Web Based Enterprise Performance Appraisal Information System

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Abstract *— This contribution presents the positive results obtained at the Faculty of Mechanical Engineering, VŠB – Technical University of Ostrava, Czech Republic, with the Quality Management System, which was certified in the year 2005. The next step that was done applying the system Total Quality Management (Excellence System), according to the EFQM Excellence Model in the year 2006. A set of keys, presenting the state of the faculty and their results, has been developed during this application process. To register and present all keys and also as a support for future benchmarking, a project to develop a web based enterprise performance appraisal information system, has been completed as a student project. This contribution presents the result obtained during the completion of the student's project focused on developing user friendly web based information support for the TQM system, built at the faculty. There are also the results from the TQM system application, which could be also interesting for other technical faculties and universities. The developed information system is now ready for use in the next campaign of the self-assessment report, and also for a benchmarking project which has been done with many technical faculties in last three year. Some interesting results of applying the past project are also presented in the contribution and could be helpful for other technical faculties or as a background for future analysis focused on the technical teaching process.*

Index Terms *— EFQM, Excellence, Quality, University*

SELF-ASSESSMENT PROCESS

The Faculty of Mechanical Engineering joined the project focused on applying the Quality Management System at VSB – Technical University of Ostrava at the end of the year 2004 in concurrence with the pilot application of QMS at the Faculty of Electrical Engineering and Computer Science, which was the first faculty in the whole Czech Republic with a functioning QMS system. At the end of the successfully QMS system certification at the Faculty of Mechanical Engineering in May 2005, it was clear that it would be a long way to fully implement all management instruments, especially those used by all faculty members at all management levels which need a lot of work. The university management system is different from a typical company management system. The obtained results from the faculty QMS system have been very interesting also for all other technical faculties. The main goals were presented at the International Conference on Engineering Education 2006 [3], 2007 [4], 2008 [5], 2009 [6] and as a chapter in the INEER book *Innovations 2007 World Innovations in Engineering and Research* [7] as a part of the faculty Excellence System (best practices). It was very satisfying when representatives of two other technical faculties from the Czech Republic asked for cooperation meetings to transfer our results to their faculties. How important quality assurance in higher education is, especially in the European Union, is described in many papers, presented at previous ICEE conferences [1, 9, 14]. The use of quality management systems in higher education is more and more common, as is described in more and more papers, such as [8, 11, 12, 13].

Together with the standard QMS instrument expansion, like processes risk analysis based on FMEA (Failure Mode and Effects Analysis), SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis as a background for significant decisions, the consistent utilization of preventive and corrective actions, and joining and enabling of faculty staff members, we were looking for the next forms for developing the faculty management system. The QMS model based on ISO 9000 norms is oriented on suppliers and customers, but the university is as complicated and depends on the academic staff, that is we have to focus at least also on the employees. Then we were looking for some more complex system, which can describe the university management system more complexly. Because we were from the beginning oriented on industrial standards, it is not surprising that we choose the system Total Quality Management based on EFQM (European Foundations for Quality Management) Excellence Model [2]. An important aspect of the model is detailed self-assessment methodology, usable for a faculty or university [10], which is compulsory in the Czech Republic for all State universities, according to the University Act.

Many analyses were done during the self-assessment process and more than fifty interesting faculty performance and efficiency indicators were found. For example, in the groups of results (6 ÷ 9)

6. People Results

- Faculty staff fluctuation.

- Actual age structure in separate academic staff group (professors, associate professors, assistant professors, lecturers).
- Number of academic staff included in the project focused on their personal development (funded by the Czech Ministry of Education, Youth and Sports).
- Faculty staff satisfaction questionnaire results – Fig. 8.
- Number of internal commissions focused on improving the management system.

7. Customer Results

- Results from the student satisfaction questionnaire, see Fig 3.
- Results from an external evaluation focused on graduates, Source: *Final report from the project "Professional Structure in Mechanical Engineering in the Moravian-Silesian Region"*
- Number of applicants for individual study branches.
- Total number of applicants.
- Number of failed students.
- Number of graduates in bachelor study branches.
- Number of graduates in master study branches.
- Number of students in Ph.D. study branches.
- Comparison of the number of students in all mechanical faculties in the Czech Republic.
- Comparison of applicant acceptance in all mechanical faculties in the Czech Republic.
- Results of first-year students in bachelor study.
- Results from the Student Competition (number of student works awarded).
- Department goal compliance – number of students per study branch.
- View on the reason for university study – comparison between graduates and first-year student opinions.
- View on the reason for choosing our faculty – comparison between graduates and first-year student opinions.
- View on the reason for choosing a concrete branch– comparison between graduates and first-year student opinion..

8. Society Results

- Project assessment result from the last five years, done by the Government Advisory Board for R&D. This assessment is also used as a background for financing the university program "*Specific Research*".
- External evaluation of technical universities done by the Czech newspaper "*Hospodářské noviny*" in the last year. This analysis was used even though there were many exceptions to the methodology and data collection.
- Unemployment of graduates from technical faculties, source: *Centre of Educational Policy (http://svp.pedf.cuni.cz)*.

9. Key Performance Results:

- R&D project income.
- Industrial projects income.
- The length of study in every study degree – teaching process efficiency indicator.
- New project application success.
- Number of faculty staff.
- Number of students and graduates in every study degree.
- Pedagogical output by every department.

The main problem found during the last four years, when we wrote the self-assessment report, was to collect and organize all data needed for the report. In this case we completed the student R&D project, described in this contribution.

DATABASE

The first analytical output was based on the index definition. The main problem was how to store data for such a huge number of different indexes. Also the set of indexes could be changed next time. So the data structure must be able to include all needed data also for the future indexes. We have a start from the findings:

- The independent axis in most indexes is time (years) or a list of values (list of departments).
- Dependent axis shows values for every independent value.
- In many cases we need to show more dependent indicators in one chart.
- A different display style is advantageous for different charts..

In the Figure 1 you can see the database structure, which respects all our needs. It is possible to define different independent axis (tbl_osa_x) and store a concrete value list for every defined axis (tbl_osa_x_hodnoty). In a similar way it is possible to define many depended indexes (tbl_osa_z). Index definition (chart definition) combines one x-axis and more z-axis, individual values are stored into table tbl_udaj. The last table (tbl_theme) includes a definition of chart style, colours etc.

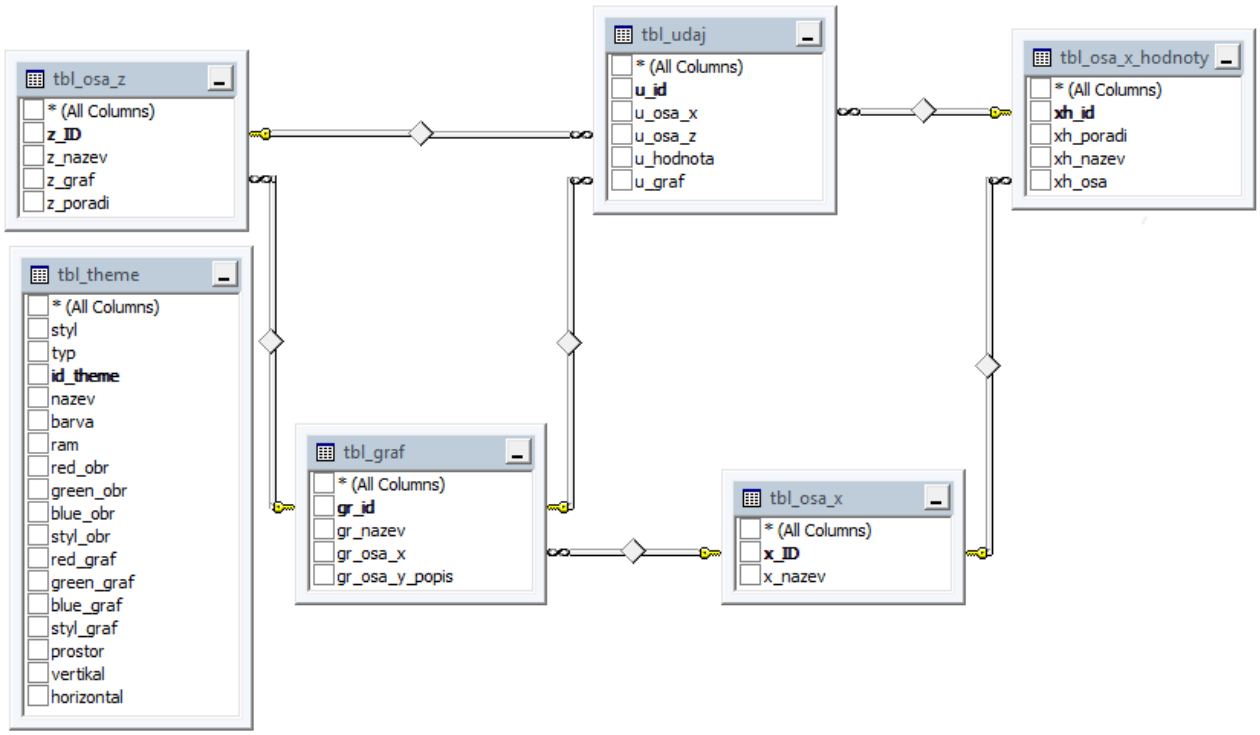

FIGURE 1
DATA STRUCTURE OF DEVELOPED INFORMATION SYSTEM

CLIENT APPLICATION

The client applications for data acquisition, index management and final result presentation have been developed in the ASP.NET environment. The main user menu items are:

- Help.
- X-axis definitions (independent values).
- Z–axis definitions (dependent values).
- Chart (index) definitions.
- Values filled-in.
- Result presentation.
- System administration (users management).

A whole user interface has been developed as maximally user-friendly. Our experience says that users will work with this system very rarely, therefore this system must be as easy as possible. For example see Figure 2 with the index (chart) definition. In this step basic information about the index, like the chart title, z-axis title and a list of z-axes could be defined. To avoid any problem with understanding this definition system, the right part of window shows some chart example. Anyway the included help system describes all steps to define a new index and shows examples from any definition step. The final result of this index is shown in Figure 3. The right part of the window includes a chart theme definition.

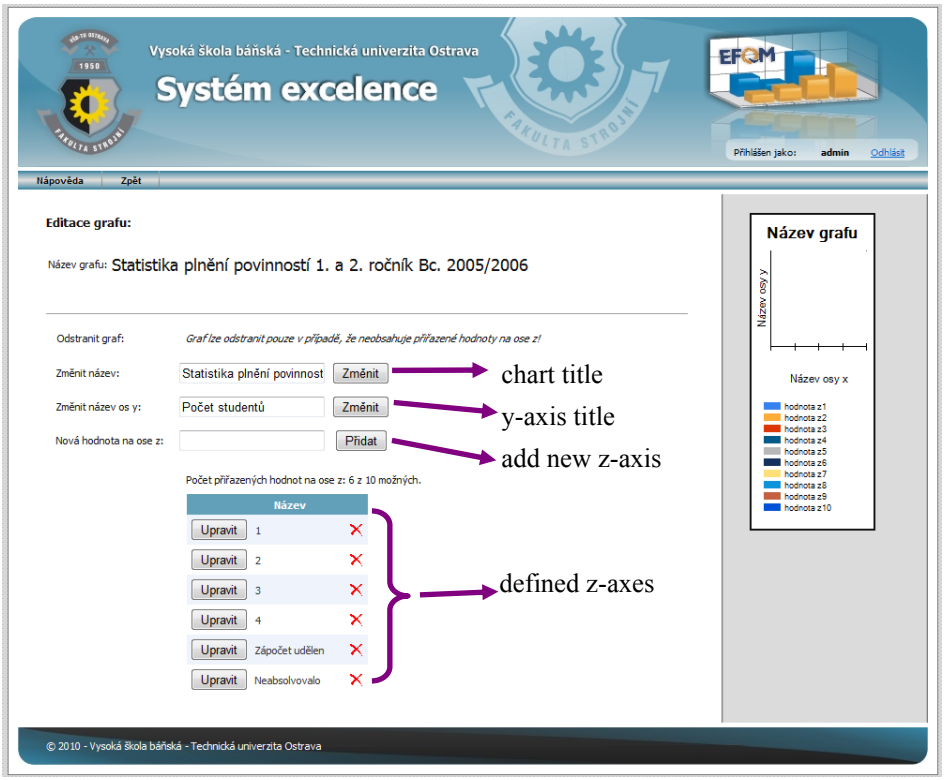

FIGURE 2
WEB BASED CLIENT APPLICATION EXAMPLE – INDEX DEFINITION

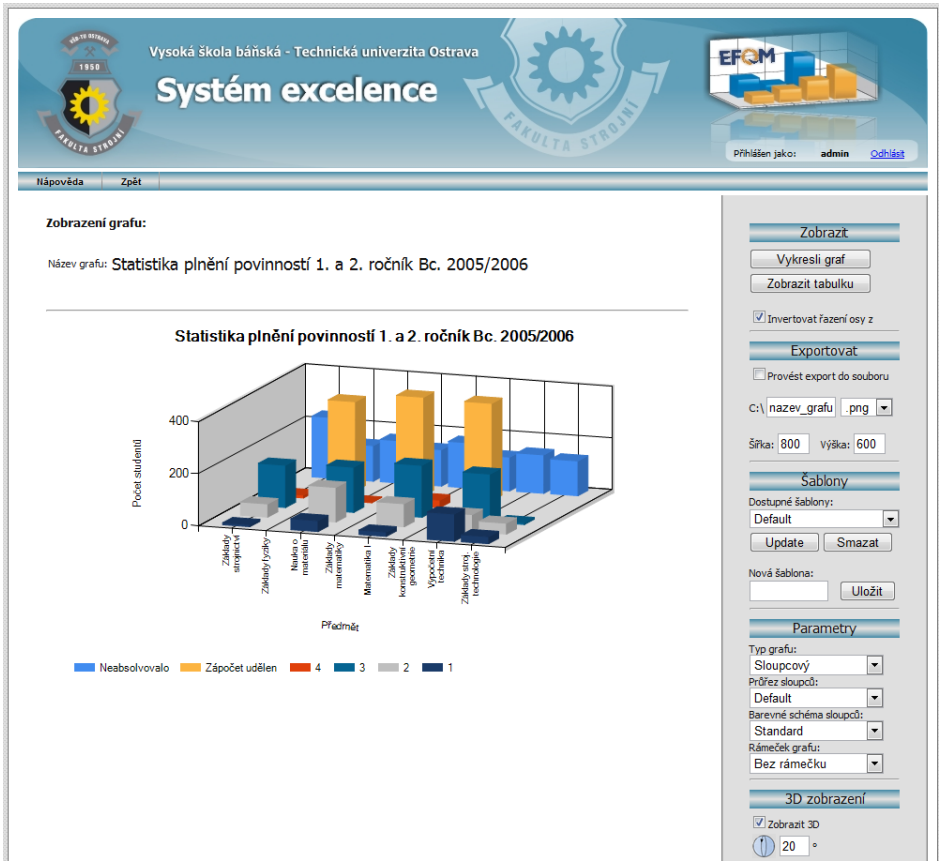

FIGURE 3
WEB BASED CLIENT APPLICATION EXAMPLE – RESULTING CHART

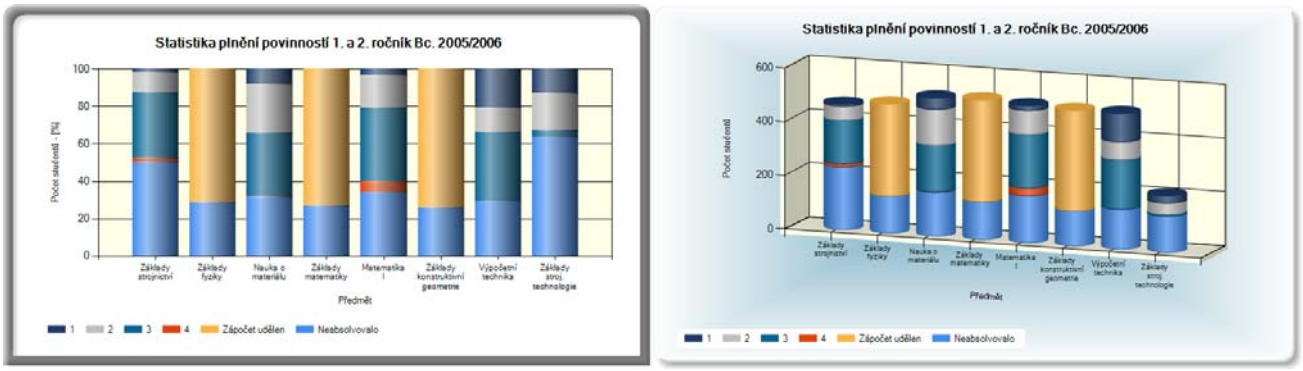

FIGURE 4
DIFFERENT CHART THEMES APPLICATION

The chart view definition could be stored as a chart theme for further use. In Figure 4 you can compare two different themes for the same chart, shown also in Figure 3.

This system is now fully working. It is filled in with analysis data from the last four years and is available for further supporting the self assessment report.

CONCLUSIONS

Orientation on the system Total Quality Management extended this way makes use of more new possibilities. A great number of opportunities for improvement were identified in the completed benchmarking project and the presented information systems help in the implementation process very much. As a great contribution to the faculty management orientation on a complex quality system I am expecting that the university is not a closed system anymore, but just the opposite, the university must very actively accept the changes of the external environment. The university must especially observe, analyze, find out new solutions, apply adequate changes in structure and management, and above all observe and verify the influence of our decisions. One of the principal features of the EFQM Excellence Model is the possibility of comparing the achieved results with other participants in the Program of the Czech Republic Quality Award, including industrial companies; it means our partners and also some very important customers. Of course, we were very happy in the case we were declared the winner of the Czech Republic Quality Award for the year 2007 [15].

It is very fruitful to develop supporting application as student projects, subsidized by the Student Grant System. Students are able to bring new ideas to the system. They are not affected by history, and are oriented on modern methods and instruments.

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