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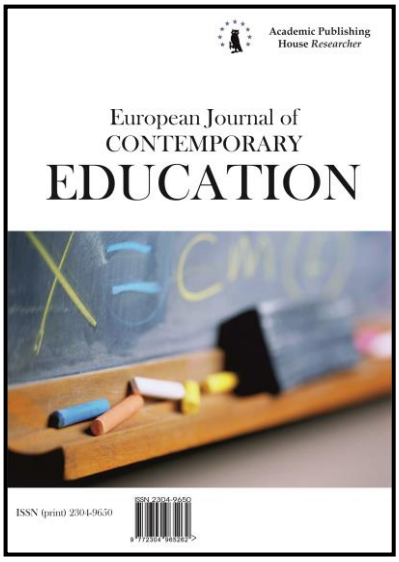

The Potential of Museums in the Mediation of Science and Technology. Museum Presentation and Education on the Example of the Technical Museum in Brno (Czech Republic)

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Abstract

This study examines museum presentations and educational activities in the area of technical museology, on the example of the Technical Museum in Brno (Czech Republic). Technical museology counts among the most popular segments of museum culture employed, in particular, in the popularization of science and technology. Through their exhibition activities, as well as museum and educational activities, museums approach target groups of visitors including pupils and students from all types of schools. Museums of technology have documented and mediated the progress in technology in society for nearly 200 years through a wide range of activities, especially in the form of the visualization of technological procedures of production, from the processing of a material to a finished product.

This contribution analyses and assesses the basic presentation, educational and scientific activities of the Technical Museum in Brno. It conveys the manners of its communication with the public, as well as the particularities of technical museology.

Keywords: technical museology, museum presentation and communication, museum education, Technical Museum in Brno.

1. Introduction

The phenomenon of technical museology started to gain momentum in the world in the late 18th century and, in particular, in the second half of the 19th century, in relation to the industrial development, as well as in connection with the organisation of world exhibitions showcasing the achievements of science and technology, art and material culture of the individual countries. Thanks to their appealing nature, technical exhibits and collections became extremely popular with visitors to world exhibitions, and later also to museum exhibitions of a technical character. It is not

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difficult to explain what fuelled this popularity and interest. It was the character of the technological and scientific exhibits which, in the form of attractive presentation, visualization, demonstration, quality and accessible commentary, have a potential to captivate most visitors. Needless to say, answers to questions such as How did it originate? How was it made? How does it work? What is behind it? How was it used? etc. interest the larger part of the population.

Technical museology has undergone a complex development in the last 200 years, in the course of which it evolved into its current form. The changes did not only concern the character of acquisitions and collecting activities; the forms of presentation and direction of the institutions changed as well, in line with the general focusing of museums chiefly on visitors and the social importance of the preserved artefacts. What manner of presentation and communication is typical of museums of science and technology? What are the current possibilities of approaching the general public in the field of technical museology? What is the role of technical exhibits in the educational process? These are some of the questions this article seeks to answer.

2. Materials and methods

The sources and literature on the subject are rich, and concern the area of general museology (Waidacher, 1993; Stránská, Stránský, 2000; Maroević, 1993; Beneš, 1997; selected issues of the current practice in Marstine, 2006) and the history of museology (Špét, 1979; Bazin, 1967; Alexander, 1979 et al.), as well as the concept of technical museology (e.g. Majer, 1982; Neustupný, 1968; Pubal, 1965) the foundations of which were only laid in the 20th century (Kirsch, 2017a; Kirsch, 2017b). These also include the modern discipline of museum pedagogy centred on work with visitors (e.g. Hein, 2002; Jagošová et al., 2010; Brabcová, 2003 et al.), and museum presentation as one of the basic forms of the mediation of the content of museum collections (e.g. Beneš, 1981; Dolák, 2015; Šobáňová, 2014a; Šobáňová, 2014b; Dean, 1996; Lord, Lord, 2002; Bukačová et al., 2014 et al.).

The methods and methodological procedures in this article thus predominantly focus on the analysis and synthesis of information from general and technical museology, and on the mentioned museum activities in the area of presentation and museum-pedagogical activities of technical museology.

As the contribution does not only examine the theoretical level but also concrete examples derived from practice, namely the example of the Technical Museum in Brno and its visualization and presentation of science and technology, we will also focus on the analysis and description of the activities of this institution. The article outlines the forms of the mediation and communication of the content of the museum's collections; special attention will be also paid to informal education and to the visualization of science in informal education organised in the Technical Museum in Brno. Among methodological procedures ,the data was acquired, in particular, by the content analysis of the museum's documents and examples of its activities. In the examination of the presentation and educational activities of the museum, information from interviews with some of its workers was employed, as well as from their specialist contributions at conferences and observations made during excursions with museology students taking place in the main building of the museum.

2.1. Communication and presentation in the museum

Exhibition activities of museums in general belong with the basic activities of these institutions. Without the mediation of the preserved relics of society (material and immaterial artefacts) and nature (naturfacts) these institutions would lose their primary purpose and would only serve as storage spaces for collections. By extension, their use would be considerably limited, and although they could serve as sources of scientific research (Kačírek et al., 2013: 43), their general potential would remain untapped. The public character of museums, their ostensive approach in presentation activities (ostension – showing or exhibiting of originals) the objective of which is, among other things, to inform, to explain particular phenomena and events, to mediate experiences (Desvallées, Mairesse, 2011: 40-41), thus particularly accentuates the educational function of museums (Etické kodexy, 2014: 27; Dean, 1996: 5-6; Beneš, 1981a; Vakhromeeva, 2018).

The study approaches the exhibition activities from the perspective (theory) of museum communication and (the theory of) museum presentation, and this also holds true specifically in the case of exhibition activities of museums of technical nature. Specialist literature often treats the

terms “museum communication” and “museum presentation” as synonyms, yet this is not always the case in museum practice. Museum communication is a broader term which also involves s museum presentation (Dolák, 2015: 9-10). Museum communication is any manner in which a museum communicates with the public, whereas museum presentation is a particular outcome of an exhibition programme (Beneš, 1997: 87) the main purpose of which is to mediate the content of collections or their part in different forms. To achieve this, museums use original, authentic items (presented as exhibits) as the bearers of museality (Stránský, 2000: 34), i.e. with a documentation and heritage value. These are supplemented with various models, dummies, plans, maps, photographs, audio-visual technology, modern IT technology, etc. Museums thus communicate with the public chiefly through the display of the authentic original items listed above, exhibits (ostension), and through signs, symbols and representations substituting originals (Dolák, 2015: 13). As a result, an exhibition is a combination of several means of expression accompanied by descriptive and explanatory texts and graphic elements with different functions, as well as exhibition elements (furniture), illumination, sound, etc. helping to create the desired ambience.

The Czech museologist Josef Beneš distinguished between the use of museum collections for specialist (scientific) purposes and educational ones (Beneš, 1997: 87). In museums of technology, both types are employed. One of them is prioritized, depending on the character of activities in a particular museum. Exhibition presentations are more of an educational character, or educational-didactic character, focused on usage, function, production process, and in terms of subjects on scientific, technical and technological aspects of the evolution and progress of society.

Museum communication has many functions. In museums of technology, the informative, instructive (explanatory) and educational functions come o the fore, followed by the cognitive function, which, however, does not mean that the content of exhibitions is not adjusted to suit a broad spectrum of visitors. While in the past museum workers laid emphasis on the scientific approach and scientific systematization targeting the needs of researchers (Beneš, 1997: 89), current presentation activities seek to find a balance between the scientific approach and the aesthetic, didactic and dramatic approaches with an effort to accentuate the emotional effect as well as the functional one stressing effective communication of information.

The purpose of museum presentations is to access certain aspects of visitors’ interest, attitudes and values so that they would realise and understand the meaning of the displayed objects. The selected form of communication thus has to lead to the understanding of the content, relations and contexts existing between collection items and other means of expression, making up a compact and synthetic whole. Presentation forms in museums differ, not only according to the theme of exhibitions but also through manners in which they express their content. Nowadays, the content has most often the character of authentic and documented presentation in which a key part is played by original exhibits in a particular context, in relation to other means of expression, with efforts to respect their role and meaning in the original environment.

In terms of exhibition activities, the following goals have been defined (Lord, Lord, 2002: 18-22):

- contemplation, with emphasis on the aesthetic aspect;
- comprehension, with emphasis on context and theme;
- discovery, with emphasis on visitors’ own findings;
- interaction, with emphasis on live demonstration and multimedia.

The concepts of presentation activities of museums blend all these aims. Emphasis is placed on what most corresponds to the character and theme of an exhibition. Naturally, it also depends on a pre-designed concept in regard to visitors.

The authors understand the term visualization in the title as a transfer of abstract notions (mentefacts) into exhibitions, i.e. as a visual form within a particular subject (Beneš, 1981: 15). In their presentations museums employ a special exhibition language (Kačírek et al., 2013: 43) based on the context, especially on the mentioned authentic objects and other means of expression. The exhibition language combines different accents of approaching visitors (Dolák, 2015: 30-33).

The visual aspect of exhibition activities ranks them, due to their character, with design. In fact, exhibition design is an art, artistic rendering of a particular subject. David Dean uses the phrase “science of arranging the visual” (Dean, 1996: 32). The main objective is to mediate the content of an exhibition, aptly, clearly, comprehensively, truly and in an attractive fashion.

2.2. Museum pedagogy

Museum pedagogy is a social science focused on museum education. It is rooted in museology and pedagogy, and is closely linked with a large number of cultural disciplines, the humanities and social studies, as well as with natural and technical sciences. In the centre of its attention are specific educational processes taking place in the museum or associated with it. Museum pedagogy has seen a global rise in interest in the last decades, and is also thriving in the Czech Republic. In the last twenty-five years of social development when the country's museums resumed the free interpretation of their collections, the society's interest in museums has gone up, as has the interest of museums in visitors.

The fulfilment of the educational potential in museum work is in the Czech context connected with the establishment of the first museums in the late 18th century and early 19th century, and has been present in their development ever since. In the mid-19th century there also emerged the idea that museum workers should be experts in some of the disciplines represented in museums. A concept of the education of the current and future museum workers started to take shape; apart from their disciplines, they were also expected to master specific museum activities of the selection, hoarding and presentation character, with ambitions to create university forms of education (Comp. e.g. Tišliar, 2017: 586-592). The term "museum pedagogy" (or museo-pedagogy) first appeared in the Czech specialist literature between the 1980s and 1990s. However, as a scientific discipline it fought for recognition throughout the 1990s fraught with discussions regarding its justification, status within museology and incorporation in the system of pedagogical sciences (Jagošová, Mrázová, 2015: 56-64; Jagošová, Jůva, Mrázová, 2010). Nonetheless, this period was marked by several highly important stimuli for the dynamic development of museum pedagogy as an autonomous scientific discipline and its application in museum practice (Jagošová, 2016: 3-5). Museum workers in particular sought paths towards approaching visitors and targeting their interest in museums, often outside their main focus in the museum. The position of museum pedagogue was viewed as necessary in this context, although it was not yet anchored in legislation. The development of museum pedagogy and the profession of museum pedagogue is supported, apart from individualized practice of the institutions, by the possibility of joining professional associations and a selection of various forms of specialist education, as well as by the study of foreign literature (e.g. Falk, Dierking, 2000; Hooper-Greenhill, 1996; Sandell, 2002) and study trips.

Efforts at further professionalization of museums logically tend towards the deepening of competencies of the branch, as well as to a closer and better collaboration between the individual museum professions, the individual museums and related institutions at different levels of museum work. In communication with visitors emphasis is placed on expertise and skills rooted in the approach of the disciplines in a museum and pedagogy which significantly contribute to the overall effect of individual museum projects for the public (Jagošová et al., 2016). International professional standards for educational work of museum pedagogues with the public (Excellence in Practice, 2005) are rooted in the principles of accessibility, reliability and development aimed at the support of education as a key to fulfil the purpose and goals of the museum institution. They are based on the prerequisites of professionalism:

1. targeting the museum public and community;
2. respect and understanding in regard to the diversity of the museum public;
3. expertise in the content of education and methods of museum education;
4. development of visitors' interest and support of the principle of collaboration;
5. development of education as a key to fulfil the purpose and goals of the museum institution;
6. positive attitude towards the learning process, and obligation to promote the knowledgeability and culture-awareness of citizens (Excellence in Practice, 2005: 10).

An inseparable part in the support of visitors' interest and the principle of collaboration is to involve the wide museum public and the individual communities with respect and understanding in regard to their diversity. In connection with visitors, museums are often discussed as educational institutions, places where people go to learn and expand their intellectual horizons; in addition, some museums promote themselves as destinations attractive for tourists. Yet museums can offer much more: they can be genuine recreational environments where people come to relax, recharge their batteries and improve their mental and physical conditions (Wasmer Andrews, 2010).

3. Discussion and results

3.1. Technical museology and museums of technology

The modern origins of technical museology go back to the year 1794 when the Conservatoire des Arts et Métiers (Academy of Arts and Crafts) was established in Paris (Waidacher, 1993: 96).

This area of museology centres on the documentation of the achievements of science and technology in the history of society. Museums of technology collect, preserve and present machines, instruments, models, means of production of all kinds, as well as anything manufactured by people (Lalkovič, 2005: 26-27). They document the progress in technology, and they also indicate prospective future visions for science and technology. The first important museums of technology were founded in the 1870s in Moscow (Polytechnické múzeum, 1872); Paris (Abbaye Saint-Martin-des-Champs Museum, 1879) and Vienna (Technologisches Gewerbemuseum, 1879) (Lalkovič, 2005: 26-27). Significant progress in technical museology came in the first half of the 20th century. Its prime movers were museums in Munich (Deutsches Museum, 1906) and Chicago (Museum of Science and Industry, 1933) (Alexander, 1979: 67-68, 70-72; Hartung, 2010: 87-92).

These institutions were preceded by museums of applied arts in the mid-19th century, developing in connection with the expansion of cities, industrialization and the development of arts and crafts. Presentation activities of these museums included, in particular, representations of the complete manufacturing process of the production of artefacts, from the processing of material, through the individual phases (stages) of the production process to the finished product, by means of period technological procedures (Waidacher, 1993: 94-95). The objective of such elaborate presentations was to educate visitors. The first museums of applied arts mentioned in specialist literature were the South Kensington Museum in London (1851; since 1899 the Victoria and Albert Museum) followed in 1864 by the Österreichisches Museum für Kunst und Industrie, Vienna (Lalkovič, 2005: 24). The earlier historical periods were marked by the collecting of artefacts of technical nature, from the Middle Ages onwards, gathered in various cabinets of curiosity which later gave rise to art collections (Nekuža, 2016: 70). The cabinets, however, mostly functioned as random collections, often with bizarre selection criteria. Items collected included, for example, historical crafts and renaissance artworks that were to serve as models, for inspiration and education (Nekuža, 2016: 71). The mediation of technological procedures and approaches to the technical and artistic processing of products was important, in the industrialization period and especially in the second half of the 19th century, for the developing secondary schools and universities of technical character, the curricula of which involved more and more often examples of technological procedures. Museums thus became places where it was possible to experience, visually or through other senses, science and progress in technology.

This long-term development resulted in the constitution of several types of museums of technology. The first group aims at the general documentation of science and technology from the perspective of development, at the international, national and regional level. The second one specialises in a particular area (e.g. mining, astronautics, transport; it also includes company museums). In addition, there are in situ monuments of technical interest that function as museums (e.g. mines, mills), and some rare material is held by geographical museums. Recent years have seen a boom of science centres which, unlike museums of technology, have a purely educational function, ignoring preservation and involvement in science and research (Vieregg, 2007: 114-119; Geschichte des Museums, 2008: 235-261). The musealization process in this type of museums, i.e. dissemination of facts (Stránský, 2000: 31-32, 57), concerns not only the collecting and preservation of technical artefacts as autonomous items selected from the real world; museums of technology in the area of musealization and documentation also seek to cover broad context relations, the natural environment of artefacts, their connections with society, their meaning and use, etc. For these reasons, in museums of technology the collection, science and research activities involve the study of the technological processes of production of objects, the principles of their functioning, and information about their original use. This information is subsequently employed by museum workers in the cataloguing and processing of the collections of technical character, but it is also equally useful in museum presentations and communication with visitors, as well as in various accompanying museum-pedagogical activities. This manifests that in museums of technology natural and technical sciences are mainly employed as applied disciplines, the information from which is used, in popular form, in communication with visitors.

The specific position of museums of technology inspired efforts to address this phenomenon at the theoretical and general level. One of the pioneers of this approach as early as the beginning of the 20th century was Oskar von Miller (1855–1934), director of the museum in Munich (Deutsches Museum) who pursued the theory and methodology of exhibition activities at the educational level, and in collecting activities prioritized acquisitions connected with teaching (Jůva, 1994: 24). Efforts to address the issues of technical museology only got their institutionalized form gradually. Apart from national professional organisations (active, for example, in France, Italy, India, Russian Federation and the Netherlands) (Sister organisations, 2018), an institution particularly active in technical museology was CIMUSET (International Committee for Museums and Collections of Science and Technology), one of the international committees of the ICOM international museum organisation (International Council of Museums) established in 1948 which brings together traditional museums documenting the development of science and technology as well as institutions focused primarily on education (science centres) and other specialised institutions (planetariums, health museums, etc.) (Baghli et al., 1998: 95). The European network of science centres and museums uniting over 350 organisations has operated since 1989 (The European network, 2018).

3.2. Technical Museum in Brno

Brno has a long tradition as a centre of industrial production and technical education, and from the 18th century onwards objects of this kind were collected by local learned societies. In the 19th century, these exhibits also emerged in the collections of some local museum institutions (Moravian Museum, Museum of Applied Arts). However, attempts at the establishment of the first museum of technology in Moravia were long without success. The conditions were most favourable in 1924 when the Preparatory Committee for the Establishment of the Technical Museum was set up within the Association of Czechoslovak Engineers. The museum did not come into existence until 1951, through the transformation of the Archive for the History of Industry, Commerce and Technical Work. However, the museum was established as a subsidiary of the Technical Museum in Prague. The Technical Museum in Brno only started to function as an independent institution in 1961. In the following years, its activities covered over thirty disciplines, as well as displays devoted to some leading scientists (e.g. Viktor Kaplan), and the museum developed a number of additional activities. Apart from creating permanent exhibitions (e.g. water and steam power, computer technology) and temporary shows including travelling ones, the museum prioritized work with visitors which was of high standards, based on extensive quantitative and qualitative research. The museum also took part in research activities and was among the applicants of state research projects. The collections were housed in the historical building of the former Convent of St. Ursula in Brno, and the museum gradually came to administer several sites of special technical interest**:** Old Ironworks**,** near Adamov (metallurgy exhibition), a baroque smithy in Těšany (exhibition of smithery and wheel-making), a windmill in Kuželov (exhibition devoted to the history of windmills), a watermill in Slup (exhibition of mill technology), Šlakhamr in Hamry nad Sázavou (exhibition of iron-milling). A turning point in the development of the institution came after the Velvet Revolution in 1989. Due to restitutions, the museum lost its original exhibition premises and moved to a reconstructed building in Brno-Královo Pole. It was opened to the public in 2003.

The Technical Museum in Brno is administered by the Ministry of Culture of the Czech Republic, and its main objective is "...to acquire, collect and preserve, catalogue, process and present to the public collections of museum nature" (Zřizovací listina Technického muzea, 2012).

In accordance with these goals, the museum chiefly gathers material evidence of the development of technology, industry, transport, industrial production, architecture and science, both Czech and international, yet it naturally also focuses on the territory of Moravia and Silesia. In addition, the museum conducts science and research activities in the field of industrial archaeology, conservation and restoration, and in collaboration with universities and further specialist institutions teaches courses in museology, conservation and restoration (Střednědobá koncepce Technického muzea, 2013).

As a research organisation it prepares specialist assessments and recommendations, its workers carry out scientific research in archives and conduct analyses in the areas of the museum's specialist activities, which the museum then employs in its work and publishes. The museum works

consistently with the public, especially children and young people, and organises activities of voluntary workers, especially through the Circle of the Friends of the Technical Museum (Výroční zpráva Technického muzea v Brně za rok 2017, 2017: 4). Its activities are not restricted to the CR, however, and the museum has launched close collaboration with a number of institutions of a similar kind abroad. The museums sees its future potential, among other things, in the creation of programmes for the specialist and general public, focus on new technological and industrial disciplines which would expand the documentation scope of the institution, and in the revitalization of its property, aimed at its better use (Střednědobá koncepce Technického muzea, 2013). Its organisational structure can be divided into three basic parts: economic and operational, technical and specialist. In view of the subject of this article, activities in the last two categories appear most relevant. In the technical category, emphasis is on the activities of the department of exhibition production and the run of technical monuments, and of the department of communication and marketing. The specialist group consists of workers in charge of the individual technical disciplines covered by the collections (i.e. aviation and astronautics, public transport, crafts, textile, history of the blind), activities of methodology centres, six technical monuments and a library. The administrators often include people formerly active in particular industrial branches, and many are educated in museology.

3.3. Presentation and communication activities of the TMB

To demonstrate the results of its presentation and communication with the lay and specialist public, the TMB has created "presentation systems", open and active systems responding to the problems and needs of the society (Střednědobá koncepce Technického muzea, 2013). They comprise permanent exhibitions, technical monuments in situ with functioning technologies and displays involving life in the region, in the form of organising joint programmes, open days, shows of historical vehicles, meetings and sales popular with visitors. There are also lectures, seminars, workshops; the museum collaborates with almost a thousand members of the Circle of the Friends of the Technical Museum in Brno, participates in teaching at schools, in the supervision of diploma theses, etc. The TMB has received numerous prizes in this respect awarded to its scientific and professional community, one example being the award for presentation activities in the Gloria musealis national competition.

3.3.1. Scientific and publishing activities of the TMB

The TMB as a research organisation conducts basic and applied research and experimental development, organised by the Department for the Documentation of Science and Technology (DDST). The DDST carries out specialist activities within the individual technological and scientific branches concerning the collections, as part of research tasks and grant projects. Their results are presented to the public through exhibitions and extensive publishing activities. Apart from exhibition catalogues and specialist literature devoted to leading figures in Moravian technology and museology subjects, there are book series (*Studies from the History of Technology and Industry*, *Acta Musei technici Brunensis*) and periodicals (*Archeologia technica*, *Historická fotografie*, *Textil v muzeu*). The published texts are often selected from contributions for international conferences organised by the museum. The TMB also holds regular lectures, seminars and workshops for the specialist and lay public.

Another organisational component of the TMB, the Conservation Methodology Centre (CMC), has both a specialist and methodological function. It is a national institution in the area of conservation and restoration of items from the collections of museums in the CR. It came into existence in 2003 and its main objective is "to increase the effectiveness of the protection of movable cultural heritage and quality care for collections at all levels." (Výroční zpráva Technického muzea v Brně za rok 2017, 2017: 7). It supports and develops protection of and care for the cultural heritage in the Czech Republic, provides methodology and consultancy assistance in the field, especially to the administrators of museum-type collections. Its workers also lead conservation and restoration courses at the Science Faculty and the Faculty of Arts of Masaryk University, Brno (Výroční zpráva Technického muzea v Brně za rok 2017, 2017: 7). The CMC publishes methodology manuals on the protection and processing of the materials of collection items, and issues the *Fórum pro konzervátory-restaurátory* journal. It played a major part in the

publishing of the Professional Ethic Code for Conservators and Restorers of the Association of Museums and Galleries of the Czech Republic.

One of the specialised workplaces of the museum, somewhat unique among museum institutions in the Czech Republic, is the Department for the Documentation of the History of the Blind People (1 employee) (Maruščáková, 2005; Hluší, 2001: 2; Smýkal, 1996). The original Brno Museum of the Blind established in 1992 was incorporated into the structure of the TMB as one of its departments in 2000 (Smýkal, 1996). In accordance with the Establishment Charter of the TMB it documents, through collection-building activities, specific aids for the blind and visually impaired employed in the Czech Republic, and systematically processes the collections. The register of the Department of Typhlopedic Information documents the history, life, culture and education of the blind and visually impaired children and adults. The department also runs a library of books in Braille and different types of embossed Roman script, and historical audio recordings. In its specialist activities it collaborates with the United Organisation of the Blind and Visually Impaired. Beyond its scientific activities and collection activities in its field (Výroční zpráva Technického muzea v Brně za rok 2017, 2017: 7) it offers consultancy and practical assistance to other museums. This assistance concerns, in particular, presentations and education, for example, consultations involving a suitable exhibition approach to selected topics and the inclusion of adequate didactic elements (with regard to visitors with different types and intensity of impairment), in the selection of suitable exhibits for haptic and interactive study, preparation and printing of exhibition texts and captions, invitations and promotional materials in Braille made on the special Pichta typewriter. The department also works with primary and secondary school students and university students and associations for the blind and visually impaired (lectures, seminars, guided tours, excursions, etc.). The department runs its own research and publishing activities including study trips abroad and participation in international projects (Publications on the history and the present of museums of the blind – see e.g. Hluší, 2004; Hluší, 2014).

Important help in the documentation and specialist activities of the museum comes from volunteers, members of the Circle of the Friends of the TMB. In collaboration with experts they centre on research into and preservation of major technical sites and objects, organisation of lectures, field trips and other events. There currently exist several sections focusing on car models, historical vehicles, barrel organs and mechanical devices, photography, history of fire brigades, historical stereovision, history of aviation and model-making, optics and electron microscopy, space rocket model-making, renovation of historical aircraft, communication technology, antique clocks, textiles and windmills (Klub přátel TMB, 2018).

3.3.2. Exhibition activities of the TMB

The museum administers a central building housing permanent exhibitions and several sights of special technical interest in the South Moravia Region and the Vysočina Region (within 90 km of Brno). They include the following sites of technical interest: The Dutch type of a windmill from 1842 (national cultural monument, Kuželov); fortification complex on the southern border of Czechoslovakia created in 1935–1938; infantry block with original weaponry and equipment used by the army in 1960–1999 (Šatov),; baroque blacksmithery from 1700 with a blacksmith's workshop from the 19th century (cultural monument, Těšany); watermill with a display on the historical development of the miller's trade (national cultural monument, Slup); The Old Ironworks – a metallurgical complex with a blast furnace and an exhibition about metallurgy (national cultural monument, near Adamov); Šlakhamr – Iron-Milling, Lumbering and Housing of the Last Owners (cultural monument, Hamry nad Sázavou) (for more information see Sights, 2018). The TMB is not located in the city centre and the sights are in small towns or villages, or outside them. The museum focuses, in particular, on the presentation of permanent exhibitions; temporary shows are not among its main features (Machová, 2017: 23-25). This is why it is important to attract visitors with interesting innovations in permanent exhibitions, or special events (e.g. Museum Night Festival, Christmas workshops, programmes in the sights of special technical interest). The main building has a wheelchair access to all its sections, and the visitors' facilities include areas for parents (changing room for families with babies) (Services, 2018). The administrators of the individual collections/sights collaborate on the exhibitions with the Department of Exhibition Production and the Administration of Technical Monuments with the staff of 14 employees (Produkce výstav a provoz památek, 2018).

The main building of the TMB houses 16 exhibitions. Some of them are related to Moravia and Silesia (historical regions of today's Czech Republic) and introduce phenomena typical of this region (e.g. metallurgy, water-powered engines, cast iron, Brno on two wheels). Yet documentation also involves a number of more general subjects (computer technology, historical vehicles and aircraft engines). The core exhibits of some of the displays come from the earlier periods (e.g. stereovision) but are adjusted to suit modern conditions and needs. The items on show are chiefly of retrospective character, and at the educational level focus on visuality and visitors' active participation. The interactive element typical of museums of technology is most distinctly represented in the Technology Playroom, the main purpose of which is to introduce visitors, especially the younger generation, comprehensively and in entertaining form, to mechanics, optics, acoustics and electricity. The method for the study of these phenomena is experiment, when visitors can, with the use of provided instructions, freely handle experimental models and observe the results of their activities. The devices are regularly replaced and replenished. A specific feature is the Culture of the Visually Impaired section documenting the historical development of care for this group of disabled citizens including teaching aids, printing devices and examples of typical crafts and occupations (Permanent displays, 2018). The in situ sights located outside Brno function on a similar principle. In their work with visitors they employ the effect of the authentic environment (Sights, 2018). In contrast, the subjects of the exhibitions centre on some modern trends in the development of technology and present specific parts of the collections, yet they also often focus on the recent past with the aim to make visitors reminisce over their youth. (There is Never Enough Lego, The World of Model-making). Exhibitions in the TMB have a synthesizing character and are staged on the occasions of major anniversaries. One example is an event prepared in collaboration with further museums entitled Industry in Moravia, accentuating the most important and typical branches of industry in the region in 1908–1928 (Výstavy, 2018).

3.3.3. Educational activities of the TMB

In the organisation structure of the museum, the area of communication with the public and education is supervised by the Communication and Marketing Department (9 employees), consisting of the head of the department, a spokesperson and positions regarding the area of project and programme activities (including the coordination of activities with the Circle of the Friends of the TMB), communication with the public (including administration of the museum website and social networks) and museum pedagogy (guiding, lecturing and pedagogical activities).

The department mediates communication with the public and is in charge of the promotion and popularization of the museum. With the Department for the Documentation of Science and Technology it creates programmes for visitor groups and facilitates their implementation through guides and lecturers. It communicates with the media, administers the website, portals and social networks, records statistics, analyses and specialist activities, especially regarding museum presentations and the number of visitors (Výroční zpráva Technického muzea v Brně za rok 2017, 2017: 7).

Two museum pedagogues are responsible for the educational activities in the TMB. One of them is in charge of education at the exhibitions in the main building, the other in the technical sights. Another pedagogue working in the museum is a lecturer leading art and technology workshops for both primary schools and the public. Specialist museum workers and volunteers (for example, university students of museology) help with programmes taking place during special events.

As the TMB has not yet completed its educational strategy, visions in the area of education are only reflected in annual reports or follow from exhibition plans. The museum pedagogues are graduates of pedagogy and museology, with long practice in the museum environment (or with practice in education).

In 2017 the TMB buildings opened their gates to 155,752 visitors, which is a record number and 20 % increase in comparison with the previous year. 69 % of the people visited the main building in Brno. Programmes implemented within exhibitions in 2017 reached the total of 961 groups for 21,530 visitors (Výroční zpráva Technického muzea v Brně za rok 2017, 2017: 30-35). The museum pedagogues work directly with school groups (primary and secondary schools) and families with children. They also work with groups of senior citizens and visitors with special

educational needs. Individual visitors are currently not in the centre of the museum's attention as regards controlled education.

The museum pedagogues also participate in the Museum Night, city camps for children, festivals of science and technology, etc (Výroční zpráva Technického muzea v Brně za rok 2017, 2017: 32). The types of programmes executed include guided tours, workshops and educational programmes with both educational and relaxation purposes. Programmes for school groups follow the state curricular documents for the individual stages of formal education (National Curricula, 2011–2018). The main building of the TMB currently offers, apart from programmes for current exhibitions, seven educational programmes for permanent exhibitions combined with five regular art and technology workshops where pupils can manufacture products connected with the subject (Pro školy, 2018).

The museum pedagogues share the descriptive and didactic analyses of the programmes at conferences or through publishing activities.

Fig. 1. School group with museum pedagogues in Technical museum in Brno

In the offer of educational programmes, the museum pedagogues specifically target school groups (chiefly primary and secondary school students, less often children from kindergartens), and focus on the organisation of regular art and technology workshops (for both schools and the general public). For families with children, the offer of special programmes in the main building is limited (Výroční zpráva Technického muzea v Brně za rok 2015, 2015: 19-21; Machová, 2017: 23-25).

Fig. 2. Technical monument in situ - Windmill in Kuželov - and family groups

The current form of inter-generation learning at the permanent displays in the main building of the TMB has not yet been systematically developed (Machová, 2017).

The museum does not provide any self-access materials for the displays (the museum pedagogues use worksheets almost exclusively in combined programmes) which would link inter-generation learning with the exhibits. The only exceptions in recent years have been worksheets for families with children, created on the basis of cooperation with the museum pedagogues as outcomes of diploma theses (e.g. Dalecká, 2012; Golianová, 2014; Machová, 2017).

Although these materials are not available for families with children during their visit to the museum, the individual displays involve interactive elements, didactic elements or play activities for children. The busiest sections across the whole spectrum of visitors include The Crafts Lane and the Technology Playroom (Výroční zpráva Technického muzea v Brně za rok 2017, 2017: 36), which is, due to the demanding maintenance of the interactive exhibits, constantly expanded and outdated exhibits are regularly replaced. In terms of education, pedagogical work is more intense in the sights of technical interest, the popularization of which has been one of the museum's priorities in recent years through their reconstruction, promotion and a selection of programmes. All-day programmes take place, owing to their character and locations outside Brno, at weekends and during the summer season, and primarily target families with children.

4. Conclusion

Museums are institutions with a significant potential for the presentation and popularization of science and technology. They visualize information and present it to the wide public, mainly through exhibition and educational activities, and they also collaborate with the specialist public (meetings, publishing activities). The case study regarding the Technical Museum in Brno (Czech Republic) describes the broad spectrum of its activities, from scientific work and care for collections to communication and presentation activities. The museum involves permanent displays and temporary exhibitions, technical monuments in situ with functioning technologies and exhibitions that are part of life in the region, taking the form of joint cultural events and educational programmes, open days, shows of historical vehicles, festivals of museum nights and other projects attracting a wide audience. The Technical Museum organises lectures, seminars, workshops, and collaborates with almost a thousand members of the Circle of the Friends of the TMB in Brno. In addition, its workers are engaged in pedagogical activities in schools (including universities), lead diploma theses, etc. The future specialist development of this institution will involve a conceptual and well-prepared approach to its educational plans in the form of an educational strategy for the museum including further educational goals such as the promotion of

inter-generation learning in the main building of the museum, search for new ways of the popularization of its scientific activities and the support of the general public's interest in the country's cultural and technical heritage.

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