

# **E-Quiz - A Simple Tool to Enhance Intra-Organisational Knowledge Management, eLearning and Edutainment Training**

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**Abstract:** It has become increasingly necessary to motivate and actively involve users to provide quality feedback for the development of future versions of applications and services within whatever institution is at issue. For this purpose we have developed an E-Quiz game to accelerate the process of learning, understanding and the successful usage of new technologies and applications. The E-Quiz is based on a simple content management system where questions and answers can be defined, personal and organisational data can be stored and a rule system on performance scores can be executed. E-Quiz games are an integrated part within a new IT marketing strategy including internal eCommunity systems, which have evolved over the past few years in response to decreasing user acceptance caused by new applications and technologies. E-Quiz games are not limited to IT content and will be applied in the future to affirm general intra-organisational knowledge dissemination.

## **Introduction**

In 2007 the business world is inconceivable without computers, notebooks, mobile phones, PDAs (Personal Digital Assistant) and other Internet devices. The most mature countries using information and communication technologies (ICT) are listed in the Networked Readiness Index 2006-2007 rankings of the World Economic Forum (see World Economic Forum, 2007). The first 25 of 122 countries are: (1) Denmark, (2) Sweden, (3) Singapore, (4) Finland, (5) Switzerland, (6) Netherlands, (7) United States, (8) Iceland, (9) United Kingdom, (10) Norway, (11) Canada, (12) Hong Kong SAR, (13) Taiwan, China, (14) Japan, (15) Australia, (16) Germany, (17) Austria, (18) Israel, (19) Korea, Rep., (20) Estonia, (21) Ireland, (22) New Zealand, (23) France, (24) Belgium, (25) Luxembourg. The Networked Readiness Index (NRI) measures “the degree of preparation of a nation or community to participate in and benefit from ICT developments. The NRI is composed of three component indexes which assess: (i) environment for ICT offered by a country or community; (ii) readiness of the community's key stakeholders (individuals, businesses and governments) and (iii) the usage of ICT among these stakeholders”. The race between these countries is motivated by the fact that apparently there is a correlation between the overall wealth of a country and the NRI. Denmark and Sweden have climbed up the rankings because the government has emphasized education, ICT penetration and innovation quite early. This resulted in an excellent education system, a good market environment for ICT and a good balance in ICT usage between the public and the private sector. Clearly, one of the key factors of a high NRI ranking on the individual level is the competent use of ICT systems. One can try to achieve this through traditional IT training, but this does not seem to be sufficient any more. Therefore we have searched for strategies, methodolo-

gies and systems to easily broaden the user knowledge in an entertaining way. The combination of knowledge management, eLearning, computer based testing, edutainment, eCommunities, and IT marketing has led to the creation of the E-Quiz game which is being played in an intra-organisational environment. One major aspect in setting up a stimulating environment was triggered by the Web 2.0 discussions and the focus on user generated content. eCommunities are used to ensure a better understanding of applications, services and technologies by the user on one hand (see Suriowiecki, 2005) and to exploit this special user knowledge to improve applications, services and technologies on the other hand. This accelerates the software development process and shortens the life cycle of applications, services and technologies. Intra-organisational eCommunities may help accelerate the whole ICT adoption process as well as expedite development and deployment of the next extended applications and systems.

## The E-Quiz Game

The E-Quiz game is played on a desktop PC or notebook and in its mobile form on a PDA using an internet browser within an intranet. Employees can log in anonymously with a nick name or with their true identity. If they log in with their real ID they are participating in an intra-organisational game, where the highest scores become eligible for benefits, incentives and other prizes. The evaluation of the true ID involves the human resources database of the organisation or enterprise.

E-Quiz games can be played during working hours, and if someone wins a game, he or she can get incentives like vouchers for the cafeteria, a training course, a book, movie tickets, gift coupons for petrol, supermarkets, restaurants, travel, etc. Annual prizes might include a new company PDA of the newest generation, thus breaking the average hardware replacement cycle of 3 years.

An E-Quiz game is defined by the quiz master, who can set up one or more E-Quiz games. Quiz masters are specially trained employees with an ICT background. Within the enterprise they are sometimes called key users or Internet trustees, who usually have a special IT training and are responsible for content generation for the Internet and intranet within their departments. As forum operators they also serve as focal points in setting up a social network and the usage of enabling technologies, such as wikis, blogs, Web-TV, Web multimedia and enterprise search (see Brown, M., 2007). Quiz masters are technically managed by the administrator (superuser) of the E-Quiz game and organisationally by the head of knowledge management.

The quiz master defines a quiz with a quiz name, a start and end date and n questions. With only one correct answer from a pool of four for each question, the E-Quiz game engine is designed as a single choice test. All transactions of the quiz candidates are stored by the system, including time stamp, selected answers, skipped questions and ID. The candidates can easily replay their games and are being shown performance parameters like their time spent for the whole quiz or for a specific question, the average time spent by all players, their own score, the average score of all players, etc. When replaying the E-Quiz game the candidates have the possibility to assign notes or blogs for private or public use. The candidates are invited also to submit their feedback regarding questions or answers to the quiz-master. One of the knowledge management objectives of the E-Quiz game is to support the creation of theme based eCommunities. The quiz master is also a thematic operator who, 30 days after the end date of an E-Quiz game should write a summary report about the user feedback, which might include technical problems detected, wrong wordings, bad explanations, ambiguities, causal deficiencies, irrelevancies, detected levels of easiness, difficulty, unfairness, etc. These reports are submitted to the head of knowledge management of the organisation or company for further investigation. Usually they lead to changes in the training of quiz masters, etc.

The E-Quiz game is being played by the candidates on their own PC (desktop or notebook) or PDA within the intranet or while being connected to the Internet using a virtual private network (VPN) tunnel. Each E-Quiz game has one general theme and contains between 5 and 20 questions. The time between start and end of the E-Quiz game is measured. The application areas of E-Quiz games cover all intra-organisational themes, e.g. IT, finance, human resources issues, facility management, security, corporate code of ethics and business conduct, logistics, production, research & development, marketing, accounting, etc.

The E-Quiz game is not played in a controlled environment like a paper and pencil test in school with an observing teacher caring for fairness. The correct answer is not the only essential measure, because it may have been copied from a list which has been prepared by candidates who have already completed the E-Quiz game successfully. Therefore we chose the elapsed time required to finish the test as a relevant measure for score keeping. Candidates

can use all tools to answer the questions, including a list with the correct answers. But the sequence of questions is chosen arbitrarily, so it costs time to search for the right answers and to copy the results into the active E-Quiz game. Even if the candidate learns the right answers by heart, the knowledge management strategy has been fulfilled as well, because the overall goal is to quickly learn new technologies, methodologies and applications. After answering with a mouse click in a check box the candidates immediately see if they were right or wrong. If the answer was incorrect the system immediately reveals the correct answer as well as an optional explanation. The time to watch an explanation - e.g. a video clip - is excluded from score keeping. However, incorrect answers result in a time loss.

This workflow has been chosen because the user should learn as fast as possible. So those candidates who know all the right answers in a short period of time have an advantage over those who are slower or make mistakes. Candidates are motivated to repeat the E-Quiz game if they have failed one or more items. However, the repeat rate is also being measured and negatively influences the score. Hence the candidates who succeed the first time get the highest scores and are potential winners. Once all questions have been answered a score is presented to the candidate: the data includes statistics and a comparison to other candidates' scores. Each item is being displayed on a separate screen both on the PC or notebook and the PDA. The screen is used for text, graphics and multimedia elements. The E-Quiz game engine loads the full game with all code to the local PC or PDA, so that the delivery of multimedia clips (video/audio) causes no delay. After the mouse click in the check box of the last question the elapsed time is being measured and transmitted to the server. Multimedia elements might include short videos, audio clips, pictures, graphics and short animations. The overall time span to successfully complete an E-Quiz game should be less than 15 minutes for an advanced user and less than 30 minutes for slower and not so well prepared candidates allowing for extra time to cognitively process the questions.

## **Intra-organisational situations favouring the usage of E-Quiz games**

Situation 1: How to motivate users to use shortcuts for faster interaction with a new smartphone?

If the IT department rolls out a new PDA generation, e.g. a smartphone such as the BlackBerry 8800, the following internal (i) and external (ii) processes have to be considered: (i) hardware replacement rules (minimum usage time for a PDA in years), criteria including: entitlement to a company owned PDA, individual customisation of the PDA directly related to the employee's job profile, individual PDA model and settings, documentation (serial number of the PDA, SIM/PIN/PUK-codes), documentation of server settings, configuration and documentation of gateways and access to certain applications, account management procedures, inventory procedures and (ii) providing a quick overview and a short training about the main functions, delivering the paper and electronic manual of the smartphone, offering remote help desk services and internal or external training courses. Following the delivery of all necessary steps, the users of the new smartphone will realise that they can optimise their work by using shortcuts instead of navigating into the deep menus of the graphical user interface of the smartphone. In this case an E-Quiz addressing the usage and implementation of shortcuts available on the new smartphone BlackBerry 8800 is a good-strategy to improve handling skills.

Situation 2: How to convince employees of the benefit of strategic planning utilising Balanced Scorecards?

In medium and large organisations and enterprises strategic planning is a necessity. The Balanced Scorecard (BSC) is a typical executive methodology to ensure the employee's active cooperation and support. In an E-Quiz game for executives the main concepts of the BSC as well as the main goals and actions of the business year are covered.

Situation 3: How to change telephony behaviour of the users following the introduction of a VOIP-gateway?

The IT department introduces a new voice-over-IP (VOIP)-gateway, which dramatically reduces the cost of international phone calls. Users have the choice to use POTS (plain old telephony system) or VOIP, which may have the disadvantage of lower quality. The best technical system does not save money if the user's behaviour does not change. So an E-Quiz game should help to convince users to reconsider their telephony behaviour.

## Architecture of the E-Quiz system

The following figure shows the main parts of the E-Quiz system including its Web 2.0 features.

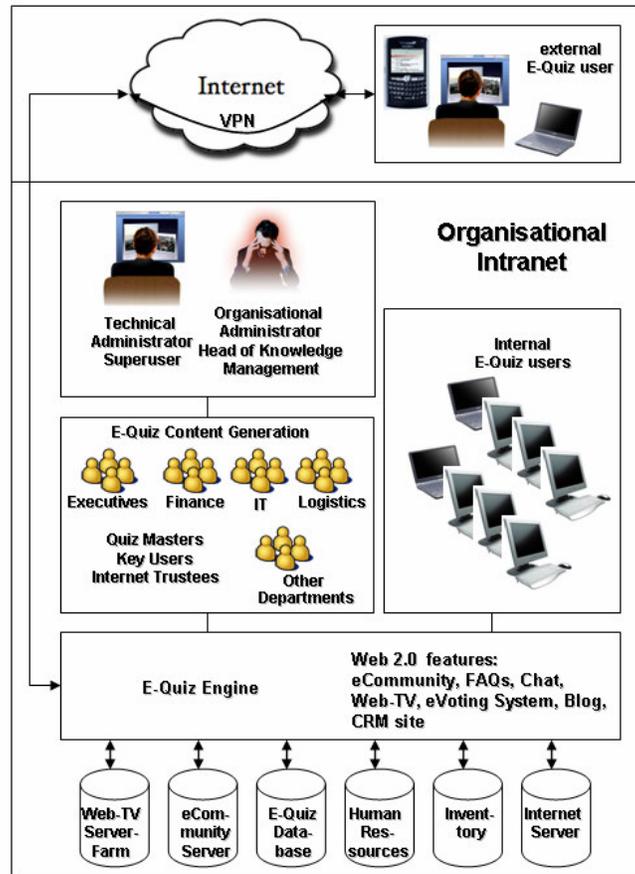


Figure 1

Several server and database systems are connected to the E-Quiz Engine. The Internet Information Server delivers the content to the user within the intranet and to the Internet using a VPN tunnel. If the user wants to be identified the human resources database is involved and evaluates the ID. The human resource database also helps to identify the right candidates according to their job profiles for a specific E-Quiz game. The inventory database is involved if a new hardware is introduced, e.g. a new PDA. The inventory database knows all details about hardware devices, software installations and all applications that are in use. A combination of the human resources database and the inventory database identifies the users with a new PDA. Jointly they assist in the selection of the right candidates. In the E-Quiz database the E-Quiz games of the quiz masters are stored with all tracked data. The eCommunity server provides an eCommunity system with a forum or newsgroup, a forum operator, frequently asked question lists, blogs and chat rooms. From the Web-TV server video clips and audio podcasts are downloaded to the PCs or notebooks and PDAs. The E-Quiz Engine pushes the E-Quiz content to the different devices, tracks user interaction, computes the results of the E-Quiz game and combines all elements within the knowledge management process. The quiz masters (key users or Internet trustees) define the E-Quiz games in cooperation with the knowledge manager. The administrator/superuser handles the user accounts, executes updates, tracks event data from the servers and manages

the stability of the system. In future releases the E-Quiz system will be extended into a multi-client system to host E-Quiz games for several organisations. Furthermore we plan the integration of set top boxes allowing the employee to play the E-Quiz at home on their TV sets.

## **Focus on PDAs and smartphones**

PDAs, PocketPCs and smartphones will be probably the Internet devices of tomorrow (see Lopez, 2007). The recent Internet history shows the decrease of the desktop-PC and notebook in terms of mass usage. In the year 1990 there were approximately 300.000 hosts and about 3 million users worldwide (see Internet Systems Consortium, 2007). The first GSM call was made by Radiolinja in Finland in 1991 (see GSM World, 2007). In 1995, the number of hosts had increased to about 5 million and 45 million users. In the same year around 10 million SIM cards for mobile phones were registered. In 2000, 72 million hosts along with 420 million users were online, but for the first time more GSM users than Internet users were counted (450 million subscribed SIM cards). In 2005, one billion Internet users were online on 318 million hosts, but 2.14 billion subscribed SIM cards for mobile phones were in use. In 2007, 443 million hosts for 1.115 million Internet users (see Internet World Stats, 2007) are estimated and 2.5 billion subscribed SIM cards for mobile phones. However, an increasing percentage of Internet enabled PDAs are registered. In 2010, 4 billion subscribed SIM cards for mobile phones including PDAs are expected (see Golem.de, 2006). Assuming a 3-5 year mobile phone replacement time span would mean that in about 2015 nearly all PDAs will fully operate as an Internet device.

Subsequently we expect the PDA to be the future edutainment and information management device with many tools for knowledge workers. Therefore the E-Quiz game is optimized for the PDA, which is directly and always connected to the intranet of the organisation or enterprise.

The first E-Quiz game prototype for PDAs has been released on a BlackBerry 8800 smartphone. The arguments to start with BlackBerry smartphones are: (i) its widespread use in professional medium and large organisations and enterprises, (ii) its simple integration with push-based access to email, calendar, contacts, task and notes; with instant messaging, web based and enterprise applications and (iii) its built-in security features, e.g. exchanging data over an encrypted tunnel to the BlackBerry Enterprise Server located inside the organisation or enterprise. The BlackBerry 8800 smartphone has a built-in GPS system for location based services, like geographical navigation, geographical search and geographical information systems. For practical daily use the BlackBerry 8800 smartphone offers EDGE-connectivity, 5 hours battery life for talk time and up to 22 days of standby time (which practically translates into a 2-3 day battery life time for a busy mobile user), a full QWERTY keyboard, a media player, a microSD expansion slot, speaker-independent voice dialing, a bright 2.4 inch, 65000-colors 320 x 240 QVGA display, miniUSB connectivity and good audio quality on the speakerphone. The media player supports various audio (MP3, WMA, AAC, AAC+, eAAC+, AMR-NB, and MIDI) and video formats (MPEG4, WMV, and H.263 files). In the future the E-Quiz game will be released for other PDAs, PocketPCs and smartphones if they support a browser oriented platform.

## **The E-Quiz game as a Tool within the Intra-organisational Web 2.0**

The intranet within an organisation or enterprise has developed into the most important infrastructure to deliver a suite of tools to improve productivity, which is more and more based on complex knowledge. Fast knowledge distribution in the age of Web 2.0 is no longer done statically by merely providing web sites with content (documents, video clips, audio messages, etc.) as a pick-up service but additionally utilizes more and more direct online communication via phone, softphone, email, messaging, chat, videoconferencing, etc. The combination of content design including user generated content (Web 2.0) and intelligent communication accelerates the whole process of knowledge dissemination. It is faster to talk directly to someone who knows the solution to a problem than to search for a solution which might not exist. But if interactive communication like phoning, messaging and chatting should be beneficial for groups and eCommunities, it is necessary to document the results of this communication. This methodology is implemented into the E-Quiz game. If E-Quiz candidates do not understand an item, they can easily call someone with the PDA via GSM or softphone on the PC or notebook, or can check online forums, or can use the messaging system. This allows the candidate to better understand the problem item in question. If, through web logging, comments, forum entries, FAQs, etc. the candidate generates beneficial content which might prove helpful to other candidates, the candidate gets rewarded with bonus points through an e-voting (polling) system. The more beneficial knowledge candidates provide for the community, the more bonus points they can accumulate. Providing solutions for others is a value: in this case the value to the organisation is transformed into a real benefit.

## **The E-Quiz game within the High Performance Workplace Concept**

The High Performance Workplace (HPW) is a new concept for a business community workplace, which combines the personal workplace with personal information, eCommunity features, knowledge components, and communication tools as well as strategic tools like the balanced scorecard, intellectual capital reporting and knowledge balance sheet. The HPW is designed as a technical and organisational tool for the knowledge worker as (in analogy) the car is for the taxi driver. The HPW consists of hardware, software and telecommunication infrastructure, e.g. desktop PC, notebook, PDA, smartphone, printer and scanner facilities, fast internet connectivity on a wired network, fast mobile internet connectivity with WLAN and UMTS HSDPA, VPN infrastructure, core applications like office software, email, internet browser, SAP finance and accounting software, CRM business software, VPN software, VOIP softphone, messaging and videoconferencing systems. The main clients for eCommunity features are the internet browser, email, a messaging client and a softphone. This makes the HPW into not only a technical cockpit but also into an infrastructure to collect information to support the eCommunity as well. The intranet is the main storage area for knowledge tools, eLearning, and collaborative computing. So it is necessary that the mobile knowledge worker has access to the intranet from outside over WLAN, UMTS/EDGE/HSDPA access and as a backup-solution also with modem using POTS and ISDN. Within this intranet the E-Quiz system is located. The E-Quiz game can be played locally from the desktop PC or notebook, or from outside the organisation or enterprise on the notebook using a VPN connection or on the PDA. The E-Quiz game is announced via email containing a link. The user can decide to participate or not. If users choose not to partake they are required to notify the system, otherwise an automatic daily reminder will be sent.

The HPW is an individually customised personal web portal. It is the default Intranet homepage for the employees containing lots of personal indices and embedded information. All this is displayed within a clear and user-friendly navigational structure. The employees have access to a variety of database entries of personal interest to the employees, e.g. human resource information about their presence time within the organisation or enterprise, all incoming and outgoing telephone calls to and from their extensions, all inventory allocated to those person (including all accounts, software packages installed, PDAs, notebooks, desktop PCs, etc.), personal and other employees' presence status, personal balanced scorecard goals and fulfilment rates, incoming and outgoing email statistics, projects overview, eCommunities overview and management, etc. In this personalised portal eLearning plays an important role. In the eLearning sub pages the E-Quiz site can be accessed, and personal and community statistics on E-Quiz games can be reviewed. E-Quiz games can be subscribed to and E-Learning sessions are being tracked according to learn- and understanding-tracking (see Astleitner and Schinagl, 2000).

## Short Overview of E-Quiz Systems

The E-Quiz concept is very similar to eAssessment and eCertification (see Schinagl, 2001). The difference between an assessment test and an E-Quiz game is a psychological one, because an assessment test is typically used after completing a learning unit for self assessment. Candidates of an assessment test should know which parts they understood and which parts require more learning effort. The E-Quiz game includes a variety of entertaining features, e.g. competition, rewarding structures, prizes, incentives, high score winner celebrations and even some real material benefits. E-Quiz games are becoming a new commercial trend in eGames, especially on game consoles. The Nintendo DS console game released in 2006: "How old is your brain?" is based on the work of neuroscientist Ryuta Kawashima from Japan's Tohoku University and utilises puzzles, arithmetic, sudoku, and quizzes for mind jogging; claiming that exercise games slow brain aging (see Freitas, 2006). "Big Brain Academy" is an extension of "How old is your brain?" and at this time is available for Nintendo DS and will be released for the Nintendo Wii platform in summer 2007. Brain games using E-Quiz games are a new trend on game consoles.

A well known authoring tool for E-Quiz games is the open source content management system Moodle (see Moodle, 2007). In Moodle, the quizzes use a variety of question types, e.g. multiple choice, true-false, and short answer questions.

Hosted Test (see Hosted Test, 2007) is based on application service providing (ASP) as a commercially hosted service. After having purchased an account subscribers can log in and author and administer their own tests, assessments and practice exams online.

Easy Quiz Authoring Tool (see Easyteach, 2007) is a simple authoring tool to create three kinds of quizzes: match questions and answers quizzes, (ii) type an answer quizzes, and (iii) multiple-choice quizzes.

ToolBook (see ToolBook, 2007) is one of the first content authoring tools for multimedia eLearning and offers a complete suite of multimedia applications for content authoring including quizzes.

The CASTLE toolkit (see Castle toolkit, 2007) from the University of Leicester is an online authoring tool to create interactive quizzes for use on the Web.

CQuest Assessment Software (see CQuest, 2007) is commercial software to create computerized assessment tests, exams or quizzes.

QuizYourFriends (see QuizYourFriends, 2007) is an easy authoring tool for quizzes on the Web.

Questionmark Perception (see Questionmark, 2007) is an assessment management system to author, schedule, deliver and report on surveys, quizzes, tests and exams.

QuizManager (see QuizManager, 2007) is a network-based multiple-choice quiz builder, runner, marker and reporter.

QuizSuite (see QuizSuite, 2007) consists of QuizMaster and QuizWhiz. QuizMaster is a multiple choice quiz authoring program. A tutor uses QuizMaster to create quizzes that are then taken by students using QuizWhiz.

Last but not least we point out three funny E-Quiz sites, which are worth checking out:

(i) Geek Quiz. Homepage: <http://www.coolquiz.com/life/geek/> - Online test to determine your Geek Quotient, registration required.

(ii) Lantenengo Quizzes. Homepage: <http://quizzes.lantenengo.com/> - Create a quiz to share with friends or try one of the ready-made ones. Registration required.

(iii) Whichisworse.com. Homepage: <http://whichisworse.com/> - Visitors can choose which the worst choice is and get the average result of choices from all visitors.

## Conclusion

The E-Quiz game has been developed to be integrated into a whole suite of knowledge management applications. It is an integral part within the High Performance Workplace (HPW) concept. The overall goal is to motivate employees to faster adopt and also adapt too to new technologies, applications and services. The E-Quiz games are authored by the key users or Internet trustees in the departments and users' feedback should create an eCommunity activity. The E-Quiz games are primarily intended to be played quickly on PDAs/smartphones. PDAs are Internet and communication devices, so employees should also (re)learn to use communication to swiftly solve problems.

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