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# Analysis of Managers' Cognitive Models (ORAC Classification) and its Impact on the Effectiveness of Implementation of Management Decision Support Systems: The Case of the Healthcare Sector

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***Abstract:***

***Purpose:*** *The aim of the article is to show the importance of reasoning (cognitive models) and experience of managers as a key success factor in implementation of management information systems (MIS). An important goal of the article is also to identify information needed and the importance of information and management decision support systems in healthcare which is one of the important sectors of the economy.*
***Design/Methodology/Approach:*** *The article is based on secondary and primary research. The literature in the area of decision support systems in management and factors that influence the success of implementing these systems were analysed. Quantitative and qualitative research was carried out on the information systems of health care facilities and information needs of decision makers. The conclusions of the research were based on the following research, in-depth group interviews (FGI), individual in-depth interviews (IDI) with directors of medical facilities (27), interviews with facility employees (PAPI), interviews with patients (PAPI), Delphi study using the CAWI technique.*
***Findings:*** *There is a great need to implement decision support systems due to the growing amount of information available to managers and the need to process it quickly.*
***Practical Implications:*** *The article presents a unique approach showing how the cognitive systems of managers and their way of reasoning influence the type and specifics of management decision support systems.*
***Originality/value:*** *The article presents a unique approach showing how the cognitive systems of managers and their way of reasoning influence the type and specificity of management decision support systems.*

***Keywords:*** *Information systems for management, support of managerial decisions, decision-making models, management in health care.*

***JEL classification:*** *J24, M12.*

***Paper Type:*** *Research study.*

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## 1. Introduction

Choosing the optimal system for a given organisation is not easy. Most often, there are two dimensions defined (Dutt, Wierenga, and Dalebout, 1997), which are important from the point of view of supporting management and should be taken into account when selecting a system. These are: (1) the subject of support, (2) the form of support. The subject of support is what is to be supported or what we want to support. There are three subjects of support (Wierenga and Van Bruggen 1997):

- *Results.* Making results-oriented decisions mainly involves waiting from the system to indicate the final decision. The most common answer is: "in order to get a given" output "it is best to use such a specific "input" set.
- *Process.* When the processes are designed as the subject of support, the emphasis is on determinants of the decisions made, and not only on the final result.
- *Learning.* When learning is in the focus of decision support, the relevant question is "How can I improve the decision?" Or "How can the process and / or data be set up so that the decision maker can do better next time?"

The support form can also be divided into 3 modes:

- *Automation.* Decision automation is in fact related to the tradition of research on decision support systems, as the first systems emphasised the automation of decision-making procedures, mechanisms used in the decision-making process.
- *Informing.* Zuboff defines the function of informing as "Informate" and interprets it as a concept combining intelligent technology for capturing and providing information about an organization.
- *Stimulating.* Stimulating is the search for new solutions by questioning the existing state of affairs, norms and rules, by combining distant and even seemingly contradictory elements.

The choice of decision support systems depends on the degree of structuring of the decision-making problems of managers that are to be supported by the systems. An important issue is therefore whether (and to what extent) it is possible to present the problem logically. Most of the MSS (Management Support System) deal with structured research problems. Management support systems for unstructured problems are missing. Weakly structured problems are formulated qualitatively rather than quantitatively, which is one of the key deterrents in the area of designing such systems.

Another important variable that influences the way of using MSS is the manager's professional experience in working with tool-based decision support (Perkins and Rao, 1990). Spence and Brucks have shown that novices are much more likely to use decision-making assistance. At the same time, the usefulness of MSS for experienced experts was questioned.

The decision-making process is also determined by the time needed to decide. Time constraints may make it impossible to perform studies or find appropriate procedures. Time pressure is considered an important factor in the design of information systems (Hwang, 1994). The shortage of time makes it difficult to search for information, causes its selective and superficial processing (Van Bruggen, Smidts, and Wierenga, 1996), and even suspends (blocks) activities related to making decisions about creating or adopting a strategy, and maintaining the status quo (avoiding changes).

***Figure 1.*** *Key factors influencing the selection of management decision support systems*

| **Optimisation** | **Inference / reasoning** | **Analogy** | **Creativity** |
|---|---|---|---|
| The character of the decision problem | | | |
| Highly structured | Medium structuring | Low structured | No exact wording of the problem |
| Accurate knowledge about relationships between variables | Knowledge of most important variables | Poor theory | No theory |
| Quantitative data | Quantitative or qualitative data | Experience/Cases | Loose associations |
| **Manager's cognitive model** | | | |
| Analytical decision maker | Analytical decision maker | Heuristic decision maker | Heuristic decision maker |
| No experience required | Experienced decision maker | Experienced decision maker | No experience required |
| Ability to operate on quantitative data | Ability to operate on quantitative data | No ability to operate on quantitative data | Creative abilities and internal motivation. Lack of ability to act on quantitative data |
| **Change of the environment and time pressure** | | | |
| Lots of time to make a decision | Little time to make a decision | Little time to make a decision | No time pressure |
| Stable market | A dynamic market | A dynamic market | A dynamic market |
| Quantitative / analytical orientation in the organization | Analytical orientation in the organization | Heuristic orientation in the organization | Heuristic orientation in the organization |

***Source:*** *Own study.*

In management, we deal with both high and low structured problems. A solution that can be adopted in the case of unstructured research problems is to divide a larger, complex problem into smaller parts - "framing" (Russo and Schoemaker, 1990), which can be logically presented and subjected to quantitative analysis. In the case

of poorly structured research problems, knowledge-based MSS should be used, applying processing methods in the field of artificial intelligence and cognitive science. An important aspect influencing the possibilities of structuring the research problem and thus the choice of a management support system involves the variability of the environment. In a stable environment, it is relatively easy to build a mathematical model and perform some form of optimisation. However, in a turbulent environment (VUCA) (Kupczyk, 2020; Marsh, 2018), policymakers are additionally under pressure to understand and interpret what is happening (Bucklin, Lehman, and Little, 1998).

## 2. Cognitive Models of Managers and Management Support Systems

The key factor influencing the effectiveness of implementing management decision support systems lies with the manager's way of reasoning - the manager's cognitive model. Decisions can be analysed in the mode of reasoning in accordance with the adopted ORAC classification. The 'modes' of managers' reasoning - the cognitive models of managers can therefore be divided into:

- Optimisation
- Inference / reasoning
- Analogy
- Creative thinking

The impact of the cognitive model on a dedicated decision support system is illustrated in Figure 2.

***Figure 2.*** *Assignment of management support systems to cognitive models of managers (ORAC classification) and the type of support offered by systems*

| Cognitive model / mode of operation | Support object (s) | Support mode | Optimal management support system |
|---|---|---|---|
| Optimization | Result - the best solution | Automation | • MM marketing models<br>• ES expert systems |
| Inference / Reasoning | Process and learning | Information | • IS information systems<br>• DSS Decision Support Systems<br>• NN neural networks<br>• KBS knowledge-based systems |
| Analogy | Process and learning | Stimulating | • Inference systems based on CBR cases<br>• NN neural networks |
| Creative | Process of creating, developing new solutions | Stimulating | • Inference systems based on CEP cases |

***Source:*** *Own study.*

The choice of a management support system should also depend on many other factors, including:

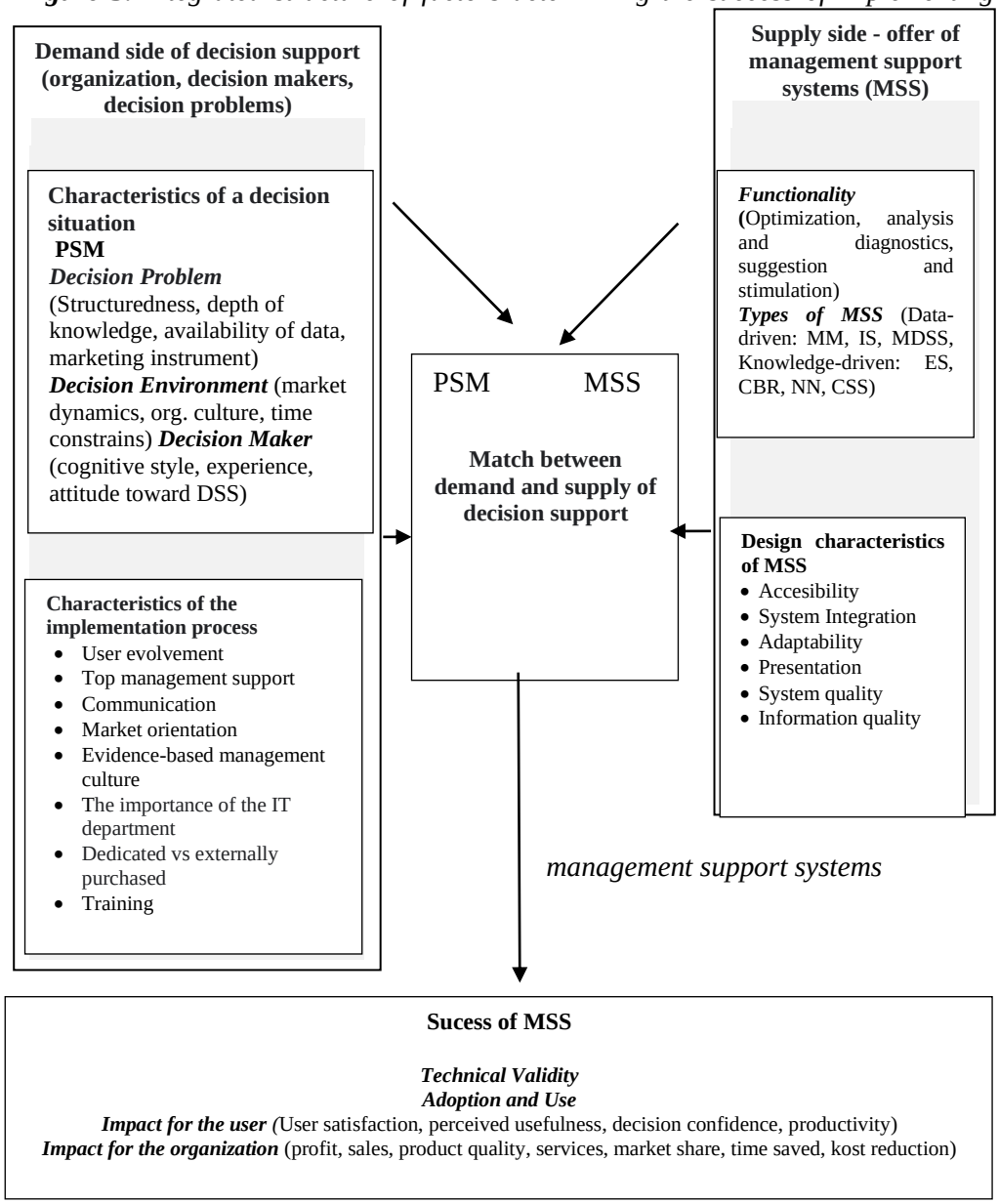
- technological advancement of organisations / entities - both hardware and software,
- types of software used by users (decision makers). In this case, both the diversity of this software and its functionality are important,
- awareness of the staff who will use the system's functions. In this case, it should be remembered that the experience in the use of analytical and management systems is a key element,
- type and quality of databases. In this regard, the type of data will be important - whether it is quantitative or qualitative. The completeness of the databases will also be of great importance. Undoubtedly, access to primary data that is collected and stored will be of great importance, but when they reach higher levels of management (regions, ministry) they are already partially processed, and most databases require "raw data",
- state of knowledge in a specific field. It covers management, including marketing, public health, psychology, and sociology. The range of verified models that could serve as decision-making models in this area is rather small.

In industries where demand and supply as well as the price of products or services are market regulated, demand is created by the needs of decision makers, in particular: research and decision-making problems, environmental features and the characteristics of decision-makers (Wierenga and Van Bruggen, 1997). Sometimes, however, that it is the supply that creates the demand for IT tools. An example of such a situation is the implementation of CRM systems in Poland in the years 2000 - 2005. The offer of ICT companies for this type of software significantly increased the demand for their implementation (Dembińska, Hołub-Iwan, and Perenc, 2005). No research has been conducted in this area, but the following subjective conclusions can be made:

1. When demand is created by supply, companies often choose a product that they do not use later. The implementation of the system is a "top-down" action, and in a situation where there are no "bottom-up" initiatives, i.e., needs of managers, MSS are not used and do not fulfil their role.
2. The implementation of CRM systems contributed to managers' interest in marketing orientation and the idea of customer relationship management, enriched the knowledge of managers and contributed to the growth of their experience.

The conclusion is obvious, the preferable conditions occur when the systems are implemented where there is a demand for them and awareness of the needs, however, it is worth considering that the implementation of MSS systems can have a positive impact on the development of knowledge when it is still lacking.

***Figure 3.*** *Integrated structure of factors determining the success of implementing*




***Source:*** *Original study based on B. Wierenga, G.H. Van Bruggen, The Integration of Marketing Problem-Solving Modes and Marketing Management Support Systems, Journal of Marketing Vol. 61 (July 1997), 21-37.*

Thanks to the implementation of the system / tool, it is possible to build the awareness and experience of managers in the field of understood management, decision making and the use of information in decision-making processes.

## 3. The Specifics of Managerial Decisions on the Example of the Health Care System in Poland

In the case of the healthcare sector, research problems require diverse modes of operation – from optimisation to analogy. Creative problem solving will be rarely used. The range of quantitative data that can be generated for the system regarding the number of visits, type of visits or costs of medical procedures can give an incredibly good (large and complete) database that is a starting point for looking for ways to optimize the system. The analyses will be based on models that are a mathematical representation of the problem in the health care system. The task of optimisation systems will be to find the objectively best solution for the given assumptions. If the obtained data is qualitative, it is better to use expert systems - ESs, because the goal of ES is to find the best solution if the problem is described in qualitative terms.

An important advantage of ES is that the system also shows relationships between variables (Wierenga and Van Bruggen, 1997). Expert-class systems, e.g., KBSs (Knowledge-Based Systems), (Lu, 2020) will cause that the acquired and processed knowledge will constantly develop, and due to the so-called dynamic memory will enable managers to consistently expand their knowledge in a continuous manner and change this knowledge into their own, new, more perfect models.

In the case of the healthcare system, systems for monitoring and diagnosing market events are important, too. They present short, synthetic reports and charts about the most important events on the market (quasi-market) of medical services. Variables of key importance for selected groups of managers can be monitored. You can monitor the length of queues, as well as patient satisfaction indicators, number of people using prophylactic programs, the number of cases of particular illnesses, etc. If models are built into the system, it can suggest solutions to the problem or decisions in reports and charts. As R.C. Blattberg, R. Glazer, and J.D. Little, in the age of the "information revolution", such systems that take over some of the manager's reasoning are essential.

The search for analogies is especially dedicated to management decision problems. Such a situation may take place in many markets, e.g., FMCG products, banking or insurance services, where information systems have a long history and there is a large amount of knowledge about customer and investor behaviour or the impact of socio-demographic, economic or political and legal factors. This mode should be successfully used in management in health care systems. Unfortunately, in the case of the medical services market in Poland, it will be almost impossible to refer to analogies due to the lack of evidence or cases that may constitute a scientific reference for decisions made. For the same reason, we will not use CBR case-based reasoning systems on the medical services market in Poland. Such systems can only be used by private "healthcare funds" or networks of institutions, which collect and analyse data from the environment into a case database. The inability to use modern

management support systems in the Polish health system results, as can be seen from the weaknesses of the previous activities in the field of public statistics and the lack of organizational culture - information orientation, knowledge in management.

Case-based systems using analogy are more likely to be used rather by medical teams and clinicians to make decisions about diagnosis and treatment. The databases of medical cases, taking into account the nature of procedures, drugs (Ponikło, 2007) and other factors, can be supplied from libraries of such systems already operating in the United States – evidence-based healthcare management (EBM), provided that the time for introducing drugs to the market and progress in therapies are synchronised in Poland and the United States. However, Poland should probably build its own libraries of medical cases to support doctors in making decisions in the area of diagnosis or therapy. The use of foreign libraries may concern so-called rare diseases.

So far, there are only a few studies and theories that indicate other factors that may guide the way to choose the optimal information system, for example:

- R.H. Sprague (Sprague and Watson, 1989) points out that the selection of MSS should refer to the phases of the sequential decision-making model. However, this approach is difficult to accept, as we are not sure whether managers make decisions sequentially.
- R.N. Anthony (Wierenga and Van Bruggen, 1997) proposes that selection of an MSS should involve determining in which area of strategic management there is a need for support, e.g., strategic planning, organising, strategic control or operational control, etc. However, this approach also seems to be inadequate. Firstly, such a separation would be of negative impact in terms of data loss, which, to reach the strategic level, must be collected and analysed at lower levels. On their basis, for example, both analyses for operational control and (after processing) for strategic control can be created. B. Wierenga, G.H. Van Bruggen also argue that the weakness of this approach is that in the same management area, variable types of decisions are made. R.N. Anthony's approach may end up limiting the system and increasing the cost of building it.
- A.G. Gorry and M.S. Scott Morton (1971) presented a matrix that is a combination of two dimensions of R.N. Anthon and R.H. Srague, i.e., the phases of the decision-making process and the area of strategic management. This proposal, with slight extensions, was used by other authors (Carlsson and Turban, 2002), but it is difficult to agree that it might be useful in the context of criticism of the two previous approaches. This approach can be particularly adverse from the point of view of the functionality of modern MSS, e.g., information flow, system learning processes.

Trying to understand the authors' intentions, can be admitted that such a division may be useful in entities operating in specialised markets, with production or distribution orientation, where the scope of decisions is narrow and limited to a

certain type of situations. Nowadays, the trend favours rather integration. At enterprises (especially medium and large ones) there is a tendency to integrate IT systems of the entire company, including modules for various functional areas, such as production, logistics, marketing and finance, and others (the so-called ERP – Enterprise Resource Planning). Research results show that the integration of marketing support systems with the wider management support system is effective and desirable (Wierenga, Van Bruggen, and Staelin, 1999).

The trend of integrating systems and databases is just beginning to emerge in public sectors such as social welfare and education. In this respect, the situation in the health care system is quite complicated, as there are many diverse and incompatible systems, and some entities use more than one programme. Undoubtedly, however, the health care system needs and deserves a system that will support decisions in all areas of management, i.e., planning, strategic and operational control, at all management levels. There is a concern that in the case of the health care system, the division of strategic management areas and assigning them separate systems will be unfavourable for the system.

The factor that may be the key success potential of MSS implementation is the interplay (balance) between the factors on the demand side (types of decision-making processes) and the factors on the side of the tool supplier (management support functionality). According to F.D. Davis, M. Alavi, and E.A. Joachimsthaler, the degree to which this potential will be realized depends on the design features of the MMSS and the characteristics of the implementation process. Considering the specific nature of the healthcare sector, and above all the fact that this industry has no significant experience in the use of IT tools supporting management processes, the MSS implementation process should be related to training, presentation of evidence for the effectiveness of the system, and informing users about its philosophy, measures and the overarching purpose of use, and after-implementation support (support service).

Researchers indicate (Wierenga, Van Bruggen, and Staelin, 1999) that the evaluation of MSS is increasing with time as they are used, and the availability and use of MMS contributes to an increase in the demand for information from managers and for support from the systems. Moreover, the availability and use of support systems influences the way decision makers solve problems (Benbasat and Todd, 1996). Since the analysis concerns public health management support systems, it is also worth taking into account the guidelines formulated in this regard by the World Health Organization WHO. WHO indicates the following key factors for the implementation of effective public health information systems:

1. The designed systems must consider the policy structure and the specifics of the health system. Indicators of the "core" of the system should be related to the most important goals of the health policy development of a given country, with available databases, analyses currently underway and

strategies for the distribution of this information and communication channels.

2. The planned system should be a strategic plan rather than an operational health policy activity in a given country. The emphasis on the plan's strategic focus is not only related to the time horizon, but primarily to the involvement of the most important people responsible for health policy in a given country. It is suggested that ministries of health and health plan coordinators be involved to guide and control the implementation of the system.
3. The information system should take into account the information needs of decision makers at regional, national and global levels.
4. Investments in the information system should be primarily correlated with the needs of decision makers. In this approach, it is suggested that the system should be built from the top, not from the bottom.
5. Strengthening the national health information system and regional systems requires cooperation at an international level and, above all, connection with international systems. It is suggested to involve international experts in the design of the information system, as this brings about good results. The healthcare information system should be compatible with international statistics. Building the system should take into account the achievements of international organizations in this area.
6. It is important to prepare the health care staff responsible for the public health information system in a given region or entity as coordinators who understand the functionalities of the system (these people are necessary in the processes of system improvement).
7. It should be ensured that the healthcare information system takes into account the criteria and legitimate statistics expressed in Fundamental Principles of Official Statistics, such as: impartiality, science, ethics, transparency, consistency and efficiency, coordination and cooperation (Lippeveld, Sauerborn, and Bodart, 2004).

## 4. Information Needs of Decision-Makers in Healthcare in Poland in the Context of the Development of IT Systems

All activities in the process of designing information systems should start from the analysis of decision-making needs. Decision-making needs, in turn, are the basis for determining information needs. Information needs provide guidelines for designing methods, techniques, and tools for data collection, based on a wide spectrum of social, economic and psychological research methodologies. In 2012, a study[1] was conducted in one of the regions in Poland to assess information needs of decision-makers and the state of management information systems used by directors of medical institutions. The aim of the study was primarily to determine the information needs of decision-makers and the use of management information systems in the management of a facility[2].

The existing knowledge resources (databases, the state of information systems) and the collection and processing of data do not allow for professional management of public health in the region in a methodical manner, consistent with the management theory, in which decisions are based on knowledge and analysis of experience (e.g., evidence-based management). Public health information resources available at the regional level characterise all the listed problems of health care information systems, in particular the lack of available information necessary to make decisions at the regional and medical institution level. At the same time, the respondents pointed to the great importance of information and decision support systems in health care management. In a question, respondents marked actions that might contribute to the improvement of the situation in health care out of a list provided by the researchers. They chose the following:

- Organising a system for obtaining, analysing, and processing data by the local government (functioning of hospitals, environment, trends, forecasts), necessary to make long-term decisions in the organization and protection of the health needs of the population.
- Providing managers of medical facilities with access to data necessary to make strategic decisions, e.g., investment or restructuring.
- Development and implementation of a standard for data and information obtained and processed at the regional level, compatible with other systems, used to make strategic decisions and to monitor the situation. Creation of mechanisms for motivating medical facilities to provide data.

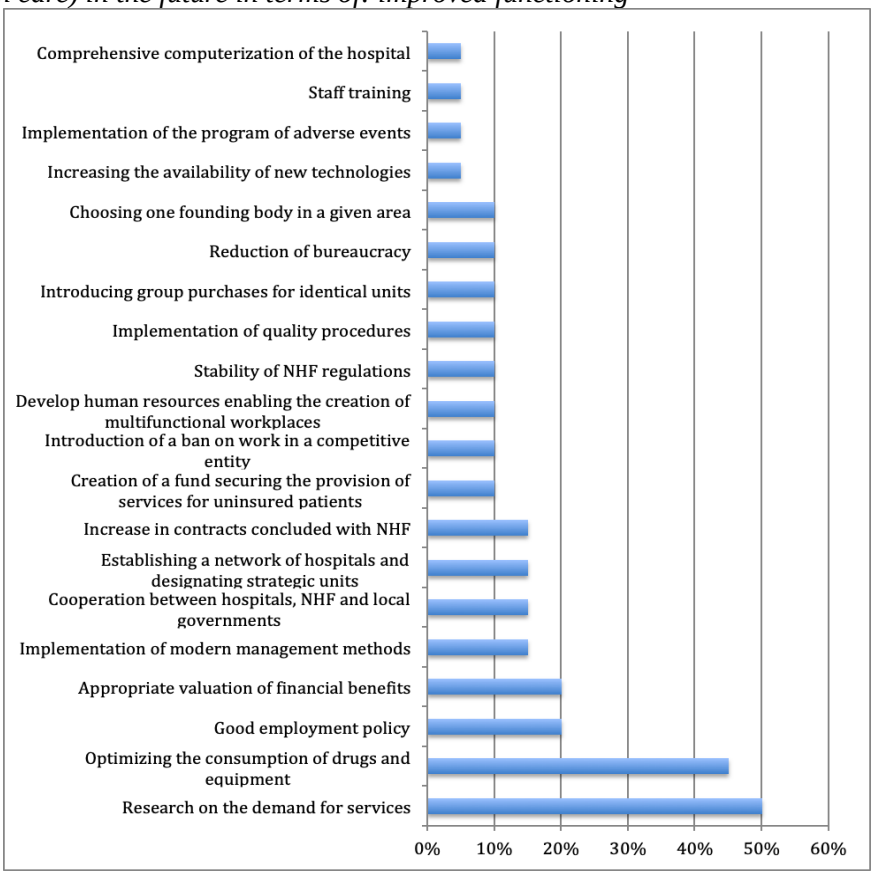
During the study, it was observed that directors of medical institutions were interested in the situation at other institutions and in comparisons to other institutions. Therefore, it is not surprising that among factors of improvement, experts indicate sharing of information on effective solutions (case studies) used in other medical facilities in the region – benchmarking and motivating the management of medical facilities to implement them. This is another factor that may contribute to the improvement of the health system in the region. It is not without significance that it concerns cases (evidence) that could constitute the knowledge base of the management support system (CBR systems).

In fourth place (out of 24 indicated factors), experts indicated providing managers of medical facilities with access to data necessary to make strategic decisions, e.g., investment or restructuring. Indication of this factor emphasises the lack of access to management information on the part of directors of medical facilities, and the great importance that directors attach to the use of this information (Figure 1).

Access to data necessary for management is, in the opinion of directors of medical institutions, experts and employees, a key factor that may affect the situation in the health care sector and improve the functioning of medical facilities (that is, in fact, what the directors are responsible for). Striving to improve the quality of functioning of medical facilities is the basis for taking actions aimed at improving the quality of

services, improving their availability to patients and, as a result, improving the health indicators of the population. The largest number of experts indicated access to information from population studies on demand for medical services as a factor which might contribute to reduction of overall costs of functioning of the healthcare system in the studied region.

***Figure 1.*** *Percentage of responses for rounds I and II of the Delphi survey, indicating which of the measures / solutions will definitely improve the situation (in health care) in the future in terms of: improved functioning*



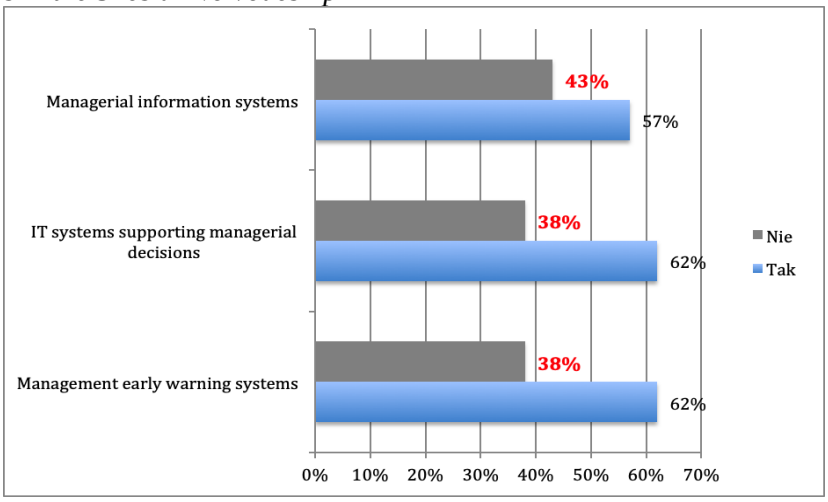

***Source:*** *Own study based on research results.*

Analysis of the responses, showing the sources of data on changes in the decision-making environment, allows us to conclude that the knowledge of directors is at best at the level offered by the public statistics provided, including the consequences of delaying their publication. The most important data sources are information from the National Health Fund and the Marshal's Office. About 4 out of 21 respondents follow their own observation and monitoring of the environment. Three people indicated that they used information from the Statistics Poland and various institutes. Some managers learn from professional literature and, quite surprisingly, from the

media. The list of answers is presented in the chart. Among other sources of information on trends, tendencies and forecasts used by the management boards of the surveyed medical facilities in the Silesian Voivodeship, the following were indicated: publicly available forecasts on the medical market, data obtained in cooperation with the Health Department of the Medical University, public data of the Ministry of Health, Quality Monitoring Centre, reports of voivodship consultants, reports of national consultants for given specialisations, register of the Voivode, Public Health Centre, data from the poviat, National Development Strategy, analyses by the founding body, plans and forecasts of the National Institute of Hygiene, information from the Centre for Healthcare Information Systems, knowledge gained from congresses and meetings.

Eight (8) directors of the surveyed medical institutions indicated that they used Managerial Information Systems (MIS), Management Decision Support Systems (MDSS) and Management Early Warning Systems (SWOK). Thus, hospitals using information systems are in the minority, but nevertheless the rate (35-40% of units) is quite high.

***Figure 2.*** *Systems used in operational and strategic management in health care facilities in the Silesian Voivodeship*

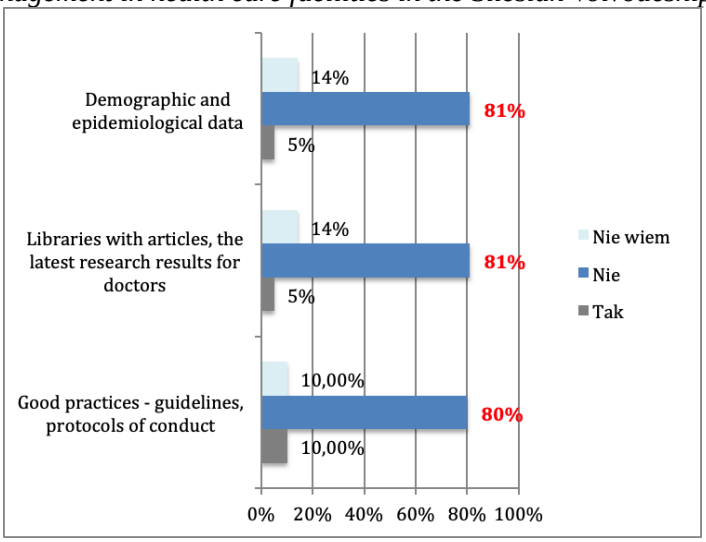



***Source:*** *Own study. Individual in-depth interviews with directors of medical facilities in the studied region of Poland, 2012, (N = 21).*

According to 12 directors of the institutions covered by the study, IT systems allow for quick generation of synthetic reports for managers of various levels and units, showing indicators and data relevant to a given organisational unit. Among the indications, however, there are mainly reports generated on the basis of internal data: payroll, HR, accounting, IT reports (use of IT equipment by users), bed occupancy, percentage of contract fulfilment, number of services provided, information on drug expenditures from the pharmacy, information on drug expenditures in departments,

information on fixed assets and equipment, performed diagnostic tests (microbiology, laboratory) or performance of contracts and the results of individual laboratories. At seven units, IT systems do not allow for quick generation of synthetic reports for managers of various levels and units, showing indicators and data relevant to a given organizational unit.

***Figure 3.*** *Bases of management information systems used in operational and strategic management in health care facilities in the Silesian Voivodeship*




***Source:*** *Own study. Individual in-depth interviews with directors of medical facilities in the Silesian Voivodeship, 2012, (N = 21).*

The concentration of employees' responses on internal reports proves that the majority of the surveyed hospitals have internal health information systems (HIS). Due to the automation of certain processes, such systems are treated as managerial information systems (MIS), managerial decision support systems (DSS) or management early warning systems (SWOK).

The level of development of decision support systems, in accordance with the definition and classification, is determined by its content and the scope of the analyses performed (Wierenga and Van Bruggen, 1997). The decisive question was the structure (content - what kind of information they collect) of information systems used in medical facilities.

Out of 21 surveyed medical facilities, only one facility declared that its information system had a built-in knowledge base about the environment. Within the information system, one medical facility had databases from the environment (demographic, epidemiological). One facility declared that its system contained articles and results of research and therapy, and two facilities within the information system have databases of medical procedures and databases of good practices. The answers to

this question basically confirmed that hospitals only had internal (in-hospital) information systems.

Another important issue in the context of information systems involves also the degree of integration of all system modules supporting different departments. After analysing the answers, a conclusion can be drawn that a maximum of only 50% of program modules on which hospitals work are integrated. It is much better in clinical hospitals where most of the modules are integrated. None of the surveyed hospitals has the MRP II system or even the independently functioning CRM module of Patient Relationship Management.

According to the respondents, the basic function of their systems was collecting and recording internal data and generating reports for the needs of settlements with the payer, i.e., the National Health Fund. At 16 units, the systems were also used to monitor the situation of the facility.

## 5. Conclusions

Key research conclusions in the context of implementing decision support systems in healthcare are the following:

1. There is a great need to systematically acquire knowledge about the situation in health care. Currently, however, access to such knowledge is limited.
2. Access to reliable information is treated as one of the main factors that may contribute to the improvement of the situation in health care, and in particular to the improvement of the functioning of medical facilities.
3. Lack of information necessary to make decisions is noticed by various circles: directors of institutions, regional administration, representatives of science, representatives of patient organizations, doctors.
4. There is a lack of knowledge among hospital management staff, but also awareness of information needs, i.e., the type and scope of data that could be used in day-to-day management and strategic decision making. There is a noticeable lack of experience of managers in making long-term decisions.
5. Management is limited to operational and tactical decisions, and planning is limited to the next year at most. This approach results to the greatest extent from the short planning and allocation of funds from the National Health Fund.
6. Directors of medical facilities need both data from internal information systems and data from the environment to manage. Thirteen out of 21 directors reported the need for external and internal data for the strategic management of the facility.
7. The directors lack basic information on the strategies, plans, directions of the sector's development and health policy at the national and regional level. The research revealed that, in principle, there are no long-term plans for the development of the health sector in the regions.
8. The types and scope of listed external data that directors would need are very general (e.g., "EU funds", "legal regulations", "information about other sites in the

region"), which allows the conclusion that directors indicate rather what they are interested in than what they actually need to manage. The general answers also show that it is difficult for the directors of medical institutions to define their information needs.

9. The most obvious links between information needs and decisions concern data in the field of epidemiology versus decisions regarding the increase or decrease in the number of hospital beds. Generalising most decisions in the area of managing medical institutions, including restructuring, are based on two variables: (1) financing of procedures by the National Health Fund, (2) epidemiological indicators.

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**Notes:**

*1 Research on the information systems of health care facilities and the information needs of decision-makers was carried out as a part of a programme implemented by the Marshal's Office of one of the regions in Poland, entitled Strategic Change Management. The title of the research project: "Study of the level of health services provided in selected health care units in the context of the diagnosis of the level of development of regional public services and the forecast of their demand and impact on the labour market in the light of demographic and socio-economic trends". The following research was carried out as part of the entire research project: in-depth group interviews (FGI), individual in-depth interviews (IDI) with medical facility directors (27), interviews with facility employees (PAPI), interviews with patients (PAPI), and the Delphi study using the CAWI technique. The field research was carried out in May-September 2012*

*2 The research concerns one of the key regions in Poland and cannot be projected on the entire population of hospitals in Poland, but it can be assumed, by analogy, that the situation in other regions of the country is similar. This voivodship is a good example for analysis, as it has the greatest potential in health care, measured by the number of hospital beds per 10,000 inhabitants and it is the second largest region of Poland (in terms of the number of inhabitants). Hospitals in the region have the second largest budget from the National Health Fund (after the Mazowieckie Voivodeship). It is very important that the region, in the opinion of specialists in the medical services industry, is considered the most developed in terms of such factors as: medical infrastructure, innovative medical technologies and procedures, management and organization of patient care.*