

Article

# Monitoring and Control in Program Management as Effectiveness Drivers in Polish Energy Sector. Diagnosis and Directions of Improvement

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**Abstract:** The activity of enterprises in the energy sector is complicated by the complexity and capital intensity of the resources and processes used. In the current market conditions, an additional challenge is the implementation of sustainable development, including, in particular, environmental and social goals. These circumstances require efficient and effective management, and this is possible, inter alia, thanks to the use of the project management. However, this approach requires not only implementation, but also professional monitoring and control, which is considered and diagnosed in this article. The purpose of this article is to: (a) verify the programme management areas subject to the monitoring and control process; (b) identify and evaluate the effectiveness of the most frequently used methods in the process of monitoring and control of the programme implementation. A qualitative study using a structured interview was conducted among 21 experts involved in the implementation of programmes from the energy sector. The authors found that energy companies monitor and control programmes in key, but traditional areas such as lead times, costs, risks and benefits. They less often refer to 'soft' areas of management, such as: work, communication or quality. In terms of the monitoring and control methodology used, significant discrepancies were found between the methods considered effective and those that are most often used in practice. This requires decisive improvement actions. At the same time, it is worth emphasising that the majority of managers prefer compact and quantifiable forms of monitoring and control, such as: earned value method, Gantt chart and comparing plans to results in individual areas. The sector also lacks a systemic approach to programme management, which should be distinguished from single project management, which is why the authors presented their own approach to solving this problem.

**Keywords:** management in energy sector; Polish energy enterprises; project and program management; monitoring and control process



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## 1. Introduction

For many years, enterprises from the energy sector have been facing many strategic challenges resulting from internal and external conditions [1–3]. Their activities are technologically complex and capital-intensive [4–7]. It also requires the implementation of many innovative solutions in response to the growing requirements of institutional and individual customers. Currently, energy producers are additionally required to take a responsible approach to environmental protection and a rational use of raw materials [8–10]. The growing requirements of local and regional climate policies force a strategic reorientation of energy companies and the transformation of the energy sector aimed at maximising efficiency and effectiveness, as well as respecting the principles of sustainable development [11,12].

The above circumstances require special management skills and a careful selection of management methods and techniques, which is why the design approach works perfectly in energy companies. It enables the separation of specific tasks, which are entrusted to specific teams equipped with the necessary means and resources [13–15]. The above

mentioned complexity of the activities of energy enterprises means that these entities simultaneously implement several, and sometimes even several dozen projects of various nature. In order to systematise them internally, programmes consisting of several/a dozen projects are created [16–20]. At the same time, both the projects and programmes—despite the thematic heterogeneity—are intended to contribute to the effective implementation of energy enterprise strategies. In order for this task to be fully performed, it is necessary to constantly monitor and control the effects achieved at the level of individual projects and the entire programme. However, it should be clearly emphasised that the results of monitoring and control are not only a source of information about the state of project or programme implementation, but most of all a starting point for carrying out corrections and improvements. Therefore, these activities can be an important determinant of the effectiveness of the strategy implementation in the energy sector.

However, for this to happen, it is necessary to separate and consistently implement monitoring and control not only at the level of a single project, but also, and perhaps even primarily, at the level of the entire programme. Such a recommendation results from the mentioned thematic diversity of projects, and thus the possibility of undesirable results of their joint impact on the strategic goals of the enterprise.

Considering the conditions described above, the main goal of this article is to diagnose the state of monitoring and control in programme management in energy enterprises. As part of this diagnosis, the authors seek answers to the following research problems:

1. How is the monitoring and control of programmes covering individual projects carried out in energy enterprises?
2. What methods of project monitoring and control are most often used, and which of them do managers perceive as the most effective?
3. How can the monitoring and control system of programmes in the energy sector be improved?

Obtaining answers to the above research questions is the starting point for the development of recommendations aimed at the improvement of monitoring and control in the programmes of energy enterprises. The obtained answers make it possible to meet the key challenges facing the energy sector. Firstly, they improve operational and strategic management. As a result, energy companies can focus on a broader spectrum of activities and become more effective. Secondly, the results create an opportunity to increase the soft skills of managers, which is of particular importance in traditional sectors due to managers' tendency to prioritize technical and economic aspects of enterprise management. Additionally, thirdly, the improved management of programs and projects will allow Polish energy enterprises to make better use of EU funds, including in particular those related to the Just Transition Fund.

The obtained diagnostic results provide knowledge on the course of monitoring and control in the management of programmes in energy enterprises. Studies in this area have been conducted, and their results let us diagnose existing problems and irregularities in this area. They also enable the development of guidelines aimed at solving existing problems and eliminating identified irregularities, which has a positive impact on the effectiveness of the implementation of the objectives of projects, programmes, and, consequently, the strategies of energy enterprises.

## 2. Literature Review

### 2.1. Programmification as a Result of Increasing the Project Management Complexity

Project management in modern companies no longer encompasses only the efficient implementation of individual projects [21], but more importantly, problems concerning resource planning and allocation [22,23], relationships occurring between projects [24], knowledge development and exchange [25,26], as well as linking projects to each other and to the organization's strategy [27,28]. In a nutshell, the approach to project management ceased to be purely operational and moved to the level of strategic management [29,30]. The growing importance of projects in the activities of enterprises is referred to in the

literature as projectification. Ch. Midler, in 1995, with the example of Renault, observed the phenomenon of projectification through a gradual increase in the intensity of project activities, which resulted in changes in the structure, management and efficiency [31]. In 2006, H. Maylor et al. developed the concept of projectification and coined the term programmification [32]. It boils down to the statement that the main tool for transforming an organization or a strategic change concerning the organization is not only individual projects, but coordinated groups of projects in the form of programs or portfolios [33,34].

Current literature shows that many people, companies or organizations are aware of what projects are [35], know how to plan them, implement them, and provide their effects and results. Nevertheless, project management is an area widely known and understood [36]. In contrast, the term “program” is still enigmatic [37,38] and most often used interchangeably with the term project [39,40]. Consequently, companies and organizations manage programs just like projects, which usually leads to the undertaking failing to meet the required expectations [41,42].

There is a plethora of definitions of the term program in the literature [38,43,44]. Table 1 shows the program definitions in international standards for program management [45–47].

**Table 1.** Program definition according to international standards.

International Project Management Organizations		
PMI (Project Management Institute)	OGC (Office of Government Commerce)	IPMA (International Project Management Association)
<i>“is defined as a group of interrelated projects, lower-tier programs (sub-programs) and activities concerning the whole program, managed in a coordinated way, thereby achieving benefits that managing each of these components in isolation would not provide.” [48]</i>	<i>“a temporary, flexible organizational structure established to coordinate, direct and oversee the implementation of a group of related projects and activities to deliver results and benefits related to the strategic objectives of the business.” [49]</i>	<i>“is created to achieve a strategic objective. A program is a temporary structure of interdependent program components, managed in a coordinated way to enable change and deliver benefits.” [50]</i>

Source: own elab.

Thus, a program can generally be understood as a group of interrelated projects [32,51] that share a common pool of resources [33,52], aim to achieve benefits in a coordinated way [53,54] and are managed by the program organization to achieve one or a set of strategic objectives [55,56]. However, project management consists in carrying out deliberate planning and controlling the tasks included in the project and making an appropriate allocation of funds assigned for implementation, using appropriate techniques and methods [57,58]. The aim of the program is to produce results and benefits related to the strategic objectives of the organization [59]. From the point of view of program management results, the effects delivered by the projects are only the path to what the program manages. The program “looks” from the perspective of achieving a specific state, benefit, thanks to the use of results, effects of projects [44]. The result of the program can be achieved in various ways. The program’s focus is the implementation of benefits thanks to the achieved result, and not only the delivery of effects [48,49]. It should be emphasized, that program management does not replace project management, which should be effectively implemented at its own level [33].

## 2.2. Sustainability and the Life Cycle as New Challenges in Project and Programme Management

The idea of programme/project programme management is an ideal solution for large enterprises that carry out many complex and diverse tasks, therefore it is willingly and often used in the energy sector. In this way, it is not only possible to coordinate numerous investment projects, but also closed R&D projects that strengthen the innovativeness of energy enterprises. Currently, many of them refer to eco-innovations [60–63], which are a direct response to the mentioned need to adapt the energy sector to the principles of sustainable development and corporate social responsibility.

Optimization in the context of sustainable development should not only cover issues relating to the reduction of environmental change [64,65], but also changes in the paradigm

of life-cycle thinking in both a single project and a program [66,67]. According to the GPM P5 Standard for Sustainability in Project Management elements of a program should be used in future projects [68,69]. Given that in many industries the approach changes, especially in ones that are constantly interfering directly with the environment [70–72], and changes are being made through projects, programs and portfolios, sustainability is crucial for program management [73].

The main objective of the P5 standard is to identify potential impacts on sustainable development (both positive and negative), which can be analysed and presented to top management, and as result favouring informed decision-making and efficient resources use [70]. In addition, the P5 standard allows projects and programs to be directly adapted to the organization's sustainability objectives, as a result of the emphasis on the potential effects of the project [74] and their environmental impacts [68]. Although the P5 standard itself is mainly focused on projects, as the authors point out, it is scalable to the program and portfolio level [70].

Efficient and effective monitoring and control approaches and decisions ensure that the program's sustainable objectives are reached [75,76]. This also translates into a reduction in capital expenditure, maintaining standards in projects, etc. [77,78]. Monitoring and control are considered an integral part of the decision-making process and not just an additional technical analysis. Sustainable program management can be understood as planning, monitoring, and controlling the implementation of the entire program as well as projects launched as part of its implementation, support processes, taking into account the environmental, economic, and social aspects of the life cycle of resources, effects and results of individual projects, aimed at achieving benefits for stakeholders and empowering them in a transparent, ethical manner, including the active participation of stakeholders [70,79].

A program has its own life cycle, although it is more complicated than in the case of a project, it still clearly defines the structure and the order in which the program should be executed. The project life cycle is largely focused on the outcomes the project delivers [36]. In the case of the program, the delivery of benefits becomes the priority. During the program life cycle, projects are initiated, implemented and closed, and the program constitutes the so-called umbrella over projects [80]. When performing a comparative analysis of the different phases of the program life cycle in the SPM [48] and MSP [49] standard, several similarities as well as differences can be highlighted:

- The pre-program phase is the same as the program identification phase;
- The program establishment phase and the processes involved in setting up the technical infrastructure included constitute the program definition phase;
- The phase of setting up the governance structure and the technical infrastructure contain processes that overlap with the tranche management phase;
- The capacity delivery phase and the benefit implementation phase are related;
- The program closing phase and the program closing stage are the same.

Although the life cycle of the SMP standard and the MSP standard are different at first sight, the constituent processes of the different phases or stages are similar, although some of them may differ slightly in their names. The program life cycle proposed by the IPMA standard [50] describing individual competence guidelines combines both the MSP approach and the PMI standard. It consists of six stages concerning: Identifying, defining, establishing and closing the program, which are cascaded, and managing the program and delivering benefits, which are implemented adaptively. Generalizing the life cycle of a program within the framework of the standards described, it does not have significant differences. Furthermore, the phases/stages indicated are identical or overlapping in the form of the processes involved. According to all the standards discussed, programs are implemented in phases [81,82]. In these phases, there is a gradual transformation of the strategic vision into concrete business benefits [33,83]. However, it is important to note that the structure of the phases may vary depending on the type of program itself, e.g., programs in the infrastructure industry [84,85] differ significantly from programs for implementing process improvements in organizations [86,87]. All the standards in

question present the program life cycle at a high level of generality, thus presenting the typical phases for program implementation.

Appropriate program management decision-making based on reliable data and information requires an effective program monitoring and control process [48]. At the program level, monitoring and control consist in obtaining and consolidating data on the status and progress from individual projects or program packages (non-project tasks). Monitoring also involves linking the program to the management structure to provide the organization with a clear picture of current and future benefits [88]. Effective reporting of program results supports appropriate preventive and corrective actions at the program level [76], especially in the benefit delivery phase of the program life cycle [89]. Moreover, these corrective actions may also result from management oversight, especially when programs require statutory compliance with external and government agencies. In the case of programs, Integrated Change Control includes redirection or modification of the program to suit needs, based on feedback from individual projects or work packages [90]. Moreover, changes may be due to the program's links to other undertakings or external influences due to government regulation, market changes, economics or political issues [33].

Bearing in mind the benefits related to the proper use of programme management, in a further part of the study, the considerations and research were narrowed down to the methodology and pragmatics of implementing projects and programmes in energy sector enterprises, trying to find out to what extent they correspond to the theoretical recommendations and standards postulated in the literature on the subject.

### 3. Materials and Methods

Using an inductive approach and structured interviews, a critical realism perspective was adopted. Findings from the literature review covering program management in the context of its life cycle [33,80–83] and processes [45,46,61–63,84,88,90] indicate a paucity of methodological approaches to program monitoring and control processes. In addition, the use in practice of a program management approach like a large complex project is emphasized [27,39]. The research undertaken in this paper aims to provide:

1. Verification of program management areas subject to monitoring and control process.
2. Identification of the most commonly used methods, techniques and tools in the process of monitoring and controlling program implementation with a division into particular areas.
3. Evaluation of the effectiveness of identified methods, techniques and tools in the context of the program monitoring and control areas.

In order to answer the stated research objectives, the research was conducted by means of an expert structured interview, based on a focus group of practitioners involved in program management in the energy sector.

The first set of questions was designed to collect data on the experts participating in the survey. In addition, a qualitative study was conducted among practitioners who were members of the international project management organization (International Project Management Association IPMA Poland).

The sampling method used in the interviews is theoretical selection, which means that the experts should be those who are most familiar with the topics covered by the study. In contrast, the number of interviews is determined by theoretical saturation [51,91]. The research was carried out between July and September 2020 in Polish energy companies. In order to obtain the widest possible research sample, the invitation to participate in the research, in the form of a letter of intent, was mainly addressed to enterprises by means of direct contacts (meetings or telephone calls) and direct mailing, using a contact database including 25 entities. The effort resulted in 21 experts confirming their willingness to participate in the study.

All these experts have many years of experience and knowledge in the field of project and program management. The selection of the sample was therefore deliberate and included only managers who specialize in the issue of the article. In addition, all respondents

are members of IPMA and hold advanced certificates in the field of project management, which documents their professional knowledge, experience and justifies the selection of the sample. The full characteristics of the research participants are presented in Table 2.

**Table 2.** Characteristics of the experts participating in the study.

	Category	Number of Experts	Percentage
Role in the program	PMO Manager/Director	3	14.29%
	Member of the program Board	2	9.52%
	Program leader/director	11	52.38%
	Member of the program monitoring team (steering group)	3	14.29%
	Program consultant	2	9.52%
Experience	Up to 5 years	12	57.14%
	From 5 to 10 years	5	23.81%
	Over 10 years	4	19.05%
Certifications	IPMA level A	6	28.57%
	IPMA level B	7	33.33%
	MoR	3	14.29%
	MSP	3	14.29%
	PRINCE2	8	38.10%
	Scrum	3	14.29%
	PMP	5	23.81%

Source: own elab.

The layout of the questionnaire is directly related to the research problems presented in the article. Its purpose is primarily to diagnose practices in the field of monitoring and control of program implementation in energy enterprises. The need for such a diagnosis results from the previously identified research gap, which indicates the wrong identification of the program with the project and the lack of assessment of the results of managing the entire program of projects. The questions included in the questionnaire allow: to identify the areas of program monitoring and control, obtain information on the methods used in this area and assess their effectiveness. This, in turn, is a starting point for indicating improvements, modifications and clarifying the principles of project management in energy enterprises.

The structure of the interview questionnaire was based on the analysis of program management standards [48,49], existing theories and discussions with other academics as suggested by Saunders et al. [47]. The interview questionnaire consisted of 4 main questions concerning:

1. Characteristics of the expert including profile, experience and the sector in which they carry out the programs.
2. Identification of areas of program management to be subject to monitoring and control.
3. Indication of the methods, techniques, tools and documents that are used for monitoring the previously indicated areas (the number of questions in this issue was dependent on the number of indicated areas; maximum 12 questions).
4. Evaluation on a Likert scale of the effectiveness of the identified methods, techniques, tools and documents in the context of the monitoring and control of the identified area (the number of questions in this issue was dependent on the number of areas identified; maximum 12 questions).

Data analysis was performed using descriptive statistics based on raw data from interviews. The reliability of the research results was confirmed by following quality checklists for qualitative research, as recommended by Miles and Huberman [52], to verify the analysis processes and results. The reliability and relevance of this qualitative study is ensured by considering: reliability (the interview questionnaire was checked by 2 independent management practitioners serving on the board of IPMA Poland), internal validity (questions in the questionnaire were linked to international program management standards [48,49])

and external validity (diversity of sampling encouraging wider application, results are partly supported by existing theory).

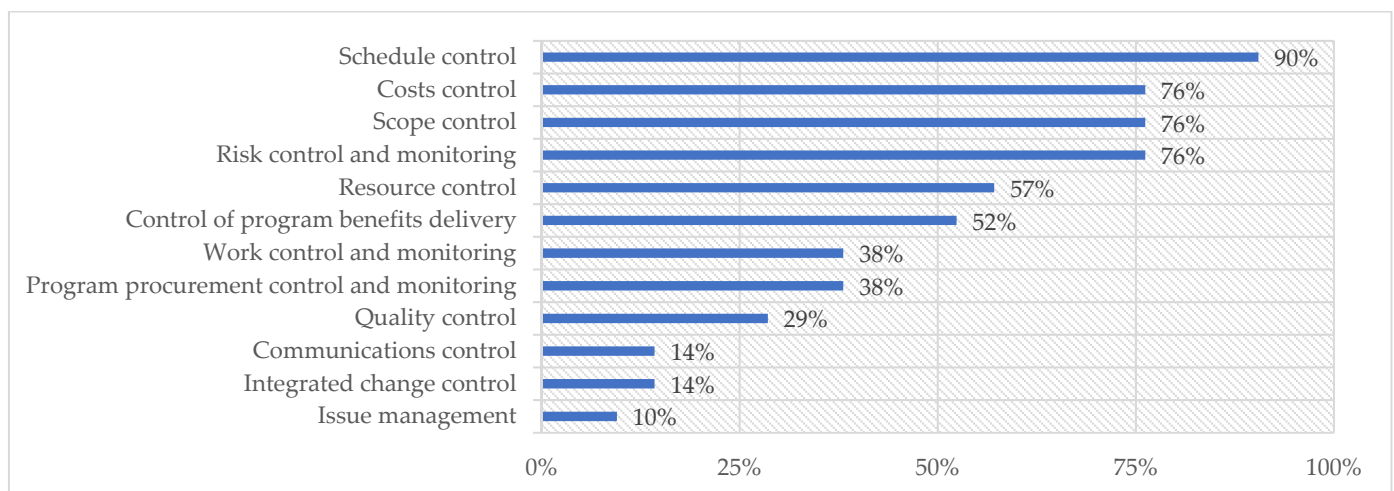
#### 4. Results

This section has been divided into two parts in line with the objectives of the article: verification of the program management areas subject to the monitoring and control process; identification of the methods, techniques, tools and documents that are used for monitoring the previously indicated areas; assessment of the effectiveness of the identified methods, techniques, tools and documents in the context of monitoring and control of the indicated area.

The analysis of the research findings included their preparation with the use of descriptive statistics tools. At the same time, it should be noted that the obtained results are preliminary and constitute the basis for further in-depth research, which is the subject of other studies, i.e., development of recommendations for managers in the field of methodological program management and the selection of appropriate methods, techniques and tools for the program management process.

##### 4.1. Verification of Areas of Program Management to Be Subject to Monitoring and Control

In the researched sample (21 experts), 120 potential actions were identified, which are subject to control and monitoring from the program level. The obtained data was then sorted and duplicate results were removed, assigning a correspondingly increasing number of indications of a defined activity. As a result of this exercise, 57 potential actions subject to control and monitoring were obtained. Then, the obtained results were grouped according to the features they related to. This resulted in 12 areas of program control and monitoring (Figure 1).



**Figure 1.** Identified program areas subject to the process of monitoring and control. Source: own elab.

The area most frequently indicated by experts is the control of the schedule (90.48% of indications), including the process of ensuring that the program will deliver the required potential and benefits on time [92,93]. In addition, this process includes reviewing and monitoring the start and completion of priority activities and milestones at both the ongoing project and program level against the planned timeframe of the main program schedule [48]. Successful program management largely depends on aligning program scope with cost and schedule, which are interdependent [53,90]. Updating the baseline program schedule and managing changes in schedules at the level of ongoing projects is required to keep the baseline program schedule current and accurate. Furthermore, this control allows not only the identification of delays or setbacks in the delivery of potential, but also opportunities to accelerate the implementation of individual projects included in the program.

Other most frequently identified areas by experts (76.19%) are cost control (the process for controlling changes to the program budget and the individual component projects that shape that budget [90]), scope (the process for controlling changes to the scope of the program [54]) and risk control (the process for tracking identified program risks, identifying new risks to the program, executing a risk response plan and evaluating their effectiveness throughout the program life cycle [45,55]). The conclusions of the overall analysis of the results highlight the importance of controlling time, cost, scope and risk as parameters that directly determine not only the project, but also the program. The importance of these most relevant parameters is widely described in the literature [22,39] highlighting their interconnection and the relationships that exist between them. As the surveyed experts indicate, the cost control process is most often separated to the financial controlling unit in the organization or the PMO or PSO.

Resource control, which was indicated by 57.14% of experts, is the process of managing all program resources and related costs, in accordance with the program management plan [48]. Resource control includes commitment, sharing, allocation and release of resources between the organization, program and component (a single project or non-project task). Resource control also includes the analysis of expenditure on resources assigned to the program to ensure correctness and completeness [36,88]. The rest of the experts indicate control of this process: at the level of project portfolio management, by the Central Project Management Office or the Center of Excellence. This is clearly a valid approach, as resource sharing can be a critical management intervention in program management practices [84].

Control of the delivery of program benefits is the process of gathering all information on the effects of individual projects and non-project related activities to provide a clear picture of the delivered benefits of the program as a whole [74,84]. Although this area is most strongly emphasized in popular program management standards [48,49], it was only indicated by 52.38% of experts. Furthermore, as Fernandes and O'Sullivan [84] highlight, benefits management identifies a set of key activities to be performed, with a clear set of controls, inputs, outputs and resources. The more ambiguous and uncertain the benefits, the more important it should be to focus on them and to confront the assumptions and risk factors that may affect their implementation [93]. Moreover, one of the elements that distinguish a program from a project is precisely the process of benefits management, which is carried out in parallel to the process of capacity delivery by the projects included in the program. Similarly, as Breese [93] notes, the practice of benefits management is not always consistent with theory. According to program management standards [48,49], benefits should be implemented at the strategic level of the program; however, as experts point out, control of both the business case and the program benefits occurs at the corporate level, not at the program management level. Programs carried out by experts are most often strategic in nature, which translates into shifting the responsibility for the business benefit to the strategic level, most often to the management of the company.

The area of monitoring and control of work and procurements in the program was indicated by 38.10% of experts. The process of monitoring and control of work in the program focuses on collecting, measuring and consolidating information on the performance of individual projects in order to understand the results of individual projects in relation to the entire program [48,94]. However, the program procurement control process is the process of monitoring and managing relations with contractors and users at the program level, excluding processes carried out at the component (project) level [49]. The process includes purchasing and sourcing external resources that cover the program domain and are not covered by a specific project. Most often these processes are found in the PMO, which measures and accounts for work at both project and program level based on indicators.

Quality control (28.57% of indications) is the process of monitoring the specific potential (benefits) and results of the program in order to verify that the quality requirements (criteria) are met. Only 28.57% of experts indicated using this process at program level. The remainder indicates quality control as:



- A process carried out at corporate or organizational level in the form of a separate unit (e.g., quality control department, quality maintenance, etc.), where compliance with the applicable quality standards, e.g., ISO, is verified;
- A centrally dedicated PMO or PSO with direct responsibility for reviewing the quality requirements for defined benefits and program outcomes;
- A secondary theme that is measured at the level of individual projects in the form of, for example, compliance lists on the implementation of benefits by the program. Then, the quality management process focuses only on the quality of the outputs, the results delivered by individual projects, and not on the quality of the program management process, which remains a secondary topic.

The areas related to communication control (the process ensures that information, data, rules and procedures are received, recorded and directed to the intended recipients) and integrated change control was only indicated by 14.29% of experts. Therefore, it can be said that in the vast majority of the programs implemented in Polish enterprises, these areas are not subject to the process of control and monitoring directly at the program level, or as a result of dispersed responsibility they occur at the level of individual projects or are treated as corporate processes supporting the program. As noted by Fortune et al. [57], organizations continue to rely on traditional methods to engage with stakeholders, although research shows that these are ineffective. Moreover, it should be noted that integrated change control is a very important area of program implementation, as it is the process of coordinating changes throughout the program, including changes in cost, quality, schedule and scope [48]. This process controls the approval and rejection of change requests, escalates requests according to tolerance thresholds, determines when changes have occurred, influences the factors that cause changes, ensures changes are beneficial and agreed upon, and manages how and when approved changes are applied [48,49]. With the current turbulent environment, it is hard to believe such a low share of this area. One reasonable explanation may be the use of complex IT systems to report and analyse changes occurring at both program and individual project level while managers are unaware of the origin of the data on the basis of which they make key decisions. Furthermore, strategic awareness cannot be assumed to exist, even at high levels of the organization [57].

The area concerning the control of issues was only indicated by 9.52% of experts. As with integrated change control, this process is a permanent part of every program and project. There is issue management in every project undertaken. Moreover, issue management is the process of effectively identifying, tracking and closing issues to ensure that stakeholder expectations are consistent with program activities and outputs. Issue management at the program level may also include resolving issues escalated from component projects that could affect the overall progress of the program and that could not be resolved at the project level [48].

In the light of the results obtained, it can be concluded that there are usually several key areas monitored and controlled in programmes implemented in Polish energy enterprises. Observing these areas is supposed to provide answers to the following questions:

1. Does the programme bring the expected benefits, and are they achieved on time?
2. Is it economically effective and does it not generate excessive costs and unnecessary consumption of resources?
3. Does it correspond to the originally specified range?
4. To what sources of risk is it exposed?

Obtaining answers to the above questions makes it possible to determine the effectiveness and efficiency of achieving the goals set in a given programme, and therefore also lets us determine to what extent the programme contributes to the achievement of strategic goals of energy enterprises. The high percentage (over 50%) of indications regarding the monitoring and control of such critical parameters as: time, costs, efficiency, and risk, allows us to conclude that the surveyed enterprises approach programme management in a rational and correct way. Nevertheless, it is a very traditional approach, deeply embedded

in the economic sphere, which may not be conducive to sustainable project management in the energy sector.

The answers provided by the respondents indicate much less attention to less measurable, intangible aspects of control and monitoring, such as: work, quality, communication or integrated change control. This may result from the lack of appropriate methods and tools, as well as from the belief that the mentioned factors contribute to the achievement of the programme objectives to a smaller extent, and thus have a lower impact on the level of implementation of the energy enterprise's strategic goals.

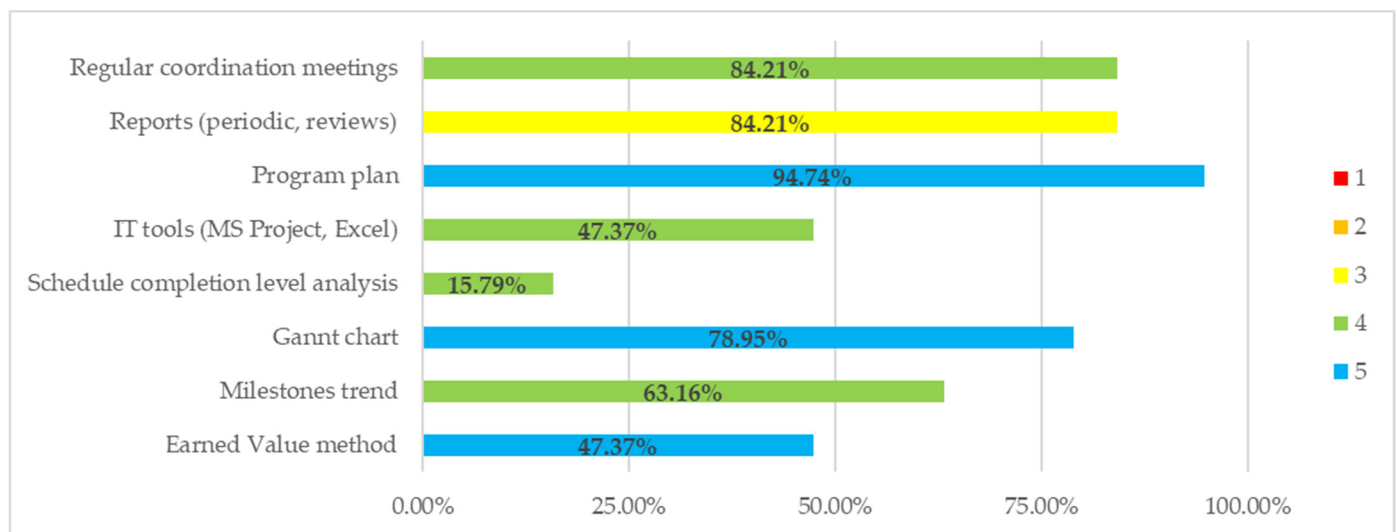
#### 4.2. Identification and Assessment of Methodology Used for Monitoring and Control of Program Management Areas—Key Areas

The aim of this research was also to empirically identify the most frequently used methods, techniques and tools for the process of monitoring and control of program implementation. The sample (21 experts) identified 416 potential methods, techniques and tools. The obtained data was then sorted and duplicate results were removed, assigning a correspondingly increasing number of indications. As a result of this action, 67 identified methods, techniques and tools for the process of monitoring and control of the program implementation were obtained. Then, the obtained results, according to the experts' recommendations, were assigned to 12 identified areas of monitoring and control.

In addition, when indicating a method, technique or tool, the experts were required to assess its effectiveness for use. A five-point Likert scale was used to evaluate effectiveness (1-low effectiveness—red; 2-little effectiveness—orange; 3-medium effectiveness—yellow; 4-high effectiveness—green; 5-very high effectiveness—blue).

This subchapter presents the monitoring and control methodology used in the key areas of programme management (most often indicated by experts—over 50%).

As shown in the previous subchapter, schedule control is the most frequently monitored and controlled area of a programme. The tools used for this purpose, along with the assessment of their effectiveness, are presented in Figure 2. The respondents indicate that experts most often use the programme plan and the Gantt chart in this area. They also consider these tools to be the most effective. They also find the earned value method as effective, but they use it much less often. It is also worth noting that the surveyed energy enterprises very often use reports as part of monitoring and control, although in the context of effectiveness they are assessed as much less effective. Most likely, it results from their descriptive and time-consuming form, not subject to further processing and not taking into account any universal form of quantification.



**Figure 2.** Evaluation of the effectiveness of the methods, techniques and tools used for the schedule control process. Source: own elab.

When analysing the results in the area of cost control (Figure 3), it should be noted that the multi-stage expenditure control and the earned value method are the most popular among experts and have a very high efficiency. Monitoring the program budget is one of the key aspects of ensuring that the program meets business objectives. In addition, a program whose expenditure exceeds the planned budget may lose its business rationale, resulting in its redefinition or closure. As experts point out, even small overruns in program expenditure are subject to audit and should be justified. Moreover, experts also draw attention to the need to update the budget base in line with approved changes that have a significant impact on costs. In the case of monitoring and cost control, the most effective and popular methods are identical, which is good proof of the implementation of these stages of programme management in the analysed area.

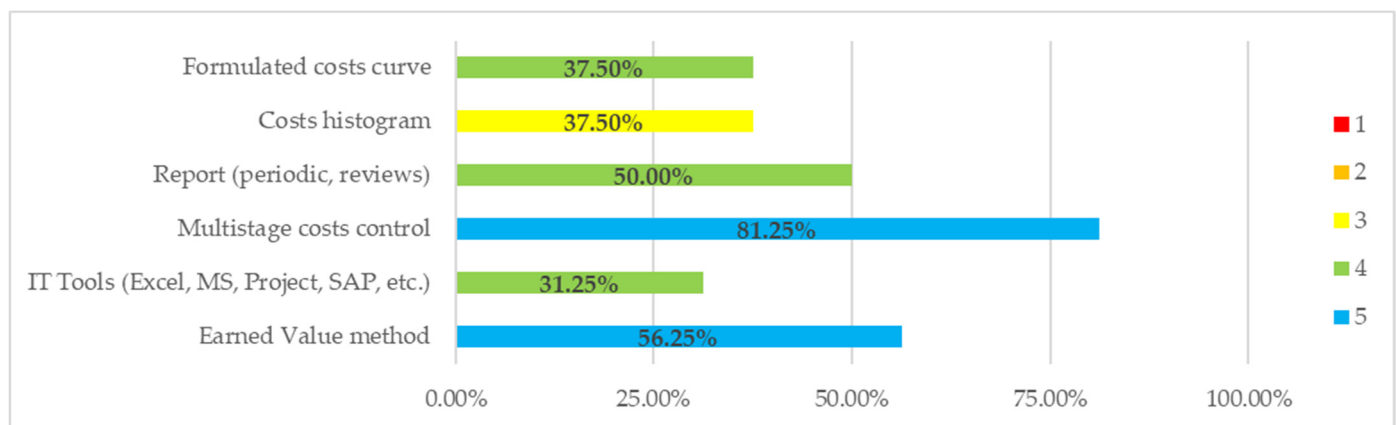


Figure 3. Evaluation of the effectiveness of the methods, techniques and tools used for the cost control. Source: own elab.

In the area of scope control, experts recommend the use of the earned value method (68.75%), the Milestone Trend (75.00%), management control (62.50%) and reports (81.25%). Nevertheless, the last two listed were the most popular, but were less effective than the first two listed. By making an analysis of the intended use of the indicated methods, techniques or tools by experts [16,60], their legitimacy should be considered, even if their direct purpose is linked to project management (Figure 4).

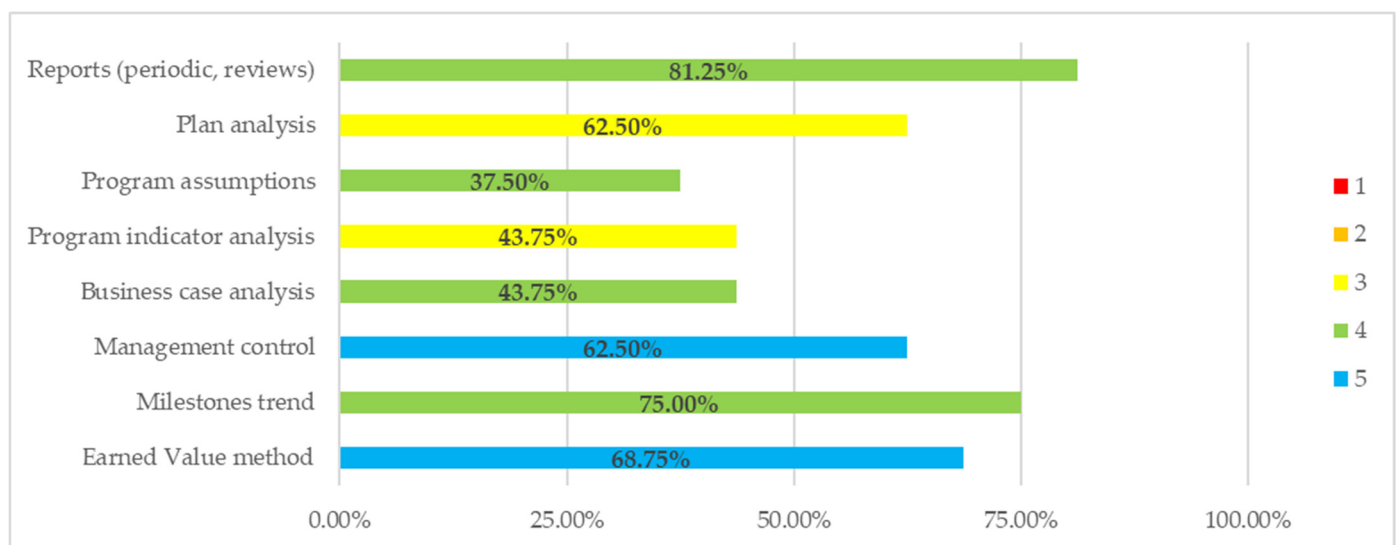
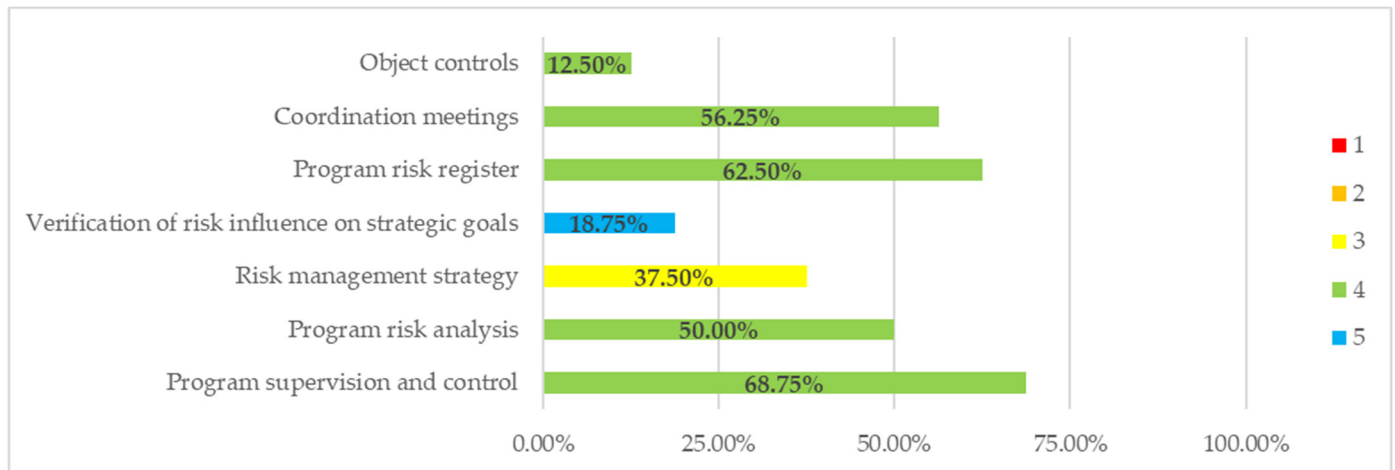


Figure 4. Evaluation of the effectiveness of the methods, techniques and tools used for the scope control process. Source: own elab.

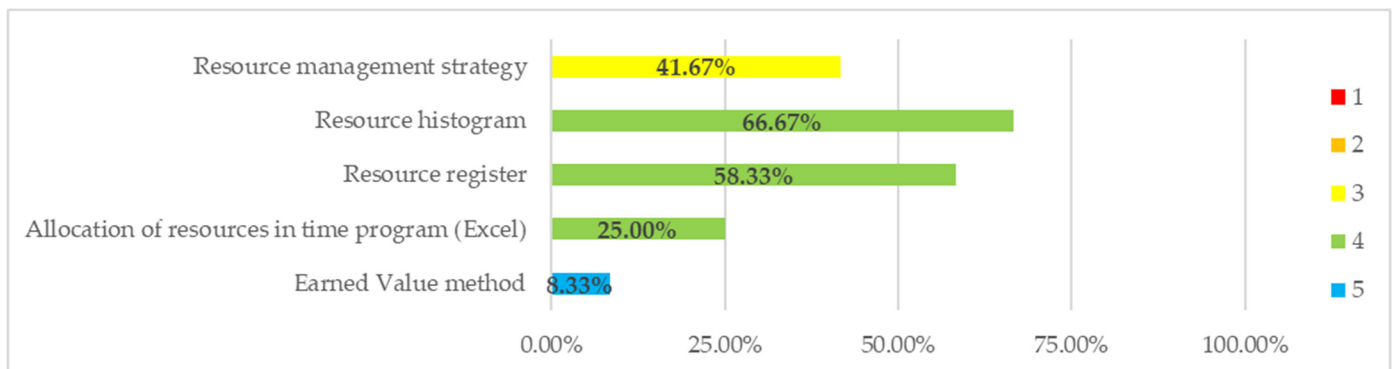
The area of risk monitoring and control was indicated by 76.19% of the surveyed experts. Analysing the research results obtained (Figure 5), the experts primarily highlight:

program supervision and control (monitoring and control of progress, risk management and resolution of issues) (68.75%), program risk analysis (50%), program risk register (62.50%) and holding coordination meetings (56.25%). The purpose of risk and issue management is to support more effective decision-making through an appropriate understanding of the risks and issues and their likely impact on program implementation. Inadequate risk management can certainly translate into making management decisions and can certainly affect the achievement of strategic goals. However, it is worth noting that the most frequently used methods were not what the experts found to be most effective. They assessed the verification of the impact of risk on strategic goals of energy enterprises as the most efficient, which is not done too often.



**Figure 5.** Evaluation of the effectiveness of the methods, techniques and tools used for the risk control process. Source: own elab.

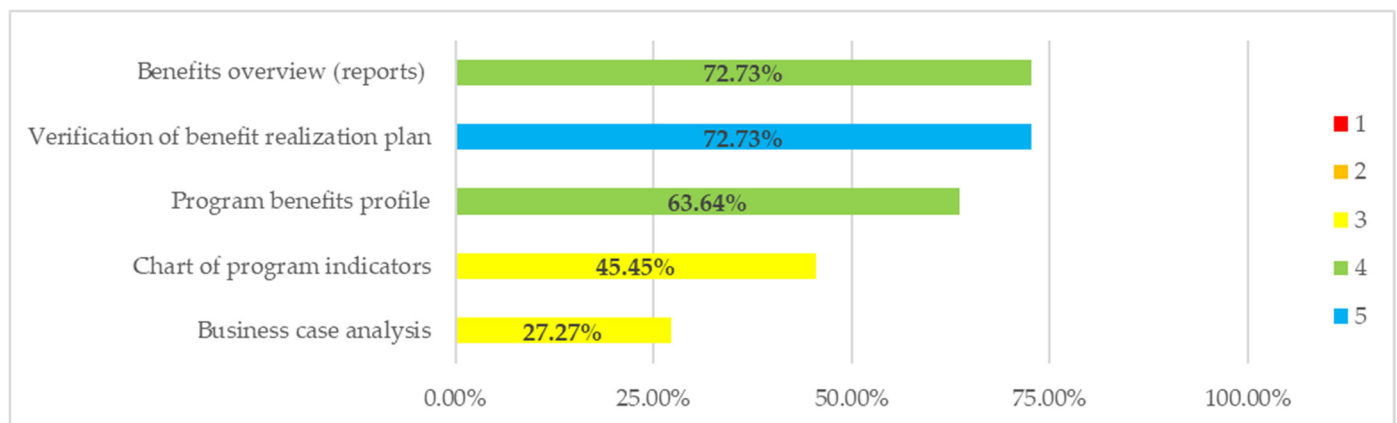
In the area of program resource control (Figure 6), experts indicated as most frequent the use of a register and resource histogram, although the earned value method is considered the most effective. However, it should be noted that the document on the resource management strategy, which is a system document, often imposed by program management standards, was indicated by 41.67% of experts with the average effectiveness of its application to the monitoring and control process. One of the main tasks of the program manager is to monitor, control and adjust program resources to ensure effective benefit delivery [45]. Appropriate prioritization of resources makes it possible to make efficient use of resources that are not available in large quantities and to optimize their use in all program projects.



**Figure 6.** Evaluation of the effectiveness of the methods, techniques and tools used for the resource control process. Source: own elab.

Benefits are the driving force behind most organizational change initiatives, including program implementation. Benefit management occurs from the very beginning of the

program implementation, where the benefits are identified (benefit profiles are defined), through the planning of the benefit implementation and execution of the implementation, up to checking that the benefits planned at the beginning are implemented (the benefit review) [49]. In fact, program benefit management has its own life cycle that runs parallel to the program cycle. According to experts indicating the area (52.38%), it should include an analysis of the program benefits profile (63.64%), verification of the benefit implementation plan (72.73%) and reviews of benefits (reports) (72.73%). However, it should be emphasized that the analysis of the business case from the point of implementing the benefits was only indicated by 27.27% of experts pointing to this area. It should also be noted that, unlike a project, the program aims to deliver benefits resulting from the implementation of individual projects (Figure 7).

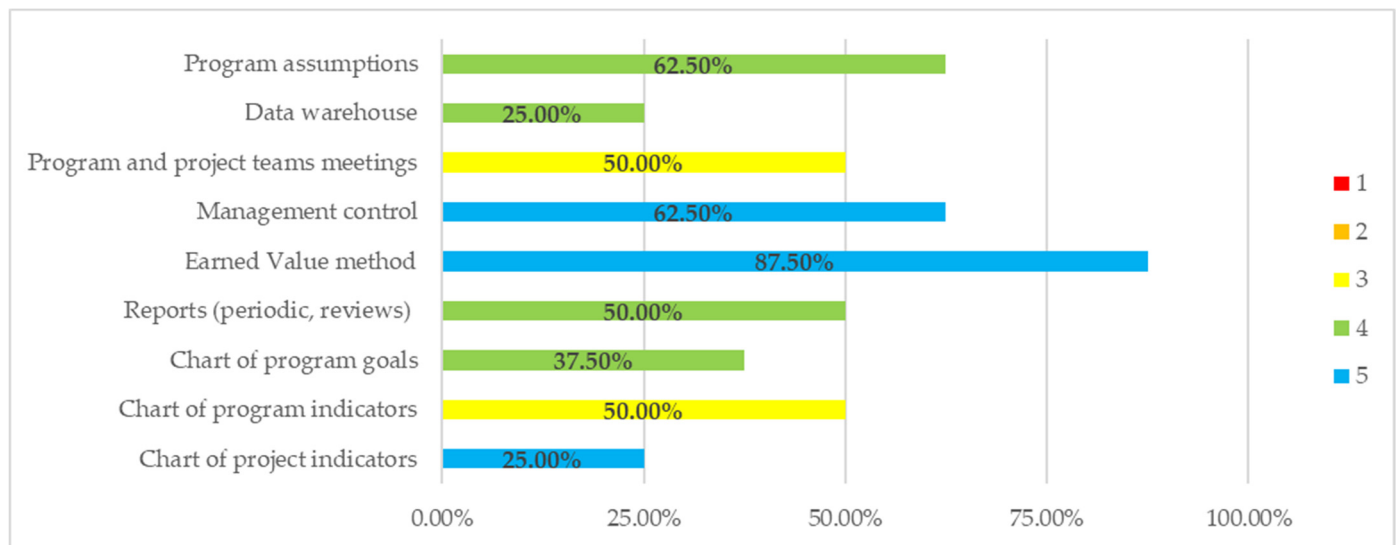


**Figure 7.** Evaluation of the effectiveness of the methods, techniques and tools used for the benefits provision control process. Source: own elab.

Summarising the research results in the context of the most frequently monitored and controlled areas of the programme, it can be noticed that the surveyed managers consider those most effective methods as: earned value method as well as comparing and verifying the achieved results with planned results (cost, risk, benefits area). Reports and registers are very often used in many areas, but respondents felt that they were less useful. It should also be added that the only area in which there was consistency between the methods considered most effective and most popular was the area of monitoring and cost control, which lets us conclude that this is an important area that receives a lot of attention and organisational care. Undoubtedly, it results from the direct impact of costs on the effectiveness of projects, programmes and, consequently, the entire enterprise, which is of great importance in the capital-intensive energy sector.

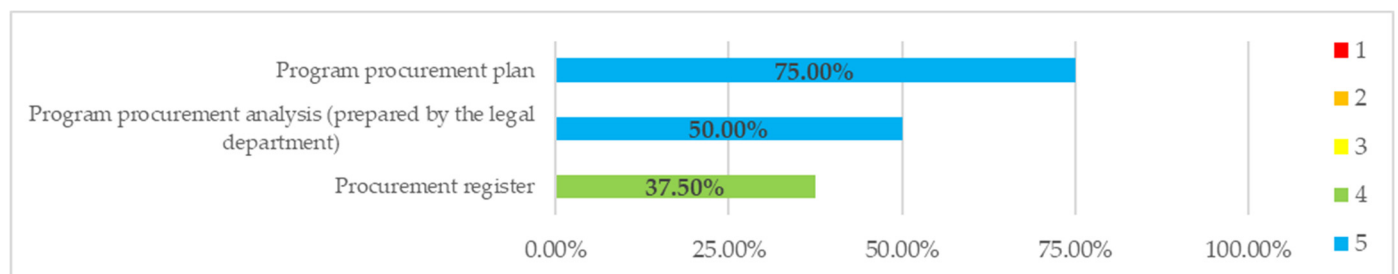
#### 4.3. Identification and Assessment of Methodology Used for Monitoring and Control of Program Management Areas—Less Important Areas

This subchapter presents the methods of monitoring and control used in less popular areas of programme implementation (indications below 50%). The first of these areas is the work monitoring and control process (Figure 8). The experts awarded the highest effectiveness in terms of effectiveness to the earned value method, management control and chart of project indicators. Earned value method is one of the methods of project management aimed at measuring results or progress. By means of calculations and graphs, it allows for the obtaining of information about the current state of costs, schedule or work results. It allows for the easy comparing of the current state with the assumed state, as well as predict the trend and estimate final effects [95]. As a result, it is often used in monitoring project parameters regarding work, time and cost.



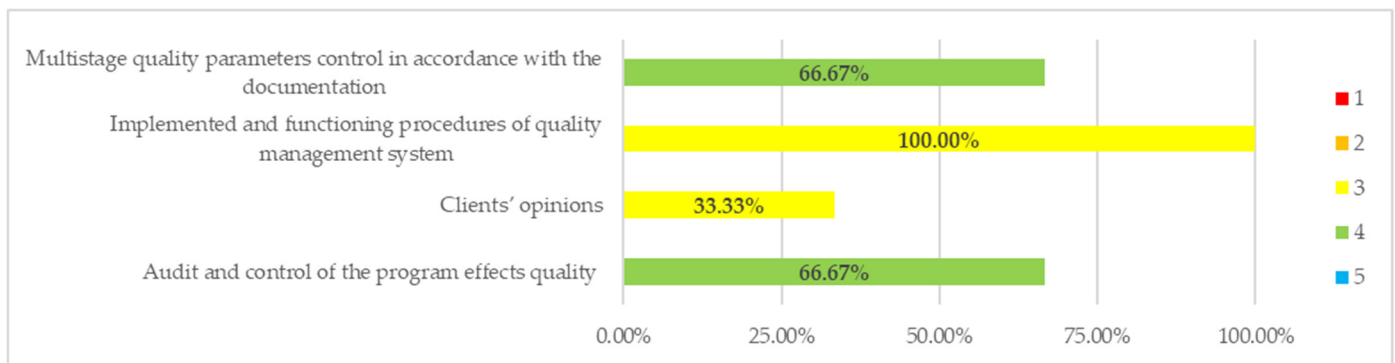
**Figure 8.** Evaluation of the effectiveness of the methods, techniques and tools used for the work monitoring and control process. Source: own elab.

Procurement monitoring and control includes purchases and sourcing of external resources that cover the program domain and that are not covered by a specific project [48]. The control of this area is indicated by 38.10% of experts. Moreover, 50% of them recommend the use of the analysis of the program contract performed by the legal department and 75% of the development and verification of the program procurement plan (Figure 9). However, it should be noted that only 37.50% of experts indicating this area recommend using the register of procurements.



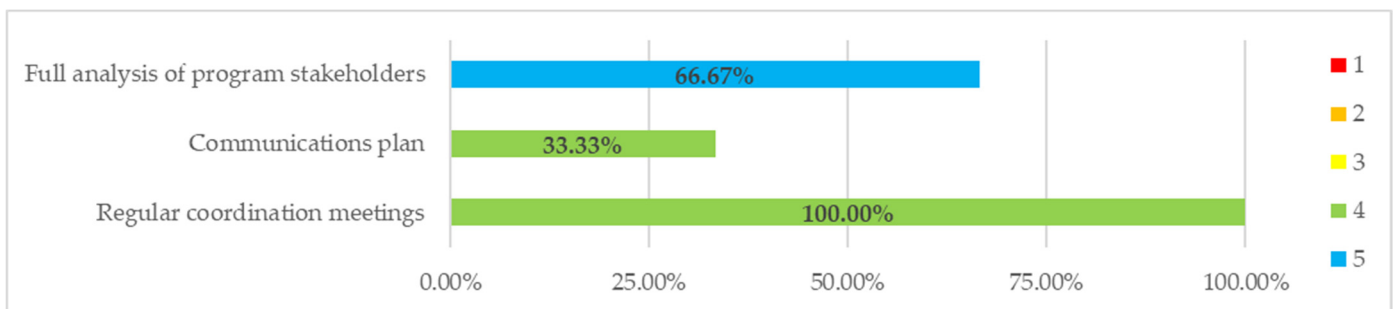
**Figure 9.** Evaluation of the effectiveness of the methods, techniques and tools used for the procurement control process. Source: own elab.

The next analysed area is quality monitoring and control process (Figure 10). Quality in project management and program management has two meanings. On the one hand, it means the quality of the process, the way the project is organized. On the other hand, quality means managing, ensuring and controlling the quality of the project's outputs and results. When analysing the obtained results, this area was only indicated by six experts. At the same time, all these experts indicated functioning procedures of the implemented quality management system, e.g., ISO. However, it should be noted that they also unanimously emphasize the average effectiveness of these procedures from the quality control point of view. In the case of controlling the effects or results of the program or individual projects, they recommend audits and quality control of the program effects (66.67%) and the control of quality parameters in accordance with the documentation at many stages of implementation (66.67%).



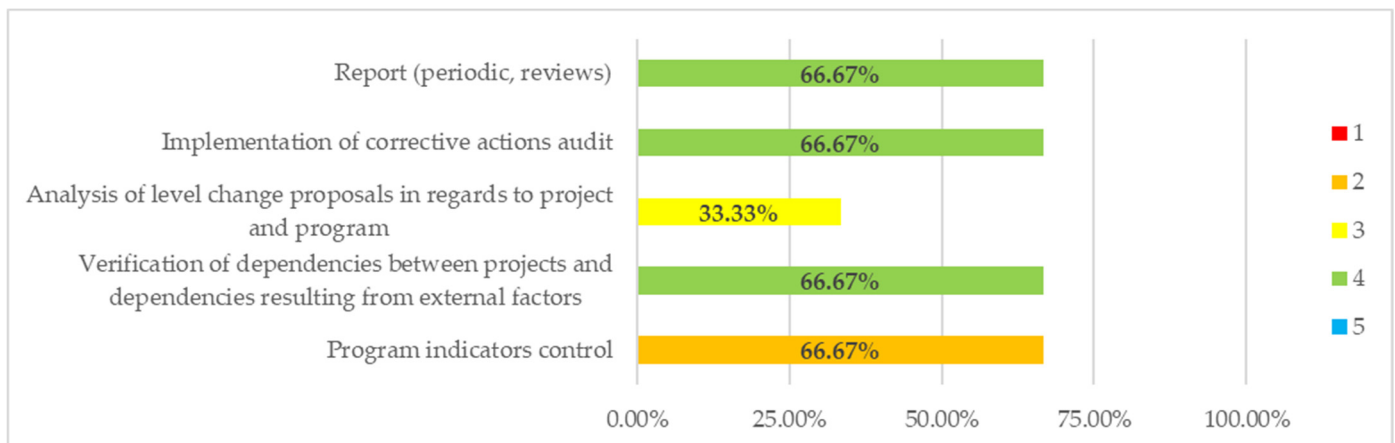
**Figure 10.** Evaluation of the effectiveness of the methods, techniques and tools used for the quality control process. Source: own elab.

Program management is the process of developing, communicating, implementing, monitoring and ensuring the policies, procedures, organizational structures and practices associated with a given program. The results of which are guidelines for efficient and effective decision-making and supply management, focused on achieving the goals of the program in a consistent manner, taking into account the relevant risks and requirements of stakeholders [48,49]. Communication management in a program concerns the processes necessary to ensure the timely and correct preparation, distribution, collection, storage, finding and final disposal of information relating to both the program and individual projects [63]. The success of the program largely depends on the efficiency of the communication process, the shape of which is primarily determined by the manager. When analysing the obtained research results, the area of communication control is omitted by most of the experts participating in the research. Only 14.29% of the respondents declare their participation in this process. Moreover, the control is limited to conducting regular coordination meetings, developing and verifying a communication plan (Figure 11).

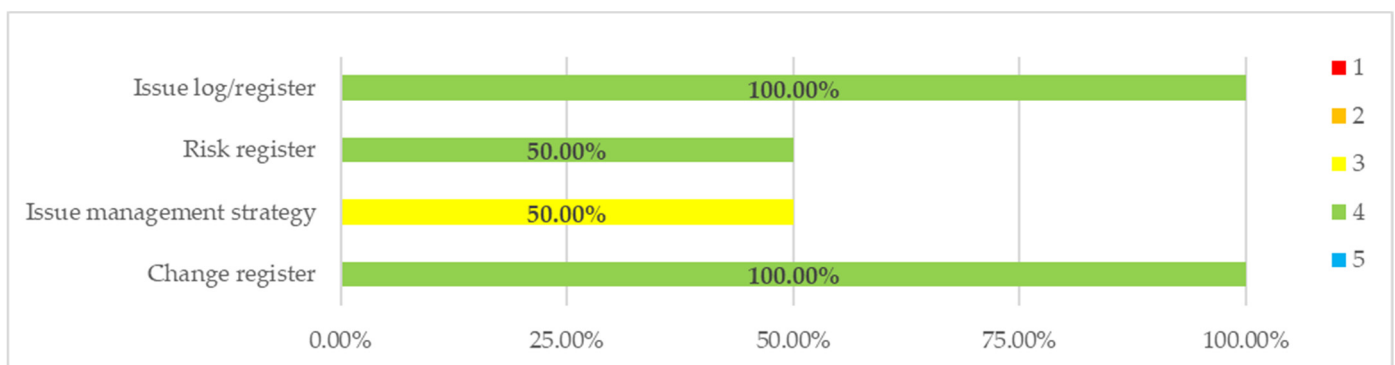


**Figure 11.** Evaluation of the effectiveness of the methods, techniques and tools used for the communication control process. Source: own elab.

The area of integrated change control was indicated by 14.29% of the surveyed experts. When analysing the obtained research results (Figure 12), the most frequently used methods, techniques and tools that are also effective in this process include: verification of dependencies between projects and dependencies resulting from external factors, audit of the implementation of corrective actions and reports (periodic and review). Integrated change control is the process, at which the impact of each change is assessed against the program [33,58]. This requires an evaluation of the entire program [90]. The difference between “program monitoring and control” and “integrated change control” is that integrated change control is based on managing all changes to the scope of the program, while the previous one focuses on managing how this scope is executed [59]. In connection with the above, the actions indicated by experts are justified and effective in relation to taking appropriate actions in situations where it is necessary for the correct implementation of the program (Figure 13).



**Figure 12.** Evaluation of the effectiveness of the methods, techniques and tools used for the integrated change control process. Source: own elab.



**Figure 13.** Evaluation of the effectiveness of the methods, techniques and tools used for the issue control process. Source: own elab.

When analysing the results, it should be noted that only two experts perform systemic activities related to issue management. Moreover, it only uses the change log and the register of issues. There are random events in the implementation of each undertaking, especially a project or program. It is believed that this area is unconsciously overlooked by experts in favour of corporate solutions for event handling or integrated directly into risk management processes.

In the less frequently monitored and controlled areas of the programme, described in this subchapter, a greater variation in the used methods can be observed, which is due to the large diversity of these areas. Due to the non-measurable or difficult-to-measure aspect of most of them, managers more often and more willingly use reports and registers that allow for a descriptive presentation of given conditions, circumstances or events. Nevertheless, the relevance of results to plans and managerial supervision in this case are also of great importance. The comparison also shows a greater compatibility between the most effective and the most commonly used methods, in particular in such areas as: procurement control, integrated change control and issue control.

## 5. Discussion

### 5.1. Theoretical and Practical Approach to Program Monitoring and Control

Monitoring and control at the program level consist of obtaining and consolidating information about the status of individual projects or other program components. The general purpose of the monitoring and control processes is to allow for the appropriate action to be taken where necessary for the correct implementation of the program. In the course of the research process, 12 areas to be monitored and controlled at the program level were identified. These areas are concurrent in scope with global program management



standards [48–50] and publications addressing this topic [23,74,94]. Moreover, it should be noted that in no case of the experts surveyed was the application of monitoring and control to all areas indicated.

By deepening the obtained research results with the use of an expert interview, the most frequently used and effective methods, techniques and tools were distinguished for the process of monitoring and control of the program implementation, divided into individual areas of monitoring and control. The analysis of the results clearly indicates the use of program management system documents, i.e., reports, logs, and plans. However, the methods and techniques of the highest effectiveness indicated by experts are commonly known methods used in project management (e.g., earned value method, Milestone Trend, or the resource histogram). A synthetic comparison of the most frequently used methods with those considered to be the most effective is presented in Table 3.

**Table 3.** Comparative analysis of monitoring and control methods in energy enterprises programmes.

Area of Monitoring and Control	The Most Effective Methods	The Most Popular Methods
<b>KEY AREAS OF MONITORING AND CONTROL</b>		
Schedule control	Program plan Gantt chart Earned Value method	Program plan Regular coordination meetings Reports
Cost control	Multistage cost control Earned value method	Multistage cost control Earned value method Reports
Scope control	Earned value method Management control	Reports Milestone control Earned value method
Risk control	Verification of risk influence on strategic goals	Program supervision and control Program risk register Coordination meetings
Resource control	Earned value method	Resource histogram Resource register Resource management strategy
Benefits provision control	Verification of benefit realization plan	Benefits overview Program benefit profile
<b>LESS IMPORTANT AREAS OF MONITORING AND CONTROL</b>		
Work control	Earned value method Management control Chart of project indicators	Earned value method Management control Program assumptions
Procurement control	Program procurement plan Program procurement analysis	Program procurement plan Program procurement analysis
Quality control	Audit and control of the program effects quality Multistage quality parameters control	Implemented and functioning procedure of quality management system
Communication control	Full analysis of program stakeholders	Regular coordination meetings
Integrated change control	Reports Implementation of corrective actions audit Verification on dependencies between project and dependencies resulting on external factors	Reports Implementation of corrective actions audit Verification on dependencies between project and dependencies resulting on external factors
Issue control	Change register Issue log	Change register Issue log

Source: own elab.

The comparison presented in Table 3 shows that the surveyed energy enterprises monitor and control the most important areas of the programmes. However, they do not use methods considered to be the most effective for this purpose. Therefore, in the future, the selection of these methods should be improved so that its results meet the needs of managers and can actually strengthen the effectiveness of strategy implementation in the energy sector. Due to the number and variety of the methods indicated, it would also be necessary to structure them and create a uniform system of monitoring and control dedicated to the programmes (a proposal for such an approach is presented in the next subchapter).

An important observation is also the fact that the respondents focus on the traditional, efficient approach to programme and enterprise management, which should undoubtedly be attributed to the conventional nature of the energy sector. Nevertheless, due to the need to balance economic with environmental and social priorities, managers should also pay more attention to intangible parameters and effects, such as work, quality and communication. The research conducted so far unequivocally shows that they have a significant impact on the effectiveness of projects, programmes and strategies.

When making a comprehensive analysis of the obtained results, it should be noted that the distribution of the assignment of methods, techniques and tools depends on the number of areas indicated by the respondents. Moreover, some areas of monitoring and control of the program are indicated by less than 50% of the respondents, which translates into the obtained research results. When making a deeper analysis, it should be noted that most of the methods, techniques and tools are commonly known and used to manage individual projects. The conclusions of the literature review [48,94–96] clearly indicate that methods, techniques and tools should not be transferred from the single project level to the program level. However, it should be noted that no potential methods, techniques or tools that should be used at the program level are proposed. Furthermore, according to expert opinions, the methods used should be appropriate to the intended outcome. Experts unequivocally stress that there is no point in using complicated, time-consuming methods that end up having no successful effect. It is therefore necessary to select methods, techniques and tools in such a way that the result obtained from their application is commensurate with the cost of achieving it. Furthermore, program management in a process context is dispersed within the management organization in favour of ancillary and support processes.

Bearing in mind the above circumstances, the next subchapter presents the concept of a monitoring and control system for programmes in the energy sector.

### *5.2. Program Monitoring and Control Process Conception Elaborated Based on Research Results and Theoretical Recommendations*

The programme monitoring and control strategy according to the programme life cycle is developed in the definition phase [48,49]. To start this process, as in the case of a project, appropriate guidelines are required concerning (Figure 14):

- Strategic programme goals commensurate with the strategic goals of the organisation, relating to individual areas affected by the programme;
- Programme context, which is the description of the set of conditions under which the programme is being implemented [37]. In the field of project management, the term “context” is used interchangeably with the terms “environment” or “project setting” [97]. The conditions in which the programme or project is implemented may affect or limit it. On the one hand, the life cycle programme will be affected by the environment, but on the other hand it will also affect the environment in return. In addition, the contextual approach should be considered from two perspectives: programme conditions resulting from the environment (operational level) and programme conditions resulting from adaptation to the conditions in which it is implemented, that is matching the techniques, methods, and tools used for the organisation’s project maturity level (system level);

- Programme organisation (which presents the key elements of the organisation) is understood as a hierarchy of organisational dependencies necessary for effective programme management. A proper programme organisation bases itself on clearly defined and described roles, and at the same time appropriately assigned responsibilities for these roles and a management structure adequate to its type, size, and complexity [98]. In this context, the organisational structure of the programme, and above all the selection of an appropriate team, combining experience and competencies with the proper fulfilment of the roles assigned to them, must support the decision-making process;
- Benefit management, which occurs from the very beginning of the programme implementation, where benefits are identified (benefit profiles), through planning their implementation and execution, until checking whether the benefits planned at the beginning are realised (benefit review) [48,49]. Programme benefit management has a life cycle that runs parallel to the programme cycle.

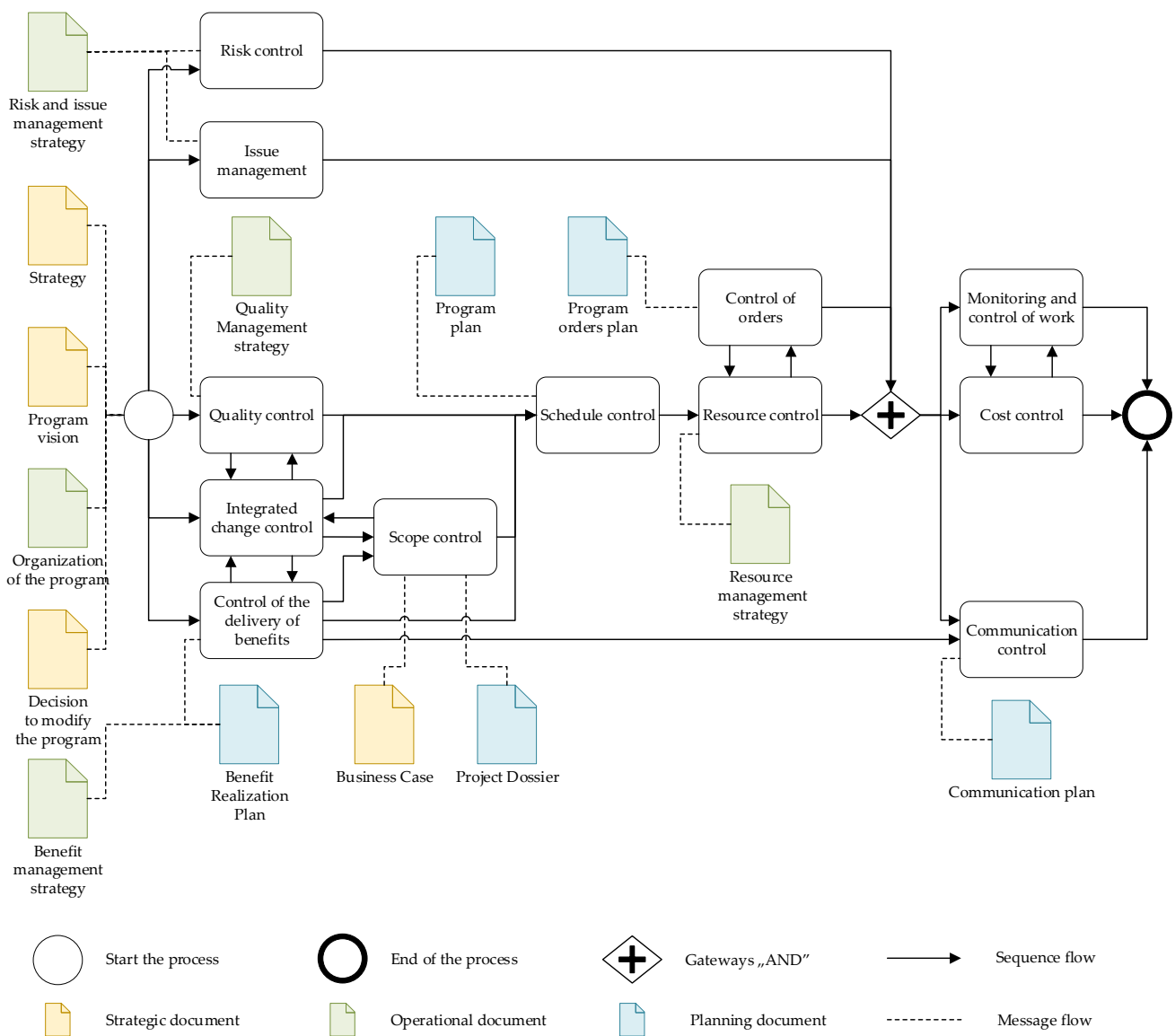


Figure 14. Programme monitoring and control process—concept. Source: own elab.

The overall programme monitoring and control process begins in parallel with the development of guidelines on procedures, responsibilities, selection of methods, techniques, and tools, and frequencies for the processes related to:

- Risk and issue control—the main goal of risk and issue management is to support effective decision-making through an appropriate understanding of the risks and issues and their likely impact on programme delivery. The monitoring and control process should not only include the control of key risk factors having a significant impact on the achievement of the strategic goals of the programme, but also translate into making management decisions.
- Quality control—ensuring that all management aspects of the programme are working properly and that the programme is on track to achieve its goals. Following the obtained results, if there are separate quality control processes in the managing organisation, it is recommended that the programme should also be adapted to them. In addition, quality control directly affects and is affected by integrated change control.
- Integrated change control—the integrated control process is based on managing all changes to the scope of the programme, while not focusing on managing the way in which this scope is carried out [59]. Therefore, a direct link to the process of benefit delivery, as well as to quality control and scope control, is indicated.
- Benefit delivery control—the primary goal of a programme (as opposed to a project) is to deliver benefits. Monitoring and control in this process should include the degree of validation of the introduced changes in the organisation and verification of the assumed goals at the business level. In addition, the more uncertain and ambiguous the benefits are, the more important it should be to focus attention on them and to face assumptions and risk factors that may affect their delivery [93]. Changes to the business needs that correspond to the programme will have a direct impact on the integrated change and scope control of the programme.

Based on the conditions obtained in the development of the integrated change control and the control of the delivery of programme benefits, it is recommended to define the guidelines for scope control, which will include the control of all projects and their results initiated under the programme in accordance with the business case.

Planning and control are key to the success of any programme. The development and maintenance of a programme plan require the continuous coordination of all project plans implemented under the programme. Therefore, schedule control should focus on dependencies between projects and dependencies resulting from external factors that cannot be controlled. In addition, this process includes the review and monitoring of the commencement and completion of priority activities and milestones, both at the level of implemented projects and the programme, in relation to the planned time frames. Successful performance of this process requires the consolidation of information obtained from the quality control, integrated change control, scope control, and delivery of programme benefits control processes.

The resource control process begins with the use of a programme schedule to determine what key resources are required at the right time for initiated projects. This process, like the others, continues throughout the entire programme life cycle to ensure that scheduled resources are ready and available as required, to avoid delivery delays. Moreover, resource control must be directly linked to programme schedule control and order control. Resources required by programme projects can be limited and costly, so both the resource control and procurement process must also ensure that the resources are not wasted or not used as this will have a negative impact on the overall programme budget.

Based on the consolidation of information from the above areas of programme control and monitoring, it is recommended to develop guidelines, procedures, responsibilities, methods, techniques, and tools for: work, cost and communication control.

The cost control plan at the programme level should provide advice on cost estimation techniques and cost control, while at the same time ensuring that the costs reported by component projects can be collected in a valuable manner and enable comprehensive

financial reporting to the organisational level. In addition, cost control should be in direct relationship with the tracking of work through the earned value management (EVM) method, which uses budget as a representation of the value of work. The value of the work performed at any point in the delivery process can be compared with the actual cost of delivering it and the value of the work scheduled to be performed at that point in time. This makes it possible to predict future performance based on the actual performance achieved so far, both in terms of cost and time.

The last area that is commensurate with work and cost control concerns communication control. This process is based on the cyclical collection and consolidation of real data and analysis by comparing it to the base data. These activities are aimed at monitoring the progress and execution of both the entire programme and individual projects included in it. In addition, it is used to forecast further results and to present this data to relevant stakeholders. The success of the programme largely depends on the efficiency of the communication process, the shape of which is primarily determined by the manager.

## 6. Conclusions

In traditional sectors, and the energy industry undoubtedly belongs to such sectors, managers primarily focus on technological, technical and economic issues that determine the effectiveness of the enterprise's operation. Meanwhile, there are many management factors influencing the efficiency and effectiveness of the organisation and therefore directly contributing to the better functioning and more effective implementation of the strategy. One of them is project and programme management described in this article. This form of carrying out tasks and projects allows for the decentralisation of management, proper ordering of the scope of tasks, duties and responsibilities. It also enables ongoing monitoring and control of each project and programme. In large and organisationally complex enterprises operating in the energy sector and currently facing numerous challenges, effective project and programme management may contribute to making the undertaken activities more flexible and increasing their efficiency and effectiveness of the entire organisation.

Considering the above circumstances, the results of the conducted research contributed to the development of economics and management in the energy sector through:

1. Providing knowledge about the areas of monitoring and control of programmes in energy enterprises;
2. Enabling the identification of methods used to control programmes in energy enterprises;
3. Indicating a tool gap between the most effective and the most frequently used methods of monitoring and control programmes;
4. Developing a systemic concept for monitoring and control of programmes in energy enterprises.

The authors found that energy enterprises monitor and control programmes in key but traditional areas such as lead times, costs, risks and benefits. They less often refer to 'soft' areas of management, such as: work, communication or quality. In terms of the monitoring and control methodology used, significant discrepancies were found between the methods considered effective and those that are most often used in practice. This requires decisive improvement actions. At the same time, it is worth emphasising that most managers prefer compact and quantifiable forms of monitoring and control, such as: earned value method, Gantt chart and comparing plans to results in individual areas. The sector also lacks a systemic approach to programme management, which should be distinguished from managing a single project, which is why the authors presented their own approach to solving this problem.

The research carried out has two key limitations. The first one refers to the geographical area of research which is Poland. Nevertheless, the research gap identified on the basis of literature studies is international in nature, therefore the research results can be generalized to other energy sectors where energy projects are managed, especially in emerging and developing economies. The second limitation is the deliberate selection of the sample and the small number of experts. However, it is worth emphasizing, that their selection

was carefully considered and they meet the high requirements regarding experience in project and program management, and they represent a fairly narrow group of managers dealing with these issues in the energy sector. Their responses can therefore be considered credible and useful in improving the principles of organization.

The current literature and standards on program management lack a systematic approach to the process of monitoring and controlling program implementation. However, taking into account the effectiveness of the methods, techniques and tools indicated by experts and their intended use, it should be concluded that they are used rationally. It is recommended to conduct in-depth research on the methods, techniques and tools used in the program management process and to develop a systemic approach that takes into account the program management processes and recommended tools that should be used in these processes. These studies should take into account causal relationships and answer questions about the rationale for selecting specific control and monitoring methods and the basis for assessing their effectiveness. In order to deepen them, it would be worth presenting case studies on individual programs implemented in a specific energy enterprise.

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