

## TREND ANALYSIS OF THE BUSINESS INTELLIGENCE(BI) USES IN THE MANAGEMENT PROCESS OF PUBLIC AND SME (SMALL MEDIUM ORGANIZATIONS) ORGANIZATIONS

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**Abstract:** *Main topic and the purpose of the research relate to the analysis of trends in knowledge management in SME organizations and public sector. The basis for the present development trends in the field of business intelligence applications in public management studies are included in before printed research works. The second objective are the development possibilities of application data warehousing and OLAP {On Line Analytical Process} in enterprises SME with advances in information technology available to users in a standardized integrated system. The aim of the present study is to identify the possibility of increasing the use of BI tools in different types of organizations and identify the needs of conscious differentiation expectations depending on the outlays and the scale of achievable outcomes.*

**Key words:** Knowledge Management, SME, BI tools, OLAP tools, benchmarking, management systems

**JEL Classification Codes:** D83, H72.

### 1. INTRODUCTION

The aim of the work is to highlight two specific types of organizations, in which for various reasons we observe trends in the development of BI applications used to support management functions. The first group of BI applications used to assist financial management of Local Government Units (LGUs) is discussed in the previously quoted monograph, the expanded range of it application in development strategies of metropolitan areas are included in [5].

Openness, accessibility and standardization of the information contained in the planning and execution of the budgets of municipalities allows to build data warehouses with long-term budgetary information and local governments use their content as presented in [8, 9, 10]. The homogeneous structure of information of planning and billing budgets of the LGU allows you to create data warehouses containing the budgets of all local government units for the period of nine years to guarantee the standardization of data structures budget.

In [5], we presented the concept of benchmarking in financial management of local government units (LGUs). Possibilities of using BI tools to analyze the budgets of local governments is presented in [7] under the conditions occurring in the Kujawsko-Pomorskie voivodship. Differentiation of the local governments' budget's state, depending on the level of capital expenditures, presented in the whole country in [5]. The above examples of BI being used to support the financial management of local government, can inspire the use of these methods in solving various problems in decision-making of local authorities at different levels [12], [13].

The second group of organizations, whose importance in application of BI in decision-making processes appeared to be minimal, relates to the small and small to medium sized

organizations. The decisive criteria in this area seemed to be the cost of creating a BI implementation for the client and the relatively low complexity of the decision-making processes. The tendency to create standard systems to support the management of SMEs, with integrated database implemented using MS SQL Server, became the cause of a technological breakthrough. The relatively low fee license of MS SQL database server, includes software cost, data warehouse and OLAP (On Line Analytical Process) that ensure basic BI standards of archiving databases and generating complex reports.

These conditions meant that systems such as INSERT or Symphonia targeted for small and small medium-sized businesses, for a small fee, offered a basic version of the data warehouse and reports supporting the important functions of management. The scope and method of use of the reports and analytical data frequently depends on the initiative of the owner and his experience. A broader assessment of the possible usage of BI tools provides M. Dyczkowski's "Analysis of Business Intelligence systems applications in economic efficiency in the MSE sector" [2]. This publication is one of the results of research funded by the National Centre for Research & Development (NCBiR) under the INNOTECH, carried out by the University of Economics in Wrocław. For those, who are interested in more detailed information, works [3] and [4] contain a wide range of issues carried out in the framework of the research project INNOTECH. In terms of the cited publications on the applications of BI in management in the MSE enterprise sector, we can conclude the implementation and operation of BI systems that are the sources of competitive advantage: [5] and in the monograph [6].

The hypothesis of the research work implies that the use of BI tools in the public sector and in small and medium-sized smaller organizations depends on the needs of the organization, executives' initiative and decision of business owners.

## 2. THE LOCAL SELF-GOVERNMENT SECTOR AND ITS SHARE IN THE POLISH ECONOMY AND THE SELECTED EUROPEAN COUNTRIES

The Polish self-government sector includes, added to the public finance sector:

Territorial self-government units (TSGUs): 2479 communes, including 66 cities with poviats rights, 314 poviats and 16 voivodships (provinces);

Self-government budget units and self-government budget companies, inter-commune associations and associations of poviats;

Self-governmental legal persons.

The significance of self-government sector illustrates its share in the national economy on the basis of the data from 2011 is presented in table 9. For Poland it is 14.2 % GDP, which provides for the advantage compared to the level of Czech 11.3% GDP, Slovakia 6.6% GDP, Hungary 11.1% GDP), as well as France (11.7% GDP) and Great Britain (13.4% GDP).

Scandinavian countries have a vast advantage in this respect: Denmark 37.4% GDP, Sweden 25.2% GDP, Finland 22.1% GDP, and Norway – a significantly lower level of 15.0% GDP.

Chief public service provider and investor.

**Table 1. Expenses of the self-government sector and the General Government sector in relation to GDP\***

Country	Self-government sector	General Government sector	Participation of self-government sector
Czech	11.3%	43.4%	26.04%
Denmark	37.4%	57.9%	64.59%

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Finland	22.1%	54.2%	40.77%
France	11.7%	55.9%	20.93%
Holland	16.7%	50.1%	33.33%
Norway	15.0%	44.6%	33.63%
Poland	14.2%	43.6%	32.57%
Slovakia	6.6%	38.2%	17.28%
Sweden	25.2%	51.3%	49.12%
Hungary	11.1%	48.7%	22.79%
Italy	15.3%	49.9%	30.66%
Great Britain	13.4%	49.0%	27.35%

\*In the case of the Eurostat data – not all of the flows in the General Governments sector are consolidated.

Table 1. it enables to compare the size of expenses of the self-government sector to the size of the expenses of the public finance sector, which shows that in the conditions of Poland the self-government sector in public investment had one-third share. This participation is significantly higher than in France or Great Britain, and is similar to the participation of the self-government in Holland or Norway.

Legal framework for the financing of local government units and standards for debt management solutions used in Germany have been presented in [20]. The authors of publication on interpretation of existing regulations pointed out that the proposed solutions can be the only interpreted as recommendations [15]. Different standards of debt management may result from solutions which are in force in the interpretation of individual cases.

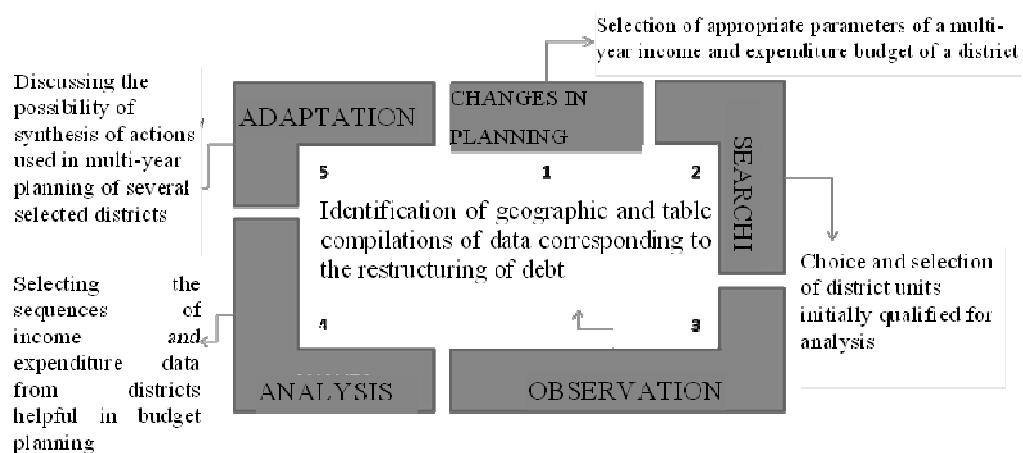
The self-government sector in Poland is the most important public service provider and investor. According to the data from the budget reports in 2011, the territorial self-government units spent the most on education and upbringing from the expenses amounting to PLN 181.6 billion: 29.2%. Another crucial item in their budgets are expenses on transport and communication (18%) and social welfare (12.1%). The participation of expenses in public administration is 8.5%. The current expenses of the territorial self-government units amounted to PLN 139.2 billion (76.6% of expenses in total), and the propriety expenditure PLN 42.2 billion (23.4%). At the same time proprietary expenditures of the state budget (without co-financing of the investment with the EU funds) amounted to PLN 14.9 billion, out of which in the form of earmarked subsidies PLN 2.4 billion was given to the territorial self-government units. One needs to notice that the structure of the budget expenses of the territorial self-government units does not reflect their whole activity because a series of self-government tasks are performed also with the use of other entities, including the extra-budgetary units and municipal companies.

### 3. APPLICATION OF THE DATA WAREHOUSE AND BI TOOLS IN A BENCHMARKING ANALYSIS OF LGU BUDGET INFORMATION

A factor limiting the level of economic risk for administrative districts in a sequence of decisions which allows to restrict the deficit level justifies the application of benchmarking, in particular in relation to rural and mixed urban-rural administrative districts, in accordance with the model presented in Figure 1.

Building the budget of LGUs for a following year primarily involves identification of those parameters which are stable, as well as those, which are characterized by negative consequences – delivering fewer resources compared to those anticipated in the plan, or occurrence of

additional budget encumbrances. These may occur due to a higher level of operating costs of resources put into use, compared to those received as a result of income exploitation.



**Figure 1. Model of application of the benchmarking method to LGU**

*Source: Own research.*

The passing of budgets up to 2012 was influenced by the rule of local government unit budget balancing, stipulated in the provisions of the 27th of August 2009 public finance act. This rule was first applied in the year 2011. In accordance with it, the body constituting local government units cannot pass a budget, in which the planned current expenses are higher than the planned current income increased by the excess balance from previous years and any available funds. Effective use of BI tools is dependent on the creation of a data warehouse, which makes it possible to unify and associated data accumulated from various information systems and databases of the organization. The BI system generates reports specific to the analytical objectives or calculates Key Performance Indicators of the enterprise, based on which hypotheses are formed, which are afterwards verified by performance of detailed data “overviews” using analytical tools (e.g. OLAP, data mining) [1], [5], [6], [14].

Each of the aforementioned standards has specific solutions for a data warehouse, as well as OLAP, data-mining tools and many other software solutions used to support business decisions and analyses. In their works, [5], [6], used the MICROSOFT SQL SERVER BI standard. By using this standard, a multi-dimensional database was efficiently separated into key dimensions and a clear table form was created. The tools for presenting selected data provided the possibility to conduct analyses of benchmark summary results. The diagrams illustrating previously processed data enabled visual assessment of the change trends in the financial situation of districts by comparing the parameters and processed indicators in different sets of information aggregation.

#### **4. REPORTS OF UNIFORM PARAMETER SETS OF DISTRICTS TO SUPPORT THE MANAGEMENT OF FINANCES USING THE BENCHMARKING METHOD**

The budget planning process is one of the primary objectives of a LCU’s financial authorities. In operating terms, the planning process encompasses the upcoming budget year, but is also a basis for long-term financial planning. This process may begin in any period, but in practice it commences in the third quarter of the year preceding the one for which the plan is developed [22]. The terminal date for preparing an initial budget plan is the 15th of November,

when the administrative district's authority (head/mayor/president) is obliged to present the district council and Regional Accounting Chamber with a draft of the budget act, including clarifications and information regarding the state of municipal property. The budget development process consists of:

- adoption of economic data to the budget for the upcoming year and specification of primary parameters of public services funded from the budget,

- development of work schedules of objectives realized using budget funds (including new objectives) and drafts of income and expenditure plans (including investment and long-term plans), as well as estimation of the financial results with their justifications,

- initial distribution of income and expenditure amounts among individual objectives and specification of limits for those expenditures,

- preparation of budgets for special objectives or sections within the scope of preparing the LGU's budget draft and presenting it to the district council for acceptance,

- discussion of the council and its decision regarding the draft of the budget act.

In the period between submitting the budget and its ultimate passing, there can be further changes applied to the draft, e.g. by the District Council, however, without the permission of the head/mayor/president, it is not possible to implement changes which increase the budget deficit. The passing of the final version of the budget must take place until the 31st of December and in special circumstances, until the 31st of January. The budget act is passed by the council in an open vote with a simple majority of votes, in the presence of at least half of the council's legally established members [1], [19].

The conducted analysis and consultations with district treasurers' show that it would be beneficial in the planning process to compare own data with the data of similar districts, namely, to apply the benchmarking method [20]. Comparison to other, similar districts provides the possibility of taking advantage of the positive experiences of those, who are doing better, as well as avoiding negative factors, which may have occurred in similar districts. This method is used commonly in the operations of market companies, constituting one of the pillars of modern marketing. The acquisition of parameter sets of homogenous districts, which make it possible to use the benchmarking method, is possible thanks to the use of the data warehouse equipped with tools for creating groups of homogenous districts. Distinguishing a comparative group for the largest cities associated in the Union of Polish Metropolises [6] is relatively easy, these districts cooperate with each other through exchange of information and constitute a fairly small group, realizing similar objectives[17]. A similar situation applies to cities with county rights, while in the case of other district the issue is significantly more complex. Districts which may apparently be similar, may in fact differ and a comparison of data may not be justified. The data warehouse should be equipped with tools enabling the specification of homogenous groups on the basis of any selected quantitative and qualitative parameters (characteristics). Some of those characteristics, such as population, area, territorial affiliation, may be predefined and filled in by the system. Other characteristics, e.g. natural resources, natural environment, social structure, number of companies, should be definable and filled out by users of the data warehouse. The data warehouse should also provide the user with a possibility to create a homogenous group by explicitly specifying a set of districts for comparison within a given analysis.

Redundancy of information may lead to lack of clarity of the prepared reports, as well as an excessive load on the IT resources. A data warehouse prepared in this manner shall constitute an excellent tool for conducting benchmarking analyses to support the planning process. It would allow districts to specify the areas of potential risks and opportunities based on the experiences of other, similar administrative units. It should be underlined, that due to the fact, that a data warehouse may only provide financial data, the analyses achieved through it could point to areas

of non-conformity and suggest a direction for further exploration, which is the first step to deeper financial-qualitative analysis.

Processes occurring in various stages of solutions in the Data Warehouse are presented in the Figure 2.



**Figure 2. The prototype and target standard of data warehouse of LGU budgets**

*Source: own development.*

Figure 2 shows a graphical illustrating the source of supply and the synthetic results which were achieved in obtaining research already completed or verified during the six consultative meetings with representatives of the financial services of selected municipalities.

The above particularized decentralized solutions of the data warehouse of municipal budgets provide, in our opinion, an excellent possibility to obtain reports on the following specified parameters relevant in the budgets of municipalities and indicators which are contained in the software made by the warehouse, with the possibility of extending the target depending on the needs and expectations of users. Users understand first and foremost the treasurer and financial services of the LGUs, the governing bodies including the administrative receiver [18].

The data warehouse offers predefined reports based on standard financial indicators used widely in scientific research and management practices of LGUs in terms of income, expenditure and debt.

The use of BI in public management differ significantly in relation to commercial enterprises in which these tools may be (and in many of them are) a source of competitive advantage. Economic efficiency of investment decisions in the local government does not have to be the overriding criterion, more focused on their social approval, which can be a source of risk in the conditions of high running costs of investments already made. An area of particular concern for the policymakers of the budget organizations is the state of their budgets. This means that the BI solutions will mainly focus on supporting the budget planning and the search for alternatives in periods of development and approving of the LGU's budget. Under these conditions, it is possible, that the highest popularity might be obtained by the benchmarking solutions. The second reason, why public organizations might reach for BI tools is a high level of local government budget deficit and the threat of bankruptcy. The advantage of these solutions can provide a low cost of implementation and operation of this type of solutions which is presented through some example statements contained in chapter 4 [5].

## **5. USE OF BI APPLICATIONS IN SUPPORTING DECISION-MAKING PROCESSES IN SMALL AND SMALLER MEDIUM-SIZED ORGANIZATIONS.**

The third group of organizations in which the importance of BI applications in supporting decision-making processes appeared to be little affective is small and small to medium sized organizations. The decisive factor in this area seemed to be the cost of creating a BI implementation for the client and the relatively low complexity of the decision-making processes. In the process of designing and programming standard systems to support the management of SMEs, with integrated database, the new generation software was using MS SQL database server. A few years' prior, the software was used to create ERP systems, eg. popular Polish system – SIMPLE, or an international standard MS Dynamics Microsoft. In recent years the company INSERT has focused on creating a software for micro and small businesses, generations of INSERT GT and INSERT next programs were created with MS SQL database, which led to a technological breakthrough. The relatively low fee license of MS SQL Server database included the cost of software, data warehouse and OLAP (On Line Analytical Process), which ensure basic standards of BI for archiving databases and generating of complex reports.

These conditions meant that systems like INSERT or Symphonia targeted for small and small medium-sized businesses, for a small fee offered a basic version of the data warehouse and reports necessary to support the important management functions. The scope and method of the reports and analytical data usage frequently depends on the initiative of the owner and his experience [21]. The affiliated companies of the system manufacturer INSERT, that show an ability and interest in working with small and small medium-sized companies, acquire the ability to create a profile data warehouse with dozens of proposals reports and make them available at low prices. These solutions are typically used selectively and most recipients of the reports will be the owners and analysts preparing materials for meetings with business partners.

The before mentioned circumstances contribute to the perpetuation of habit to reach more advanced reports provided with BI, which can lead to more advanced communication implemented within the company and in its business contracts. An increasingly popular solution for cross-organizational data exchange between business partners, promote the development of methods for automatic analysis of information support of small and medium-sized organizations, which can be demonstrated through the example of business 1 discussed in Chapter 3 of this work.

## **CONCLUSION**

The analysis of the BI tools usage determinants in the public sector, indicates that one of the most popular areas may be planning processes and budgeting. An exceptional motivation for the LGU's in this case might be a risk of excessive budget deficit. In case of small and medium-sized enterprises, the scale on which they use BI in management process, considering the more and more readily available solutions, depends on the activity of the business owners and the requirements imposed by the business partners. The foregoing statements are the answers to the research hypotheses stated at the beginning of this work. Those, who are interested in more detailed, substantive and methodological information related to the conditions of BI applications in the management are encouraged to refer to the monograph [5] published by Lambert Academic Publishing in 2016.

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