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BigData–PublicControlling
Fundamental changes in Public Management

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Abstract. *The @ is the link between the name of the recipient and its address. The e-mail has revolutionized the communication behavior. It represents a new era of information and data exchange. The speed of information exchange and the possibility of non-physical data transport have fundamentally changed human communication. Big Data has become the synonym for a new technological age. Generally Big Data collects data and delivers valuable and useful information (Baron, 2013, 1). A general definition of the term has not yet taken place in science and practice.*

The work of the public sector is based on the collection, identification and use of data in many areas. Public organizations are often data monopolists and the only provider of public goods. The acquisition of new information in the sense of Big Data requires a connection between existing data and the use of new information. This gives the public administration a whole new potential.

The organizational function "Controlling" supports decision-makers in the context of management and control (Horváth, 2011, 16). The proximity of Big Data and Controlling is obvious. This article describes the potentials resulting from the use of Big Data and its effects on Public Controlling. Big Data will revolutionize Public Controlling and thus the public administration as a whole.

Keywords: *Big Data, Public Controlling, public sector, efficiency, effectiveness*

Reikšminiai žodžiai: *Didieji duomenys, viešasis reguliavimas, viešasis sektorius, efektyvumas, veiksmingumas*

Public Controlling

There are various approaches to justify Controlling as an independent business management discipline. It is supposed that Controlling is more than merely summarizing existing management tasks such as planning, reporting and variance analysis. In the last 20 years a coordination-oriented approach has become accepted. The autonomy of the controlling function is seen in the coordination of the business management systems. This is the main difference to the terms "Performance Management" or "Performance Measurement", which deal with the specific performance (output and outcome) of an organization. Controlling as a task field can be carried out by various, responsible persons or even the management itself.

Public controlling has established itself as an organizational function in public administration. The reason for this is the need for coordination and management of administrations. In practice, Public Controlling focuses on operational management. The main reasons for this are a lack of strategic thinking, the lack of resources and the ability to identify benefits (Brede 2005, 71). In recent years, public organizations have been developing their Controlling systems specifically for their business. The production of public goods, the lack of competition and the focus on legal behavior influence organizational understanding. Efficiency and output orientation are of secondary importance under these conditions. To date, public organizations have not found a suitable control model. The long debate in science proves it. After about 25 years of reforms the status quo shows different consequences. An integrated approach for external and internal accounting is missing. To date, the Council members have no better information to make decisions within their responsibility.

Due to legislative tasks, a measurement of efficiency and effectiveness is a challenge. The result is that Public Controlling generates little benefit. Therefore it is underdeveloped compared to the private sector.

Many public organizations have adapted their inadequate Controlling in such a way that it provides at least a small benefit. Often, the Controlling system is linked to target systems / balanced scorecards, so that it can be used as a basic information and steering system. The following figure outlines the status quo of Public Controlling:

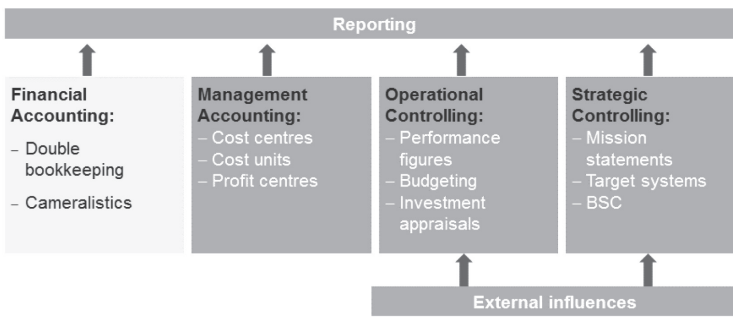

Figure 1. **Public Controlling elements**

Source: made by the author, bases on literature analysis

Financial accounting is the basic data source. It is determined by legal regulations in the private and public sector. Management Accounting provides basic information for the Controlling on an operational level. It is largely determined by formal requirements, e.g. cost and benefit analysis for public investment must be made. Strategic elements are usually guiding models and target systems. Often only mission statements are made, without a link to organizational objectives. Such a system is not able to provide an advantage for the management. Also there is a lack of personal.

There is a lack of alignment between the organizations and their objectives. Objectives are often not ambitious and not output-oriented. Therefore, these "systems" often function only as a communication tool and not as a steering instrument. There are multiple reasons for that. One main reason is a lack of incentives for implementation. Strategic management is based on deep data analysis and a debate about making the right decisions. In the private sector, the companies must do this every day, due to a permanent change in the environment. This is inconvenient but necessary to survive. The struggle for survival is more or less unknown in public organizations. As a result, public organizations do not need to deal with strategic issues. This situation is comfortable for employees and also for executives in the public sector. There are no incentives to deal with strategic issues.

Companies analyze e.g. social developments with the aim of winning new customers. They align their behavior and resources with the identified necessities. The so-called FinTech companies (financial services and technology) are e.g. results of a changing environment. Recognizing market and customer expectations is not to be expected due to the lack of strategy orientation in the public sector.

Politics is the contracting authority for public organizations. Politics focuses on reelection opportunities, which hinders long-term and sustainable decisions. Under these circumstances, it is difficult to develop Controlling comparable to the private sector. A key reason for this is that decision-makers only implement management systems that serve their own welfare (Streim, 1986, 11).

In summary, it can be stated that Controlling in the public sector should be further developed. The strategic orientation is lacking and an integrated approach is missing.

Big Data

Big Data became synonymous with a new technological age. As the name suggests, Big Data manages large and complex data records. The data were already available in large quantities, but were not or only insufficiently structured. The technological development of the last 10 years enables automatic evaluation and processing. This leads to new services and products without the use of people. Examples of this are contact suggestions in social networks or customer-specific advertising on the internet. In practice, Big Data means collecting data and gaining valuable and useful information (Baron, 2013, 1). A huge amount of existing

information is technically filtered to support decision making for people and institutions. The identification and understanding of relationships, which could not yet be noticed, is now possible (Mayer-Schönberger, Cukier, 2013, 29).

For the definition and description of the concept four properties for sketching Big Data in the Controlling context is typical: „Volume" stands for data sets, „Variety" for diversity, „Veracity" for credibility and „Velocity" for the generation and processing of data (Horváth, Gleich, Seiter, 2015, 27). The concept also generally refers to the new technologies in order to be able to evaluate and process data.

The application of Big Data means that structures must be amended. Then Big Data can work as a digital transformation process (Gänßlen, Losbichler, 2014, 3). This is challenging for the public sector because of its formal regulations. It is therefore not surprising that Big Data has gained some importance in the private sector and is an exception to the public sector (BITKOM, 2015, 109-113).

In some policy areas, the use of Big Data in the Controlling context has been started in the past few years. In social insurance a biography of the citizen was conceived. With this it is possible to provide people specific offers e.g. in case of unemployment. Big Data analysis is used in tax administration. These determine, according to defined algorithms, which tax declarations must be examined in detail. Furthermore, fraud management systems are used in areas where disbursements are made. These discover e.g. embezzlements by employees. The principle is the same than a new contact suggestion in a social network. Certain properties, e.g. the payout frequency, the payout height, the payout location are the starting point for a deeper analysis. Such examinations and methods are required by the supervisory authorities. In particular, the European Union calls for appropriate investigations to ensure the correct use of funding.

Big Data, as well as Public Controlling, are not based on intrinsic motivation. The reason for the lack of intrinsic motivation is that there is no market and no competition in the public sector. Big Data projects currently represent more risks than opportunities for decision makers.

External requirements lead to public action. The Big Data Status quo is currently reactive and not proactive. This is a waste of resources for different reasons. The organizations have a lot of data and often also the technical prerequisites to use this data. Due to the obvious potential for improvement in the public sector (e.g. lack of financial resources, efficiency and effectiveness of public administration), it is incomprehensible not to use the Big Data potential.

There are other peculiarities of the public sector that are responsible for the few Big Data initiatives in the public sector. A key factor is data protection. E.g. cyberattacks and malware led to a problem consciousness in the society. Furthermore, the public sector is particularly sensitive in the area of data collection and data processing. This becomes apparent by the introduction projects of new software systems in the public sector.

In summary, there is a great potential for Big Data in the public sector. The use of the potential is not easy because of the special circumstances. Therefore, in an

organization, a person, function or department must be responsible for overcoming these obstacles. On the one hand Controlling deals already with lots of data. On the other hand Controlling is often equated with a pilot of the organization. Therefore Controlling should be responsible for implementing and dealing with Big Data.

Big Data@PublicControlling

A technical innovation and an underdeveloped Controlling meet in the public sector. For different reasons, they will not be separated from one another in the long run. Otherwise the public administration loses its ability to reform and its modernity (Hesse, Ellwein, 2004, 387). The following aspects show this:

- Decision making

If Controlling is understood as a subsystem of management, planning, control and information provision (Horváth, 2006, 134), then it is inextricably linked to Big Data. By linking different data sources, Big Data provides information that supports decision making. The acquisition of new information will lead to new decision making requirements. Experts are therefore assuming that the Controller role will be strengthened in the Big Data era (Gänßlen, Losbichler, 2014, 2).

- Information quality

The benefits of Big Data and Controlling appear to be unlimited: Political coordination means consolidation and / or enrichment of data for the purpose of decision-making, ultimately: transmission with added value of information quality (Gebauer, 1997, 378). Therefore, Big Data can lead to a new era of political coordination and control. The quality of information increases due to winning new information. These are evaluated by the Controlling department. Algorithms about the demographic development of the population provide e.g. politics new basics for their political program.

- Financial situation

The financial future of the public sector is uncertain. Controlling and Big Data are the keys for high efficiency and effectiveness of public institutions and their performance portfolio. With Big Data, new services can be offered to citizens. For example, Data such as household income, property prices and population growth could be combined for real estate investors.

- Demography

The staff is overage in the public sector. The average age is higher than in the private sector. Employer attractiveness in the public sector has been affected by a below-average wage and salary developments. A new generation was not attracted for financial reasons. Organizations with a high need of human resources have recognized that they can no longer meet their personnel requirements in the coming years. They react with digitalization projects to be able to substitute staff. Big Data and Controlling offer completely new possibilities in this context. They can replace physical work with digital solutions.

- Forecasting

New Public Management has defined huge amounts of key figures in the public sector. These cannot make any statements about future developments. The reason for this is that the key figures were designed with data from the past. At this point, Big Data can act as a forecasting driver. Important predictions (e.g. economic development, tax revenue) will be significantly more sustainable in the future. This enables "improved" political decisions with corresponding effects. To understand the connections between cause and effect, the competences of Controlling are necessary. In this way, controlling plays an advisory role in the future.

- Business processes

Business processes in the public sector are often heterogeneous and cannot be standardized (for example, unemployment insurance versus tax administration). Business process optimization and benchmarking are not widely used in the public sector. The work processes are personnel intensive and potentials for a higher efficiency and effectiveness are existing. Big Data can manage complex business processes and add new data and information (Buschbacher, Konrad, Mußmann, Weber, 2014, 92). Data about business processes are stored in the ERP systems (for example, number of transactions, cost of the cost center, number of employees in a department). Big Data can combine this data. This produces results that a business process analysis cannot deliver. The reason is that the data quantity is extremely high. Controlling has the task of using this new transparency and giving recommendations to the management.

In the sense of Alfred Chandler's "Structure follows Strategy", instruments to steer an organization and the organizational structure itself must be derived from the strategy. Public Controlling must evolve under Big Data circumstances from a past oriented, unstructured, reactive, non-strategic to an active, strategic, prognostic function. In the future the Controlling department is the manager of the system, a strategy developer and a policy consultant.

Use case: integration in the labor market

There are numerous application examples for Big Data in the public sector and the (new) role of Controlling. The following is a use case which provides a great benefit to society: the integration of unemployed people into the labor market.

Unemployment statistics have a lot of data. The preconditions for the use of Big Data are ideal. The Controlling department of the Federal Agency for Employment in Germany already examines various causes and effects on integration into the labor market. The department analyzes in detail which training courses really supports integration success. Thus, a statement about the supporting or inhibiting function of certain integration courses is possible.

The following figure shows typical information about unemployed people. The first five columns show the age, the sex, the region in which they live, the duration of the unemployment aid and their family status. The sixth column shows the customer group. In reality, there are more customer groups that provide information on the opportunities for an integration success into the labor market. People are „away" from

the labor market, when an integration problem exists. This can be, for example, an education that is not up to date. The column „Used training courses" shows, which training courses unemployed people used. The last two columns show the number of children and whether the unemployed are reintegrated into the labor market.

Age	Sex	Federal state	Unemployment aid (duration in month)	Civil status	Customer group	Used training courses	Number of children	Back in the labour market?
47	M	1	4	Single	Close	A	No	No
27	M	5	30	Married	Away	A, B, C	3	Yes
53	F	3	2	Widowed	Close	B, C	2	Yes
36	M	2	27	Married	Away	A, B, C	No	Yes
54	F	2	14	Divorced	Away	A, B, C	1	No
28	M	1	6	Divorced	Close	B	2	Yes

Figure 2. **Simplified example of Big Data analysis in the labor market**

Source: made by the author, bases on a real complex analysis in practice

If the data is analyzed in detail, it becomes clear that the characteristics that lead to an integration success are difficult to recognize. The integration success is found in different unemployed persons. Big Data provides anomalies in data sets, which must be interpreted and comprehended by the Controlling department. In this example, the following unemployed people are integrated into the labor market:

- Away from the labor market, age under 36, used training courses A, B, C
- Close to the labor market, age under 36, used training course B

Controlling must identify whether, for example, the training courses are only suitable for young people. Furthermore, the question arises, whether older unemployed people might not want to be integrated. There are further questions which should not be discussed further here. At the end it becomes clear that Controlling and Big Data together can generate a great benefit. It is not necessary to create new jobs. A great financial and social benefit can be achieved through a fast integration of unemployed people into the labor market. Big Data provides the necessary data base through correlations. Controlling interprets the information and gives recommendations for action

By combining further data the exact merging of jobseekers and employers would be possible. The consequences would be inter alia declining costs in the social system and the increase in gross domestic product (faster job placement). The bureaucratic costs, which arise through unmotivated / simply assigned / „wrong" job seekers, could be avoided.

Controlling is responsible for the definition and determination of the data bases and thus becomes a close cooperation partner for IT. It deals with the conceptual development of the data combinations and the establishment of a corresponding reporting system. The change in Controlling from a reactive to a proactive role becomes clear. Controlling and Big Data can run the public sector much more efficiently and effectively in the future.

Conclusion

Big Data is currently revolutionizing the processes in the public and private sectors. New products emerge, which were only possible through the technical developments of the last decade. Controlling supports the management of organizations through planning, coordination and control tasks. This role must be aligned with the Big Data requirements. This has the following consequences:

1. Controlling must use the new technical possibilities. If organizations do not use Big Data, they will have a competitive disadvantage. As a result, other competencies are required in Controlling departments. In the future, e.g. competencies in statistics and databases are necessary.
2. Controlling must act strategically. The reason for this is that Big Data shows connections. Controlling must interpret these relationships and draw conclusions. It has to give recommendations to its Executives. With this they are able to manage the future success of organizations.
3. Controlling in the public sector is underdeveloped compared to the private sector. This offers Big Data great opportunities. Organizations have the chance to make a development step. By implementing Big Data and Controlling, the internal control and steering system can reach a new level. This is based on completely new data sets and leads to a higher information level.
4. A typical task of Controlling is the analysis of historical data. The Controlling interprets results and provides a preview. Thus its role is reactive. With Big Data, more and quantitatively better data is available. In order to benefit from this, controlling must play an active role. It must grow more into the role of business development.

References

1. Baron, P.; Big Data für IT-Entscheider, Riesige Datenmengen und moderne Technologien gewinnbringend nutzen, München 2013.
2. BITKOM, Big Data und Geschäftsmodell-Innovationen in der Praxis: 40+ Beispiele, Berlin 2015.
3. Brede, H.; Grundzüge der Öffentlichen Betriebswirtschaftslehre, 2. Auflage, München 2005.
4. Bundesministerium der Finanzen, Vermögensrechnung des Bundes, Berlin 2013.
5. Buschbacher, F.; Konrad, R.; Mußmann, B.; Weber, M.; Big Data Projekte: Vorgehen, Erfolgsfaktoren und Risiken, in: Gleich, R., Grönke, K., Kirchmann, M., Leyk, J. (Hrsg.), Big Data und Controlling, München 2014.
6. Gebauer, K.-E., Planung in Regierung und Verwaltung, in: König, K.; Siedentopf, H. (Hrsg.), Öffentliche Verwaltung in Deutschland, 2. Aufl., Baden-Baden 1997, S. 377-394.
7. Gänßlen, S.; Losbichler, H.; Big Data - ein Segen für das Controlling, White Paper des Internationalen Controller Vereins, Wörthsee 2014.
8. Gourmelon, A.; Mroß, M.; Seidel, S.; Management im öffentlichen Sektor, Organisationen steuern - Strukturen schaffen - Prozesse gestalten, München 2011.
9. Hesse, J.; Ellwein, T.; Das Regierungssystem der Bundesrepublik Deutschland, Band 1, 9. vollständig neu bearbeitete Auflage, Berlin 2004.
10. Horváth, P.; Controlling, 10. Auflage, München 2006.
11. Horváth, P.; Controlling, 12. Auflage, München 2011.
12. Horváth, P.; Gleich, R.; Seiter, M.; Controlling, 13. Auflage, München 2015.
13. Mayer-Schönberger, V., Cukier, K., Big Data, Die Revolution, die unser Leben verändern wird, 2. Auflage, München 2013.
14. Streim, H.; Grundsätzliche Anmerkungen zu den Zwecken des Rechnungswesens, in: Lüder, K. (Hrsg), Entwicklungsperspektiven des öffentlichen Rechnungswesens, Speyrer Forschungsberichte, Speyer 1986, S. 1-26.

Didieji duomenys viešajame reguliavime Esminiai pokyčiai viešojoje vadyboje

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Anotacija

Simbolis @ (eta) išreiškia tiesioginę sąsają tarp gavėjo vardo ir jo adreso. Pastebėtina, kad elektroninis paštas sukėlė tikrą perversmą komunikacinėje elgsenoje. Jis žymi naują informacinę erą ir duomenų apsikeitimo pokyčius. Informacijos apsikeitimo greitis ir augančios galimybės ne fiziniu būdu perkelti duomenis, reikšmingai pakeitė žmonių tarpusavio komunikaciją. Didieji duomenys tapo naujo technologinio amžiaus sinonimu. Dažniausiai didieji duomenys kaupia duomenis ir suteikia vertingą informaciją (Baron, 2013, 1).

Kol kas mokslo ir praktikos srityse nėra bendrai pripažintos šio reiškinio sąvokos. Viešojo sektoriaus funkcionavimas neatsiejamas nuo duomenų rinkimo, atpažinimo ir jų panaudojimo daugelyje sričių. Viešojo sektoriaus organizacijos dažniausiai yra duomenų monopolininkės, vienintelės viešųjų gėrybių teikėjos. Naujos informacijos įsisavinimas didžiųjų duomenų kontekste reikalauja ryšio tarp turimų duomenų ir naujos informacijos panaudojimo. Tai suteikia viešajam administravimui visiškai naują potencialą. Organizacinė reguliavimo funkcija paremia sprendimų priėmėjus valdymo kontekste (Horváth, 2011, 16). Didžiųjų duomenų ir reguliavimo funkcijos tarpusavio ryšys – akivaizdus. Straipsnyje mėginama apibūdinti galimybes, kylančias dėl didžiųjų duomenų panaudojimo viešajame reguliavime. Didžiųjų duomenų panaudojimas lems perversmą viešojo reguliavimo ir viso viešojo administravimo srityse.

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