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Sustainable structure for the quality management scheme to support mobility of people with disabilities

Miroslava Mikušová*

ISEMOA Project Manager, University of Žilina, Žilina, Slovakia

Abstract

The paper is aimed to carry out a comprehensive overview of the state-of-the-art regarding policy audits and quality management schemes, related to the accessibility of public transport and public space, including the success factors and features of these schemes and the problems and barriers related. It is focused on general and much-used international standards and models as ISO 9 000 family, ISO 14 000 family, EMAS and the EFQM Excellence model. It describes general structure of the schemes, working process, covered areas and type of indicators used as well as the way that they address detailed content-related matters, related specifically to the “public” accessibility. It also provides discussion on suitable structure for the standardized accessibility and quality management scheme focused on help to people with disabilities to move independently in the public spaces.

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1. Introduction

Every day a significant part of the population encounters many barriers in public spaces and on public transport. Among them are, for example, people with baby buggies or heavy luggage, people with mobility problems, those with hearing- or visual impairments or people with learning difficulties. Because of these barriers for many people it is difficult or even impossible to move around independently in the public spaces. Thus instead they have to depend on a car or mobility-service for much of their regular travel.

* Miroslava Mikusova. Tel.: +421-41-513-3562; fax: +421-41-513-1527.

E-mail address: mikusova@fpedas.uniza.sk

Municipalities, cities and regions can help their inhabitants and visitors to adopt a less car-dependent lifestyle by ensuring that public spaces and public transport services are fully accessible. Improved accessibility for pedestrians, wheelchair-users, cyclists, and public transport passengers to day-to-day services such as shops, kindergartens, service-, sports-, and leisure-facilities contributes directly to increased quality of life in the city or in the region. Musyoka et al. [1] indicated that for people with reduced mobility these improvements can make independent travel to public spaces a reality for the first time.

Clarke [2] stated that one of possible ways for this improvement is application of systematic approach based on standardized quality management (QM) scheme related to the area described above. This finding was confirmed also by ECMT [3]. According to result of ISEMOA project [4] the core of this scheme there should be a moderated audit process that helps to local and regional stakeholders, together with an external auditor, to assess the state of accessibility of public space and public transport in their area and to develop strategies and measures to continuously improve its quality.

In order to achieve sustainable mobility for all in a travel-chain perspective (without any missing links along the route) both micro and macro-level accessibility should be handled.

- The macro-level concerns geographical accessibility and land-use patterns in terms of location, distance, density, diversity etc.
- The micro-level concerns the occurrence of various barriers (poor standard) on pavements and other pedestrian facilities, bus stops / stations, and vehicles. Physical barriers (e.g. high kerbs, uneven surfaces, slopes, snowy and icy conditions, poor contrasts, entrances without ramps and door-openers) are problematic for people with reduced mobility due to a mismatch between individual capacity and environmental demand.

Our municipalities, cities, and regions should be supported in their efforts to remove barriers in public spaces and public transport and to improve the accessibility of day-to-day services by sustainable transport modes. It can be effectuated by development of quality management system (QMS) that can support local and regional authorities in their work for the continuous improvement of the accessibility of the door-to-door mobility chain with sustainable transport modes. This system should be built on well-known quality management methods like the ISO9000 standards and the EFQM Excellence and CAF models, which had been applied successfully in quality management tools for mobility management (MaxQ), bicycle planning (BYPAD) and accessible public transport (MEDIATE) as presented in this paper.

2. Standardized quality management schemes

2.1. ISO 9000 family

The ISO 9000 family of standards represents an international consensus on good quality management practices. It consists of standards and guidelines regarding quality management systems and related supporting standards.

ISO 9001:2008 is standard that provides a set of standardized requirements for quality management systems, regardless of what the user organization does, its size, or whether it is in private or in public sector. It is the only standard in the family against which organizations can be certified – although certification is not a compulsory requirement of it. Other standards in the ISO 9000 family cover specific aspects such as fundamentals and vocabulary, performance improvements, documentation, training and financial and economic aspects.

The requirements for a quality system have been standardized. But many organizations like to think of themselves as unique. So how does ISO 9001:2008 allow for the diversity of say, on one hand, a "Mr. and Mrs." enterprise, and on the other, to a multinational manufacturing company with service components, or a public utility, or a government administration?

The answer is that ISO 9001:2008 lays down what requirements the quality system must meet, but does not dictate how they should be met in any particular organization. This leaves a great scope and flexibility for implementation in different business sectors and business cultures, as well as in different national cultures.

The standard requires the organization itself to audit its ISO 9001:2008-based quality system. To verify that it is managing its processes effectively or to put it another way, to check that it is fully in control of its activities. In

addition, the organization may invite its clients to audit the quality system in order to give them confidence that the organization is capable of delivering products or services that will meet their requirements. Lastly, the organization may engage the services of an independent quality system certification body to obtain an ISO 9001:2008 certificate of conformity.

This last option has proved extremely popular in the market place because of the perceived credibility of an independent assessment. The organization may thus avoid multiple audits by its clients, or reduce the frequency or duration of client audits. The certificate can also serve as a business reference between the organization and potential clients, especially when supplier and client are new to each other, or far removed geographically, as in an export context.

In addition to audit, there is a requirement for management review of the system to ensure that it is suitable (for the organization and the objectives) and effective in operation. The management review is the ideal forum to make decisions on how to improve in the future.

2.2. ISO 14 000 family

The ISO 14000 family addresses various aspects of environmental management. The very first two standards, ISO 14001:2004 and ISO 14004:2004 deal with environmental management systems (EMS). ISO 14001:2004 provides the requirements for an EMS and ISO 14004:2004 gives general EMS guidelines. The other standards and guidelines in the family address specific environmental aspects, including: labeling, performance evaluation, life cycle analysis, communication and auditing.

ISO14001 requires an environmental policy to be in existence within the organization, fully supported by senior management, and outlining the policies of the company, not only to the staff but also to the public. The policy needs to clarify compliance with environmental legislation that may affect the organization, and stress a commitment to continuous improvement. Emphasis has been placed on policy, as this provides the direction for the remainder of the management system.

The environmental policy provides the initial foundation and direction for the management system and will be more stringently reviewed than a similar ISO9000 policy. The statement must be publicized in non-technical language so that it can be understood by the majority of readers. It should relate to the sites within the organization encompassed by the Management System. It should provide an overview of the company's activities on the site and a description of those activities.

The preparatory review and definition of the organization's environmental effects is not part of an ISO14001 assessment. However, examination of this data is provided by an external audit, with a wealth of information on the methods adopted by the company. The preparatory review itself should be comprehensive in consideration of input processes and output at the site.

This review should be designed to identify all relevant environmental aspects that may arise from existence on the site. These may relate to current operations, to future or perhaps even unplanned activities. They will certainly relate to the activities performed on site in the past (i.e. contamination of land).

The initial or preparatory review, will also include a wide-ranging consideration of the legislation which may affect the site, whether it is currently being complied with or if copies of the legislation are available. Many of the environmental assessments already undertaken have highlighted that companies are often unaware of ALL of the legislation that affects them, and being unaware, are often not meeting the requirements of that legislation.

Company usually declares its primary environmental objectives that can have the most environmental impact. In order to gain most benefit, these are becoming the primary areas of consideration within the improvement process and the company's environmental program. The program is the plan for achieving specific goals, or targets along the route; to a specific goal. The plan describes the means to reach those objectives such that they are real and achievable. The EMS provides further detail on the environmental program. The EMS establishes procedures, work instructions and controls to ensure that implementation of the policy and achievement of the targets can become real. Communication is a vital factor, enabling people in the organization to be aware of their responsibilities, aware of the objectives of the scheme, and able to contribute to its success.

As with ISO 9001, the ISO 14001 requires a planned comprehensive periodic audit of the EMS to ensure that it is effective in operation, meeting specified goals, and that the system continues to perform in accordance with relevant regulations and standards. The audits are designed to provide additional information in order to exercise effective management of the system, providing information on practices which differ to the current procedures or offers an opportunity for improvement. As ISO 9001, also ISO 14001 requires a management review of the system to ensure that it is suitable (for the organization and the objectives) and effective in operation.

2.3. EMAS

Eco-Management and Audit Scheme (EMAS) is a voluntary environmental management system (EMS), under which companies and other public organizations evaluate, manage and continuously improve their environmental performance. EMAS has been operative since 1995. The latest revision (EMAS III) came into effect on 11 January 2010. Currently, more than 4,400 organizations and approximately 7,600 sites are EMAS registered.

EMAS was originally restricted to companies in the industrial sectors. Since 2001 EMAS has been open to all economic sectors including public and private services. EMAS was strengthened by the integration of EN/ISO 14001 as the environmental management system required by EMAS, by adopting an attractive EMAS logo to signal EMAS registration to the outside world, and by considering more strongly indirect effects such as those related to financial services or administrative and planning decisions.

The core elements of EMAS are performance, credibility and transparency. By carrying out annual updates of environmental policy targets and actions to implement and evaluate them, registered organizations continually improve their environmental performance and provide evidence that they comply with all environmental legislation that is applicable to them. Third-party verification from independent auditors significantly adds credibility to registered organizations, by guaranteeing the value of both the actions taken and the disclosed environmental information. Transparency is generated by the environmental statement, which an organization is required to provide as part of EMAS registration.

To receive EMAS registration an organization must comply with the following steps:

- Adopt an *environmental policy* containing commitment both to comply with all relevant environmental legislation and to achieve continuous improvements in environmental performance.
- Conduct an *environmental review* considering all environmental aspects of the organisation's activities, products and services, methods to assess these, its legal and regulatory framework and existing environmental management practices and procedures.
- In the light of the results of the review, establish an effective *environmental management system* aimed at achieving the organisation's environmental policy defined by the top management. The management system needs to set responsibilities, objectives, means, operational procedures, training needs, monitoring and communication systems.
- Carry out an *environmental audit* assessing in particular the management system in place and conformity with the organisation's policy and programme as well as compliance with relevant environmental regulatory requirements.
- Provide a *statement* of its environmental performance which lays down the results achieved against the environmental objectives and the future steps to be undertaken in order to continuously improve the organisation's environmental performance.

The environmental review, EMS, audit procedure and the environmental statement must be approved by an accredited EMAS verifier, and the validated statement needs to be sent to the EMAS Competent Body for registration and made publicly available before an organization can use the EMAS logo.

2.4. The EFQM Excellence model

The EFQM Excellence Model is a non-prescriptive framework based on 9 criteria. Five of these are 'Enablers' and four are 'Results'. The 'Enabler' criteria cover what an organization does. The 'Results' criteria cover what an organization achieves. 'Enablers' cause 'Results' and 'Enablers' are improved using feedback from 'Results'.

This model recognizes that there are many approaches to achieving sustainable excellence in all aspects of performance. It is based on the premise that excellent results, with respect to the four result criteria Performance, Customers, People and Society, are achieved through Leadership driving policy and strategy that is then delivered through People, Partnerships and Resources, and Processes. These latter are the enabler criteria. The EFQM model is graphically presented in Figure 1. The arrows emphasize the dynamic nature of the model. They show how innovation and learning help to improve enablers that in turn lead to improved results. On the left-hand side are the enablers, and on the right hand side are the results.

At the heart of the model lies the RADAR logic: Results, Approach, Deployment, Assessment and Review (more or less similar to the Plan – Do – Check – Act or PDCA-Cycle). Within this non-prescriptive framework, certain fundamental concepts underpin the model. Behaviors, activities or initiatives based on these concepts are often referred to as Total Quality Management (TQM). These fundamental concepts are: Results orientation; Customer focus; Leadership and constancy of purpose; Management of processes and facts; Partnership development; People development and involvement; Continuous learning; innovation and improvement; and Corporate social responsibility.

There are different versions of the EFQM excellence model for large companies, operational and business units, for the public and voluntary sectors and for small and medium sized enterprises. EFQM can be used at different levels. These levels are introduced to provide consistent European recognition to organizations at each step of their journey to excellence. There can be a link to certification, but this does not always need to be the case.

The levels are as follows:

- The first level is “*Committed to Excellence*”. It is designed for organisations at the beginning of their journey to excellence. The emphasis is on helping organisations understand their current level of performance and to establish improvement priorities.
- The second level is “*Recognised for Excellence*”. This level is available to EFQM-members and non-members. It is based on the full EFQM-excellence model, and offers applicants the benefits of a structured approach to identify organisational strengths and areas for improvement, and recognises successful efforts to implement excellence and good practice.
- The third and highest level is “*EFQM Excellence Award level*”. It offers organisations that aspire to achieve European best or world-class levels the chance to compare themselves against the ‘best’.

It has to be noted that certification through the EFQM is based on a voluntary agreement and there is no legislative compliance. The certificate can follow both an internally and an externally defined standard, depending on the level of excellence the organization wants to achieve. The EFQM model is a self-assessment scheme; if the organization feels that it makes good progress, then there is a possibility to apply for another, external recognition.

3. Quality management schemes covering the working process

In this group we obviously find the ISO 9000 family of standards, which represent international consensus on good quality management practices. The same stands for the ISO 14000 family of standards in the field of environmental management. Other interesting and established schemes are the EFQM Excellence model and the CAF (common assessment framework), the latter being based on the EFQM model. According to results of Bösch et al. [5] the EFQM model/CAF can be considered a QM instrument for the public sector, which is of special interest for the sustainable QM scheme as the responsibility of accessibility issues mostly is in the hand of the public sector.

As many of the developed QM-schemes in the transport field have been inspired by these international standards and models, we will directly focus on the transport related QM-schemes as we then cover the ISO-schemes and the EFQM Model (CAF) automatically.

Interesting transport QM-schemes found in the state-of-the-art review are:

- MaxQ (Mobility Management QM-scheme) and
- BYPAD (Bicycle Policy AuDit),

both being highly inspired by the ISO standards and the EFQM model/CAF.



Fig. 1. MaxQ model [4]

These schemes do not only measure the status of the working process but support a progress and give the organization tools for continuous improvements. This should be a requirement when developing a new, modern QM-scheme. MaxQ is quite new (2009), but has been used successfully by several cities in Sweden. As presented in the state-of-the-art-review BYPAD has successfully been applied in practice by over 100 towns, cities and regions, and up-dated, which makes it very interesting as inspiration for sustainable QM-scheme. Especially interesting is that BYPAD is covering towns/cities as well as regions precisely as the sustainable QM-scheme is intended to do.



Fig. 2 - BYPAD „Spiral of development” for towns, cities and agglomerations [5]

The structures of BYPAD and MaxQ are all similar as they have the same background. MaxQ comprises of four components, each being concretized in a number of elements or quality criteria (in total 12 elements). The same structure stands for the BYPAD-scheme, but the number of components is three divided into in total nine elements placed.

Table 1. Components in the MaxQ and BYPAD schemes

MaxQ		BYPAD	
1.	Policy	1.	Planning
2.	Strategy	2.	Actions
3.	Implementation	3.	Monitoring
4.	Monitoring& Evaluation		

Another interesting feature in the BYPAD-scheme is the regional aspect; the BYPAD-scheme is not only applicable for cities/towns, but also for regions. This can be very useful, as the sustainable QM-scheme should cover regions as well. The BYPAD-scheme for regions follows the same overall structure as for towns/cities (i.e. division into three components; planning, action, monitoring), but the elements are to some extent different taking regional aspects into consideration.

Both MaxQ and BYPAD, and also the QM-scheme from the MEDiate project, contain a "development ladder". Whilst MEDiate uses exactly the same levels of development as BYPAD, they are slightly different in MaxQ. In these schemes the quality of the processes in each of the elements are determined separately by assigning a quality level on a ladder of development to each of them, see table 2.

Table 2 - Levels of development in MaxQ, BYPAD and MEDiate

MaxQ	BYPAD	MEDIATE
<ul style="list-style-type: none"> • 5: Total quality MM • 4: Chain-oriented MM-approach • 3: System-oriented MM-approach • 2: Process-oriented MM-approach • 1: Activity-oriented MM-approach • 0: No evidence of MM-approach at all 	<ul style="list-style-type: none"> • 4: Integrated approach • 3: System-oriented approach • 2: Isolated approach • 1: Ad hoc-oriented approach 	<ul style="list-style-type: none"> • 4: Integrated approach • 3: System-oriented approach • 2: Isolated approach • 1: Ad hoc-oriented approach

The ladder of development shows, at a glance, the overall quality level of at least the working processes in the organization, and to some extent also the level of the outcome.

The actual naming of the levels are of less importance as long as the naming follows an understandable order (from low to high quality), and that the levels are well defined. In MEDiate a well-structured definition of the levels are included which can be used as inspiration for sustainable QM-scheme.

Other scheme based on the EFQM-scheme is the PROSE-scheme, which is not active in the field of transport but in the fields of health & welfare and education & training in Belgium. The scheme has 9 elements following the EFQM structure, and a path of development being determined in the self-assessment process just as in the MaxQ- and BYPAD-schemes. The scheme is very sector-specific detailing the core processes. The online diagnosis and self-assessment tools collect a lot of information, thus offering members benefits in terms of sector-specific information (e.g. what indicators are suitable for measuring impact). PROSE has become not only a QM-scheme but also a sector expertise network. This could be of interest for the sustainable QM-scheme.

4. Quality management covering the working process and the actual situation

There are not so many relevant QM-schemes actually covering both the organizations working processes (described by process-related indicators) and the actual situation in "real life" (described by status-related

indicators). As the field of accessibility (especially on a micro-level) is characterized by physical factors (such as low floor buses, curb stone height), the ambition of the sustainable QM-scheme should be to assess both areas.

BYPAD partly covers the actual status, but uses the information as supporting input when reviewing the working process more than using it for reviewing the actual situation itself. In direct words: information on the actual situation doesn't directly influence the score in the review of the organizations bicycle work. Still, BYPAD can serve as inspiration on how to cover the actual situation in the sustainable QM-scheme.

The Swedish handbook "Accessible City" deals both with the working process and the actual situation. In Accessible City the following phases are included:

- Organisation, vision and goals
- Travel demand and primary routes
- Inventory of the accessibility/usability of the routes
- Analysis of measures and establishment of action programme
- Control of fulfilment of objectives and estimations of consequences on accessibility
- Compilation of the accessibility plan

All phases 1-6 cover the process while phase 3 covers the actual situation. The handbook gives a good guidance on how to conduct an inventory of especially the micro level, and for some aspects even the meso level.

Also the Swedish Traffic Safety Audit deals both with the working process and the actual situation. This audit has been used successfully in Swedish municipalities over a couple of years and is therefore very interesting when developing the sustainable QM-scheme. The audit serves as a basis for developing a traffic safety plan. This could be interesting, as the same model could be used for sustainable QM-scheme for eventually creating an accessibility plan. The following table shows the main elements of the traffic safety audit. The two main dimensions being assessed are the traffic safety "culture" and the traffic safety "standard/status". Within these dimensions there are seven elements. The elements are relevant (indicators are present) for one or both of the dimensions. The indicators are awarded scores (better performance/quality = higher score), and the different areas have different maximum scores, which stands for the weighting between the different areas (higher maximum score = higher weight/greater importance).

In the same manner as MaxQ and BYPAD, the Traffic Safety Audit contains a type of ladder of development. In this case the traffic safety "culture" and the traffic safety "standard/status" are awarded stars (see table 3).

Table 3 - Dimensions and elements in the Swedish Traffic Safety Audit. Example of points (maximum points in brackets).

	<i>Traffic safety "culture"</i>	<i>Traffic safety "status"</i>
1. Actual level of traffic safety	-	1 (3)
2. Organization and steering	4 (7)	-
3. Planning	2 (3)	-
4. Traffic planning, safety measures	1 (4)	6 (13)
5. Maintenance of infrastructure	2 (3)	3 (5)
6. Vehicles, journeys, etc.	2 (4)	2 (4)
7. External cooperation	2(4)	-
Total points	13 (25)	12 (25)
Total stars (max. 5)	**	**

5. Possible benefits of the application of Quality management schemes in urban and regional planning

Correct and well supported application of Quality management schemes in urban and regional planning can have multiple benefits. Implementation of Quality management scheme in the area of accessibility of public transport and public space should help to municipalities, cities or regions:

- raise awareness regarding the importance of accessibility, and the role of accessibility for creating an energy-efficient and sustainable transport system for all;

- improve credibility, efficiency, and effectiveness of the work with accessibility;
- identify strengths and weaknesses in the work with accessibility;
- get inspiration and new ideas for improving the work with accessibility;
- establish a structure for a systematic and effective approach for accessibility planning, implementing, and evaluation;
- establish a structure for efficient stakeholder involvement in accessibility planning, implementing, and evaluation;
- establish communication channels among all relevant stakeholders;
- show that the municipality, city or region is proactively working towards improved accessibility;
- establish a comprehensive view on accessibility in the municipality, city or region.

6. Conclusions

Based on the study made for creation of this paper it is possible conclude that there exists several working models that can form the basis of a workable quality management scheme, relevant to the support and improve accessibility of public transport and public space of the cities/towns/regions for people with reduced mobility. It is an important observation stemming that micro accessibility (individual accessibility concerning the individual's possibility) is relatively commonly audited. Macro accessibility (the geographical meaning of accessibility), however, is rarely the focus of quality management schemes and audits.

In relation to find suitable structure for the quality management scheme is possible to conclude that structure and content of the MaxQ and BYPAD systems can serve as inspiration. The schemes are in use and well-functioning and comprise of the essential components that are needed despite area of use (cycling, Mobility Management): vision, goals, programs, procedures for monitoring etc. The components of the MaxQ-system can be re-used with adaptation to the accessibility field. For example, as user needs are of special interest for people with reduced mobility the issue of "user needs" possibly could form a component itself.

It is important to take into consideration development of these schemes. There is no clear evidence that MaxQ and BYPAD are being used as full-bodied quality management systems, i.e. that the working processes in the cities/towns/regions are affected due to the outcome of the audit and that there is a follow up of continuous improvements (repeated audits). The sustainable QM-scheme should try, if possible, to strengthen the importance of implementing a full-bodied quality management system that ensures continuous improvements.

Other important consideration is that accessibility is a very wide concept. Accessibility is an issue in the overall land use planning as well as on a very tangible level ("curb stone"-level). Therefore relevant scheme should to cover all levels; the macro, meso and micro levels of the accessibility. It should as well embrace walking and public transport above cycling (By Pad) and Mobility Management (MaxQ), which should reflect in the number of indicators.

Due to the character of the accessibility topics not only the working process but also the actual situation must be covered. This is not the case in the MaxQ- and BYPAD schemes. Therefore the scheme should as well be inspired by Swedish Traffic Safety Audit, which embraces the actual situation as well. An integrated approach where the actual situation is covered within the same components as the working process should be the goal of the development. The Swedish Traffic Safety Audit and Accessible City can be used as inspiration on how to measure and assess the actual situation.

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