# Q-KEY2 - an educational game for improving employees' quality awareness

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## Abstract

Nowadays, customer satisfaction is of high importance for a company's success and therefore, quality is a central business objective. For this purpose, an effective quality management system requires the integration and participation of all employees. In order to improve employees' quality awareness proper training methods are necessary.

For this, simulation games are a widespread instrument, since "learning by doing" is a great way for maintaining contents in mind. With it, various learning situations are created which require interactive and communicative processes. The participants are directly asked to act individually as well as to reflect their decisions and actions in a group.

The education game Q-Key2, which has been developed with industrial partners at the institute of the authors within a research project, is based on the DIN EN ISO 9000ff and supports the process of introducing quality management systems. The aim is to enhance the quality consciousness and the employees' qualification of Total Quality Management. By teaching central ideas of several standards, the participants learn about the importance of a preventive behaviour and the advantages of continuous improvement.

This paper shows how Q-Key2 can motivate employees and reduce fears or negative expectations when implementing TQM.

### Keywords

Total Quality Management; Quality Management System; Education; Simulation Game; Management Game; Interaction

## 1. Introduction

Nowadays, an effective quality management is an essential part of a competitive and successful company. Moreover, "Quality as a success factor" will continuously increase its importance as strategic marketing concept. A sustainable quality management requires all employees of the company to be included and collaborate in processes. Hence, the quality of the company's products and processes will be perceived as a key company goal considering the creation of customer satisfaction which will ensure the company's success on a long-term basis. Quality awareness is an essential factor regarding the success factor quality and the coherent concepts and policies (Brauner, 2016).

But how can the employee's awareness of the importance of the quality for a company's success be built?

One of the key elements is the employee's motivation to have a good look at quality and the complex processes of the creation of quality. Due to larger companies and their division into company departments which work separately, the quality awareness of employees is an increasing problem in most companies.

Employees used to work individually, mainly being asked to comprehend and cope with the assigned task, i.e. each employee had to understand the complexity of the assigned task individually in order to make the right decisions and to classify the task according to its meaning for the whole process. This aspect is reflected in the present – merely passive – training programs (seminars, lectures, brochures etc.). Employees are taught to work as individuals only concentrating on their own area of responsibility. The egoism mentioned above, as well as personal disagreements between employees lead to inefficiency and consequently, to dissatisfaction of customers. Many employees lack basic knowledge: knowledge about the complexity of processes, dependencies and interaction between different departments. In this context, the employees' attitude towards their work and tasks represents another challenge. Only, if considering it to be meaningful, the employee identifies with a given task and becomes committed to it on a long-term basis. Hence, the organization of tasks of each employee requires being encouraging concerning motivation and quality.

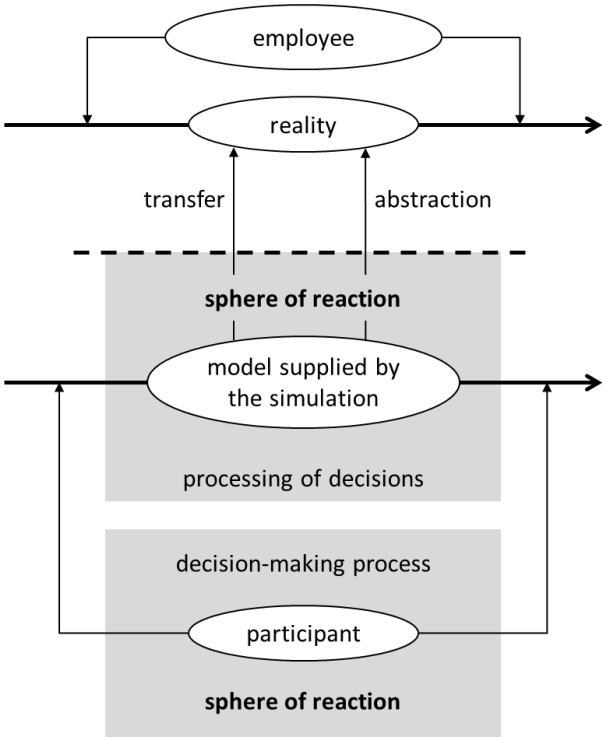
Once a sustainable quality management system is introduced into a company, a new role is assigned to its employees. As members of a team they have to be able to conduct negotiations and to make complex decisions in cooperation with other employees. These abilities are not only required within their own group but also when interacting with other groups of the enterprise or groups from cooperating, national or international enterprises. Therefore, employees have to be encouraged to think independently and act individually and quality-oriented.

Today, employees can only be prepared sufficiently for their jobs if training methods include the different dimensions of the employees' area of responsibility within the company. Hence, teaching methods should create learning situations which require interactive, communicative skills and lead the individual, as well as the group to reflect their decisions and actions (Balikci, 2012). The created situations should be based on realistic issues and enable employees to share on-the-job experiences with other employees. In this context, teaching methods should not just reduce problems didactically but reflect the complex reality of today's working conditions (Ulrich and Capaul, 2003).

## 2. Educational Games

Educational games are a useful tool for solving problems together. They help to define common goals, work on tasks playfully and provide employees with the foundation of teamwork (Kickmeier-Rust et al., 2011). Figure 1 illustrates the basic structure of an educational game by means of the control circuit model.

*Figure 1. Theory and structure of educational games*




Source: Own Elaboration

The basic structure of educational games is mainly composed of the rules of the game, the sphere of action, the sphere of reaction and the flow of information. Thereby, the rules of the game define the frame of the simulation game and ensure its feasibility. The rules can be varied in their degree of strictness and the way they are interpreted. Thus, they have a great influence on the degree of abstraction by defining the scope of the simulation game and the features of its other components (Kleiman, 2008).

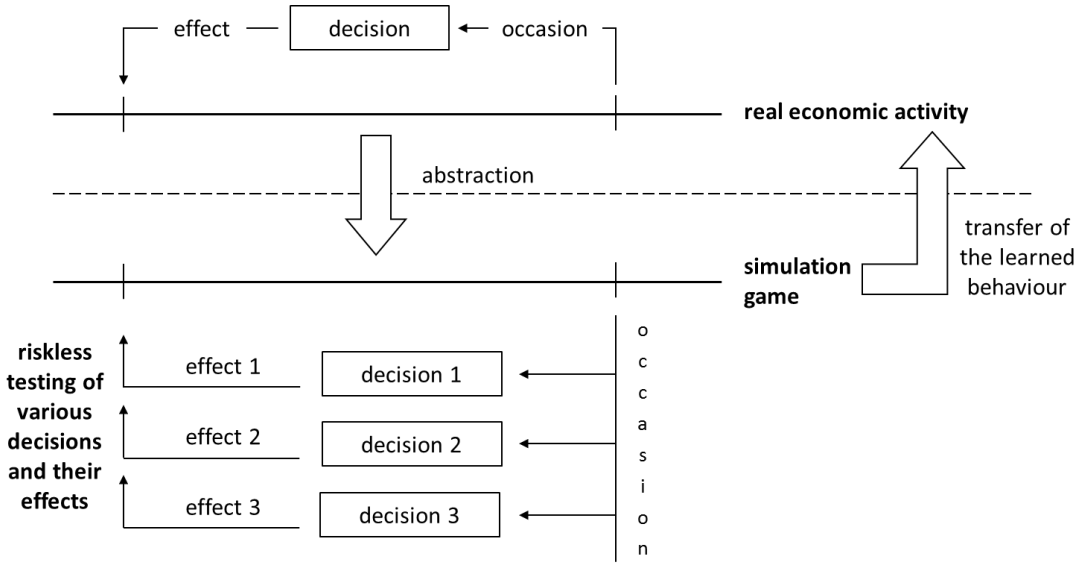
The sphere of action is represented by the participants, who have to make decisions on the basis of the given information and within the limits defined by the rules of the game. Their decisions lead to reactions which represents the sphere of reaction. The way of reaction can be varied. Often, the participants' decisions are transformed into the corresponding results and reactions by logical models backed by computer programmes. This transformation process can also be carried out by means of the rules defined by a board game or role play.

According to the differentiation between the two spheres, the sphere of action ensures the decision-making process and the sphere of reaction defines the processing of these decisions. It is the task of the quizmaster to control these two processes, thus, supporting the learning process of all participants (Wainess, 2007).

The aim of educational games, in which participants are confronted with realistic work situations, is to quickly impart practically-oriented experiences which have a long-lasting effect on the employee but do not cause any risk to the running business. In this way, the

participants learn to deal with a given situation “playfully”, without having to fear the possible negative consequences their strategies might have (cf. figure 2).

*Figure 2. Process and advantages of simulation games*




Source: Own Elaboration

Learning from own mistakes at the workplace is only possible restrictively. But, learning from one’s mistakes can occur without risk due to practically based simulations. Besides the learning success, this also leads to a relief of performance pressure on each employee. The employee learns playfully, that a paramount company goal can only be reached satisfyingly, if all employees participating in the decision process cooperate and communicate with each other. Moreover, a learning success is not only achieved by success, but by failure and the resulting improvement of a fictional task (Chow et al., 2011).

In experimental games, learning is primarily a response to knowledge and skills. Only secondarily, it is a response to the imitation of mandatory behaviour. Participants learn to cope with different formulations of a question and to quickly adjust to a new situation. With it, a cooperative behaviour in decision- and planning processes can be trained, subconsciously internalized and practiced in working life. Consequently, experimental games offer advantages for internalizing quality consciousness (Trautwein, 2010):

- Orientation and decision training
- Development of action-oriented competences
- Development of social skills
- Training of cooperative behaviour
- Sustainable conveying of specialist knowledge

In view of the “Learning by Doing” synergetic effect which was extensively investigated in the learning theory, the percentage of internalized information and contents of educational games is above 80%. Due to the variety of problems connected with the handling of business processes, the methods and aims of the various existing management games differ widely. One of the most important features used to differentiate between these game types are the various ways of processing and evaluating the decisions made by participants, i.e. the 'model' of the game.

Here, simulation games can be divided into three categories: computer-based simulation games, card games and board games. As computer-based simulation games are spread widely,

the applicability of hand and board games within companies is often underestimated. However, these varieties of simulation games can be of great benefit to employees in quite a lively and practically oriented way (Ulicsak and Wright, 2010).

Computer-based simulation games often lead to the so-called "black-box syndrome", which means that due to processes taking place in the background the participants are often unable to detect or understand interdependencies and consequences. Hand and board games, however, offer a clear and vivid presentation of their contents. By including visual and motor elements into the learning process, the constituents can be disclosed more comprehensively than by mere "invisible" concepts and definitions. The decision-making processes become transparent, and the interdependencies between decisions and consequences are easier to understand.

In order to impart essential knowledge and abilities and due to the great importance of communication, the use of computer-based simulation games is rather restricted in terms of their characteristic features as explained above. Concerning teaching methods the communication process has to be the centre of attention, e.g. simulation games, during Total Quality Management training (Crostack and Schneider, 2001). As a conclusion, a combination of a card game and a board game is best suited for this purpose.

## 3. The educational game Q-Key2

The educational game Q-Key2 developed by the department of quality management of the German institute for research and transfer is designed to make employees sensitive to the concept of quality, the intricate origins of quality and its consequences for internal and external customers. In this connection, “Q-Key 2” is a combination of a board game and a card game, which supports the implementation of a quality management system based on DIN EN ISO 9000 ff.

Introducing an educational game to employees is a useful way to prepare them for a new quality management system. In addition, the effectiveness of quality systems can be increased by preparing employees for the new quality concept and its complex links such as the strategic variables of time, costs and quality of the enterprise.

The aim of Q-Key2 is to enable the participants to directly experience the intricate influences on the development of quality in the enterprise, particularly the conflicts between time, costs and quality, which will come up automatically when a quality system is introduced. Q-Key2 not only imparts a deeper knowledge in the field of quality management, but also encourages teamwork within a group of participants who are responsible for their decisions in the team and in the whole enterprise. Teamwork is known to be the key to a continuous improvement of quality, cost-effectiveness and time needed by the product to pass through the enterprise. 'Learning by doing' is certainly the most effective way to develop a certain sense of quality, especially when working in a team (de Freitas, 2006). These targets are covered by the respective elements of Q-Key2.

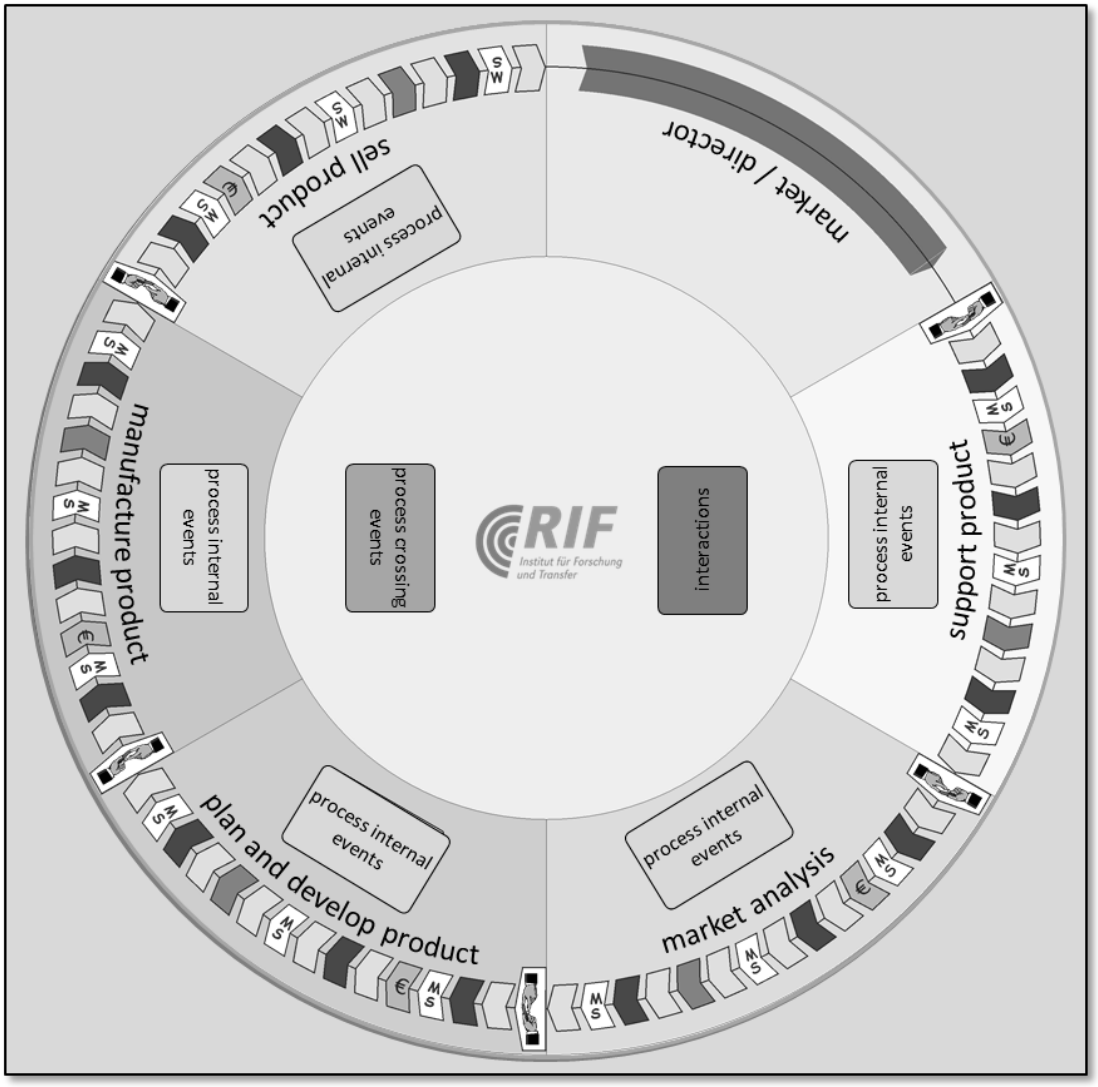
The target groups of Q-Key2 are project teams dealing with the introduction of quality management into small/medium sized enterprises, but also employees of SME in general. In both cases the participants should be composed as a cross-section with members coming from different levels of the hierarchy of the company.

### *3.1. Aim of the game and game structure*

The Educational Game’s constant task is to increase the company’s sales and hence, assure its long-term competitiveness while making decisions that are based on the ideas of the quality management. In doing so, the fictitious company is divided into five departments.

Each of the five participating groups (1-2 persons each) has the task to manage one of the following departments of a fictitious enterprise: market analysis, plan and develop product, manufacture product, sell product, support product (cf. figure 3).

*Figure 3. Q-Key2 game board*




Source: Own Elaboration

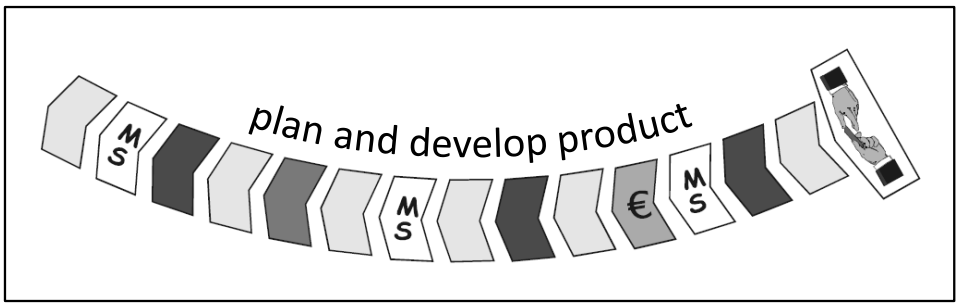
The aim is to protect the departments from process-internal events and process-external events in a preventive way by carrying out various quality management measures. Before starting the game, the participants take place at a table, where the game board is centrically placed so that each player can move his piece comfortably. At the beginning, each player has three pieces and 20,000 euros seed capital. Each process section starts the game with three products. These three products (pieces) are placed at the particular input field (field with hand-symbol).

*3.2. Course of a game round*

The process section "market analysis" begins. The game is played clockwise. In each round, the following steps are passed: The process controller rolls two dices. The number of eyes on the dice indicates how many fields a product can be pulled forward. The process

responsible himself decides which product he is moving forward. Both moves have to be made in a row and individually, whereby the process responsible decides whether both moves are made with one single or two different products. Each process responsible is only in charge of the products that are located in his section (cf. figure 4, department: plan and develop product).

*Figure 4. Q-Key2 game board - enlarged excerpt*




Source: Own Elaboration

Products have to be led through each department as quickly as possible, but with a high level of quality and at lowest costs possible. In this context, the passage of the products is determined both by the dice and by the decisions made by the participants. If the products hit certain squares, a card must be drawn and/or the participants have to react to certain internal and external events taken from the daily routine especially of small and medium sized enterprises (SME). In doing so, the participants can collect "jokers" used to protect their respective department against various kinds of events, such as rejects because of a loss of quality, which might affect the department itself or the enterprise as a whole.

Yellow coloured fields mark process internal events (cf. figure 4). If a process responsible reaches such a field with his product, he picks up the top card from the stack "process internal events" (cf. figure 3) and reads it out to the other players. The event always relates to the own process section, either individually or in cooperation with another process section. On this occasion, two different types of process internal event cards exist:

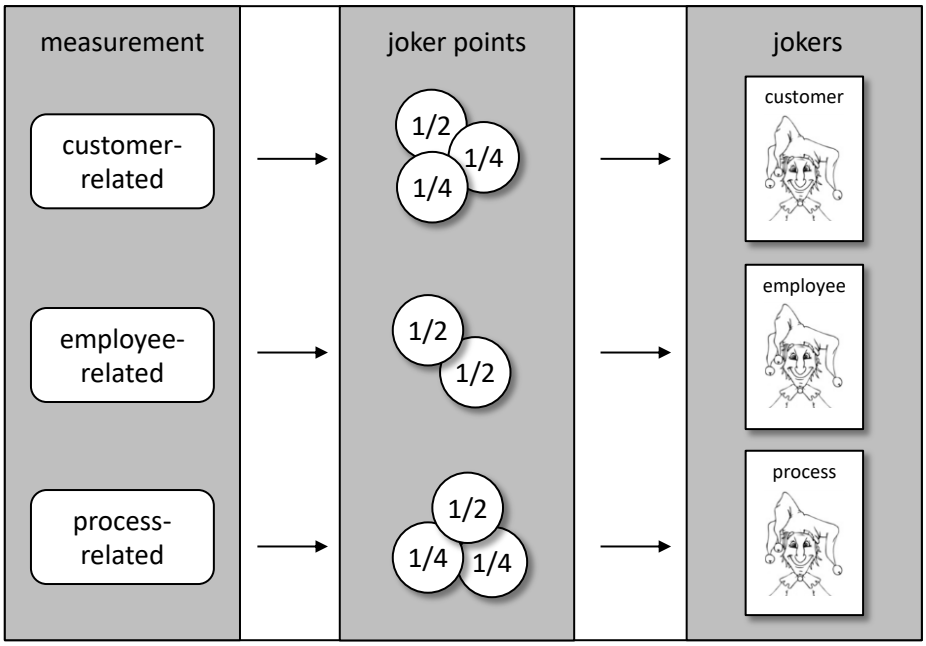
- Simple event cards: the events do not allow the process responsible player to make an own decision
- ABC-cards: the events require the process responsible player to decide on one out of three interaction alternatives. Then, the quizmaster (a trained RIF-Institute employee) informs all players of the decision's consequences on the specific department.

Red coloured fields mark event affecting the company on the whole or at least two process steps (cf. figure 4). Once placing a product on such a field, the process responsible player takes the card on top of the "Process crossing events" draw pile (cf. figure 3) and reads it out. The event read aloud affects all indicated process segments except when a process responsible player holds a joker against the event.

When reaching a policy field (MS) (cf. figure 4), the player has to choose a card from the "policy-card" draw pile to implement quality-oriented measures in his/ her segment. The chosen measure is read aloud and the quizmaster explains the decision's consequences pointing out the costs, required time it takes and its protective effect. Moreover, the quizmaster hands "joker-points" to the acting player which can be exchanged for jokers. Jokers honour the process segment for its quality awareness and can protect the segment from prospective events which is noted down on the game cards. Altogether, three Joker cards can be acquired: the customer joker, the process joker (affecting process management,

transparency, information and communication) and the employee joker (affecting leadership, training and professional development) (cf. figure 5).

*Figure 5. System for creating joker points and jokers*




Source: Own Elaboration

Instead of performing measures, an interaction game (Interaction draw pile) with one or more other players can be played if being agreed on. If the teammates work out the given term (i.e. QM-handbook, audit, supplier evaluation, etc.) before the hourglass-time expires, all players of the interaction game receive joker-points, as well.

If a product reaches the bonus field (€) (cf. figure 4) the affected process segment receives a bonus. The player responsible for the process can now roll the dice. The thrown number is multiplied by 500 and the player receives the calculated amount from the bank (500 to 3,000 euros).

If a product reaches a blue pause field (cf. figure 4) it has to pause for one round. In doing so, the counter is placed next to the pause field and the product is not allowed to be moved forward or backwards. Also, a pause can be activated by a specific event.

*3.3. Interim evaluation and end of the game*

When passed through their own segment, the products are handed over to the next department along the hand-over fields. The player, who handed over the product, receives 5,000 euros from the bank. Once reaching the hand-over field, the player places the product at the start field of the next process element, also when having thrown a higher number than needed to reach the hand-over field. With it, the following process element is responsible for the product. If the handing over of the product happens too late and the next process segment has no more products to play with, the player being responsible for the process has to pay a fixed penalty of 5,000 euros per round.

*Figure 6. Industrial partners and students playing Q-Key2*


Source: www.eventfotograf.in / © JRF e.V.

After approx. one hour (6 rounds of playing) an interim evaluation takes place which points out and discusses the progresses made in the quality segment of the fictive company under the quizmaster's guidance. Afterwards, the game continues.

After approx. two hours (12 rounds of playing) the quizmaster ends the game. A concluding evaluation gives information about the financial situation of each player and the company.

## 4. Summary

The motivation of employees to think about quality is rather low in a lot of German companies. Simulation games can operate as an effective and simple teaching method which creates interest in quality issues. The easy access of employees to a game is a great advantage. The principle obstacles are the managers deciding about conducting a game.

In this context, simulation games can be seen as an add-on method to teach employees the contents of quality management. Simulation games show direct links to employees' daily work. Nevertheless, simulation games do not replace seminars or training courses. But, they can deepen the knowledge and understanding of quality management concepts. In order to reduce prejudices and restraints of (non QM-department) employees simulation games are a valuable help and have to be preferred.

A "regular training", like it is commonly used for introducing quality management programs, has a noticeable weaker impact than a simulation game. The German RIF Institute of Research and Transfer made very positive experiences with the simulation game Q-Key2 in companies and also with the education of the Dortmund and Kassel University's students. Several seminars played the game and it was - besides the fun - a good method to check whether the students understood their quality management lecture or not.

Q-Key2 deliberately operates without the use of computers, as computer systems hide what Q-Key2 endeavours to make understandable: the interdependence of processes which lead to the development of quality. The "playful" interaction increases the participants' motivation

and willingness to learn. The clear and understandable structure of the simulation game makes it possible for the employees to learn from their own experiences and mistakes and to put new ideas directly into practice.

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