it is necessary to analyse the scree plot and the factor loadings. The scree plot (see Figure 1) confirms the dominance of one factor over other ones. The graph points to the selection of only 3 factors, however relatively high eigenvalues of subsequent factors indicate a necessity for more careful analysis of the factor loadings. The analysis of non-rotated factor loadings reveals the existence of a hidden data structure covering only 15 variables out of 122 survey variables.

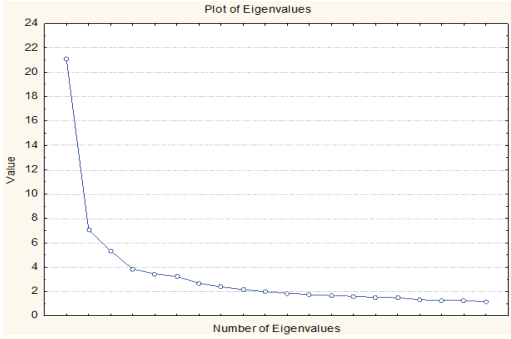

Figure 1. The Scree Plot

The rotated loadings' structure (e.g. with the use of Varimax rotation) indicates that factors 1, 2, 3, 4, 7 and 15 seem to be significant. The remaining factors are rejected since they are insignificant, and of little general character. After rotation and with slightly reduced loadings (to 0.6), the factor analysis indicates that there is a link between 52 variables and the overall number of 122 survey questions. Verification of the correctness of the results performed with the use of the centroid method yields an identical data structure. The centroid method slightly changes the order of factors. Again, for 52 relevant variables, we verify the reliability of scales. The exclusion of insignificant variables reduces the Cronbach's alpha slightly below 0.9, which allows to evaluate the accepted set of variables as optimal and not showing signs of redundancy. Similarly as before, the variability of the Cronbach's alpha is small and there is no clear necessity to eliminate additional variables from the analysis. The Kaiser-Meyer-Olkin (KMO) measure is well above the required minimum. Such a high value indicates that EFA method is very accurate and points to a high degree of reduction in the studied variables. After assessing the adequacy of the modified set of input data, we use the Principal Axis Factor (PAF) method to determine eigenvalues (for 52 variables). The correlation matrix determinant is very small (1e-20) and, therefore, we have to apply some mathematical procedures for its adjustment (i.e. diagonal modification and matrix standardisation). The results indicate a dominant role of the first eigenvalue with almost 40% share in the total variance. There are six factors which account for more than 83% of the total variance, however, the loadings for factor no. 6 proved to be too small to distinguish a specific variable. The Figure 2 shows the dominance of the first factor.

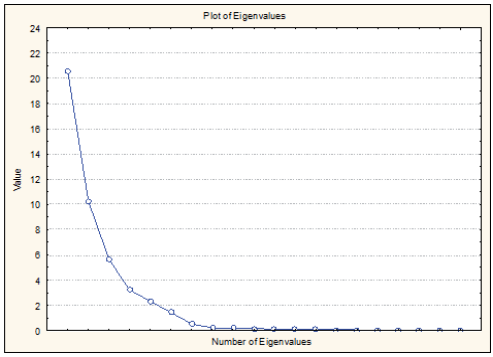

Figure 2. Plot of Eigenvalues

Table 4 shows the list of variables (with their names) grouped into 5 factors with their corresponding loadings.

Table 4. Variables selected by means of EFA method and sorted into groups constituting factors (F)

Var	Variable name	F1	F2	F3	F4	F5
3	Monitor the emergence of new technologies (availability of staff and their attitude towards new technologies; technical requirements defined by public administrations before obtaining permits for investments)	**0,761**				
65	Good and proven technology	**0,816**				
66	Availability of technologies in terms of their delivery time from the moment of placing an order	**0,809**				
68	Availability of technologies in terms of their reasonable time of delivery	**0,800**				
69	Availability of technology in terms of their warranty period	**0,763**				
70	Availability of technology in terms of their fast post-warranty service	**0,827**				
72	Use of modern design methods, e.g. BIM	**0,698**				
97	Corruption is at a low level	**0,611**				
11	Stability of the political system	**0,527**				
95	The political environment is secure, stable, effective and adapted to business needs	**0,592**				
96	The political system effectively responds to the economic challenges (i.e. government policy responds quickly and effectively to changes in the economy)	**0,528**				
1	Continuously monitor the national economic situation		**0,866**			
10	Stability of the economic system		**0,677**			
14	Predictability of state policies		**0,888**			
19	Access to bank guarantees to secure good performances of the agreements and completion of investment projects on time		**0,907**			
21	New taxes introduced sporadically		**0,798**			
22	New taxes introduced every 4 years		**0,865**			
24	New taxes introduced several times a year		**0,917**			
74	Average unemployment rate at which job finding takes 3 months		**0,929**			
76	Low inflation rate		**0,892**			
77	Positive GDP growth over 1 year		**0,891**			
78	Positive GDP growth over 1-2 years		**0,932**			
79	Positive GDP growth over 2-3 years		**0,936**			

Table 4 (continued)

12	Stability of the social system			**0,899**		
15	Availability of qualified managers			**0,855**		
16	Availability of personnel for executive positions			**0,810**		
85	Social stability of the country			**0,876**		
101	Substantive assessment of a candidate as the basic criterion for filling positions in public administration, State Treasury and utility companies			**0,824**		
105	Adequate pro-social state policy			**0,847**		
108	HR policy pursued by the Government, supporting the construction processes			**0,871**		
109	Working conditions			**0,855**		
110	Freedom of movement for workers			**0,877**		
111	Qualified workforce			**0,826**		
115	Visas issued to employees for the 3-year period			**0,826**		
116	Visas issued to employees for the 4-year period			**0,845**		
13	Stability of the legal system				**0,831**	
25	Stable, transparent and simplified tax law				**0,832**	
30	Easy-to-understand and well-ordered construction law				**0,822**	
32	Well-ordered construction code, prepared in a clear and unambiguous way				**0,846**	
35	Construction legislation changing several times a year				**0,844**	
36	Construction legislation changing once a year				**0,800**	
38	Construction legislation changing every 4 years				**0,681**	
39	Consistent legal provisions on investments processes				**0,817**	
43	Introduction of partnership agreements with self-government and state entities, and their honouring, which guarantees certainty of business transactions and, consequently, legal stability				**0,821**	
83	Long-term law and regulations stability (e.g. over decades)				**0,863**	
53	The time limit for issuing a decision on whether a given investment requires an environmental decision					**0,808**
55	Easy-to-understand, transparent and structured provisions of the Environmental Protection Act					**0,754**
56	Awareness of environmental legislation/procedures among managers					**0,730**
57	Simplified and well-structured environmental procedures					**0,716**
58	The procedure for obtaining a building permit, environmental decision or a water-legal permit, which should not take longer than 65 days (in accordance with the construction law)					**0,768**
62	Quick and effective environmental decision making					**0,796**
63	Comprehensible and transparent environmental decisions and legal acts that can be easily understood by employees (e.g. by foremen, facilities managers, works managers, site managers)					**0,796**

5. CONCLUSIONS

It is hard to find comprehensive studies addressing construction companies specialising in industrial construction. More to the point, there is lack of any inference that relates to operation of such companies and their managerial problems perceived from the perspective of their leaders. It is impossible to find complex studies for industrial construction sector, conducted systematically and updated from time to time. Its extremely complicated nature undoubtedly makes it difficult - and often even impossible - to use certain model simplifications so as to provide a relatively clear picture

of the reality. We can reasonably argue that the most appropriate perception, description, and presentation of the industrial construction sector requires the widest possible perspective of its examination. In other words, it necessitates reference to a holistic approach of a systemic and network nature [6]. Nevertheless, there is little empirical research on this subject. This might be caused by the fact that construction companies operate on a special type of market which is very complex, highly imperfect and heterogeneous, which means that it is difficult to study in scientific terms and it confronts scientists with many complex challenges. The imperfection of this market is a result of its anti-features. The construction market can be described as non-mobile, non-liquid, non-mass, non-homogeneous, non-obvious, uncertain, non-transparent, inflexible, not-immediate and ineffective [29].

Our study reveals some pivotal factors influencing management of investment processes by the companies operating in the area of industrial construction. These factors turned out to be the availability of technology in a stable political system, stability of the economic and tax systems, stable social system policies, stability and transparency of the legal system, and well-targeted environmental policies. The first factor *Availability of technologies in a stable political system* is represented by: monitoring the emergence of new technologies, good and proven technologies, the availability of technologies (which implies their appropriate delivery date, warranty term and an efficient post-warranty service), low impact of corruption, as well as the stability of the political system, effectively responding to economic challenges. The second factor *Stability of the economic and tax systems* is represented by the following variables: constant monitoring of the country's economic situation, stability of the economic system, predictability of state policies, access to bank guarantees to secure good implementation of construction contracts and timely completion of investment projects, new taxes introduced at appropriate time intervals, low average unemployment rate, low inflation rate or positive GDP growth. The third factor *Stable social system policy* addresses the availability of qualified managerial staff, availability of personnel for executive positions, substantive assessment of candidates for positions in public administration as well as in state-owned companies and municipal companies. It also takes into account an adequate pro-social policy of the state, appropriate personnel policy conducted by the government supporting construction processes, as well as appropriate working conditions and free movement of employees. The management of the investment processes in the area of industrial construction is also strongly influenced by the fourth factor, namely *the Stability and transparency of the legal system*. It is represented in the survey by such variables as: stable, transparent and simplified tax law applicable in the construction sector, structured construction code, clearly and unambiguously prepared, consistent legal regulations concerning investment

processes, or the introduction and compliance with partnership agreements with local government and state entities. The last significant factor (the fifth one), referred to as *the Environmental Policy* is represented by such variables as: clear and structured provisions of the Environmental Protection Act, term schedules for issuing environmental permits/decisions, knowledge of environmental regulations/legal procedures in the field of environmental protection on the part of management, simplified and properly formulated environmental protection procedures, as well as an appropriate procedure to obtain construction permits, environmental decisions or water and legal permits whose issuance according to the Construction Law shall not exceed 65 days, quick and effective environmental decisions and also comprehensible and transparent environmental decisions and legal acts.

All in all, the empirical study indicated 5 factors that are pivotal whose understanding is crucial for proper management of companies from the industrial construction sector. A key conclusion that can be drawn from out study is that an efficient management of investment projects in the industrial construction industry is significantly influenced by properly shaped and stable economic, environmental and legal policies of the state.

REFERENCES

1. A. O. Akinsola, K. F. Potts, I. Ndekugri, F.C. Harris, Identification and evaluation of factors influencing variations on building projects, International Journal of Project Management 15(4): 263-267, 1997.
2. J.I. Alzahrani, M.W. Emsley, The impact of contractors' attributes on construction project success: A post construction evaluation, International Journal of Project Management 31(2): 313-322, 2013.
3. S. Banihashemi, M.R. Hosseini, H. Golizadeh, S Sankaran, Critical success factors (CSFs) for integration of sustainability into construction project management practices in developing countries, International Journal of Project Management 35(6): 1103-1119, 2017.
4. W. Belassi, O.I. Tukel, A new framework for determining critical success/failure factors in projects, International journal of project management 14(3): 141-151, 1996.
5. A. Belout, Effects of human resource management on project effectiveness and success: toward a new conceptual framework, International journal of project management 16(1): 21-26, 1998.
6. M. Bryx, Rynek nieruchomości. System i funkcjonowanie, Wydawnictwo Poltext, 2006.
7. D. W. Chan, M.M. Kumaraswamy, A comparative study of causes of time overruns in Hong Kong construction projects, International Journal of project management 15(1): 55-63, 1997.
8. A.P. Chan, D. Scott, E.W. Lam, Framework of success criteria for design/build Projects, Journal of management in engineering 19(3): 120-128, 2002.
9. A.P. Chan, D. Scott, A.P. Chan, Factors affecting the success of a construction project, Journal of construction engineering and management 130(1): 153-155, 2004.
10. D.K.H. Chua, Y.C. Kog, P.K. Loh, Critical success factors for different project objectives, Journal of construction engineering and management 125(3): 142-150, 1999.
11. S.M. Dissanayaka, M.M. Kumaraswamy, Evaluation of factors affecting time and cost performance in Hong Kong building projects, Engineering, Construction and Architectural Management 6(3): 287-298, 1999.
12. H. Doloi, A. Sawhney, K.C. Iyer, S. Rentala, Analysing factors affecting delays in Indian construction projects, International journal of project management 30(4): 479-489, 2012.
13. J. Drzewiecka, J. Pasławski, Analiza zakłóceń procesów budowlanych, Budownictwo i Inżynieria Środowiska 2(1), 2011.

www.czasopisma.pan.pl PAN POLSKA AKADEMIA NAUK www.journals.pan.pl

14. L. Duy Nguyen, S.O. Ogunlana, D. Thi Xuan Lan, A study on project success factors in large construction projects in Vietnam, Engineering, Construction and Architectural Management 11(6): 404-413, 2004.
15. A. Dziadosz, M. Rejment, Wpływ zakłóceń na opóźnienia procesów budowlanych, Zeszyty Naukowe Politechniki Rzeszowskiej. Budownictwo i Inżynieria Środowiska 59(3), 2012.
16. A.S. Faridi, S.M. El-Sayegh, Significant factors causing delay in the UAE construction industry, Construction Management and Economics 24(11): 1167-1176, 2006.
17. S. Gunhan, D. Arditi, Factors affecting international construction, Journal of construction engineering and management 131(3): 273-282, 2005.
18. A.Q. Hassan, Don't burn that bridge, J. Manage. Eng. 11(6): 22, 1995.
19. D. G. Hubbard, Successful utility project management from lessons learned, Project Management Journal 21(3): 19-23, 1990.
20. N. Ibadov, J. Rosłon, Technology selection for construction project, with the use of fuzzy preference relation. Archives of Civil Engineering 61(3): 105-118, 2015.
21. E.J. Jaselskis, D.B. Ashley, Optimal allocation of project management resources for achieving success, Journal of Construction Engineering and Management 117(2): 321-340, 1991.
22. P.F. Kaming, P.O. Olomolaiye, G.D. Holt, F.C. Harris, Factors influencing construction time and cost overruns on high-rise projects in Indonesia, Construction Management & Economics 15(1): 83-94, 1997.
23. O. Kapliński, E. Zavadskas, Expert systems for construction processes, Statyba 3(12): 49-61, 1997.
24. O. Kapliński, A. Dziadosz, J.L Zioberski, Próba standaryzacji procesu zarządzania na etapie planowania i realizacji przedsięwzięć budowlanych, Zeszyty Naukowe Politechniki Rzeszowskiej. Budownictwo i Inżynieria Środowiska 58(3), 2011.
25. M.V. Książek, P. Nowak, S. Kivrak, et al., Computer-aided decision-making in construction project development, Journal of Civil Engineering and Management 21(2): 248-259, 2015.
26. M.M. Kumaraswamy, W.M. Chan, Factors facilitating faster construction, Journal of Construction Procurement 5(2): 88-98, 1999.
27. A. Leśniak, A. Plebankiewicz, Opóźnienia w robotach budowlanych, Zeszyty Naukowe WSOWL 3(1): 332-339, 2010.
28. H. Li, E.W. Cheng, P.E. Love, Partnering research in construction, Engineering, Construction and Architectural Management 7(1): 76-92, 2000.
29. A. Ludwiczak, What Is Not The Real Estate Market – Problems of Researchers, Finanse, Rynki Finansowe, Ubezpieczenia 1(85): 351-361, 2017.
30. B.A. Metri, TQM critical success factors for construction firms, Management: journal of contemporary management issues 10(2): 61-72, 2005.
31. NIK, Informacja o wynikach kontroli. Realizacja Inwestycji dotyczących budowy terminalu do odbioru skroplonego gazu ziemnego w Świnoujściu, KGP-4101-05-00/2013. Nr ewid. 187/2014/P/13/058/KGP.
32. P. Nowak, M. Skłodkowski, Multicriteria Analysis of Selected Building Thermal Insulation Solutions, Archives of Civil Engineering 62(3): 137-148, 2016.
33. J. Paslawski, Flexibility approach in the runway pavement using FLEMANCO method, Transport 23(4): 341-350, 2008.
34. J. Pasławski, T. Jastrząb, Elastyczność w zarządzaniu realizacją procesów budowlanych. Wydanie 437 z Rozprawy - Politechnika Poznańska. Poznań, Wydawnictwo Politechniki Poznańskiej, 2009.
35. Z. Pastuszak, J. Chadam, K. Phusavat, M. Polkowska, Strategic Project Management as Component of Innovative Organization, In Active Citizenship by Knowledge Management & Innovation: Proceedings of the Management. Knowledge and Learning International Conference, ToKnowPress, 2013.
36. J.B. Pocock, L.Y. Liu, M.K. Kim, Impact of management approach on project interaction and performance, Journal of construction engineering and management 123(4): 411-418, 1997.
37. J.B. Pocock, L.Y. Liu, W.H. Tang, Prediction of project performance based on degree of interaction, Journal of Management in Engineering 13(2): 63-76, 1997.
38. J.F. Rockart, The changing role of the information systems executive: A critical success factors perspective, Sloan Mgmt. Review 24(1): 3-1, 1982.
39. J. Rosłon, M. Seroka, Multicriteria selection of water insulation technology for foundation walls in an existing building, Archives of Civil Engineering 62(3): 167-176, 2016.
40. V. Sanvido, F. Grobler, K. Pariff, M. Guvents, M. Coyle, Critical success factors for construction projects, Journal of Construction Engineering and Management 118(1): 94-111, 1982.
41. J. Sobieraj, Impact of Spatial Planning on the Preinvestment Phase of the Development Process in the Residential Construction Field, Archives of Civil Engineering 63(2): 111-130, 2017.
42. A.D. Songer, K.R. Molenaar, Project characteristics for successful public-sector design-build, Journal of construction engineering and management 123(1):34-40, 1997.
43. G. Sweis, R. Sweis, A. Abu Hammad, A. Shboul, Delays in construction projects: The case of Jordan, International Journal of Project Management 26(1): 665-674, 2008.

www.czasopisma.pan.pl PAN POLSKA AKADEMIA NAUK www.journals.pan.pl

44. S.U.R. Toor, S.O. Ogunlana, Construction professionals' perception of critical success factors for large-scale construction projects, Construction Innovation 9(2): 149-167, 2009.
45. D.H. Walker, An investigation into construction time performance, Construction Management and Economics 13(3): 263-274, 1995.
46. D.H. Walker, M.W. Vines, Australian multi-unit residential project construction time performance factors. Engineering, Construction and Architectural Management 7(3): 278-284, 2000.
47. C.K. Wing, The ranking of construction management journals, Construction Management & Economics 15(4):387-398, 1997.

LIST OF FIGURES AND TABLES:

STRESZCZENIE:

W artykule podjęto temat wpływu polityki gospodarczej, środowiskowej i prawnej na zarządzanie procesem inwestycyjnym w polskim sektorze budownictwa przemysłowego. Po pierwsze, dokonano przeglądu literatury z zakresu zarządzania projektami budowlanymi. Po drugie, artykuł odpowiada na pytanie, od jakich czynników zależy skuteczne zarządzanie projektami w budownictwie przemysłowym, ze szczególnym uwzględnieniem 3 kluczowych obszarów, tj. czynników prawnych, ekonomicznych i środowiskowych. W tym celu przeprowadziliśmy badanie ankietowe wśród 158 przedstawicieli kadry zarządzającej MSP zaangażowanych w sektor budownictwa przemysłowego w Polsce. W kwestionariuszu uwzględniliśmy zmienne, które choć już wcześniej znajdowały swoje odniesienie w rozmaitych ujęciach teoretycznych, nigdy nie były jednak rozważane pod kątem praktyki. Wcześniejsze badania dotyczą bardziej szczegółowych zmiennych, które niekoniecznie dotykają specyfiki ekonomicznej, prawnej i środowiskowej. My wprowadzamy zestaw zmiennych, które mogą być wykorzystane do pomiaru efektywności zarządzania. Nasze badanie obejmuje 8 pytań podstawowych scharakteryzowanych przez 122 zmienne oraz 5 pytań metryczkowych. Wyniki badania ankietowego zostały zweryfikowane eksploracyjną analizą czynnikową (EFA), która pozwala na redukcję liczby zmiennych i koncentruje się na kluczowych czynnikach wpływających na efektywność zarządzania projektami budownictwa przemysłowego. W pracy staramy się również w sposób bardzo rzetelny i szczegółowy pokazać samą metodę badania EFA. Ta metoda badawcza pozwala na sprawdzenie wstępnej selekcji samych pytań w celu zaprojektowania odpowiedniego kwestionariusza.

Eksploracyjna analiza czynnikowa wskazuje na istnienie ukrytej struktury w badanym zjawisku. W przypadku naszego badania strukturę tę wyraża pięć czynników, na które składają się następujące zmienne: pierwszy czynnik charakteryzują zmienne (numery czynników w nawiasach - patrz tabela 4): monitorowanie powstawania nowych technologii (3), dobra i sprawdzona technologia (65), dostępność technologii pod względem czasu jej dostawy od

momentu złożenia zamówienia (66), dostępność technologii pod względem rozsądnego czasu jej dostawy (68), dostępność technologii pod względem okresu gwarancji (69), dostępność technologii pod względem szybkiego serwisu pogwarancyjnego (70), stosowanie nowoczesnych metod projektowania, np. BIM (72), korupcja na niskim poziomie (97), stabilność systemu politycznego (11), otoczenie polityczne, które jest bezpieczne, stabilne, efektywne i dostosowane do potrzeb biznesu (95), system polityczny skutecznie odpowiadający na wyzwania gospodarcze (96); drugi czynnik opisany jest za pomocą zmiennych: stałe monitorowanie sytuacji gospodarczej kraju (1), stabilność systemu gospodarczego (10), przewidywalność polityki państwa (14), dostęp do gwarancji bankowych zabezpieczających umowy i terminową realizację projektów inwestycyjnych (19), nowe podatki wprowadzane sporadycznie (21), nowe podatki wprowadzane co 4 lata (22), nowe podatki wprowadzane kilka razy w roku (24), średnia stopa bezrobocia, przy której znalezienie pracy trwa do 3 miesiący (74), niska stopa inflacji (76), dodatni wzrost PKB w ciągu jednego roku (77), dodatni wzrost PKB w ciągu 1-2 lat (78), dodatni wzrost PKB w ciągu 2-3 lat (79); trzeci czynnik składa się ze zmiennych: stabilność systemu społecznego (12), dostępność wykwalifikowanej kadry kierowniczej (15), dostępność kadry na stanowiska kierownicze (16), stabilność społeczna kraju (85), ocena merytoryczna kandydata jako podstawowe kryterium obsadzania stanowisk w administracji publicznej, Skarbie Państwa i spółkach użyteczności publicznej (101), odpowiednia prospołeczna polityka państwa (105), polityka kadrowa prowadzona przez rząd, wspierająca procesy budowlane (108), warunki pracy (109), swoboda przepływu pracowników (110), wykwalifikowana siła robocza (111), wizy wydawane pracownikom na okres 3 lat (115), wizy wydawane pracownikom na okres 4 lat (116); czwarty czynnik charakteryzuje się następującymi zmiennymi: stabilność systemu prawnego (13), stabilne, przejrzyste i uproszczone prawo podatkowe (25), łatwe do zrozumienia i dobrze uporządkowane prawo budowlane (30), dobrze uporządkowany kodeks budowlany, przygotowany w sposób jasny i jednoznaczny (32), przepisy budowlane zmieniające się kilka razy w roku (35), przepisy budowlane zmieniające się raz w roku (36), przepisy budowlane zmieniające się co 4 lata (38), spójne przepisy prawne dotyczące procesów inwestycyjnych (39), wprowadzenie umów partnerskich z podmiotami samorządowymi i państwowymi oraz ich honorowanie, co gwarantuje pewność obrotu gospodarczego, a w konsekwencji stabilność prawną (43), długookresowa stabilność prawa i regulacji (83); natomiast czynnik piąty składa się ze zmiennych: termin wydania decyzji o tym, czy dana inwestycja wymaga uzyskania decyzji środowiskowej (53), zrozumiałe, przejrzyste i uporządkowane przepisy ustawy *Prawo ochrony środowiska* (55), znajomość przepisów/procedur środowiskowych wśród kadry zarządzającej (56), uproszczone i dobrze zorganizowane procedury środowiskowe (57), procedura uzyskania pozwolenia na budowę, decyzji środowiskowej lub pozwolenia wodno-prawnego, która nie powinna trwać dłużej niż 65 dni (58), szybkie i skuteczne wydawanie decyzji środowiskowych (62), zrozumiałe i przejrzyste decyzje środowiskowe i akty prawne zrozumiałe dla pracowników (63).

Podsumowując, pięć wyodrębnionych przez nas czynników głównych wyjaśnia ponad 80% zmienności objętej zmiennymi ujętymi w tej strukturze EFA. Pierwszy czynnik wyjaśnia prawie 40% całkowitej wariancji i jest dominujący w analizowanej strukturze, drugi - ponad 19%, trzeci nieco ponad 10%, czwarty nieco ponad 6%, a piąty odpowiednio 4,43%. Struktury czynników zostały przez nas odpowiednio nazwane i są to w kolelejności: dostępność technologii w stabilnym systemie politycznym, stabilność systemu ekonomicznego i podatkowego, stabilna polityka systemu społecznego, stabilność i przejrzystość systemu prawnego oraz dobrze ukierunkowana polityka ekologiczna. Pierwszy czynnik reprezentowany jest przez: monitorowanie powstawania nowych technologii, dobre i sprawdzone technologie, dostępność technologii (co oznacza odpowiedni termin dostawy, okres gwarancji i sprawny serwis pogwarancyjny), niski wpływ korupcji, a także stabilność systemu politycznego, skutecznie reagującego na wyzwania gospodarcze. Drugi czynnik reprezentowany jest przez następujące zmienne: stały monitoring sytuacji gospodarczej kraju, stabilność systemu

gospodarczego, przewidywalność polityki państwa, dostęp do gwarancji bankowych zabezpieczających dobrą realizację kontraktów budowlanych i terminowe zakończenie projektów inwestycyjnych, nowe podatki wprowadzane w odpowiednich odstępach czasu, niska średnia stopa bezrobocia, niska stopa inflacji czy dodatnia dynamika PKB. Trzeci czynnik dotyczy dostępności wykwalifikowanej kadry menedżerskiej, dostępności kadr na stanowiska kierownicze, oceny merytorycznej kandydatów na stanowiska w administracji publicznej, a także w przedsiębiorstwach państwowych i spółkach komunalnych. Uwzględnia on również odpowiednią politykę prospołeczną państwa, właściwą politykę kadrową prowadzoną przez rząd, wspierającą procesy budowlane, a także odpowiednie warunki pracy i swobodę przepływu pracowników. Na zarządzanie procesami inwestycyjnymi w obszarze budownictwa przemysłowego duży wpływ ma również czynnik czwarty, reprezentowany w badaniu przez takie zmienne jak: stabilne, przejrzyste i uproszczone prawo podatkowe obowiązujące w sektorze budowlanym, uporządkowany kodeks budowlany, jasno i jednoznacznie przygotowane, spójne regulacje prawne dotyczące procesów inwestycyjnych, czy też wprowadzenie i przestrzeganie umów partnerskich z jednostkami samorządowymi i państwowymi. Ostatni istotny czynnik (piąty) reprezentowany jest przez takie zmienne jak: jasne i uporządkowane przepisy ustawy Prawo ochrony środowiska, harmonogramy wydawania pozwoleń/decyzji środowiskowych, znajomość przepisów/procedur prawnych z zakresu ochrony środowiska po stronie kadry zarządzającej, uproszczone i odpowiednio sformułowane procedury ochrony środowiska, a także odpowiednia procedura uzyskiwania pozwoleń na budowę, decyzji środowiskowych czy pozwoleń wodno-prawnych, których wydanie zgodnie z *Prawem budowlanym* nie powinno przekraczać 65 dni, szybkie i skuteczne decyzje środowiskowe, a także zrozumiałe i przejrzyste decyzje środowiskowe i akty prawne.

W opracowaniu omówiono 5 czynników i uważamy, że ich zrozumienie jest niezbędne do prawidłowego zarządzania projektami w zakresie budownictwa przemysłowego. Efektywne zarządzanie projektami inwestycyjnymi w budownictwie przemysłowym zależy od właściwie ukształtowanej i stabilnej polityki gospodarczej, ekologicznej i prawnej państwa. Jednak tylko niektóre z tych zmiennych zależą od samych zarządzających, a inne od decydentów sprawujących władzę, którzy decydują o gospodarce, ustawodawstwie czy kształtowaniu odpowiedniej polityki środowiskowej.

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