

Performance measurement embedded in organizational project management of general contractors operating in Poland

Eryk Głodziński

Abstract

Purpose – The purpose of this paper is to discuss contemporary knowledge relevant to the application of performance measurement (PMe) in the concept of OPM and to compare findings from a literature review with solutions recommended for utilization by managers from general contractors operating in Poland. There are few studies related to the mentioned topic, much fewer describing the geographical area of Eastern Europe.

Design/methodology/approach – Triangulation of research methods was selected. First literature review, next desk research and finally descriptive statistical analysis and interview were conducted. The research methods were applied in three steps whose beginnings overlapped and the mid-term findings from one study complemented others.

Findings – PMe should be focused on management and governance issues. Its evaluation is related to various organizational levels (permanent organization, portfolio, program, project, construction site and supply chain), most of them are under valued by practitioners. The conducted study pointed out that there are numerous supporting tools and measures applicable in organizational project management (OPM). The managers recommend combining various tools in one comprehensive OPM system, to limit multiple manual incorporations of the same data to the various databases. The managers call to increase the practical usefulness of researchers' proposals, to educate the construction managers in the application of complex performance systems and to promote portfolio thinking.

Originality/value – The comparison of performance measurement solutions proposed by academia with experience collected from Polish construction managers could support the better application of theoretical ideas in practice.

Keywords Performance, General contractor, Organizational project management

Paper type Research paper

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1. Introduction

Organizational project management (OPM) is a fast-growing concept of management that can be applied in project-based organizations (PBO). It is an integrative mechanism that becomes a mean of emphasizing its strategic implications for the integration of the structures, processes and practices of all project management-related activities throughout the organizational hierarchy or network in an effective manner (Sankaran *et al.*, 2017). OPM is a crucial field of study. However, organization aspects of PBOs (such as organizational strategy, incentive schemes and performance management systems) are relatively less developed in the project management literature while domination of research on single project management can be observed (Miterev *et al.*, 2017). A similar situation can be perceived among studies related to the construction industry, where issues relevant to OPM implementation and exploitation are often omitted.

One of the crucial assessment criteria of OPM functioning is performance (Yazici, 2018). It has to be measured and managed on various levels of an organization: project, program,

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project portfolio and permanent organization (PBO) (Gan and Chin, 2018). However, there is few studies linking performance on various OPM levels, especially describing indirect interconnectedness of the mentioned levels (Głodziński, 2019). The issue seems to be particularly important in construction industry, where often the influence of single project on portfolio and organization is significant. The significance results from project contract values which are in average higher than in other industries.

The main objectives of the paper are to discuss contemporary knowledge relevant to application of Performance Measurement (PMe) in the concept of OPM of construction industry and to compare it with solutions used by general contractors [1] operating in Poland. PMe is defined in the paper as the process (or processes) of: setting goals, developing a set of performance measures, monitoring, collecting, analyzing and interpreting data, status reporting, reviewing and acting to enhance performance. It is more technical control that should be complemented by social control constituting performance management (Biitci, 2015).

The selection of general contractors as research subjects arose from their significant role in economies. The share of the industry production in GDP of developed countries amounts to 6%–8% (Głodziński, 2017a). General contractors deliver products (construction objects) that are necessary to stabilize and/or increase production capacity of economies. Additionally, because of high complexity of functioning (Dubois and Gadde, 2002; Girmscheid, 2006), the organizations need proper performance measurement system.

The study will be limited to Poland, the country that is one of the crucial and fastest-growing economies in Europe. There is still a lack of the mentioned research in the geographic area. Considering the mentioned aims and assumptions, the following research questions were formulated:

RQ1. How PMe is embedded in OPM of general contractors?

RQ2. What kind of peculiarities of Polish construction market should be consider in design of PMe system of general contractors?

RQ3. What kind of recommendations related to PMe improvement are provided by Polish construction managers?

To answer the presented research questions following procedure – which is reflected in the sections of the paper – was applied:

- identification of the research context by explanation of author's understanding of the relation between PMe and OPM;
- indication of current state of the art related to utilization of PMe as an element of general contractors' OPM by systematic literature review;
- characterization of environment and peculiarities of general contractors operated in Poland by descriptive statistics of main macroeconomy indicators and desk research; and
- recognition of recommendations for improvement of PMe by interview with managers from Polish general contractors.

A detailed description of the mentioned research methods is presented in the next section of the paper.

2. Research methodology

The research procedure describes four methods, namely, systematic literature review, desk research, non-participant observation and interview. The methods were applied in

subsequent steps whose beginnings overlapped and the mid-term findings from one study complemented another.

Applying systematic literature review the author selected renowned scientific text databases, such as BazEkon, Ebsco, Elsevier, Google Scholar, Scopus, Web of Science and Wiley Online Library. The publication time period between 1990 and finally 2018 (till April) was adopted. At the beginning conjunction analysis of the following words was applied: performance gap, performance management, performance measurement, project controlling with organizational project management, project-based organization, project-driven organization, project-oriented organization. The words were searched in titles, keywords and abstracts. Next, two filters were applied focusing on the application in construction industry and the crucial components of PMe, such as frameworks, variables and indicators. The literature review led to presenting the knowledge overview related to OPM in construction industry and supported design of interview tool.

Descriptive statistics of historical and current economic data published by Polish Statistical Office were applied. Changes of annual added value and synthetic indicator published between 2004 and 2018 were analyzed. Comparison of construction industry production and total economy of Poland was conducted. Complementary method for description of construction industry volatility and explanation of changeability was desk research. It was focused mainly on reports describing past and current situation in the mentioned field. The publications of influential consulting companies published between 2016 and 2018, such as KPMG or DTT and information from construction companies were considered.

The last applied research method was semi-structured interview (with the standardized list of information sought). The research sample was a group of 11 deliberately selected managers, persons with extensive knowledge and considerable experience. They were top executive project and site managers. The interlocutors work or have worked previously in the largest Polish construction companies, such as Hochtief Poland, Polimex Mostostal and Warbud. The standardized list of information contained the issues related to design and development of PMe systems. The interlocutors were asked about recommendations related to: design, exploitation and development of PMe systems, including supporting tools, measures, organizational solutions. The interviews were conducted between 2016 and 2017. They were recorded and next repeatedly listened to. The coding using *in vivo* method was carried out. The codes and subcodes were related primarily to: qualitative and quantitative aspects of performance assessment, final and mid-term project assessment, project portfolio and company performance.

In Section 3 author's understanding of relation between PMe and OPM will be described. Findings from literature review related to general contractors will be summarized.

3. Performance measurement and organizational project management of general contractors – literature review

3.1 Performance measurement as a field of organizational project management

The understanding of OPM, as an integrative mechanism, is a complementary view to an organizational function which integrates various components among PBO. It includes governance, structure and processes (Aubry *et al.*, 2012) that organize the project activities on the project as well as at the wider organizational levels (Sankaran *et al.*, 2017). According to Project Management Institute OPM is “a strategy execution framework using portfolio, program and project management. It provides a framework that enables organizations to consistently and predictably deliver on organizational strategy, producing better performance, better results and a sustainable competitive advantage” (2017). It is a concept that seeks to integrate under one roof: project management, program management, portfolio management, project governance and company management to achieve strategic objectives of an organization. OPM has to consider and then optimize, in

some cases divergent, targets of temporary organizations (projects and programs) with permanent ones (PBO) (Jonas, 2010) to ensure strategic consistency of the entity (Kozarkiewicz, 2012). It is important because achieving successful performance at project level may have counterproductive effects on other levels (Sydow *et al.*, 2004). There is a need for collaborative performance management (Busi and Bititci, 2006) that combines the activities of project and non-project components of organization, considers holistic approach to control issues, including various levels of performance measurement related to management of projects or programs including portfolio, entity and governance. The mentioned integrations should lead to optimization of PBO through achieving organizational effectiveness, including efficiency, effectiveness or stakeholder satisfaction. The presented assessment criteria of OPM need operationalization in form of proper performance measurement system. For years a revolution in the field may have been observed (Neely, 1999; Bourne *et al.*, 2000; Frank and D'Souza, 2004; Bititci *et al.*, 2012) that is related to development of: financial and non-financial measures, various performance measurement models and frameworks, employees behavior patterns relevant to performance measurement.

3.2 Fields of performance measurement at general contractor

PME was defined in the paper as a process that together with qualitative analysis, planning procedures or cultural aspects is a part of performance management. Traditionally in construction industry, it consists of evaluation of product as a facility – fulfillment of requirements related to construction object, object approach – and creation of the product – excellence of actions during project life cycle, process approach (Kagioglou *et al.*, 2001). The presented approach is limited to projects and neglects other components of OPM. The reason was certainly lack of research describing the organizational aspects of all PBO. However, the literature review in most influential journals regarding project management in construction industry confirms findings outlined by Miterev *et al.* (2017) that organization aspects of PBOs are relatively less developed in the literature, in 21st century as well. There is no one paper that includes the name of organizational project management in title or abstract. However, the published papers, especially during past 10 years, have discussed comprehensively the issues relevant to various components of OPM, such as governance and portfolio, and few articles have been related to organizational performance.

Considering the presented state of the art it is necessary to propose a definition of the analyzed concept. Applying previously mentioned and other definitions (Sankaran *et al.*, 2017) OPM can be understood as a concept that, adopting holistic approach to an integration of all project management and governance-related fields, supports the general contractors in achieving sustainable development on various organization levels. The described perspective requires inter alia: framework following the company business model (PMI, 2017), project-oriented organizational culture (Fong and Kwok, 2009), satisfactory project maturity or keeping the balance between performance and organizational learning (Wong *et al.*, 2009). Organizational learning should be seen as a crucial competitive factor.

The functioning of general contractor, for example, frequent changes in scope of activities and product requirements, close daily collaboration with client/construction site neighbors or their representatives (Głodziński, 2017a) requires both consideration of traditional success criteria such as quality (Jimoh *et al.*, 2019) and new-century approaches such as company social responsibility (Loosemore and Lim, 2017; Huang *et al.*, 2012). Taking sustainable development approach, the following groups of measures can be recognized: financial, market, customer, stakeholders, internal business processes and learning and growth (Jin *et al.*, 2013). While comparing the conducted literature reviews, the limitations of performance measurement in general contractors can be observed. Division into project, organization and stakeholders' levels (Yang *et al.*, 2010) is too narrow and should be extended.

The mentioned in the paper integration of all project management and governance-related fields has to be realized on various non-project portfolio (indirectly related to construction projects) and project portfolio (directly related to construction projects) levels. The mentioned elements constitute the scope of performance (Figure 1). The designed framework demonstrates the relations between OPM and PMe that is the answer to the RQ1.

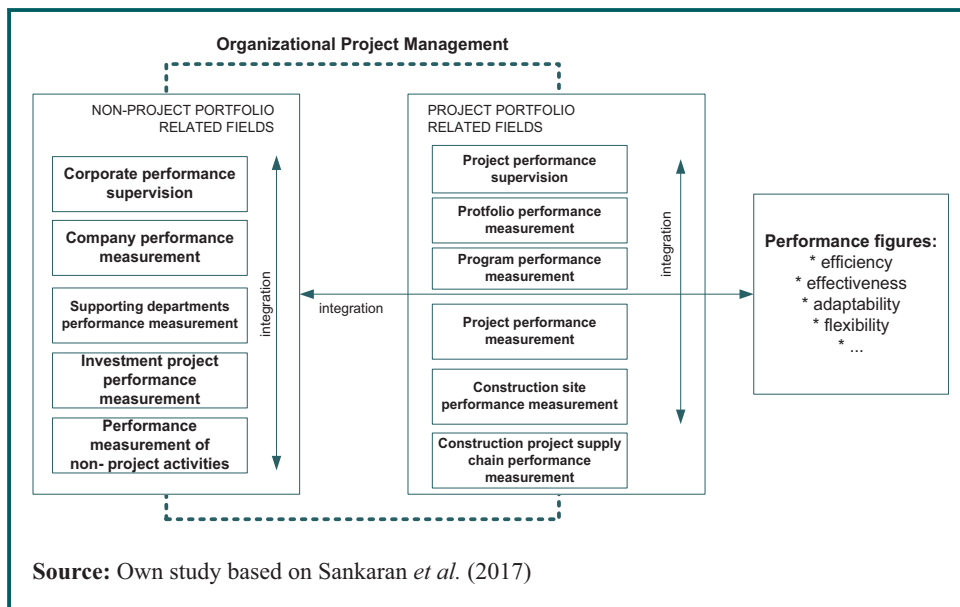
The presented fields reflect the crucial role of construction site and supply chain (Halman and Voordijk, 2012) that are less studied in management literature. It should be pointed out that site manager is responsible not only for poor manufacturing but also for safety of workflow (Styhre and Josephson, 2006) and comprehensive set of measures are to be implemented. The field related to subcontractors' and deliverers' performance measurement refers to project supply chain components. Its evaluation results from significance of subcontracting as a crucial part of general contractors' activity (Tan et al., 2017).

3.3 Frameworks and supporting performance measurement tools

One of the leading trends in construction management is the development of conceptual frameworks, methods and techniques, including supporting performance measurement. The examples of performance frameworks (presented chronologically):

- define metrics, methods, type of results and analyses in six perspectives: financial, customer, internal business, innovation and learning, project, supplier (Kagioglou et al., 2001);
- divide the assessment factors into performance driving and performance results, define measurement processes and propose measurement methods (Bassioni et al., 2005);
- consist of three levels of review (adaptation balance score card (BSC) perspectives, definition of common performance criteria, establishing a set of representative key performance indicators [KPIs]) (Yu et al., 2007);

Figure 1 Fields of performance measurement at general contractor



- base on DEA (data envelopment analysis) and evaluate seven metrics: schedule performance, cost performance, customer satisfaction, EMR (experience modification rating), profit, safety expenses, project management expenses (El-Mashaleh *et al.*, 2007);
- integrate BSC and SWOT and propose 30 KPIs (Luu *et al.*, 2008);
- base on DEA and evaluate six crucial KPIs: productivity, profitability, hanging invoice, accident frequency, sales growth (Horta *et al.*, 2010);
- base on BSC and consist of five perspectives: financial, customer, internal business, external business and innovation, is applied for assessment of supply chains in house building (Halman and Voordijk, 2012);
- base on BSC and consist of six dimensions: financial performance, market performance, customer perspective, stakeholders, internal business processes, learning and growth (Jin *et al.*, 2013);
- integrate efficiency assessment on project and organization levels, consider benefits for organization that result directly and indirectly from project execution (Głodziński, 2017a; Głodziński, 2018); and
- define crucial performance measures that are related to the time of project delivery, quality of works, clients' satisfaction and project profitability (Dziekoński *et al.*, 2018).

The mentioned frameworks have to be evaluated for further development (Linzalone and Schiuma, 2015).

The presented examples show that numerous researchers adapt well-known management supporting tools, such as BSC, DEA and SWOT. They often design very complex, comprehensive proposals that are results of qualitative or quantitative studies. The presented path of thinking partly reflects business needs because managers use well-known tools such as bar charts, Gantt charts, critical path method (CPM), program evaluation and review techniques, critical chain project management, last planner system (Ahmad *et al.*, 2016), earned value management (EVM), BSC (Kemps and Humphreys, 1992; Brandon, 2007), benchmarking, EFQM excellence model, KPIs (Beatham *et al.*, 2004). The literature overview demonstrates that KPIs are the crucial field of the studies. The second conclusion is that there is little research related to soft aspects of performance in construction industry. The third observation is that numerous papers discuss performance in construction considering the geographical context but few of them address the Polish market. The next section will discuss crucial examples of KPI presented in the literature.

3.4 Key performance indicators

The crucial components of the mentioned frameworks and supporting tools are measures. In 20th century, in the field of construction company assessment, prevailed the studies related to organizational effectiveness. Their main objective was to propose the measures that controlled current entity's achievements. In 21st century, the researchers started using the performance concept and developing components of EFQM excellence model with its KPIs. Their main objective was not only to propose the control measures but also to anticipate the future. Since then numerous studies have been conducted and scientific papers have been published. The examples of them (presented chronological) are:

- 14 most common variables of organizational effectiveness, such as level of subcontracting, attitude toward change, levels of: integration in services, adherence to rules and regulations, coordination, information flow, multiproject handling ability, planning, participation in decision making, goal setting, joint venturing, partnering, alliances, control or strengths of culture (Handa and Adas, 1996);

- numerous indicators (KPIs) grouped in seven areas, such as time, cost, quality, client satisfaction (related to product and service), business performance, health and safety ([Department of the Environment, Transport and the Regions, 2000](#));
- initial set of performance indicators (KPIs) divided in two groups, namely, qualitative (units per man-hour, cost per unit, total cost, on-time completion, resource management, quality control/rework, percent completed, earnings per man-hour, lost time accounting, punch list), qualitative (safety, turnover value and change, absenteeism, labor motivation) ([Cox et al., 2003](#));
- KPIs provided by selected organizations, such as CBPP and CIRA that control the past (defects, client satisfaction, predictability, time, cost, profitability, productivity, environment, employee satisfaction, integration of design with supply chain, risk, reuse of design, understanding client needs, design process, mobilization, final account, change, extension of time) and anticipate the future (safety, sickness, training, qualifications, communication, teamwork, innovation, staff turnover, investors in people, pay, traveling time, working hours, diversity) ([Beatham et al., 2004](#));
- 26 variables of organizational effectiveness grouped in seven areas: strategies, structure, culture, capabilities/resources, business environment, macroenvironment and general ([Dikmen et al., 2005](#));
- thirty KPIs divided into three groups, namely, economic (mainly related to project and its client), social (mainly related to employees), environmental (mainly related to natural environment) ([Furneaux et al., 2010](#));
- three general levels of KPIs: project (performance of: environment, human resources, technology, procurement, safety, design, cost, quality, time and additionally: post-occupancy evaluation, maintenance, thermal and air conditioning, participant's satisfaction), organization (financial and non-financial measures embedded in various management tools, such as balanced scorecard, EFQM excellence model, KPIs model), stakeholder (mainly based on project manager approach, including: team building, leadership, decision-making, mutuality and approachability, honesty and integrity, communication, learning, understanding and application, self-efficacy, external relations) ([Yang et al., 2010](#));
- KPIs divided into numerous categories, such as orders received, sales, cash flow, profitability, liquidity, cost, specialized project order, exploitation of new business, risk management, price quotes, public relations, environmental management, quality management, valuable business partners, operation efficiency, etc. ([Lee et al., 2011](#));
- ten top KPIs presented according to their importance: safety performance, cost performance, time performance, quality performance, client's satisfaction, effectiveness of communication, end user's satisfaction, effectiveness of planning, product functionality, environmental performance ([Yeung et al., 2012](#)); and
- KPIs defined in 10 groups of indicators: economic indicators, client satisfaction, contractor satisfaction, profitability, predictability of cost and time (related to design and construction), respect for people, environmental indicators (related to use of water, energy, vehicle, produce of waste), describing housing and non-housing clients (related to product, service, handover), consultants ([Glenigan, 2015](#)).

Analysis of the presented KPIs shows that there is a large list of the measures that are possible to applicate by general contractors. The fastest growth in research in the field has occurred in 21st century. Incremental changes can be observed during the mentioned period. No breakthrough of new KPIs was proposed. The changes were related to better description of the existing KPIs, including their division into more accurate ones (see client satisfaction vs client satisfaction from product/service). However, the quality of the

presented classifications and many others is not sufficient because in some cases there is a lack of comprehensiveness, exclusiveness or elements come from different assessment levels. There are measures and success criteria, success criteria and fields of assessment (Lee *et al.*, 2011). Some measures were grouped improperly (Cox *et al.*, 2003).

The mentioned classification related to three general levels (Yang *et al.*, 2010) reflects relations between project management and OPM sought in the paper in the highest degree. It proposes division into evaluation fields of: project, organization and stakeholders. Some doubts can arise in the last group that a number of elements can be assigned to the previous two and others not, such as influence on society or on natural environment.

3.5 Conclusions from literature review

The presented literature review confirms that performance management and measurement should follow on various levels of OPM. Nevertheless, two groups of them could be perceived:

1. project, program, portfolio and permanent organization (levels related to all types of PBOs); and
2. construction site and procurement (levels characteristic for construction industry).

The first group is comprehensive described in project management literature. The second one is focused mainly on issues related to: safety, material management or protection of natural environment. The researchers indicate that procurement performance is relevant to construction projects. Nevertheless, too little studies perceive construction site performance as measurement of technical progress, such as completion of work packages or buildings, preparation of technical equipment for construction site servicing. Especially important seems to be evaluation beyond economic and time-based indicators.

Summarizing the literature review related to frameworks and supporting performance measurement tools, numerous solutions proposed by various researchers can be observed. Nevertheless, most of them is focused on single project aspects (productivity, profitability, costs, quality, etc.) or organization level (process excellence, sales growth, learning and growth, etc.). Second observation from literature review is that BSC, DEA, excellence model, KPI and SWOT are predominant methods supporting performance management and measurement. Considering project environment peculiarities, tools such as CPM, Gantt or EVM seem to play a vital role in performance monitoring and controlling. Too little studies in the field of construction literature discuss performance issues related to project portfolio, for example, implication of project selection, resource relocation.

Summarizing the literature review related to KPI numerous publications describing assessment criteria were recognized. Most of them follow generic project success criteria, such as budget reliability, profitability, time schedule reliability, stakeholders' satisfaction, etc. The peculiarities of construction projects were identified by assessment of safety and environment protection issues. Nevertheless, too little attention was directed into additional construction project criteria and indirect project benefits or inputs that could be recognized on portfolio or permanent organizational level. Few studies discussed correlation between construction project performance and project context, thereof current market situation.

The presented findings were the assumptions to conduct the empirical studies that could demonstrate the relations between the construction industry and economy or indicate another KPIs proposals considering specificity of the construction industry in Poland.

4. Polish construction industry and Polish economy: the need of market key performance indicators design

The correlation between industry and economy can be observed especially during time of deep changes. The necessity of adaptable and flexible operation of entities verifies quality

of management and organization's environmental sensitivity. It could demonstrate existing correlations (economy vs industry vs organization). To indicate the mentioned relations, the period between 2004 and 2018 was evaluated in empirical study related to Polish market.

The first conclusion from descriptive statistical analysis is that the changeability of construction industry is bigger than the economy (Figures 2 and 3). The presented finding could not be confirmed by analysis of general synthetic indicator (Figure 4) that is treated as an early warning measure.

The second conclusion from the statistical analysis is related to time-lag between the economy and construction industry downturn/recovery. Between 2008 and 2012 European economies suffered fiscal-financial crisis that did not affect significantly the Polish economy. A few years ago, in 2012 the downturn hit Polish construction industry (Figure 2). It related to two main factors:

1. peculiarities of construction industry, where long-term projects are executed and that postpone the recession time in industry; and
2. mega projects and programs that are mainly connected with infrastructure and are financed from public sources (government budgets), which is a key proposal in Keynes theory (Głodziński, 2017b).

The recovery came within two next years. The presented fluctuation can be observed in longer period of time as well. The existing peaks are related to the growth of the economy and numerous investments (DTT, 2017):

Figure 2 Annual changes of added value in Poland (fix prices)

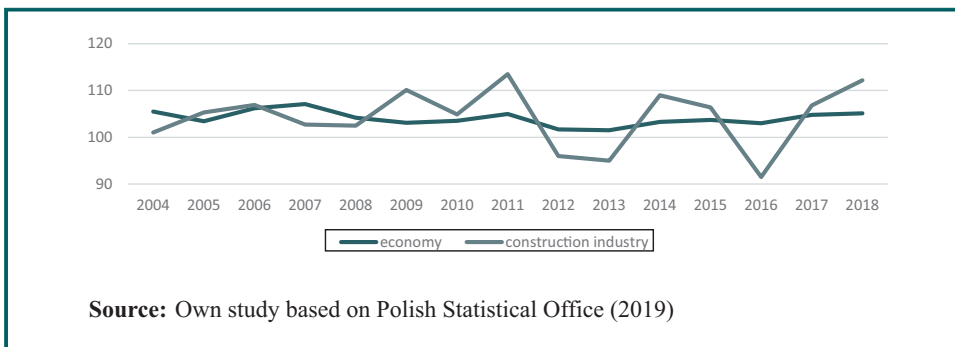
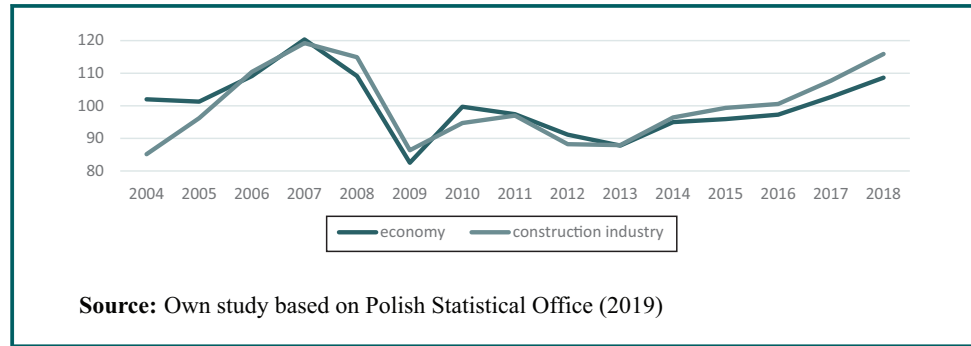


Figure 3 Annual changes of employed persons in Poland



Figure 4 Annual changes of general synthetic indicator in Poland



- 1996-2008 – mainly in residential and industrial sectors.
- 2009-2012 – mainly in infrastructure sector (roads, airports, stadiums).
- 2013-2018 – mainly in infrastructure (roads, railways), residential and office sectors.

Since 2006 the mentioned investments have been supported by EU funds and expansive monetary policy that caused an increase of citizen mortgages. It could be the third conclusion from the study. The construction industry in Poland is highly sensitive to level of government expenses.

Frequent peaks and slowdowns are the crucial macroeconomics factors affecting the industry instability. From performance point of view, it means significant fluctuation in companies' turnover, work is done secured or results. The median of net profit margin of the largest general contractors amounted to 0% in 2012, 2.8% in 2014 and 1.33% in 2017. The presented data advocates economic instability of the industry (DTT, 2013; DTT, 2016; DTT, 2017).

Searching the reasons of volatility various factors can be indicated. Till the end of the first decade of XXI century one could observed lack of competences and experience in execution of mega infrastructural investments (KPMG, 2016). Huge amounts of expenses in construction investment, supported by EU funds, caused strong competition in the market. Periodically unexpected inflation of manufacturing costs (mainly labor, material and subcontractor) negatively affected companies results. For managers vital issues were volatility of cash streams from one to another sectors and concentration of government investments in selected years (Głodziński, 2016). The first issue was related to the need of entering new construction segments (redefinition of organizational structure of PBO, development of new competences, expanding the machinery park, etc.). The latter one increased the competition, cost of financing and caused the gaps in labor force.

The mentioned changeability results from various aspects that should be consider in design of PMe system of general contractor (RQ2). The crucial aspects are related to: high level of general contractors' adaptability and flexibility, long period of construction project life cycle, the need of products (buildings) optimization during all stages of project life cycle or unpredictable stakeholders' behavior. The question is if the project construction managers consider the mentioned conditions? The answer was searched in conducted interviews.

5. Performance measurement in opinion of managers operating in Poland

5.1 Design of interview

Semi-structured interview used the standardized list of information sought. It based on performance fields identified during literature review (Table 1) that should be applied in

Table 1 Crucial findings from interviews

<i>Performance field</i>	<i>No. of interlocutor</i>	<i>Recommendations for improvement of PMe</i>
Company governance	1, 9	<ul style="list-style-type: none"> ● transparency in communication with the company stakeholders ● trust in company managers
Company management	2, 7, 9	<ul style="list-style-type: none"> ● labor management as the most important performance factor ● top-down creation of organizational culture supporting performance ● application of KPIs related to company, such as revenue, economic result, cash flow, key client satisfaction, labor satisfaction, labor development ● proper application of ICT tools supporting PMe on PBO level (software supported company integration)
Supporting department management	2, 3, 5	<ul style="list-style-type: none"> ● significant role of procurement in performance achievement ● central support of standardized materials purchase, such as concrete, steel and sand ● central support of direct stakeholders in sustainability evaluation
Investment project management	–	–
Non-project activities management	–	–
Project governance	3, 4, 5, 9	<ul style="list-style-type: none"> ● support of project labor by company management as the top factor of performance ● transparency in communication with the client ● lean reporting ● trust in project manager
Project portfolio management	1, 2, 7, 8	<ul style="list-style-type: none"> ● tender stage as a crucial driver of PLC ● designing the strategy only in selected segments ● concentration on building relations with clients ● geographical project segmentation due to labor needs ● wide competences of project managers across related segments due to market volatility ● proper resource prioritization ● proper application of ICT tools supporting PMe on project portfolio level (software supporting analysis of projects results) ● application of KPIs related to portfolio, such as tender effectiveness, work done secured, economic result, cash flow, resource utilization
Program portfolio management	–	–
Project management	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	<ul style="list-style-type: none"> ● no algorithm for design of construction project performance management ● application of KPIs related to project, such as work done, percentage of completion, economic result of the project, project backlog, invoicing, client satisfaction, satisfaction of other project stakeholders, delivered value for the client ● balance between financial and non-financial measures ● budgeting the top process supporting performance evaluation ● focusing more on project team achievement than on project itself ● creativity measurement of individual project team members ● building relations inside project team as important as proper PMe ● more effort on risk measurement ● proper application of ICT tools supporting PMe on project level (software supporting cost calculation, scheduling, project accounting, etc.)
Construction site management	2, 4, 8, 9, 10	<ul style="list-style-type: none"> ● application of Building Information Modeling as the biggest advantage in near future ● proper monitoring of quantity, thereof preparing reliable and up-to-date bill of quantity ● scheduling the top process supporting performance achievement ● milestones as the most important construction site measurements ● balance between technical and non-technical measures ● systematic preparation of technical documentation and evaluation of its quality ● regular meetings of the project team conducted in supportive atmosphere ● application of KPIs related to construction site, such as keeping deadlines, percentage of completion related to selected scope of works, product quality, safety ratio, influence on natural environment
Supply chain management (SchM)	1, 5, 6	<ul style="list-style-type: none"> ● focus on performance in subcontracting ● focus on subcontractor motivation ● negotiation skills among the top competences in SchM ● application of the concept “back to back” in contracts with the entities

Source: Own study

OPM system. The list of information was a sign of direction in which an interview should follow. The sequence of information was not maintained because the interviewer tried to avoid restricting the interlocutors in their statements. The forecasted minimum time of one interview was set at about one hour.

5.2 Research results and discussion

The conducted qualitative study led to identification of various recommendations related to design or improvement in existing PMe systems. The information from interview was grouped into performance fields (Table 1).

Most of the selected performance fields were fulfilled by the interlocutors' answers. The presented recommendations for design of PMe improvements overlap most of the findings described in literature. The following similarities can be observed:

- there are numerous methods, techniques and measures supporting performance measurement;
- KPIs are the crucial method applied by general contractors;
- there is a need to combine qualitative and quantitative evaluation of performance; and
- there are a few solutions sufficient for academia and practitioners, that considering the complexity of performance from PBO point of view.

The studies demonstrated also some differences or novelties. The empirical research indicated that:

- the PMe solutions should be complex, especially combine various functionalities (time scheduling, cost and income calculation, cash flow monitoring, monitoring of client satisfaction, etc.) in one system to avoid multiply manual incorporation of the same data to various databases;
- complex PMe solutions means to collect in one system and utilize data of various nature (economic and non-economic), such as describing market situation (GDP growth or inflation predictions, etc.) and monitoring and control of business partners (especially supply chain subjects) sustainability;
- complex PMe solutions means to collect knowledge and utilize lesson learned approach;
- there is limited number of KPIs that are accepted by practitioners who are focused on simple solutions (easy to adapt, measure or interpret result);
- practitioners do not use often complex, multicriteria measures; nevertheless, they are open to academia proposals presented in an understandable form;
- practitioners perceive a significant role of BIM in performance management; and
- practitioners do not recommend utilization of complex methods, such as DEA or BSC to a wider extent.

Summarizing, peculiarities of Polish construction market are related to monitoring, combining and controlling of volatile market conditions (indicators describing economy and sustainability of business partners) with project performance (inputs and outputs direct and indirect related to project). Volatility of market conditions was confirmed by analysis of macroeconomic indicators, such as added value, employment rate and by previously conducted empirical studies. The crucial threats connected with the mentioned conditions are related to knowledge and experience collecting and sharing. The central problem is to design an effective lesson learned system. From another side, the study pointed out that most of the used by Polish general contractors PMe solutions have a universal character.

Justification of state of the art can be the fact that numerous large general contractors that have been studied are subsidiaries of the international construction companies, such as Ferrovial from Spain, Hochtief from Germany or Vinci from France. In such cases, the Polish subsidiaries utilize the PMe solutions designed and exploited by mother companies that are adapted to the national legal regulations, such as accounting, public tender.

6. Conclusions

The paper outlines three general findings from conducted research that were highlighted in research questions.

First, it was proposed application of the generic OPM framework designed by [Sankaran et al. \(2017\)](#) for purposes of performance measurement of general contractors ([Figure 1](#)). The novelty of the described proposal is the split of performance measurement system into eleven fields that can be grouped as follows:

- generic related to management and measurement on following levels: organization, project portfolio, program and project;
- generic related to governance and measurement of project and non-project operations; and
- specific related to management and measurement of: construction site, construction project supply chain and operations of service departments supporting construction projects (tender, procurement, controlling and risk management, etc.).

The presented framework can be valuable for practitioners by designing or improving PMe systems. The proposal focuses on necessity of combining various methods and techniques supporting performance evaluation, thereof definition of measures (KPIs) supporting monitoring and assessment in all selected fields. The conducted literature review highlighted that numerous supporting tools and measures are applicable in OPM. Their selection and adaptation to the context of operation of general contractors are the crucial issues.

Second, it was demonstrated that the Polish construction market is very sensitive to economy. The mentioned feature requires management tools supporting companies' adaptability and flexibility. The paper suggests that the existing methods, techniques and measures of performance evaluation should be selected considering the organization internal and external context. It is necessary to monitor and control simultaneously project performance and market conditions, single project performance and project portfolio performance, project performance and construction site performance, construction site performance and subcontractor performance. It is recommended to combine in one system performance assessments created for management and governance purposes.

Third, Polish construction managers perceive the existing large basket of instruments supporting performance measurement. Nevertheless, the interlocutors were concentrated mainly on technical and economic aspects of performance. The interview indicated that performance should not be limited to the project execution stage. Thereby it is recommended using the same set of KPIs both in tender and execution stage. The interlocutors pointed out that there is a need to increase the practical usefulness of researchers' proposals, to educate the construction managers in application of complex performance systems and to promote portfolio thinking. The managers propose researchers to focus more on searching of complex solutions (e.g. software) that would make possible sharing data in various economic and non-economic fields.

The paper presents an expletory study into the application of academic knowledge into practice of general contractors and related to that recommendations of practitioners. The evidence from the study points toward the idea that research in the field of performance measurement should be targeted simultaneously into simplification of the proposed solutions and integration measures of various nature (economic with non-economic, project

with portfolio, time-related with cost-related, etc.). It follows the crucial assumptions of OPM. The presented findings suggest opportunities for future research.

Note

1. *General contractor* is the entity that is responsible for comprehensive realization of construction project. Its key target is to deliver the product contracted with the client. It orders some scopes of works from subcontractors, uses designers or deliverers from various technical fields.

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