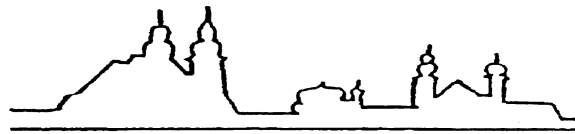


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TENDENCIES IN QUALITY MANAGEMENT

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Introduction

One of the most important tasks of each researcher and lecturer is to recognize development tendencies in his own research domain. Beyond, it enables every organization, enterprises as well as public institutions, to align the own strategy at tendencies and to make themselves forward looking. In particular we could derivate future oriented themes for the on-going cooperation between our universities.

Formulation of the problem

The current situation in Germany is shaped by the economical and political situation, which can at present be evaluated as difficult. In several contributions on the occasion of the 50th anniversary of the Deutsche Gesellschaft für Qualität (DGQ)¹ in autumn 2002, it was stated that the engagement to invest in quality to gain a long-term business success has fallen notably [1]. Many enterprises act at a short notice. The topic quality is considered to be less relevant than economically difficult situations. On the conference of the Gesellschaft für Qualitätswissenschaften (GQW)² this year in Berlin Prof. Pfeifer³, Aachen, quoted a

¹ The Deutsche Gesellschaft für Qualität e.V. (DGQ) [German association for quality] developed from the "Ausschuss Technische Statistik im AWF" [committee technical statistics in the AWF], that was established in 1952. Since 1972 the DGQ is legally independent.

² The purpose of the GQW [association for quality science] is to promote the quality science in teaching and research, to support the knowledge transfer and industrial implementation. At present 15 university professors are member of the GQW, all of those represent the field of quality management at German universities.

³ Prof. Dr.-Ing. Dr. h.c. mult. Prof. h.c. Pfeifer is laboratory for machine tools and production engineering since 30 years at RWTH Aachen. Due to his merits he received numerous awards.

pronouncement of Hans-Olaf Henkel⁴ as an answer for the offensive on innovation of our Federal Chancellor Gerhard Schröder „In Germany we do not have a problem with innovations, we have a problem with quality“ [2].

Involved entrepreneurs ask on the other hand: „We have a running Quality Management System on a ISO 9000 basis. We orientate ourselves at the EFQM model. But what comes thereafter? Where can you see development potentials?“

Let me try to give suggestions we could use in the future for a cooperation between our BTU and your Slovakia University of Technology in Bratislava, especially with the Faculty of Material Science and Technology in Trnava. It is easier to understand development trends if we look back to the past.

The history of Quality Management

Based on the scientific business management of F. W. Taylor the full-time inspector was examining quality in production [3]. The inspector was responsible for quality. If we remember, that this career profile disappeared in the middle of the 1980ies from our enterprises, then it had a long-time effect. Nevertheless without any restriction we can say that the basis of quality are the determination of facts and measurement. Because facts that cannot be measured, cannot be improved.

In the 1920ies and 1930ies statistics was first used for QM. The outrider was Shewart with his control charts [4]. Nowadays Statistical Process Control is still a powerful tool to manage production. Control charts are used for the determination of the machine capability. The same concepts are also used today to prove the qualification of measurement equipment [5].

Fisher is the father of full factoriell design of experiments [6]. This tool allows to estimate the effects of the influencing variables and their interdependencies. After intensive discussions in the middle of the 1980's concerning the concepts of Taguchi and Shainin we have an extensive closed concept for design of experiments (DoE) [7]. Today the DoE will still develop and spread. Only few engineer knows Fishers, Taguchis or Shainins methods at present. Rarely an engineer can apply DoE and adapt the methods to own needs.

The accepted principles of a comprehensive quality management go back to Deming, Feigenbaum and Ishikawa [8]. They were practised in the 1950ies and 1960ies in Japan and were operationalized with the Quality Awards which came from Japan to USA and Europe. These awards do not only have national impact, also the regions apply awards to business success. In 2004 we granted the second quality award of Berlin-Brandenburg, the region of our university [9]. In the next 10 years continuous efforts in business and politics will be needed to establish the awards in all regions.

But let me now start with my personal quality story. I will tell you about the topics I experienced and created.

Developments of the last 20 years

⁴ Chairman of the Leibnitz-Wissenschaftsgesellschaft [Leibnitz association of science] an previous chairman of the Bundesverband der deutschen Industrie e.V.

In 1985, when I did my first analysis in computer aided quality assurance (CAQ), CAQ meant control of incoming goods and control charts according to Ford Q 101 [10]. Also in the 1980ies the first risk prevention tool, the Failure Mode and Effect Analysis (FMEA) was developed in the Apollo programme [11, 12]. Simultaneously, there were efforts to quantify risks of hazardous technical equipment, such as nuclear power plants. Therefore powerful but extensive methods such as Fault Tree Analysis (FTA) or incident flow analysis were applied [13, 14]. FTA requires knowledge about the failure probability of single items. Therefore performance measures on reliability are necessary. The logical interconnection of single reasons allow to determine the total failure risk of technical equipment or plant. With this methods the probability for the so called maximum credible accident were determined [15]. As a result German nuclear plants had relatively low risk. In the 1980ies efforts lay in the prevention during development phases. Furthermore the setup of quality management systems mainly conforming to ISO 9000 was introduced to German Organisations [16]. Mainly the automotive sector was pioneer and promoter for quality management in Germany.

In the end of the 1980ies the concept of Total Quality Management (TQM) was introduced [17]. TQM meant a comprehensive approach on quality which included not only processes and results but also people. Many quality methods were promoted of which Quality Function Deployment was investigated in many studies for its positive effects in product development [18]. However, most of these methods have not been spread in organisations as expected from the potential of the methods. Here is still a vast call for action.

Newer Trends since mid 1990ies are the Balanced Scorecards (BSC) [19] and Six Sigma [20]. Quality Experts were highly delighted about the introduction of the Balanced Scorecards which has been introduced by the area of Controlling. Financial measures of business management were finally connected to measures on customers, processes and future developments of the employees.

The other large topic is Six Sigma. This strategy aims at failure reduction and therefore to cost reduction. It aims at reducing mistakes to zero and originates of Motorola. The main idea is a consequent application of quality methods, mainly statistical methods for fault prevention [21]. The implementation requires extensive investments in employee training as well as a consequent application of project management in improvement projects. Projects are designed to reduce costs verifiable.

Quality Management today

Large German companies, such as Siemens, take these quality concepts for orientation. Further, there is the obvious trend to implement concepts of quality management in all areas of business as well as in administration. Here some examples:

Quality Management in software development has a long tradition, and is still focus of research. Standards, such as the V-Model, are standard for the allocation of orders for public administration [22].

Especially in the last year EU decrees on foodstuff lead to considerations on traceability of origin [23]. However, as the food branch misses quality drivers, such as the automobile producers are for their deliverers, the interest of the food branch to extend the topic is relatively low.

In health sector in Germany, hospitals, medical practices increasingly apply quality management. Out-standing examples are the Asklepiosklinik Birkenwerder, which won the

Quality Awards of Berlin-Brandenburg in 2002 [9] and the Zahnarztpraxis, a Swiss dental practise who won the European Quality Award in 2001 [24]. So called quality reports are distributed by some hospitals to increase customers trust in organisation performance [25].

The hotel business sector is a trendsetter in business services. One example is the hotel Schindlerhof near Nuremburg, which received repeatedly the German and European Quality Award [26].

Also in the public sector Quality Management is an up-coming trend. One driver are low finances which force to cost reduction [27]. Here two aspects are important: the definition of so called products of public administration and a linkage of these products with cost-performance accounting. Even Police is very interested in this matter when optimizing process flow or when analysing effects of measures of police action [28].

Quality Professionals are highly delighted by dissemination of the quality idea. However, are these branches still fields of action for engineers? Therefore, two alternatives can be identified:

- 1) Quality Engineers expand their fields of action to cover the mentioned areas.
- 2) Recall to the origins of Quality Management to concentrate on core competencies.

Personally, I tend to the second alternative. Although the expansion to other areas is highly interesting and we are active there as well. However, the recall to core competencies in Quality Management is necessary for research.

The former Quality Assurance, also called Quality Control, was there to assure a certain level of Quality. It was therefore the main goal to control quality to achieve a necessary level. This was already stressed by Juran's famous trilogy [29]. Also Deming's quality circle follows the same idea. Continuous improvement as well as large-scale improvements, such as innovations, are covered by the Deming ideas. On the other side the level required by the market is important to stand competition. A customer feedback, can have tremendous effects. The DaimlerChrysler AG e.g., had great losses due to the so called "Elchtest", a test on a new vehicle, carried out by a Swedish specialist journal, which ended with critical road safety [30]. To define, to assure and to develop the market level, we need process knowledge, which I acquired for selected areas of production technology. To cover alternative one from above, cooperation with professionals of other areas is required.

The concept of Total Quality Management puts people as employees, managers and customers in the centre of efforts to achieve long-term success. This also means engineers have determined people in business actions. Developments with regard to human aspects should be pushed by cooperations together with sociologists and psychologists. I suppose I do not tell you any news, as you know my colleague Prof. Bartsch and my colleague Misses Dr. Hoppe, with her we submitted a research application [31].

Conclusions

In Quality Management potentials for research can be found in cross-functional approaches. A good examples is the Balanced Scorecard concept as suggestion for cooperation with economics. The main research field for Quality Management will be Quality for Profit, for sustainable companies with 0-fault politics.

In the area of quality engineering it is our task to realize developments of basic research for application. Therefore I suggest the quantification of quality, the application of genetic algorithms [32] in Design of Experiments (DOE). Further investigations on statistical tools and the assessments on the areas of application are needed.

An integration of discoveries from neighbour disciplines has further potential. Here, I see the areas of Quality together with Project Management, with Information Technology, with communication and informational process or with virtual production with special interest.

Let us take the time in Trnava to think about cooperations in the future. If we install stable cooperations, we establish parts of the future by ourselves. I am looking forward to successful cooperation with you!

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