Cloud-based Business Intelligence Solutions in the Management of Polish Companies

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Abstract

The aim of the paper is to indicate the role, scale, and benefits resulting from the application of Business Intelligence systems in the cloud computing model in the management of Polish companies. The paper characterizes cloud-based BI systems and its role in the support of a contemporary company's management. It focuses on the cloud as a factor positively affecting business organization development where the research was conducted on a sample of 400 medium and large Polish companies in the 2021 year. The research part indicates benefits resulting from the application of Cloud BI systems by medium and large companies in Poland, the popularity of Cloud BI systems, threats and barriers resulting from the application of Cloud BI systems, assessment of Cloud BI systems application in the scope of the decision and business processes support and evaluation of the application of Cloud BI systems in supporting key company's areas and activities.

Keywords: Business Intelligence Systems, Cloud Computing, Cloud-based BI, Business Analytics, Decision Making Support

1.   Introduction

Business Intelligence systems are currently one of the most important IT tools supporting the process of contemporary company management, especially playing a crucial role in the support of decision making at all levels of management. "Dynamic development in the area of IT, growing needs of recipients, and the increasing competition among suppliers of IT solutions, contributed to the rising of new forms of purchase and utilization of Business Intelligence systems. An alternative for the traditional model (on-premise) which bases itself on own IT resources of the recipient, is the possibility of purchase and utilization of Business Intelligence systems in the cloud" [4]. In the paper the authors posed the following research questions:
1) Which Cloud BI solutions are used in medium and large companies?
2) What were the motives for using Cloud BI in medium and large companies?
3) What benefits and threats resulting from using Cloud BI systems are indicated by medium and large enterprises?
4) What is the assessment of Cloud BI systems in terms of supporting decision-making processes, business processes, and projects as well as key areas in the business activity of the company

2.   Characteristics of Cloud-based Business Intelligence Systems

The literature of subject presents multiple definitions of Business Intelligence systems e.g. IGI Global conducts a review of 62 definitions [2]. The worth mentioning is the one by Forrester Research where BI is defined as "a set of methodologies, processes, architectures, and technologies that transform raw data into meaningful and useful information used to enable more effective strategic, tactical, and operational insights and decision-making." [2]

The second definition on which this paper is based on is the one by Gartner Group where "Business intelligence (BI) is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance." [2]. S. Ouf and M. Nasr state that BI enables "making better decisions through the use of people, processes, data, and related tools and methodologies" [15]. "Cloud BI (Business Intelligence) and analytics refer to the applications hosted on the cloud, used to provide an organization with access to BI-related data – dashboards, KPIs, and other business analytics. It synergizes BI with business and predictive analytics, delivering information and insights in real-time on multiple devices and web browsers" [21] Other crucial components of such systems include portals, predictive analytics tools, data and text mining solutions, alerts and notifications, workflow, querying and reporting, etc. [20].
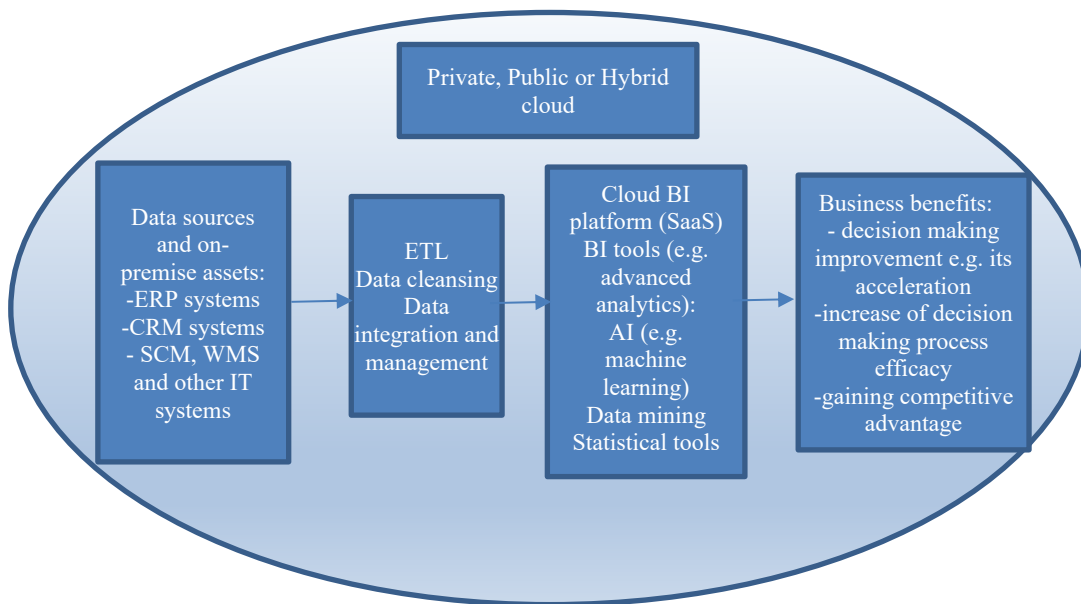
Fig. 1. Cloud BI environment
Source: Authors' contribution

The cloud BI environment proposed in fig. 1 utilizes data sources and on-premise assets including IT systems implemented in contemporary companies such as ERP systems, CRM systems, SCM, and WMS systems applied in the logistics domain as well as other ones applicable in a specific area. The data from those systems undergo the extraction, transformation, and load process (data cleansing) and with the application of the Cloud BI platform e.g. SaaS deployment, different BI analyses are conducted such as clustering, regression analyses, and so on. In order to carry out such analyses the artificial intelligence solutions (machine learning with deep and reinforcement learning), advanced statistics, data mining methods, techniques, and tools are applied. The application of the Cloud BI platform brings multiple benefits to the companies such as the improvement of the decision-making process with its acceleration, increasing efficiency and efficacy of the decision-making process, and many others which were presented in the research part of this paper.

A. Duggal states that "cloud Business Intelligence refers to the deployment of Business Intelligence tools over cloud infrastructure which can then be accessed using virtual networks including the Internet and enumerates such key advantages of Cloud BI as: cost-effectiveness, scalability of deployment, easier setup and operation, reduced overhead expenditures, advanced data sharing and improved reliability" [3]. C. Olszak states that "cloud BI has been developed in order to enhance the efficiency and productivity of business intelligence and increase the performance of BI software. It helps in shortening BI implementations, and reduction of BI application costs" [14]. W. Thompson and J.S.

Walt underline the advantages of BI SaaS solution as cost reduction and "having access to the latest software which will give the business an edge on their competition" [18]. The challenges related to the utilization of Cloud BI may be connected with security concerns and data latency and also availability, performance, integration, regulatory issues, and constraints on network bandwidth [17].

## 3.   Business Intelligence in the Cloud as a Factor Affecting Business Organization Development

Business Intelligence deployed in the cloud model as an innovative solution may contribute to business organization development. Al Aqrabi et al. claim that the "cloud is an important part of future BI and offers several advantages in terms of cost efficiency, flexibility, and scalability of implementation, reliability, and enhanced data sharing capabilities"[1]. According to the research conducted by E. Indriasari et al. on the basis of the financial sector, the functional areas of Cloud BI embrace: executive management, strategic planning, information technology, marketing, sales, research and development, finance, human resources, and centers of competencies [11]. In the logistics area, it improves the whole decision-making process, especially in relation to the supply chain, improvement of performance in different areas of business activity, cost reduction and optimization in reverse logistics, improve the efficacy of transportation, and allows for better inventory management [8]. The deployment of Cloud BI brings multiple benefits to the company which utilizes such a solution. M. Kasem and E. Hassanein enumerate such advantages as: lower costs, scalability, flexibility, and disaster recovery [12]. Other advantages of BI on-premise, as well as cloud BI, embrace: "getting in one place reliable and coherent data and information from all areas of an organization's activity; facilitated access to data coming from different sources; shortening the time of analysis, decision making and increasing efficiency of management; efficient planning, simulation, and prognosis in different angles; quick reaction to appearing market trends, detection of threats and chances in the area of leading activity; current analysis of the financial situation; lowering the number of persons involved in decision-making processes; increase of efficiency and efficacy of undertaking decisions" [6]. Business Intelligence systems enable the processing of data coming from various sources and generate valuable information for decision-makers regarding the current and future state of various areas of company business activity. Knowledge derived from the information obtained from BI systems, allows making decisions important for the functioning and development of both large, small and medium-sized companies. Significant potential in the use of BI systems in the group of small and medium-sized is constituted by the SaaS model, which is a component of Cloud Computing. The use of BI systems by companies in the SMB sector can generate a number of strategic, organizational, economic, technological and social benefits" [5]. J. Ereth and D. Dahl enumerate factors that bring benefits to companies such as "the reduction of costs or the increasing focus on key competencies, but also criteria which are more complicated to identify, for instance, the enabling of competitive advantages and new business models [7]. "Compared to traditional on-premise BI software, cloud BI solutions are more affordable to implement and give a business greater agility in how they operate. These tools also scale with a company and improve collaboration within the workplace" [19]. F. Hamidinava et al. claim that "BI tools enable the effective management of companies of all sizes by providing analytic data and critical performance indicators" [10]. Y. S. Gurjar and V. S. Rathore state that "BI on the Cloud offers huge possibilities for removing barriers to decision making by integrating high volume and mission-critical business processes. Therefore, a Cloud BI solution may be a feasible answer to the challenges of the economic crisis" [9]. L. Menon et al. present Return on Investment (ROI) for a cloud BI implementation with "financial metrics including e.g. cost reduction or revenue increase, non-financial benefits including improved customer satisfaction (i.e. Customer Satisfaction Index CSI), better information, shorter cycle-time" [13].

4. The Scale of Cloud BI Application Among Medium and Large Companies in Poland

In order to identify the scope of management support of medium and large companies by Cloud BI solutions, the authors conducted a survey in the first half of 2021, among 400 medium and large companies doing business in Poland, and which declared the use of BI systems in cloud computing. The distribution of companies in terms of their size was proportional: 50% of medium-sized and 50% of large companies operating in different industries participated in the survey. The questionnaire included questions with single and multiple answer choices and used a 5-point Likert scale. The research was conducted using the CAWI (Computer Assisted Web Interview) method, in which the respondent filled out a questionnaire posted on a website. MS Excel was used for data processing and analysis.

The analysis of the collected data shows that the largest percentage of the surveyed companies belonged to the industry sector (50%) and trade (20%). Other industries (i.e. construction, transport and inventory management, accommodation, and catering) had a much smaller share (about 10%). Among the respondents, the largest groups were IT department specialists (76%) and management representatives (19%). Managers of other departments and specialists constituted a small number of people participating in the survey (3%). Thus, the research involved personnel who understand the role and importance of IT solutions and decide/co-decide on the purchase and implementation of IT systems in the cloud, and have knowledge on the effects of using Cloud BI systems in the enterprise. On average, the surveyed enterprises in Poland have been using Cloud BI for over 5 years, which indicates that this is the period to gather sufficient knowledge and experience on the effects of using this type of solution in the business activities of medium and large companies.

The most popular Cloud BI system used in medium and large companies in Poland is Power BI (71%). A much smaller share is held by Tableau (27%) and Qlick Sense (2%). The popularity of Cloud BI systems among the surveyed enterprises is shown in Figure 1. ERP systems are the main source of power for Cloud BI systems. The dominant ERP system in medium and large companies is SAP (85%). Much less popular in this group of enterprises are ERP systems from the Polish company Comarch (about 15%) and other ERP systems (about 1%).
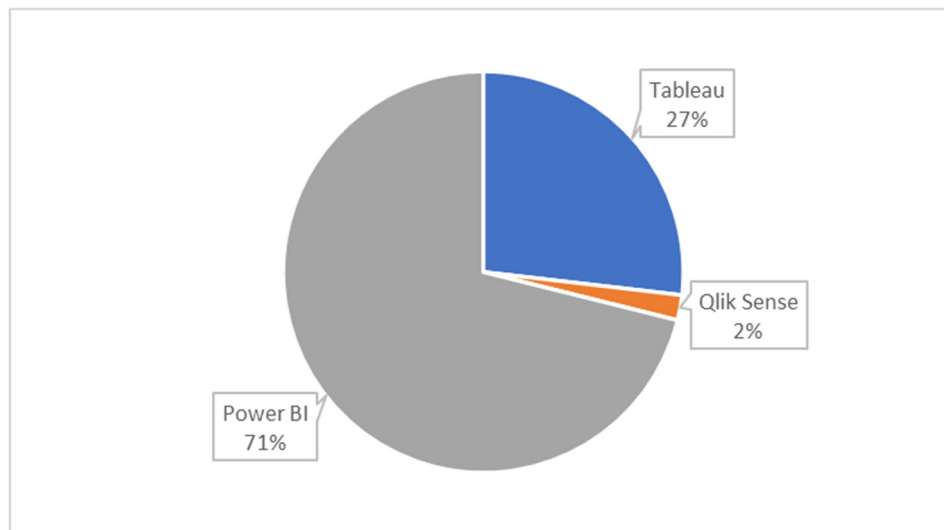
Fig. 2. Popularity of Cloud BI systems among medium and large companies in Poland
Source: Authors' study based on the conducted research

Among the surveyed group which belonged to medium and large companies, Cloud BI systems were most often hosted in a private cloud (70%), although this type of cloud is characterized by significant implementation costs and limited flexibility. The high popularity of BI systems hosted in a private cloud may result from the need for its direct

control by the company's IT staff and the lack of the need to transfer data to an external provider. Cloud BI systems in the surveyed group of Polish companies are much less often deployed in the public cloud (30%), although this type of cloud has many advantages (e.g. no investment in infrastructure, provider responsibility for IT resources, a wide selection of services, scalability of services, low cost of BI system purchase). None of the enterprises indicated that they use other types of clouds e.g. hybrid, partner, or dedicated cloud. Respondents using Cloud BI equally utilize both SaaS and PaaS services (50% each). In the IaaS model, in addition to the necessary hardware and software infrastructure, an internal or external supplier also provides a software environment for operating BI systems, while in the SaaS model the supplier takes full responsibility for the operation of Cloud BI systems. Cloud BI systems in the IaaS model were not mentioned by any surveyed Polish company classified as a large or medium-sized business entity. The popularity of a particular type of cloud and services for Cloud BI systems is presented in Figure 2.
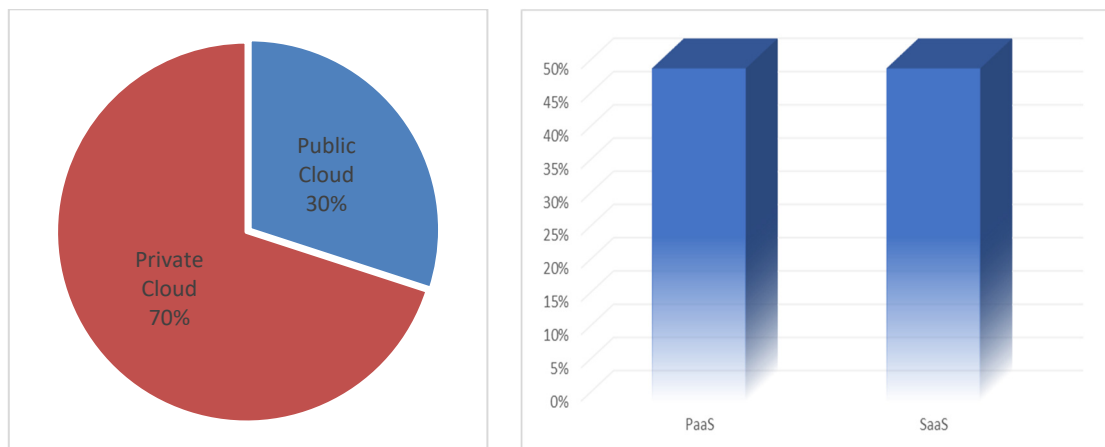
Fig. 3. Popularity of particular types of clouds and services for Cloud BI systems among medium and large companies in Poland
Source: Authors' study based on the conducted research

The main motives for applying BI systems in the cloud computing were: ensuring adequate security of the analyzed data (37%), greater availability of analysis (26%), optimization and predictability of costs (16%), improving the quality and pace of analysis (11%) and increasing the development opportunities of the company and the need for digital transformation (11%). Thus, it can be observed that the main factors for applying Cloud BI in medium and large companies in Poland were not only the increased accessibility and acceleration of performing business analyses on positive or negative phenomena occurring in particular areas of the company and the business processes realized in the era of Digital Economy, but primarily the increased security of processed data while optimizing IT investment costs. The above-mentioned motives seem to be accurate, considering the fact that as many as 70% of respondents have previously used traditional BI systems (on-premise model) and gained a lot of experience using this type of system, and only 30% of respondents had no previous local BI system installations and immediately used Cloud BI.

Medium and large companies decide to use Cloud BI systems due to the numerous benefits they gain from their acquisition and operation. The benefits of using Cloud BI systems indicated by the respondents are presented in Table 1. For each benefit of Cloud BI systems, the corresponding mean values are presented, the percentage of respondents' answers defining the given benefit on a five-point Likert scale as important (4) and very important (5), the value of the dominant, and the standard deviation. A dominant value of 3 indicates that most respondents ranked the presented Cloud BI benefits as fairly important. A low standard deviation value indicates that the individual Cloud BI benefits are centered around the mean.

Table 1 Benefits resulting from the application of Cloud BI systems by medium and large companies in Poland
Source: Authors' study based on the conducted research

Advantage	Average	Percent (4 and 5)	Dominant	Standard deviation
Constant access to current versions of Cloud BI system	3,51	40%	3	0,69
No need to purchase and develop IT infrastructure	3,30	30%	3	0,46
Low cost of acquisition, maintenance, and development of a Cloud BI system	3,30	30%	3	0,46
Faster and easier implementation of Cloud BI	3,20	30%	3	0,60
Support for mobile business operations of a company	3,10	30%	3	0,70
High level of system security	3,17	30%	3	0,83
Optimization of organization processes and data processing	3,30	30%	3	0,46
Better predictability of IT costs	3,00	20%	3	0,63
Reducing investment risk in Cloud BI	3,16	20%	3	0,67
High flexibility, scalability and performance of Cloud BI	3,26	20%	3	0,55
Transfer of liability to the supplier	3,06	20%	3	0,76
Reliable enterprise access to Cloud BI	3,26	20%	3	0,56
The advanced nature and technology of the Cloud system	3,16	20%	3	0,67
Simplicity of sharing information and knowledge	3,10	20%	3	0,34
Environmental protection (reduction of C02 emissions)	3,20	20%	3	0,40
Less demand for IT specialists	2,90	10%	3	0,54
Professional and flexible technical support	3,12	10%	3	0,38
User-friendliness of the Cloud BI system	3,00	10%	3	0,45
Cloud BI independence from hardware and software platform	2,90	10%	3	0,54

Many publications identify potential benefits and barriers of Cloud BI e.g. [16, 1, 14] but typically they are not identified on the basis of company research but a literature review. The research shows that the most important benefits that have been identified in this group of companies are of a qualitative, economic, environmental, and organizational nature. Qualitative benefits play an important role for the respondents (continuous access to the latest versions of Cloud BI, optimization of organizational processes and data processing, reliable access to the Cloud BI system, high flexibility, scalability and efficiency of Cloud BI, faster and easier implementation of Cloud BI, high level of security, substantive and technological advancement of Cloud BI). Economic benefits are also important (relatively lower costs of acquisition, maintenance, and development of Cloud BI, no need to purchase and development of IT infrastructure, reduction of investment risk in the Cloud BI). An important benefit associated with the use of Cloud BI solutions was also environmental protection associated with the use of BI systems in the cloud and lower CO2 emissions (indicated as important or very important by 20% of respondents). Among the benefits of organizational nature, respondents indicated: the simplicity of sharing information and knowledge from Cloud BI systems, support for mobile business, and transferring responsibility for the operation and development of Cloud BI to the provider. There is also a group of risks associated with the application of Cloud BI. Threats and challenges concerning the application of Cloud BI systems indicated by the respondents are presented in Table 2, where also presented are the average values for each benefit, the percentage of responses identifying the problem as important and critical, the value of the dominant, and the standard deviation.

Table 2 Threats and barriers resulting from the application of Cloud BI systems in medium and large companies in Poland
Source: Authors' study based on the conducted research

Threats and barriers	Average	Percent (4 and 5)	Dominant	Standard deviation
Internet network failures	3,32	40%	3	0,67
Risk of losing IT knowledge	3,30	30%	3	1,04
Partial dependence on the Cloud BI provider	3,11	20%	3	0,55
Data security concerns and issues	3,21	20%	3	0,42
The need to spend money on data integration	3,09	20%	3	0,88
Risk of hidden costs of using Cloud BI systems	3,12	20%	3	0,58
Incomplete possibilities of Cloud BI system adaptation to customer's needs	3,00	10%	3	0,48
The high cost of Internet connections,	2,89	10%	3	0,60
The possibility of incurring higher than expected costs	3,00	10%	3	0,50
The potential for difficulties in data migration	3,01	10%	3	0,49
Lack of local technical support	2,89	10%	3	0,57
Lack of qualified staff and competence in Cloud BI	3,00	10%	3	0,46
Temporary degradation of Cloud BI performance	2,90	0%	3	0,30
Risk of creating additional functionality necessary for the client	2,80	0%	3	0,40
Risk of unsatisfactory technical parameters occurence of Cloud BI	2,79	0%	3	0,45
Legal issues	2,68	0%	3	0,51
No or limited control over the vendor's activities	2,90	0%	3	0,32
Uncertainty and reluctance to implement Cloud BI	3,00	0%	3	0,00

The most important disadvantages and limitations of Cloud BI (with the highest number of indications as very important and critical), respondents from large and medium companies included problems of the following nature:

- technical and organizational, i.e.: Internet network failures preventing access to and use of Cloud BI system, risk of IT knowledge loss, partial dependence on the provider (resulting in, among others, weakening the ability to manage own IT area), concerns related to data security (e.g. provider's bankruptcy, protection of data sent to Cloud BI systems, lack of physical security of data sent to Cloud BI systems, lack of physical security of data sent to Cloud BI systems), incomplete possibilities to adjust the Cloud BI system to the needs of the recipient, the possibility of difficulties in data migration, lack of local technical support, lack of qualified staff and necessary competencies to implement and develop Cloud BI

- economic, i.e.: the need to incur additional expenditures on data integration (e.g. from different IT systems), the risk of hidden costs of using Cloud BI systems, high cost of required broadband Internet connections, the possibility of incurring higher than expected costs (e.g. due to unsatisfactory level of services),

Some barriers (e.g. the risk of losing IT knowledge, the need to incur expenditures on data integration, Internet network failures, the high cost of Internet connections) had a higher value of standard deviation - which means that the indicated problems both deviated from the average and at the same time were evaluated differently by the respondents (a lot of answers that the given problem is perceived by some respondents as not very important and by the rest as very important). Other barriers and problems of using Cloud BI in large and medium companies were more centered around the average.

Most of the risks mentioned above relate to Cloud BI providers in the public cloud. The

application of Cloud BI in the form of a private cloud can significantly change and reduce the number of highlighted threats and drawbacks. Minimizing the risks of Cloud BI in a public cloud can be supported by, among other things, a long time of testing Cloud BI in order to fully understand the technical conditions of the service (e.g. data portability, cooperation with local IT systems, optimization possibilities) and establishing the principles of service operation (along with controlling the level of provider support). It is also important to precisely determine the business objectives of enterprises and adjust the Cloud BI system to the reported needs and expectations. The dynamic technological progress, the development of the Cloud Computing market, and new regulations on the provision of services in cloud computing will probably influence the reduction of threats and problems associated with the use of Cloud BI systems.

Table 3 summarizes the respondents' answers regarding the assessment of the application of Cloud BI systems for decision support in medium and large companies in Poland. The measurement was made on an ordinal scale where a value of 1 means "strongly disagree" and a value of 5 means "strongly agree".

Table 3 Assessment of Cloud BI systems application in the scope of decision processes support, according to medium and large enterprises in Poland
Source: Authors' study based on the conducted research

Assessment	Assessment of Cloud BI systems application in the scope of decision making processes support			
	Cloud BI increased the efficiency of decision-making processes	Cloud BI increased the efficacy of decision-making processes	Cloud BI increased the speed of decision making (at all levels of business management)	Cloud BI enabled real-time decision making
1	0%	1%	0%	1%
2	0%	10%	0%	19%
3	50%	20%	60%	40%
4	50%	70%	40%	30%
5	0%	0%	0%	10%

The analysis of the effects of Cloud BI application in supporting decision-making processes in the surveyed group of companies allows us to state that:

- All respondents confirmed that the application of Cloud BI increased the effectiveness of the decision-making process (defining its role as quite important or important). None of the respondents (0%) considered that Cloud BI does not improve the efficiency of the decision-making process. However, enterprises did not indicate (0%) that Cloud BI systems definitely increase the effectiveness of decision-making processes - which ultimately allows us to conclude that the application of Cloud BI systems has significantly increased the effectiveness of decision-making processes.

- In the opinion of 90% of respondents, the application of Cloud BI systems increased the effectiveness of decision-making processes. 11% of respondents claimed that the role of Cloud BI systems in the scope of the effectiveness of decision-making processes is small or very small. However, the surveyed companies did not indicate (0%) that Cloud BI systems definitely increase the effectiveness of decision-making processes - which ultimately allows us to conclude that the use of Cloud Bi systems to a large extent increases the effectiveness of decision-making processes.

- 100% of the respondents confirmed that the application of Cloud BI systems increased the speed of decision-making (at all levels of enterprise management) defining its role in this area as somewhat important or important. Also, in this case, the surveyed companies did not indicate (0%) that Cloud BI systems significantly increase the speed of decision-making - which ultimately allows us to conclude that the application of Cloud BI systems significantly increased the speed of decision-making the effectiveness of decision-making processes at all levels of company management.

- 80% of respondents said that Cloud BI systems enabled decision-making in real-time,

compared to 20% who said that the role of Cloud BI systems in this area is not significant. 10% of the surveyed enterprises indicated that Cloud BI systems significantly facilitated real-time decision-making - which allows us to conclude that the application of Cloud BI systems to a large extent enabled real-time decision-making in a group of medium-sized companies in Poland.

Table 4 presents the respondents' answers regarding the evaluation of the application of Cloud BI systems in terms of supporting business processes and projects. The value 1 means "strongly disagree" and the value 5 means "strongly agree".

Table 4 Assessment of Cloud BI systems application in the support of business processes and projects
Source: Authors' study based on the conducted research

Assessment	Assessment of Cloud BI systems application in the support of business processes and projects			
	Cloud BI has allowed to improve and optimize business processes	Cloud BI provides information on current and new business processes	Cloud BI enabled more effective monitoring of the effects of realized projects	Cloud BI increased efficiency in the utilization of the company's resources
1	0%	0%	0%	0%
2	0%	0%	0%	10%
3	40%	70%	50%	40%
4	48%	29%	48%	50%
5	12%	1%	2%	0%

All respondents indicated that the application of Cloud BI systems significantly influenced the improvement and optimization of business processes (of which 48% described this impact as important and 12% as very important.

The role of Cloud BI systems in providing information on existing and new business processes was positively assessed by 70% of respondents, while 29% of the surveyed companies described this impact as important and 1% as very important.

Similarly, they evaluated the role of Cloud BI systems in terms of efficacy of monitoring the effects of ongoing projects. 50% of respondents indicated a positive impact of BI systems in this area, while the remaining respondents considered this role to be important or very important (48% and 2% respectively).

Only 10% of respondents disagree with the statement that Cloud BI systems have increased efficiency in the use of company resources. The rest of the respondents (40%) agreed that BI systems have increased the efficiency of using enterprise resources and 50% of them agreed that this impact is important.

Table 5 shows the respondents' responses regarding the evaluation of the application of Cloud BI systems in supporting key enterprise areas and activities. As with the previous tables, the measurement was carried out on an ordinal scale in which a value of 1 means "strongly disagree" and a value of 5 means "strongly agree".

Table 5 Evaluating the application of Cloud BI systems in supporting key company areas and activities
Source: Authors' study based on the conducted research

Assessment	Evaluating the application of Cloud BI systems in supporting key company's areas and activities					
	Cloud BI affected the ability to create and monitor a business strategy	Cloud BI allowed for better control of costs of production or provision of services	Cloud BI allowed for better analysis of promotional and sales campaigns	Cloud BI enabled a more effective value chain analysis	Cloud BI enabled more effective customer profiling	Cloud BI impacted better inventory and distribution analytics
1	1%	0%	0%	0%	0%	0%

2	10%	0%	0%	0%	10%	0%
3	60%	60%	60%	60%	80%	90%
4	29%	38%	37%	38%	9%	10%
5	0%	2%	3%	2%	1%	0%

The analysis of the assessment of Cloud BI systems application in supporting key areas and activities of the company allows to formulate the following conclusions:

- 11% of respondents believe that Cloud BI systems do not affect the ability to create and monitor the enterprise's business strategy. The opposite opinion is held by 89% of respondents - which allows us to conclude that Cloud BI significantly affects the ability to create and monitor business strategy.

- All respondents confirmed that Cloud BI allows for better control of production costs or provision of services (with 40% of respondents confirming that this impact is important or very important)

- Better implementation of promotional and sales campaigns with the support of Cloud BI systems - also confirmed by all respondents. Some of them indicated that in this area Cloud BI systems play an important (37%) or very important role (3%)

- All companies agreed that Cloud BI systems allow for more effective value chain analysis, many respondents confirmed that the role of Cloud BI systems in this area is important (38%) or very important (2%)

- Cloud BI systems also influence better inventory analysis and distribution analysis - which was confirmed by 90% of the companies surveyed, and 10% of them considered this influence to be important. None of the enterprises indicated that the role of Cloud BI systems in this area is very important.

It is worth mentioning that a particularly useful aspect of adopting Cloud BI solution is fast access to professional analyses (some entities declared readiness to use detailed business analyses after only 7 days from the start of implementation) and full integration with existing ERP systems used both in "on premise" and cloud computing model.

A significant challenge but also a potential value for the adaptation of Cloud BI systems are hybrid solutions. Hybrid solutions make it possible to combine local BI systems with the computing power of the cloud and services offered by Cloud Computing service providers. As a result, hybrid solutions can facilitate the transition of medium and large enterprises from traditional to cloud-based Business Intelligence systems, and the positive effects from the use of these solutions can increase interest in using only Cloud Computing systems in the future. An interesting challenge in the adaptation of Cloud BI systems might be e.g. the implementation of the multi cloud strategy, which means the creation of a heterogeneous BI system architecture that will use the resources of more than one cloud, each managed by a different service provider.

5. Conclusion

Summing up the most important findings it is worth mentioning that Cloud BI solutions are applied in many medium and large-sized Polish companies. The prevalent solution in Poland is Power BI (71%) and Tableau (27%) and much less common is QlickSense (2%), and as far as the type of applied solution is concerned the surveyed companies deploy private cloud in most cases (70%). On the basis of the conducted research, it can be stated that the scope of decision-making processes supporting Cloud BI solutions increased the efficiency and efficacy of decision-making processes, increased the speed of decision making at the strategic, tactical, and operational level of the company's management, and enabled real-time decision making. The Cloud BI model was assessed by the respondents as providing crucial advantages such as improvement and optimization of business processes, provision of information on current and new business processes, ensuring more effective monitoring of the effects of realized projects, and a significant increase in the utilization of company's resources. In the domain of supporting key company's business activities, it positively affected the ability to create and monitor business strategy, allowed for better control of production and services provision costs, allowed for better analysis of

promotional and sales campaigns, enabled a more effective value chain analysis, enabled more effective customer profiling and has a positive influence on inventory and distribution analytics. It brings multiple additional benefits such as no need to purchase and develop IT infrastructure, better predictability of IT costs, low cost of its acquisition, maintenance, and development, constant access to current versions of Cloud BI, and simplicity of sharing information and knowledge. There also exist some challenges and threats which were indicated by respondents such as: the risk of the Internet network failure, data security concerns, cost of the Internet connection, or legal issues.

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