Web Environmental Information System for Corporate Performance Evaluation and Reporting

Oldřich Faldík, Oldřich Trenz, Jiří Hřebíček, Edward Kasem
Department of informatics
Mendel University, Faculty of Business and Economics line Brno, Czech Republic
{oldrich.faldik, oldrich.trenz, jiri.hrebieck, edward.kasem}@mendelu.cz

Abstract — Many business activities and procedures influence the environment. Their environmental impacts have to be assessed. We consider companies where the procedure of measuring environmental performance (EP) is applied through an environmental management system (EMS). The paper surveys the methodology that is designated for the environmental performance evaluation of companies in the food-processing sector and introduces the architecture of the Web environmental benchmarking and reporting system (WEBRIS) that has been developed. The WEBRIS consists of several modules that can be separated into two main groups – data collection and data retrieval, which is introduced in the paper. Web information system was built as a transactional system utilizing a relational database, which forms the main data storage system.

Keywords — Benchmarking; Corporate sustainability; Corporate reporting; Corporate performance; EMS; EP; EPE; KPI; frameworks; Nette; PostgreSQL

I. INTRODUCTION

The process of improving performance by understanding, identifying, adapting and implementing best practices is called benchmarking, [1].

Benchmarking is based on exchange of information on processes and measurements. This process is resulting in the setting of realistic improvement goals. It is a process of continuous improvement, [2]. The framework based on benchmarking performance indicators and the best practices are examined. It is necessary to determine areas where the company performance can be improved. Although most benchmarking initiatives concern financial and management issues, environmental benchmarking is becoming a major element in the environmental management of companies. Benchmarking can provide an early warning in time to prevent economic, social and environmental harm, [3].

On the other hand, measuring corporate performance is difficult and challenging, [4]. In different decision-making contexts, stakeholders tend to use different criteria and methodologies, thus arriving at different and contrasting assessments of the sustainability of corporate performance in practice, [5].

The current trends of research in the area of corporate performance evaluation and corporate sustainability are discussed by Hřebíček [6, 7]. These papers concentrate on local (Czech Republic) trends in this area [8].

The ICT support tools can be divided into two groups. The first group includes generic benchmarking and the second is for specific benchmarking. Let us mention the best known of them.

e-Bench [9] is a web application for auditing and simulation/modelling. The system then benchmarks these input factors to identify how efficiently they are used by other users in the data-base. e-Bench has been successfully used in the USA, Australia and New Zealand.

Web application named Environmental Management Assessment and Benchmarking (EMAB) is designed for the maturity assessment and benchmarking of corporate environmental management efforts [10]. The portal provides the measuring of corporate environmental management efforts, a survey that is based on criteria pursuant to the ISO 14000 family [11] and the EMAS III [12] standards.

The Safety, Health and Environment Intra Industry Benchmarking Association (SHEIIBA) [13] Corporate Benchmarking Ltd. (in SHEIIBA) has built and runs bespoke safety benchmarking programmes for industry sectors. Participating companies enter accident and ill-health data into an online form each month. The data is divided by cause and type and can by split into different employee groups. Data can be viewed in graphic or tabular format as fixed periods, rolling years or time spans (up to 12 quarters or years.) The system is currently in use in 14 United Kingdom water utilities.

We introduce the methodology that is designated for the environmental performance evaluation of companies in the food-processing sector and discuss the architecture of the Web environmental benchmarking and reporting system (WEBRIS) that has been developed. In our vision, we foresaw two main objectives of the WEBRIS.

Firstly, any company may use such an information system to create various environmental reports and share its data with both its stakeholders and, in the future, with the state administrations concerned with regulatory demands and mandatory corporate reporting.

Secondly, the environmental performance evaluation (EPE) of any company is performed by evaluating its key performance indicators (KPIs). This way, the company can share with the public its environmental performance (EP) or check an EP development progress. EPE can be done through various reports as stated above or through custom dashboards.

Basic high-level requirements for the WEBRIS were:
The WEBRIS consists of several modules that can be separated into two main groups – data collection and data retrieval, which is introduced in the next section. The WEBRIS was built as a transactional system utilizing a relational database, which forms the main data storage system.

We have proposed a further extension of the reporting information system with an XML and XBRL data store to provide greater flexibility. The pilot implementation of WEBRIS has been performed in the set of twenty four SME breweries in the Czech Republic which belongs to C11 - Manufacture of beverages NACE section and which have determined their KPIs.

Another direction of the WEBRIS implementation will be connected with improving the user-friendliness (in accord with feedback) and the integration of complementary methods for measuring company EP, together with an extension into other market segments.

II. MATERIALS AND METHODS

The system WEBRIS is implemented as a web application - regarding the requirements for availability. PHP5 language (PHP: Hypertext Preprocessor) [14] was selected as the language for the application implementation. For cover security, easy extension the application and for the reason of sustainability of application the Nette framework [15] was used. The Nette framework is a MVP (Model View Presenter) framework, which allows us to separate the architecture layers to secure the consistency of the web application. The Nette is an extension of PHP5 language.

Since the WEBRIS application is focused on collecting questionnaires and generating reports, it is necessary to use a database where these will be saved and the reports calculations will be done. MySQL [16] was chosen. Given the complexity of the calculations, MySQL is the best choice.

The frontend Bootstrap framework was used in order to ensure responsiveness of the web design. This technology allows optimization of websites for mobile devices, [17].

III. RESULTS

A. User roles in WEBRIS

The WEBRIS allows the authentication and authorization. In WEBRIS (Figure 1), there are three types of users.

The first type of user is public user, who is only allowed to show the Sign in page.

The second type of user – the company allows login or a new registration. After registration the user is offered either to complete a new questionnaire or is shown the original questionnaires. In the case of a user of the administrator type, the user rights are extended with browsing the questionnaires of any company. Naturally, it is possible to register a new user - company on the registration page.

The third type of user is Administrator. This user can show or edit the questionnaire of any company. For managing the roles, we implemented the ACL (Access Control List) model, which makes authorization much easier, because the list of roles, resources and privileges is centralized.

B. The WEBRIS architecture

The WEBRIS architecture (Fig. 1) is based on the MVP (Model View Presenter) architecture. Fig.1 shows its architecture. The presentation layer is provided by Latte templates that allow better adaptation of the HTML code. Common visual elements of the information system are allocated to a separate file and included in each partial template. At the level of view Twitter Bootstrap is also used, which provides a responsive image even in mobile devices.

![WEBRIS Architecture](image-url)
The data layer includes both database systems - the RDB system and the XBRL database.

It is possible to query by both SQL and XQuery languages, because the Data layer exposes their interfaces.

The application layer provides a wide range of APIs to connect the database to various sources; this allows high interoperability of the WEBRIS.

Due to the development of WEBRIS, this application is divided into several modules.

The first module termed Survey collects questionnaires and their management. In the case of management, it is deletion or modification of questionnaires.

The second module called Reporting provides evaluation (Fig. 2) of the forms, and display of results as a diagram in a comparison with the average for the sector. Diagrams are shown on the client side using the framework Chart.js. This module also allows us to export the final report in XBRL format [18], or PDF.

The Data Extractor module provides automatic acquisition of values needed KPI calculation for reporting. This module downloads necessary data from the website or.justice.cz. It is necessary to transform data from PDF format using OCR (scanned document) to a plain text format, which is then parsed and automatically added to the questionnaire form.

As one of the key indicators, the Economic Value Added (EVA) [19] was used. It defines the difference between the net profit and capital costs. It serves for the estimation of shareholder value.

A pilot version WEBRIS is focused on agricultural businesses, brewing and manufacturing industry.

The previous version of corporate sustainability reporting information system was implemented [7, 8], [22, 23] in the past two years.

This prototype was made to ensure that the chosen indicators can be computed and implemented successfully and verify the usability of information system for the end user.

It concentrated on the assessing sustainability of crop production systems for the conditions of the Czech Republic [20] and differs from the new developed SAFA software [21]. In contrast, our application is beside others focused on a mobile access. It contains also the security ALC model.

The next objective of the WEBRIS implementation will be connected with improving the user-friendliness based on the user feedback and the integration of complementary methods for measuring company performance, together with an extension into other market segments.

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REFERENCES


