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Management Accounting System in the Management of an Intelligent Energy Sector Enterprise

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Abstract: The aim of the article was to assess the implementation of the management accounting tools in managing an intelligent energy sector enterprise. The energy industry, characterized by high price fluctuation, rising costs, and the development of modern technologies, will in the future look for diversified sources of income and changes in business models. Energy entities will move towards intelligent management using management accounting tools, providing access to complete and up-to-date information from internal and external sources and extended management capabilities. In order to obtain answers to the questions, we conducted standardized interviews and an in-depth interview (IDI—individual in-depth interview) with large enterprises, with particular emphasis on the case of Hager Polo Ltd.

Keywords: energy sector; intelligent management; managerial accounting

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1. Introduction

The dynamic development of civic energy has had a significant impact on new areas of energy industry entities' activity. The transition to a low-carbon economy, resulting from the implementation of the European Green Deal and Poland's energy policy, indicates the directions of the energy industry development. Energy enterprises have been developing their business in areas that allow integration of the future distributed energy sources throughout the entire power system.

In the future, the Polish energy sector will face various challenges determined by the broadly understood transition resulting from the implementation of the climate goals and dictated by the geopolitical situation. In the long term, the energy industry investments are expected to ensure the country's energy security as well as expansion of opportunities for the use of renewable energy sources (RES), which have already proven to be cheaper than conventional energy [1]. The need to digitalize business operations, in order to provide for the market needs and increase the quality of the services on the energy market, is another important, noticeable trend [2].

In this day and age, the energy industry faces the challenges of price volatility, low margins, high cost of service, increasing expenditures on customer acquisition and retention, research and development investment, strong competition from international players, and lower loyalty of increasingly aware customers [3]. This requires a redesign of the traditional business model towards the development of organizational intelligence. With technological advances, as well as climate change, energy industry entities will expand their offers, which will lead to changes in the area of management [4].

Improvement of management system effectiveness in an energy enterprise is an ongoing activity, constituting the basis for management system assessment. The process of effectiveness improvement involves continuous analysis and evaluation of both the course of processes and the implementation of the goals established, using the information provided by the management accounting system. This allows the managers to make process streamlining decisions as well as plan and develop strategies for subsequent years

of operation. Through the use of managerial accounting tools, energy companies adapt to the market changes and are thus able to achieve competitive advantage. Managerial accounting tools are used for continuous efficiency and effectiveness improvement. As a result, the companies transform into intelligent (learning) organizations.

This article presents the results of a literature study and an empirical survey conducted among large entities concerning management and the use of managerial accounting tools. We present the application of managerial accounting subsystem tools in an energy industry entity, namely, Hager Polo Ltd., against the background of the research carried out. The study results were supplemented by a qualitative study in the form of a case study, i.e., an individual in-depth interview (IDI) with the director of an enterprise operating in the energy sector Hager Polo Ltd The Hager Group is a leading supplier of electrical power products for industry, residential, and commercial construction. Its product range includes power distribution, electro-installation equipment, building automation, and cable routing systems. The company provides reliable power solutions for offices, hotels, retail, homes, and multi-residential buildings. The energy solutions offered by the company are flexible. The company systematically adapts its product solutions and the services offered to the variable customer needs and to climate change.

The article's contribution to research relates to the identification of management accounting tools for managing an energy company. The scope of information used by given entities may change and requires updating. We formulated the following research questions:

1. What managerial accounting tools are used in the implementation of enterprise management functions: planning, organizing, leading, controlling?
2. What managerial accounting tools do managers use in strategic decision making?
3. What managerial accounting tools do managers use in operational decision making?
4. What impact do the managerial accounting tools used have on energy industry entity management?

This article examines the use of management accounting tools in managing a large entity, with particular emphasis on the energy industry. The authors identified a scientific gap in the form of identification of management accounting tools in the management of an energy entity. The scope of information flowing from the management accounting system is changing and requires updating.

2. Literature Review

Current energy enterprise management, in the light of the legal and environmental requirements, calls for organizational changes and new strategy development. A strategy expresses the long-term goals of an enterprise, corresponds to the courses of action developed, and presents allocation of the resources necessary to achieve the objectives adopted [5]. It entails a set of targets, parameters, and the basic assumptions and plans necessary to achieve these targets, expressed in a manner enabling determination the business activities a given enterprise is or should be engaged in and the type of business it conducts or should pursue [6]. An energy enterprise's strategy should entail all planned and implemented activities, taking the existing conditions (economic, environmental, legal, technical, social, and organizational) leading to the achievement of the objective adopted into account. It represents the path towards the goal, while the targets adopted should ensure systematic development of a given energy industry entity. Nowadays, energy companies seek ways to improve their operation, in order to reach the highest possible efficiency and effectiveness. Table 1 presents selected energy enterprise management concepts.

Table 1. Selected energy enterprise management concepts.

Concept	Description
Kaizen	A concept of continuous efficiency improvement and streamlining, engaging all employees, regardless of the level, in the search of ideas to optimize every area in the organization, with the aim of eliminating errors and implementing innovations.
5S	The method is intended to establish and maintain workplace order and discipline. Its implementation establishes a work environment conducive to pro-quality activity and promotes harmonious work and continuous improvement of interpersonal relations, which positively impact overall organizational efficiency. The term "5S" derives from the Japanese words seiri—tidiness, seiton—orderliness, seiso—cleanliness, seiketsu—standardization, shitsuke—discipline. Adherence to the 5S concept improves productivity, reduces costs, and increases work safety and employee engagement.
FMEA Failure Mode and Effect (Critical) Analysis	The method is intended to identify and assess the risks associated with the weaknesses in production planning, designing, and manufacturing processes, thereby significantly reducing the risks. Application of the method enables improvement of the quality of the services provided, improvement of the reliability of the products offered, better adaptation to the customer requirements, reduction of costs, and reduction in the number of complaints and defective product claims. The concept deepens employee integration and teamwork as well as improving the flow of information in the organization.
Just in Time	The concept assumes provision of all the components necessary in each production process, at the required time, in the required quantity. Its implementation ensures reduction of inventory levels, lower warehousing costs, improved product quality and minimized costs of product inspection, higher standard of service to customers, reduced lead times, and maximized production efficiency.
Model Taguchi	The use of modern production technologies enabling elimination of deviations, from the values desired, in the level of product/service quality and in manufacturing/assembly/service-delivery processes. It is used to optimize new products/services/processes or to improve the existing ones.
Kaban Method	A method of workflow management and business process visualization. It is used to optimize work and processes, improve efficiency, and minimize waste, on the basis of reports and analysis. In modern enterprises, Kanban systems are computerized systems.
Canvas	The concept consists of nine elements: customer segments, customer value proposition, sales and service channels, customer relationships, key processes, key resources, partner ties, revenue streams, and cost structure. It is a business strategy used in new product/service launching.
QFD Quality Function Deployment	The method is intended to translate the customer needs and expectations into the quality of the products/services offered, and the customer needs into technical product/service parameters. It involves market research, development research, invention, new concept design, prototype testing, and product testing and service.

Source: own elaboration based on [7–14].

The management concepts described in Table 1 can contribute to an increase in profitability in an energy enterprise, strengthen its market position, and improve its customer confidence. Development of product offers and creation of added value for customers will allow energy industry entities to generate the expected financial results [15,16]. Implementation of the concepts presented in Table 1 requires commitment and understanding on the part of employees at every level of management [17,18]. Management concept

implementation also involves support by an adequate accounting information system, primarily by providing the managers with the information generated by the management accounting subsystem, essential at each stage of energy enterprise management [19–21]. The development of strategic management, financial and technological innovation, modern management methods and new organizational structures, and the increased dynamics of the external environment and competition have determined the growing use of managerial accounting tools by entrepreneurs [22–24]. Managerial accounting encompasses the techniques and processes involved in the preparation of the financial and non-financial information and the subsequent communication thereof to managers and employees for better decision making and more efficient control of the organization as a whole [25,26]. The studies carried out by Burritt et al. confirmed the impact of the managerial accounting tools application, which facilitates the recording and measurement of carbon emission reduction [27]. Managerial accounting information systems aid managers in their decision making regarding energy dependence and energy consumption costs in an entity, as confirmed by a study carried out by Haseeb et al. [28]. Allocation of the managerial accounting subsystem tools in an energy enterprise, including an attempt to isolate the cost centers, was undertaken by Kowalewski [29], while Wojcik presented application of a strategic scorecard in energy company management [3]. Enterprises in the energy sector, introducing changes in business models, will be heading towards "intelligent management" and "intelligent organization" based on knowledge management. Intelligent management in an energy company uses information regardless of where it is stored. Advanced process tools are used to ensure control. Automation to the preparation of business information is introduced. For this purpose, it uses a wide range of management accounting tools. Accounting is the unparalleled judge of the past, the necessary guide to the present, and the indispensable advisor of the future in each enterprise. Management accounting has two essential elements: quality of the information system and choice of the right strategy [30]. Management accounting is increasingly more the main element of the management process, not only at the operational level, but also at the strategic level. Management accounting is now related to the settlement of the organization's strategy, long-term planning, strategic decision making, and strategic control. Additionally, it plays an important role in risk management for securing the company's performance. An appropriate accounting system has a wide range of instruments that allow for reducing the negative effects of risk and taking advantage of opportunities inherent in this company's risk [31,32].

Managerial accounting must consider strategic management approaches by introducing opportunities and threats in managing the company's costs and revenues [33].

The use of managerial accounting subsystem tools is aimed at transforming an energy (or any) company into an intelligent organization. According to the Lexicon of Management (Leksykon Zarządzania), "the intelligence of an organization" is defined as "the capabilities of an enterprise which affect its operational efficiency, contributing to the enterprise's adaptation to the environment and its innovation" (translated from the original in Polish by M.G.). An intelligent organization has the ability to understand, learn, and use its knowledge and skills in new situations in order to adapt to changes in the environment [34]. It also has the ability to react and solve problems [35,36]. These capabilities include information, technological, innovative, financial, organizational, social, marketing, and environmental intelligence [37]. Intelligent organizations, according to Lobejko, are learning organizations, attentive to knowledge and its management systems, using that knowledge to ensure their development [38]. An important feature of such organizations entails the ability to operate flexibly, quickly creating and delivering products or services to customers [39]. Intelligent management is the ability of an organization to develop and strategically use the knowledge necessary to achieve its goals. It is the ability of the organization to find itself in a difficult and changing environment, through an appropriate design of the organizational structure, infrastructure, strategy, and business model [40]. An intelligent organization in the energy industry should implement streamlining and efficiency, increasing activities on the transactional systems and core processes plane while

enriching these processes with various innovations [41–43]. The basis for creating an intelligent energy industry enterprise, as a foundation for development and market growth, lies in the use of advanced analytics in management, supported by the use of automated managerial accounting tools and application of social-media-based analytics for marketing and sales [44,45].

3. Materials and Methods

Scientific research accounts for the typical and repetitive methods of preparation, collection, analysis, and then interpretation of empirical data, which is meant to provide adequate justification for the answers to the questions posed therein [46–48].

For the purpose of this article, we conducted a literature study, empirical research, and a qualitative study in the form of an individual in-depth interview (IDI) with the manager of Hager Polo Ltd. Due to the difficulty of obtaining a nationwide database of enterprises, we used the database of the entities cooperating with the Center for Knowledge and Technology Transfer (the Center for Knowledge and Technology Transfer was established in 2015; it handles the research and expert services provided by the Bydgoszcz University (research papers, specialized training, and innovation opinions) to local, national, and foreign entrepreneurs) of the Bydgoszcz University of Technology. Detailed breakdown of the database information enabled isolation of large enterprises, which yielded a database of 56 entities meeting the size criteria, i.e., entities with more than 250 employees.

The research tool used was a standardized questionnaire consisting of 2 parts encompassing 10 questions, composed of 2 metric questions, 7 thematic questions, and 1 filter question. The CAWI-Computer Assisted Web Interview method was adopted as the data collection procedure. Semi-open-ended questions with the answer variant "other" (what?), closed-ended questions in the form of a disjunctive cafeteria (possibility of choosing one answer from more than two variants), and conjunctive cafeteria (possibility of indicating more than one answer) were used. The measurement scales adopted were nominal scales (including a Likert scale, among others) and a positional scale. The data were collected in the first half of 2022. In the course of the research, 10 entities expressed willingness to participate in the study and answered all questions. After analyzing the empirical results, an individual in-depth interview (IDI), as a form of a case study, was conducted with the manager of the energy company Hager Polo Ltd. in order to obtain more complete research results. Individual interviews have become a widely used method of qualitative data collection in management and quality science research. This approach allows researchers to reach beyond the observable practices and measurable aspects, in order to obtain information on the phenomena that are not easy to observe or measure. This method is in particular used when in-depth understanding of the respondent's needs, motives, and values is essential in the research process [49,50]. The main study participant selection criterion entailed the obligation, under the provisions of the Accounting Act, to keep full accounting books, as well as the status of a large entity employment of more than 250 employees. It was also assumed that the respondents completing the survey questionnaire had to be people holding one of the following positions in a given enterprise:

- owner/manager;
- senior/executive manager (strategic level);
- mid-level manager;
- operational-level manager.

If the above criterion was not met, the questionnaire was not included in the sample.

4. Results

The research participants were large entities, conducting business under the provisions of the Accounting Law, which was the survey entity selection criteria.

The survey covered the use of managerial accounting tools; therefore, the questionnaire was addressed to managers at different levels of corporate management. As a result,

the questionnaire was completed 50% by strategic-level managers, 30% by mid-level management, and 20% by operational-level managers.

In subsequent survey questions, the managers provided answers regarding the dominant business profile. A total of 60% of manufacturing, 20% of service, and 20% of commercial entities participated in the survey.

Figure 1 shows the results of the strategic decisions made by the managers of the entities surveyed over the past 3 years. In terms of strategic management, the decisions made by the managers most commonly concerned organizational structure changes (83%). A total of 67% of the respondents reported planned energy management changes and introduction of new products/services to the market. None of the entities surveyed planned to enter a new domestic market. In the energy company Hager Polo Ltd., the managerial decisions made pertained to changes in the organizational structure and product offer development, as well as introduction of new products/services to the market.

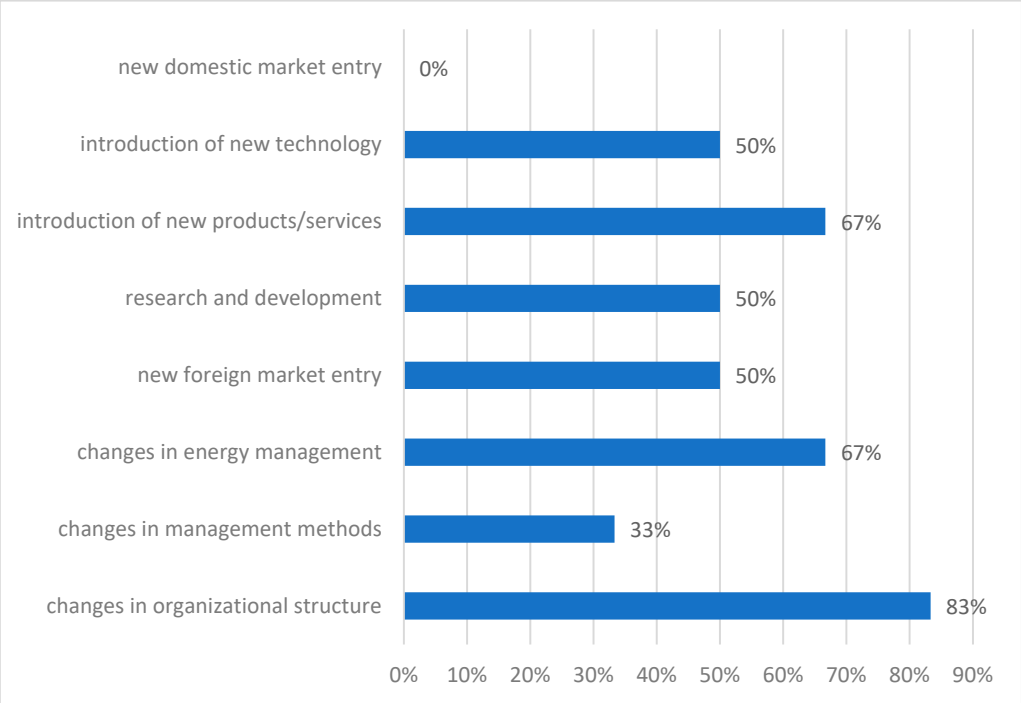

Figure 1. Surveyed entities' strategic decisions in the past 3 years. Source: own elaboration.

In the next part of the survey, the respondents answered questions regarding planning, in up to 1 year, 2–3 years, or over 3 years of perspective. The results are presented in Figure 2. With regard to the period of up to 1 year, the managers primarily indicated the need for information at 83% and energy supply at 83%. The smallest extent of up to 1-year planning, i.e., 33%, pertained to finances, revenues, costs, sales, and financial flows. In large entities, these elements are planned for periods of 2–3 years, as confirmed by 83% of the respondents. In periods of more than 3 years, the entrepreneurs plan investments (67% of the responses). In the energy industry enterprise of Hager Polo Ltd. information requiring development is planned in up to a one-year perspective and investments in over 3 years of perspective, while the other elements of business are planned by managers in periods of 2–3 years.

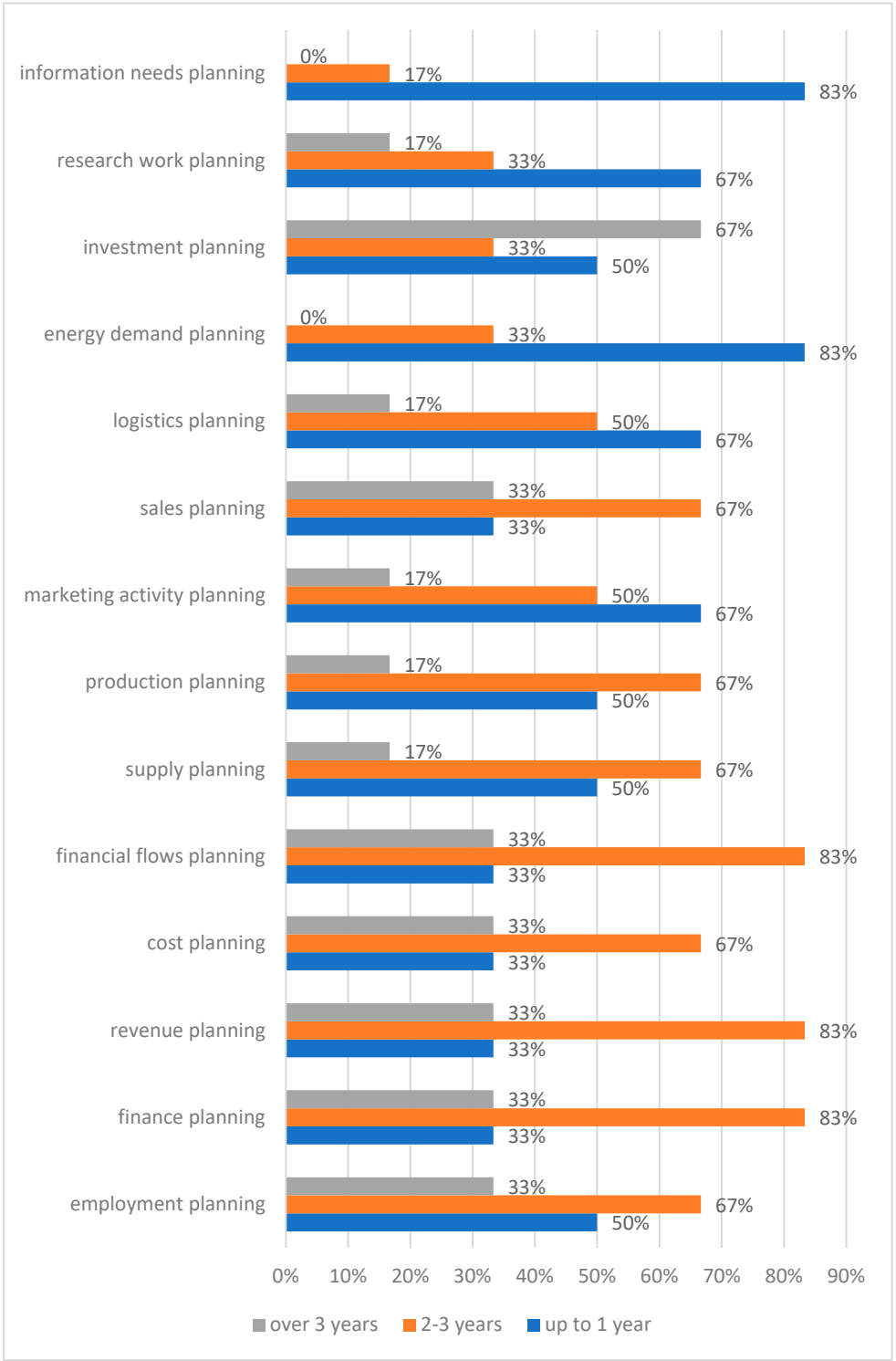

Figure 2. Planning decisions in the entities surveyed: up to 1 year, for 2–3 years, over 3 years. Source: own elaboration.

In the next questions the respondents were asked about the use of managerial accounting tools in enterprise management. The respondents provided answers on what managerial accounting tools they use in carrying out various management functions: planning, organizing, leading, and controlling; the results are shown in Figure 3.

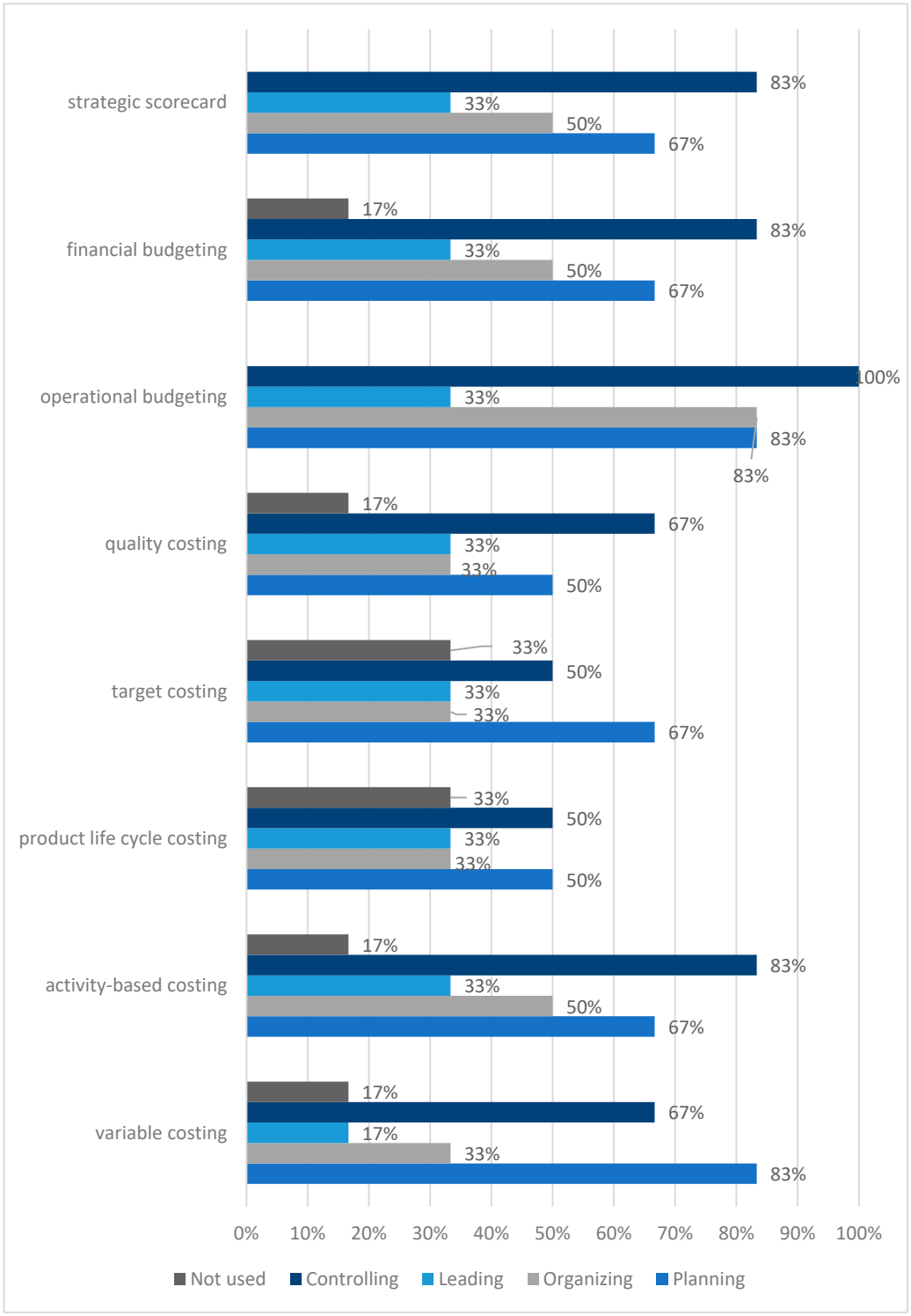

Figure 3. Managerial accounting tools used in the entities surveyed. Source: own elaboration.

With regard to planning, the managers most commonly use variable costing and operational budgeting (83% of indications); task organizing-operational budgeting (83% of indications); and activity-based costing, financial budgeting, and strategic scorecards (50% of indications of respondents). In leading, i.e., employee motivation activities, the managers are least likely to use variable costing (17% of indications), while the other tools are used to a smaller extent (33% of indications). Managerial accounting tools are most

often used in entity activity controlling, i.e., 100% of managers use operational budgeting and 83% use activity-based costing, financial budgeting, and strategic scorecards.

Against the backdrop of these results, the managers of the energy company Hager Polo Ltd. se the following in planning: target costing, quality costing, and other managerial accounting tools in controlling activities. In the areas of organizing and leadership, no managerial accounting tools are used.

In subsequent survey questions, the respondents were asked to assess the extent of each managerial accounting tool used in strategic and operational decision making. Here, we used a Likert scale, from 1 to 5, where 1 indicated a very small extent, 5 represented a very large extent, and 0 represented it not being applicable. The results are presented in Table 2.

Table 2. Assessment of managerial accounting tool use in strategic decision making.

	Small Extent *	Large Extent	Hager Polo Ltd.	Very Large Extent
Variable costing	25%	33%	x	17%
Activity-based costing	8%	50%	x	33%
Product life cycle costing	25%	50%	x	0%
Target costing	17%	33%	x	33%
Quality costing	25%	50%	x	0%
Operational budgeting	17%	33%	x	33%
Financial budgeting	8%	50%	x	33%
Strategic scorecard	25%	33%	x	17%

* Column contains the sum of the "very small" and the "small" categories. Source: own elaboration.

In the entities surveyed, activity-based costing, product life cycle costing, quality costing, and financial budgeting are largely used in strategic decision making, as per the indications by 50% of the respondents. A total of 33% of the managers use activity-based costing, target costing, and operational and financial budgeting to a very large extent. Against the background of these results, the managerial accounting tools indicated were to a large extent used at Hager Polo Ltd., as per the manager's assessment.

Table 3 shows the results of the managers' assessment of the extent of managerial accounting tool use in operational decision making.

Table 3. Assessment of the managerial accounting tool use in operational decision making.

	Small Extent *	Large Extent	Hager Polo Ltd.	Very Large Extent	Hager Polo Ltd.
Variable costing	13%	0%		33%	x
Activity-based costing	25%	33%	x	17%	
Product life cycle costing	25%	33%		17%	
Target costing	25%	33%		17%	
Quality costing	17%	50%	x	17%	
Operational budgeting	8%	17%		67%	x
Financial budgeting	17%	50%	x	17%	
Strategic scorecard	42%	17%		0%	

* Column contains the sum of the "very small" and the "small" categories. Source: own elaboration.

The tool specified as used by the managers to a very large extent in day-to-day management is operational budgeting (67% of indications), which was also indicated by the manager of the energy company Hager Polo Ltd. A total of 33% of the respondents indicated variable costing, which corresponds with the answer provided by the management of the energy industry entity. The managerial accounting tools used to a large extent were quality costing and financial budgeting (50% of indications), as well as activity-based costing (33% of indications), which again corresponded with the answers provided by the manager of Hager Polo Ltd.

The question regarding the presentation of management accounting subsystem information was answered unanimously by the managers surveyed, who stated that it constituted an important and a very important aspect in the decision-making process. Each of the elements mentioned in the survey received a rating of very important or decidedly the most important. As presented in Table 4, 67% of the respondents indicated sales analysis, financial ratio analysis, and cost and profit analysis as decidedly the most important management accounting system data. According to the manager of Hager Polo Ltd.,revenue analysis was also rated as by far the most important, while coverage margin analysis was rated as important. In total, 50% of the managers surveyed indicated revenue analysis and coverage margin analysis as important.

Table 4. Assessment of the management accounting system data facilitating decision making.

	Very Important	Hager Polo Ltd.	Decidedly Most Important	Hager Polo Ltd.
Revenue analysis	50%		50%	x
Sales analysis	33%		67%	x
Financial ratio analysis	33%		67%	x
Coverage margin analysis	50%	x	50%	
Cost analysis	33%		67%	x
Profit analysis	33%		67%	x

Source: own elaboration.

In the last question, the respondents were asked to assess the extent to which individual management accounting tools were used in company management. As Table 5 shows, according to the strategic-level manager of Hager Polo Ltd., variable costing and operational budgeting are used to a very large extent in management, which corresponded with the indications provided by 17% of the surveyed respondents representing the remaining entities of other industries. A total of 33% of those respondents indicated financial budgeting and strategic scorecard as the management accounting system data used to very large extent.

Table 5. Assessment of the extent of individual managerial accounting tools used in management.

	Very Small and Small Extent *	Large Extent	Hager Polo Ltd.	Very Large Extent	Hager Polo Ltd.
Variable costing	17%	17%		17%	x
Activity-based costing	17%	50%	x	17%	
Product life cycle costing	33%	33%	x	0%	
Target costing	33%	33%	x	17%	
Quality costing	17%	50%	x	0%	
Operational budgeting	0%	33%		17%	x
Financial budgeting	0%	33%	x	33%	
Strategic scorecard	33%	17%	x	33%	

* Column contains the sum of the "very small" and the "small" categories. Source: own elaboration.

Half of the respondents indicated use to a large extent of activity-based costing and quality costing, which corresponds with the indications provided by the manager of Hager Polo Ltd. What is more, the remaining managerial accounting tools were rated by the manager of Hager Polo Ltd. as being used to a large extent.

In order to obtain answers to the research questions posed in the article, we extended the empirical material to include the analysis of the results of an individual in-depth interview conducted by the director of Hager Polo Ltd. We selected a purposeful specialist whose knowledge and practical experience constituted a valuable source of information. Table 6 presents the results of the interview.

Table 6. Results of the IDI (individual in-depth interview) with the manager of the Hager Polo Ltd. Energy company.

Introductory Interview Questions	**Answers:**
Position in the enterprise	Chief Sales Officer
Duties/responsibilities	Team management, participation in board meetings, daily communication with employees, contacts with contractors, developing company plans, accounting, reporting, substantive and product support for employees, participation in international projects.
Main interview questions	Answers:
Strategic decisions made in the enterprise in the last 3 years	Development and expansion of the related product offer with renewable energy sources and intelligent energy management in enterprises, houses or cities, energy-saving services, and products, introducing changes in the organizational structure and management, and implementation of international projects.
Business planning decisions for the upcoming 1 year, 2–3 years, and over 3 years	To shorten planning time due to the uncertainty of the external environment, there was implementation of investment processes over 3 years, demand for information up to 1 year, and planning and financial and operational budgets for 2–3 years.
Application of management accounting tools in managing an energy entity	In the implementation of the management function in the Hager Polo Ltd. energy company, management accounting tools are used for control purposes. They use target and quality costing in planning new products and activities. According to the manager, management accounting tools are not used in motivating and organizing.
The use of management accounting tools in making strategic decisions	In strategic management, management accounting tools are used to a large extent. The controlling department is responsible for the development of analyses with the use of information from the management accounting system.
The use of management accounting tools in making operational decisions	In day-to-day management, managers operate on financial and operational budgets, for the implementation of which they are accountable for. They have access to and analyze monthly information and use activity-based costing. These reports are prepared by the controlling department.

Source: own elaboration.

The study confirmed the high degree of use of management accounting tools in the performance of control functions in the energy company Hager Polo sp. Ltd and, to a lesser extent, in planning. This allowed us to identify the gap and, in the manager's opinion, the lack of use of information from management accounting in organizing activities and motivating employees.

5. Discussion

The biggest obstacle for energy sector players is to flexibly adapt to the challenges posed by the contemporary economy, determined by the development of modern technologies and the changes in the environment, in order to maintain competitiveness and ensure growth and expansion into new markets [51,52]. Managerial accounting subsystems processes financial and non-financial information for decision making, strategy formulation, and entity value creation purposes. In today's dynamic economy, these systems are becoming an indispensable tool for energy industry players, ensuring efficiency and competitive advantage thereof [53,54]. This study conducted by us has confirmed the high degree of managerial accounting tool utilization in day-to-day and strategic management of large entities, including the energy industry. Analyzing the results obtained, it should be noted that, in the energy industry, no managerial accounting tools were used for implemen-

tation of two management functions—organizing and leading. With regard to planning and controlling, however, individual tools were used to a very high and high extent, as per the surveyed managers' answers. Table 7 presents our suggested areas of managerial accounting tool utilization in leading and organizing

Table 7. Application of managerial accounting tools in energy entity management.

Management Function	Managerial Accounting Tool Use
Organizing	• changes in organizational structure; • adaptation of the managerial accounting tools used to the business activity needs and specifics; • analysis of the entity's fixed and current asset management; • coordination of the activities specified in the plans developed, in order to achieve the intended results; • improvement of the planned activity coordination process and information exchange through prepared reports, statements, summaries, and analyses, including visualization thereof;
Leading	• indication of opportunities for more efficient resource use, which translates into increased enterprise value and improved results; • employee motivation to achieve the goals intended, through presentation of developed reports and analyses; • systematic provision of employees with information; increase in employee engagement at every level of management; • introduction of online communication with the finance and accounting department; • development of labor intensity analyses; • linking employee remuneration systems to the implementation of the plans set.

Source: own elaboration.

As we have found, this result indicates a possibility of introducing changes in the management system of the energy industry entity, through the use of modern technologies and changes in the accounting information system. It is important to note the high assessment of and the need for visualization of the information derived from the management accounting system. These changes set the direction for the development of an intelligent enterprise in the energy industry. Assessing the results of the study carried out, it can be noted that the information derived from the management accounting system supports creation of an intelligent energy industry enterprise, which should incorporate three main elements:

1. Intelligent suite;
2. Digital platform;
3. Intelligent technology.

An intelligent suite encompasses, inter alia, the systems supporting customer relations and service, financial, controlling and accounting processes; the supply chain and purchasing networks; the information flow processes between individual organizational levels; and network and production asset management. A digital platform constitutes the source of information and provides system integration through the use of advanced intelligent technologies such as robotic process automation (RPA), business intelligence (BI), or machine learning (ML) [55–60]. It allows for advanced business analysis and provides real-time access to data [61–65]. RPA (robotic process automation) tools are introduced in the financial accounting systems and involve automation of repetitive activities. Implementation of advanced managerial accounting tools can be facilitated by modern technologies

equipped with BI (business intelligence), followed by development of ML (machine learning). Business intelligence (BI) is a modern technology enabling data analysis through developed indices—key performance indicators (KPI). BI provides analysis of historical and current data as well as forecasting of business operations, including clear, accessible data visualization for managers. BI applications are built-in, configurable navigation dashboards enabling real-time reporting and data analysis, based on a central database, operating jointly with ERP systems [66,67].

Machine learning (ML) is an artificial intelligence subset, a computational method that, using dataset-based algorithms, enables prediction of the future, or estimation of risk. A managerial accounting information system can use machine learning to create sets of reports for forecasting, diagnosis, reporting quality improvement, error prediction, and anomaly detection [68,69]. The above-mentioned elements facilitate development of energy industry entities towards organizations of intelligent management, and consist of

1. internal processes digitalization, and automation of implemented tasks treated as natural communication;
2. systematic analysis of weaknesses and deviations in the achievement of the goals intended;
3. conduction/support of research and development activities;
4. introduction of new technologies;
5. introduction of network organizational structure and delegation of responsibility to lower levels of management;
6. exploitation of the full employee potential;
7. knowledge management.

The strategy adopted in the energy company Hager Polo Ltd. involves enhancement of the energy security of the enterprises served by provision of reliable, energy-efficient power infrastructure solutions. The company implements the concepts described in Table 1 in its strategic management, with particular emphasis on the Kaizen concept of continuous improvement and streamlining at all organizational levels, alongside QFD (quality function development) aligning product offerings with customer expectations. According to the manager of Hager Polo Ltd., intelligent management involves strong emphasis on individualizing the customer needs in order to provide appropriate solutions as well as ensure comprehensive project execution. When implementing innovations and new technologies, the company always follows the customer needs.

An intelligent energy company management strategy should take development of electric power systems and the political situation into account.Innovation and sustainable development, in the context of these strategies, will be determined by modern technologies and supported by managerial accounting subsystem information. The path towards formation of a new business and regulatory model in the power industry will be shaped by the development of the concept of intelligent organizations and network organizational structures [70]. The energy enterprise's success, in the long run, will depend on the inclusion of good communication and trust-building among the management, employees, and stakeholders in the company's strategy [71,72].

6. Conclusions

Summarizing the research results, we show that management accounting tools support the implementation of the management processes in large enterprises, including energy enterprises. In the performance of the management function, the management accounting system in motivating employees and organizing the entity's operations is used the least, which was confirmed by the manager of the Hager Polo Ltd. energy company. The results of the study also show that large entities have a high demand for information provided by the management accounting system in making strategic and operational decisions by managers and the need for their visualization. The use of management accounting tools in intelligent management of an energy company may bring tangible benefits in the areas of

1. Repetitive process automation (RPA)—answering queries using AI chatbots, transaction classification, fixed and current asset management, process control, online communication, problem solving at various organizational levels, and savings, enriching the use thereof with a finance module that allows, at this stage, financial forecasting, financial control, simple budgets, and KPIs (key performance indicators) tailored to the specifics and information needs of the energy industry entity.
2. Real-time decision making—the amount of the data provided is increasing, and the algorithms based on BI or ML technologies enable data visualization and allow managers to predict business decisions.
3. Creation of business value—by processing large amounts of data through defined algorithms, reducing the time of analysis performance via real-time decision making.

An intelligent enterprise should be perceived as such by both the market environment and its employees. Automation and digitization allow simplification of processes, which is positively perceived by various stakeholder groups. This offers the space for enhancing process function attractiveness by including elements that not only build advantage and efficiency but also bring about new employee competencies and value, which in turn constitute a pillar of further development of the energy enterprise.

The considerations in the article and the presented research results may constitute the basis for further scientific research in the fields of

- wider use of the tools of the management accounting system in the performance of the management function in an energy company;
- use of management accounting tools tailored to the needs of the energy entity;
- application of modern technologies supporting the functioning of the management accounting system, providing managers with access to information in real time.

The information used from the management accounting system in the energy sector entities will change, and the tools will be updated.

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