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FACTORS FOR BUILDING A COMPETITIVE ADVANTAGE OF ANALYTICAL LABORATORIES ON THE MARKET

Bożena GAJDZIK[1*], Andrzej WYCIŚLIK[2], Krzysztof GAJDZIK[3]

[1] Silesian University of Technology, bozena.gajdzik@polsl.pl, ORCID: 0000-0002-0408-1691
[2] Silesian University of Technology, andrzej.wycislik@polsl.pl, ORCID: 0000-0003-0736-0300
[3] Szpital Wojewódzki w Bytomiu; krzysztof.gajdzik@wp.pl, ORCID:
* Correspondence author

Purpose: The reason for writing the paper was radical changes in the organisation of the work in laboratories after the transformation of the economic system in 1989. Since this year, a market economy in Poland has been built. The authors present key changes in laboratories after transformation of the system in Poland. The key areas of change are building relationships between a laboratory and an accreditation organisation and customer. The purpose of the paper is to present key areas of changes in the laboratory market. The research methods included an analysis of literature and the standards concerning quality management in research laboratories and accreditation of laboratories.
Design/methodology/approach: The paper presents factors for building the competitive advantage of research laboratories in a market economy. The authors presents information about changes based on their experiences and observation of the laboratory market.
Findings: The result of the collected information is a segmental analysis of changes in laboratories.
Research limitations/implications: The implemented changes in research laboratories are a basis for further development. There are several types of laboratories which take on different forms depending on the characteristics of their testing. The work adopted the concept of describing the general conditions of the functioning of laboratories on the market without delving into the specifics of the laboratory (no division of laboratories into different types: medical, physical, measuring, industrial, etc.). The article characterises market conditions for a laboratory understood as a room with equipment in which the research is carried out by the staff – a research laboratory. Research laboratories until 1989 operated in the structures of state-owned enterprises or in the structures of large organisations (hospitals, universities, institutes). The implemented changes have created new customer-oriented laboratories.
Originality/value: The information presented in the article broadens the knowledge about the transformation of laboratories in Poland.

Keywords: laboratories, transformation, market, competitiveness.

Category of the paper: general review.

Introduction

In 1989, the new government in Poland began to build the foundations of a market economy. The 1990s in Poland were a period of deep and radical changes implemented in the economy and within individual organisations. The restructuring of organisations involved a process of adapting individual areas of their functioning to the new requirements of the market economy (Borowiecki, 2014, pp. 17-18; Cabała and Bartusik, 2006, p. 19). The process of changes also covered operations in research laboratories. The restructuring of the laboratories was preceded by the privatisation activities of enterprises and/or institutions within the structures of which the institutions operated (Krajewski, 2009). Some laboratories have changed owners (sale of laboratories to domestic and foreign investors), and some research laboratories had to be liquidated, because they were not able to meet the new needs of customers, most often due to a lack of funds for the purchase of new research equipment. A large number of laboratories that operated within the structures of large state-owned enterprises were separated from them and started providing services on their own. The process of separating research laboratories from larger organisational structures (steel mills, breweries, dairy plants, meat processing plants, hospitals) was called laboratory outsourcing (Trocki, 2001, p. 13).

Technical, methodological, organisational and personal restructuring were considered to be key areas for the restructuring of research laboratories in the period of economic change in Poland. Many laboratories in production companies started additional activities for other external domestic and foreign customers. The first consisted in the reprogramming of laboratory tests to adapt them to the new needs of customers within the market (many laboratories, in addition to performing tests for the production company within the structures of which they operated, began testing for other external domestic and foreign clients). The second type of restructuring was the introduction of changes in the number and structure of employees (depending on the scope and type of research performed, the number of employees increased or decreased). Employee competence requirements have been gradually developed in individual laboratories. New jobs have also appeared, e.g. a manager for the quality of laboratory tests. Particular laboratories under market activity conditions adopted marketing strategies, which were preceded by market discernment and market analysis for the laboratories' researches (analytics) and the services provided. Marketing was focused on building a competitive advantage by diversifying the market offer (Mytych and Ligarski, 2015).

Increasing requirements related to the integration of Poland with the structures of the European Union at the end of the last century led to the need for research laboratories to guarantee a high quality of performed tests (laboratories carried out activities related to the implementation of a quality system in accordance with the requirements of the PN-EN ISO /IEC 17025 standard) and the use of the principles of Good Laboratory Practice (GLP). Individual research laboratories applied for an accreditation certificate. The award of a test

laboratory accreditation certificate was a formal recognition that the laboratory has the appropriate competence to perform specific tests or types of tests (more information in reports, PCA).

The operation of laboratories in market economy conditions and, above all, gaining a competitive advantage over other laboratories preceded changes in such areas of their operation as: employees (staff), apparatuses, methods, certified reference materials (standards), chemical reagents, auxiliary materials, spare parts and laboratory management. This publication emphasises the most important factors building the competitive advantage of research laboratories in market economy conditions, at the same time pointing to the relationship between a research laboratory, the accreditation organisation (PCA) and the customer. The strategy of building a competitive advantage is addressed to individual market segments. A different scope of building a competitive advantage occurs in research activities, which is also different in expert services and technical, medical or environmental assessments. The key determinants of building a market advantage include a guarantee of high quality research and timely implementation of research, as well as the reliability, accuracy and credibility of research results. Research laboratories are considered competitive if they ensure that tests are carried out at the highest possible level, thus satisfying the most demanding and important clients in a given industry. The competitive advantage of laboratories is built on the basis of their research (tests) and services, taking into account the marketing image of the laboratories on the market. This competitive advantage means that the laboratory gains a better position than it's competitors on the market. It is a relative measure of its functioning on the market – it allows the customer to offer services or products corresponding to their expectations that are better than the offers of the competition. This is expressed in higher product quality, lower prices and better service, or more comprehensive fulfilment of customer needs (Porter, 2010).

1. General framework and requirements for laboratories on the market

The main task of research laboratories is to carry out research for the benefit of clients (customers). Laboratory tests must be performed fairly, in accordance with the adopted methodology and technique of testing. The laboratories also provide laboratory consulting services and participate in research expertise. Laboratories must be impartial and independent when carrying out research and service work. The management and laboratory staff must not be subject to commercial, financial or administrative pressure, which may affect the test results obtained or the technical, medical and environmental judgments issued by the laboratory. The obtained test results are presented in test reports. The laboratories are gradually gaining clients' trust concerning their technical competence and the credibility of the results provided.

Subcontracting of tests should take place with the consent of the contracting authority, and information on this should be included in the final report on the tests carried out (Gajdzik and Wyciślik, 2011).

Under market economy conditions, laboratories should not focus on the number of tests carried out, but on the quality of tests. The remuneration of laboratory management and staff should not depend on the number of samples tested or the number of results issued. This limitation results from the duration of the measurement cycle, e.g. if twenty full analyses can be performed during an eight-hour working day, the implementation of subsequent tests may indicate excessive haste or lack of due diligence, i.e. a significant risk of errors. However, rewarding employees who work more efficiently than others is not excluded.

In the area of laboratory research, the key to the good functioning of laboratories is compliance with GLP principles (Good Laboratory Practice) (Owen, 1995; Huber, 1997). GLP principles are structured rules of conduct when performing tests and a set of organisational undertakings necessary to determine the appropriate conditions for planning, conducting and monitoring tests, as well as recording the results obtained and the methods of their presentation. The GLP principles apply to the correct operation of research laboratories, quality control, accuracy and precision of the results obtained (Wyciślik et al., 2017). The GLP strategy can distinguish the "tactics" of activities in research laboratories, known as GAP (Good Analytical Practice). It is also worth noting the importance of the Responsible Care Programme (RCP), which includes, among others, development of safe technologies for the production of chemical reagents, their transport, use and disposal and, therefore, the essential elements of both the quality system and environmental management, but also procedures related to the accreditation of research laboratories (Evangelinos et al., 2010). In the group of "Good Practice Principles" are: GLP (Good Laboratory Practice), GAP (Good Analytical Practice), GMP (Good Manufacturing Practice), GSP (Good Storage Practice), GTP (Good Transport Practice), GDP (Good Distribution Practice). All codes ensure that the customer receives products or services of good quality from laboratories (Fifield and Kealey, 1991; Wyciślik et al., 2001). In laboratories, such elements of GLP are very important (besides the market product: research and services): quality programme, documents used, staff – knowledge and competences, methods used, equipment and materials used, obtained certifications and market image (Figure 1).

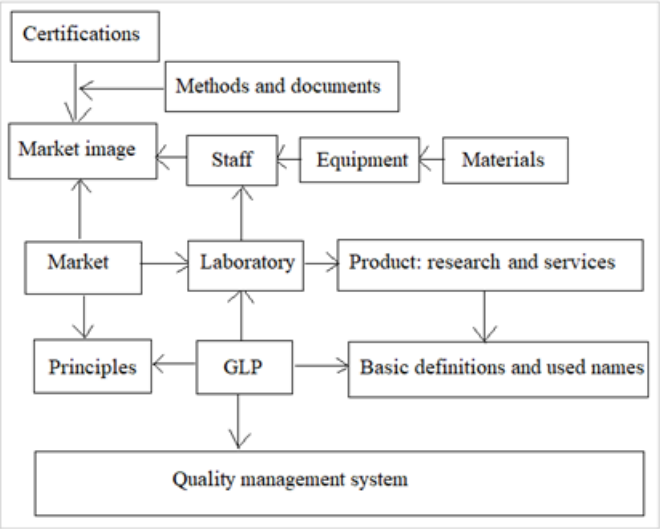

Figure1. Laboratory on the market – key areas of market activities and GLP. Source: own work.

There are different organisations on the market, with some laboratories competing with others they cooperate with, and others are neutral for their business. The different forms of cooperation between organisations on the market strengthen the positions of individual laboratories, e.g. laboratory cooperation with industry, laboratory cooperation with universities, cooperation of commercial laboratories with public (government) laboratories, etc. (Edelheit, 1995; Crow and Bozenam, 1991). Good laboratory practices are built on the basis of the achievements of laboratories. Laboratories seeking a competitive advantage should adopt these practices and take action in accordance with them.

2. Marketing planning in laboratories

To adapt laboratory methods to customer needs and to new market requirements, laboratories build marketing strategies. Marketing is an important operation of laboratories. There is a strong impact of marketing on the commercialisation of research and knowledge transfer (Comer et al., 1980). In the planning of development, management takes into account the type of laboratory research (methods) currently carried out and prepared for future implementation, also taking into account the possibility of purchasing innovative technical equipment (Wierzowiecka, 2004).

In constructing a marketing strategy, laboratories adopt the following objectives:

- increasing the market share of laboratory research and services and increasing the number of orders,
- modernising the research and measurement database and investing in new research methods,
- training of staff and developing personal competences.

The individual objectives range in from different types of laboratories (industrial, medical, etc.) are addressed to different clients (internal or external clients). Individual elements of the activity are combined into larger programmes that fall within the scope of the marketing plan. In laboratories operating within a larger institution, this creates a general timetable to control the progress in implementation of the marketing plan. It is important that particular programmes are coordinated and coherent (Wojtynek and Wyciślik, 2002b).

Marketing planning covers:

- laboratory quality policy,
- needs of internal and external customers,
- strengths and weaknesses of the laboratory or institution in which the laboratory is located, in the context of market opportunities and threats (SWOT),
- principles and rules for a laboratory, taking into account the expected trends in the development of laboratory practices,
- marketing targets and particular strategies and plans, taking into account the financial plan,
- programmes in relation to the marketing targets, taking into account the allocation of measures to guarantee the development of the laboratory,
- directions of development of analytics, taking into account new methodological trends and new techniques.

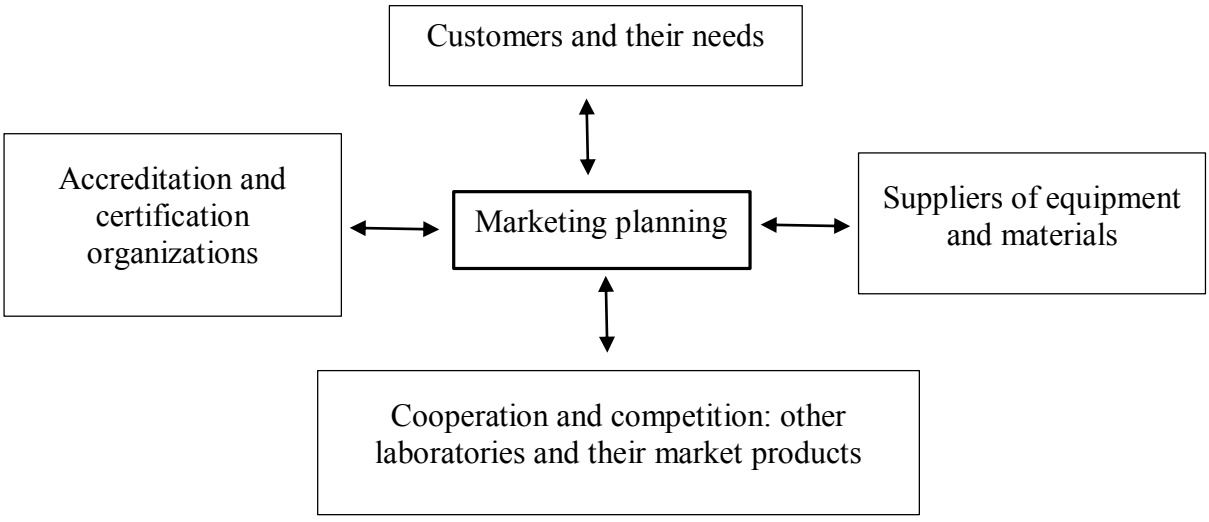

Figure 2. Key objects of market planning in laboratories. Source: own work.

Marketing planning in laboratories began after the foundation of the market economy. This process began with promotional and informational activities. Laboratories then carried out market research, including research on customer needs. Currently, marketing in laboratories is a very extensive activity, implemented using many tools to influence stakeholders. In the concept of Industry 4.0, smart marketing fundamentals are created in laboratories. Smart Labs use modern information, electronic, 3D printing and modern research technology Massive Open Online Labs (MOOLs) (Salzmann and Gillet, 2013).

3. Determinants of the choice of measurement methods in laboratories

Laboratories carrying out a research process select the appropriate measurement methods for the implementation of the research (test). From the substantive side, the factors conditioning the choice are the scope and type of research, technical equipment and employee competences. The methodological procedures developed should include a full description of the entire analytical cycle, including sample preparation for testing (weight, digestion method, reagents and auxiliary materials used, e.g. filter, laboratory glassware, certified reference materials), measurement (statement of measurement parameters, physical interference, methods of correcting interactions, preparation of standard solutions, optimisation of equipment conditions, performance of determinations, methods of calculating results) and method validation, as well as additional information and remarks important in the proper conduct of the analytical cycle. A list of bibliographic references or standards based on which specific methodological procedure has been developed should be attached. Methodological procedures should be accompanied by instructions for the use and maintenance of laboratory apparatuses (equipment) and procedures for its calibration. As part of ensuring the high quality work of chemical analytical laboratories, it is necessary to check the correctness of the measurement method used (if it is not standardised), i.e. its validation (Wyciślik and Wojtynek, 2002a). Absolutely validation requires instruments after each repair and computer software to operate devices with any changes or updates. The validation rules and cases where the laboratory should validate the test methods used are defined by the PN-EN ISO/IEC 17025 standard. Economic criteria are determinants of the choice of analytical method, in addition to the substantive determinants. Moreover, there is quite close interdependence in this regard. Each analysis of the substantive factors of the selection of the analytical method, often identified with the quality of the results obtained and the purpose of the studies carried out, is accompanied by a thorough economic assessment. Economic factors should mainly be related to investment and operating costs, while taking into account the cost of employing laboratory staff with appropriate qualifications. Investment costs include, in particular, the purchase of laboratory equipment and control and measuring equipment together with a basic set of spare parts and equipment for the preparation of samples, glass wares and polyethylene, as well as other necessary auxiliary utensils. All investment costs, which are relatively high due to the significant price of modern measuring instruments, should be closely correlated with the actual needs of the laboratory (Don and Haines, 2000).

In accordance with the PN-EN ISO/IEC 17025 standard, a laboratory should use appropriate methods and procedures for all measurements falling within its scope. This applies to sampling, handling, preparation, storage and transport. The laboratory should use test methods, including sampling methods, that meet the customer's requirements and which are appropriate for the

tests concerned. It is recommended to use the most up-to-date versions of methods published in international, regional or national standards (Michalski, 2010).

The quality of the test procedure and its implementation affect the quality of the results. When assessing the suitability of the procedure, it is necessary for it to be verified so that it can be used for the subjects tested ~~with~~ potential influencing factors. When applying the procedure, the results obtained shall be checked (Volodarskij and Koshevaja, 2013; Volodarskij, Warsza and Koshevaja, 2014). Measures of the accuracy of measurement methods are presented in the Fig. 3.

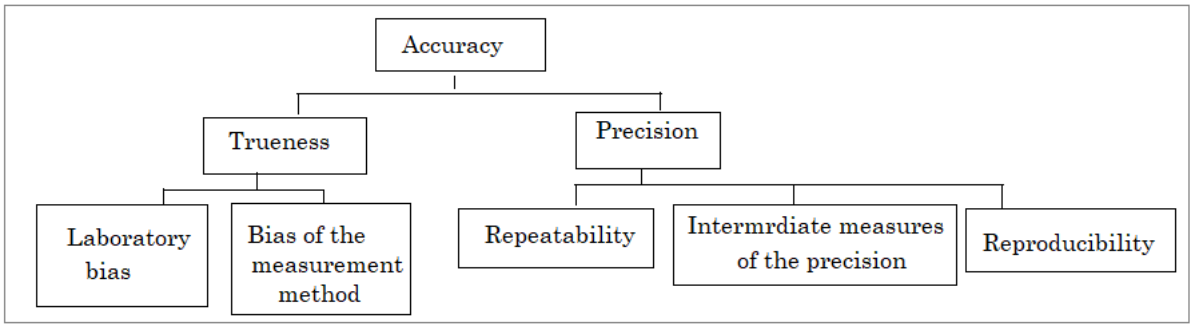

Figure 3. Measures of the accuracy of measurement methods in laboratories. Source: Volodarskij, Warsza and Koshevaja, 2014.

4. Development of competences of laboratory staff

In accordance with the 17025 standard, a laboratory has technical staff and managerial staff (including designated deputies). In addition, the laboratory should specify: the responsibility, powers and interdependence of the staff who manage and perform or check work affecting the quality of the tests. The PN-EN ISO/IEC 17025:2005 standard requires staff to be qualified on the basis of appropriate education, training, experience and/or demonstrated skills to carry out individual tasks.

Laboratories, using various human resource management capabilities, can also develop strategies and management programmes, including (Wierzowiecka, 2014):

- planning of human resources;
- recruitment systems for employees, taking into account the different sources of recruitment of persons and types of labour markets;
- incentive systems, with an emphasis on creating internal motivation;
- organisation of teamwork, taking into account the factors that shape the effectiveness of teams;
- assessment systems of employee work.

The competences of staff are important factors in the proper functioning of research laboratories on the market. Employees employed in a laboratory are required to have appropriate and confirmed substantive qualifications, as well as reliability and regularity during work. The development of laboratory competence is also closely related to the expansion of its research base, the purchase of modern laboratory equipment is the basic element in this respect. In the area of these activities, in addition to the purchase of complete apparatuses, it is also necessary to consider retrofitting already existing measuring devices in order to increase their research capabilities, increase the accuracy and precision of the results obtained or increase work efficiency and reduce the time of the analytical cycle. In addition to continuous improvement of qualifications through participation in various trainings, specialist workshops, as well as symposia, seminars and scientific conferences, the most effective methods to support competences include various forms of cooperation with universities and other scientific and research centres, as well as leading industrial laboratories, to effectively solve specific research problems. Confirmation of the competence of laboratory employees is also associated with their appointment to develop standards as part of the work of the Technical Committees of the Polish Committee for Standardisation, as well as their participation in surveys carried out in order to submit comments and amendments when drafting new standards (Gajdzik and Wyciślik, 2012).

5. Laboratory quality systems

Research laboratories operating in conditions of market activity, including laboratories that are part of a larger organisation or institution (university), should build a quality assurance system. The decision to implement a quality system in a laboratory can be aimed at non-quantifiable or hard-to-quantify benefits, e.g. in the case of a quality system in a laboratory, an increase in the prestige of the company, improving its image in the eyes of customers or improving the organisation of work so their results will be visible only in the distant future. (Matyjaszczyk, 2005).

The quality system is the organisational structure, procedures, processes and resources necessary for quality management and its user requirements (PN-ISO 8402). The requirements for technical competence and a quality system in laboratories are set out in detail in the PN EN ISO/IEC 17025:2018 standard. The laboratory quality system should cover the different stages of the implementation of research and service work, from initial contact with the customer to the transmission of a test report. The laboratory's quality system must be in line with the entire research cycle and should be consistent for all stages of the work carried out, from sampling to presentation of test results. Quality assurance in a laboratory means:

- using measures in accordance with the requirements of the relevant documents,
- continuous supervision of all processes and documenting all activities,
- the development and implementation of self-regulating activities that ensure the continuous identification of non-compliance and elimination of the causes of their occurrence.

The foundations of the quality assurance system in a laboratory are the developed documentation related to its activities. The documentation structure consists of: quality policy, quality book, procedures, instructions, reports. The development of a laboratory quality policy, the quality system implementation schedule and the provision of necessary resources allows for the acceleration and coordination of work. These activities are supported by the training of staff who participate in the implementation of assigned tasks. The basic document describing the quality system in a research laboratory is the Quality Book (in the new edition of the PN EN ISO/IEC 17025:2018 standard, this is not a mandatory document). Laboratories document general procedures related to the activities and the conduct of the laboratory, as well as test methods and procedures and instructions used along with supporting documentation (Namieśnik et al., 2007). Laboratories should document general procedures related to their activities and the methods used. The implementation of the quality system according to the requirements of the PN-ISO 17025 standard ends with the obtaining of a laboratory accreditation certificate, which is a formal confirmation of the use of a quality system. After this stage, laboratories move to continuous improvement of individual areas of their market activities (Matyjaszczyk, 2005).

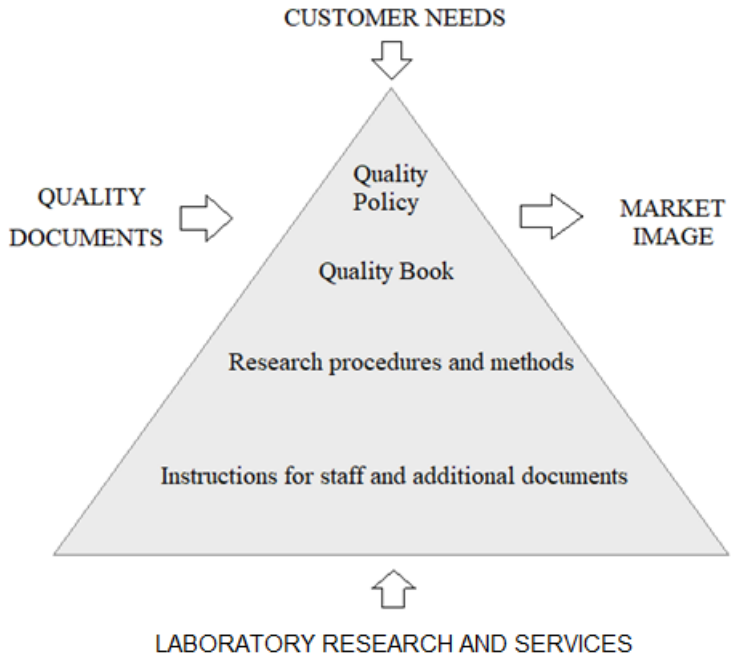

Figure 4. Quality management system in a laboratory – key components. Source: Standard PN-EN ISO 9001.

In the PN-EN ISO/IEC 17025:2018-02 standard, there are no longer any requirements for documented procedures related to the management system activities referred to in Chapter 8 in the old standard (17025:2005), nor is there a quality book requirement. It is assumed that the number of documents will decrease when laboratories adapt the quality management system to the requirements of the new standard.

Laboratories (particularly in an institute) use different quality standards and create an Integrated Management System (IMS), which combines elements of the PN-EN ISO 9001 and PN-EN ISO/IEC 17025 standards. The combination of several elements of the two systems has ensured consistency in governance and has created opportunities to build a single management system that meets the criteria of both standards at the same time. The implementation of the integration of management systems affects:

- closer and more efficient cooperation between those directly involved in quality issues,
- application of the same rules for the implementation and monitoring of the quality management system,
- exchange experience between employees in different management systems,
- better quality management, both at the institute and in laboratories,
- more efficient use of resources,
- cost reduction.

Laboratories use the PDCA method (Plan – Execute – Check – Act) and a process approach to the tests performed by laboratories (Madejczyk et al., 2007; Zając, 2019). The process approach is particularly prominent in the new edition of the PN-EN ISO/IEC 17025 standard (2018), A process approach defined in the ISO 9000 series standards. Each process is defined by: inputs, resources, stakeholders, exits, the owner of the whole process and implementation meters.

6. Laboratory accreditation and benefits for laboratories on the market

An important element of the transformation of laboratories is the accreditation system, organised and managed by the Polish Centre of Accreditation (PCA). The organisation (the centre) has been on the market since 1 January 2001. The Polish Accreditation Centre was established on the basis of the Accreditation Office at the Polish Research and Certification Centre (PCBC) and the Accreditation Team of Measuring Laboratories at the Main Office of Measures (GUM) (www.pca.gov.pl). The first accreditation certificate issued as a result of the accreditation process was granted to a research laboratory in 1992 (https://www.pca.gov.pl/o-pca/informacje-o-pca/historia/).

Accreditation is a form of ensuring quality in the laboratory, guaranteeing customers confidence in the results of the analyses carried out by the laboratory. Each test laboratory must be accredited, i.e. strict quality control of the tests carried out. The accreditation process is awarded appropriate certificates and quality marks. Accreditation of research laboratories should be conducted in accordance with the guidelines contained in the PN-EN ISO 17025 standard. Since February 2018, the date of approval of the new edition of the PN-EN ISO/IEC 17025 standard, all laboratories applying this standard must adapt their management systems to the new requirements so that they can be assessed by accreditation organisations within three years of its publication.

In Poland, the number of accredited laboratories is increasing. The number of valid accreditations in in 2000 was 337, in 2001 – 390, in 2018 – 1 596 (Report PCA, 2019). More than 50 000 accredited laboratories are on the world market (Zając, 2019). The number of laboratories accreditations is presented in Fig. 5. In Poland, most laboratories are located in the Mazovian voivodeship (Washed and Ligarski, 2015). Most laboratories are accredited in the field of physical performance testing, followed by chemical and environmental laboratories, which are also mostly involved in sampling (a detailed register is kept by the Polish Centre for Accreditation).

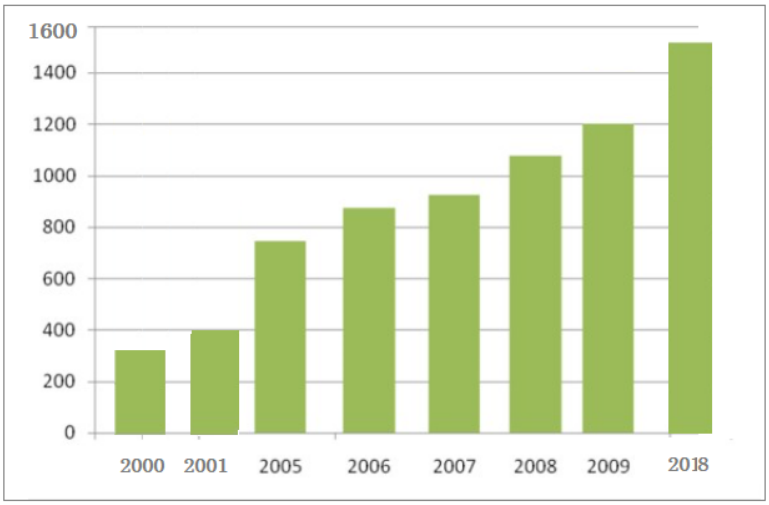

Figure 5. Number of laboratories accreditations in the period from 2000-2018. Source: on the basis of: (PCA Reports 2001-2018; Washed and Ligarski, 2015; Michalski, 2012).

The accreditation system should be voluntary and accessible to all research laboratories operating within different organisational units, regardless of their size, legal status, field (area) of operation and participation in scientific and technical organisations, as well as other associations. Laboratory accreditation is granted for three years. The PCA oversees accredited laboratories by carrying out control audits: scheduled (once a year) and special. The PCA has the right to: suspend accreditation (for one year), withdraw accreditation, limit accreditation, expand accreditation, extend and resume accreditation or transfer accreditation law. Confidence in the accreditation system is based on the assumption that both the evaluation procedure and regular laboratory supervision are trustworthy and that accreditation and surveillance

procedures are so effective that any inconsistencies in the laboratory applying for accreditation will be identified and effectively removed. External benefits related to the awarding of a laboratory accreditation certificate are (Filipiak and Nowostawska, 2000; Rosikoń and Wyciślik, 2002; Michalski and Mytych, 2011; Michalski, 2013; Bieńkowska and Bieńkowski, 2010):

1. Recognition of the laboratory's competence in carrying out certain tests, as well as the methods used.
2. Increase in the prestige of the organisation, which includes an accredited laboratory.
3. Placement in the register of units (laboratories) with certified quality systems.
4. Allocation of additional points by a government in the categorisation of research establishments with accredited laboratories.
5. Better position of the laboratory on the market (the laboratory can obtain greater orders for the performance of research).
6. Better position of the laboratory on foreign.
7. Facilitating the recognition of foreign certification bodies and obtaining foreign certificates.
8. Increase in the chances of applying for research topics under European Union research programmes.

Internal benefits include:

1. Ordering laboratory work covering the entire analysis cycle.
2. Improving the organisation of work in a laboratory.
3. A concrete and unambiguous definition of the responsibilities and competences of individual employees during the work.
4. Establishing clear and legible procedures for dealing with certain situations, e.g. failure of a laboratory apparatus.
5. Systematic upgrading of the qualifications of laboratory staff through participation in planned trainings.
6. Improving personal relations and greater integration of the laboratory staff.
7. Obtaining satisfaction from the work done in a certified laboratory.

7. Three segments of the laboratory market

When assessing the functioning of laboratories under market economy conditions, their complexity is considered due to the location and position of the market, their role and the tasks they perform, the requirements of the certification body and, above all, customer satisfaction when commissioning specific studies. The functioning of the laboratory is analysed in a three segment system: laboratory – accreditation unit – customer. The introduction of a quality

system imposes on the laboratory, in specific areas of competence, the need to maintain a sufficiently high level of content, which naturally entails high costs, including, inter alia, increasing costs of staff training, purchase of specialised equipment, use of chemical reagents and standards with appropriate certificates, etc. The client (customer), on the other hand, in addition to reliable test results carried out using modern laboratory apparatuses in an efficient and cost-effective manner, strives for the lowest possible costs for the commissioned research and services. In order to meet customer satisfaction, the laboratory staff should also, as far as possible, rapidly introduce the latest technical and methodological solutions in accordance with European and global trends and standards. Moreover, given the market conditions and competition, the laboratory cannot afford to lose existing customers, especially considering that acquiring new customers is difficult and costly. It is important to highlight the huge role played by the testimonials and certificates obtained by institutions. The accreditation certificate is a showcase of the laboratory and a valuable competitive asset, significantly increases its prestige and increases the chances of applying for research topics both within national competitions and the European Union. The ~~efficacy and~~ effectiveness of laboratory accredited research and services and the actual value and rank of the accreditation certificate are confirmed by the market (Fig. 6).

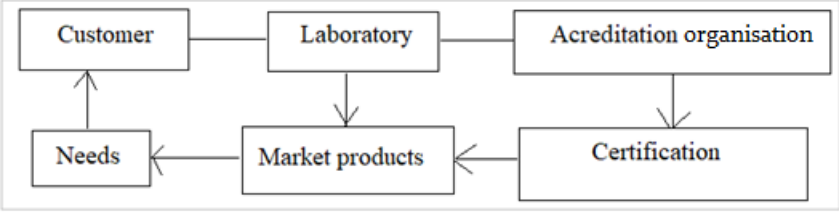

Figure 6. Three-segment assessment of a laboratory on the market. Source: own work.

This relationship is particularly important for the functioning of laboratories on the market. Services provided by laboratories (research service) are an extremely difficult creation for the consumer to define at the beginning of the process (research cycle). This is determined in particular by its characteristics as intangibleness and diversity. The recipient of the service is not able to familiarise themselves with the service before the process of providing it. It must therefore trust the service contractor in that the laboratory will perform the service in a fully satisfactory manner. The scope of research and analysis by laboratories varies considerably. Consumers may find it difficult to choose a service with specific quality standards. A combination of intangibles and the diversity of research services results in an increase in the risk associated with the purchase of a particular service. It is easier for consumers to be accredited by a laboratory. The solutions introduced in laboratories standardising the research (analytical) process make it easier for consumers to make decisions and reduce the risk of these decisions (Bieńkowska and Bieńkowski).

Summary

Adapting laboratories to market economy conditions required a number of changes in different areas of their activities. The entire test cycle has generally been organised, from sample preparation to testing, to specific tests and reliable results. The laboratory premises, apparatuses and inspection and measuring equipment, as well as auxiliary equipment, were also affected. Facilities use chemical reagents and reference materials with the necessary certificates. The development and implementation of appropriate analytical (measurement) methods, including validation, play a key role. When implementing a quality system, all areas of operation of the laboratory are integrated into a single structure that is fully evaluated by the accreditation body. Laboratory employees systematically improve their competences to operate innovative laboratory equipment. The marketing of the facility is aimed at increasing the market share and building a competitive advantage through quality, timeliness, trustworthiness and reliability of research.

Final conclusion: The market economy has created new opportunities for laboratory development, and the number of accredited laboratories is growing year by year. Laboratories have improved quality management systems and have become customer orientated so as to create their own forms of a competitive advantage on the market (better offer, higher quality, more precise test methods, better trained staff, etc.).

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