

**Lifelong Learning Programme 2007-2013
LEONARDO DA VINCI, Transfer of Innovation**

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**Supporting system for nonformal and informal learning
for low-skilled workers**

IT System of Monitoring and Evaluation of Employees' Competencies

USER GUIDE

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Professional competence level evaluation in work and education environment

Professional competence level evaluation system describes a set of conventional methods and IT tools to identify the needs for professional development of workers through determining competence gaps which result from changes in job requirements. Competences are defined as comprehensive skills and psychophysical features of a worker, enabling the successful completions of tasks in certain situations, with the use of qualifications obtained in a formal, nonformal and informal education.

The information system created is solutions which has the ability to aggregate, process and analyze competence requirements for any profession functioning on the market. It should be noted that on the market there are no such solutions which, on the one hand, are a database of vocational tasks, skills and competences required in the real working environment, on the other give the ability to interact with workers' actual skills. This is particularly important for knowledge management in a company, including the planning and development of education and vocational training programmes.

Economy based on knowledge and contemporary labour market need instruments to promote the development of human resources. Such support can be designed competence evaluation system, which provides innovative management tool for support and development of human resources in a company.

Our computer system follows in the idea of the European Qualifications Framework (EQF) in learning throughout entire life, which constitutes a new way of understanding qualifications across Europe and a reference point for creating transparent qualifications structures in each country. Computer tool developed also refers to the National Standards of Professional Qualifications and National Qualifications System. In Poland currently there are no such solutions which, on the one hand, are a database of vocational tasks, skills and competences required in the real working environment, on the other give the ability to interact with workers' actual skills and competence in order to create the plans and programmes vocational training and retraining workers.

The results achieved as a result of this task's completion are in accordance with the National Strategy for Lifelong Learning, and in particular:

- they encourage companies in the field of vocational development of personnel by evaluating qualifications and competences of workers, in correlation with the requirements work stations,
- they allow employees (and candidates) to judge the relative value of qualifications and competences using descriptions of vocational qualifications and standards and IT tools supporting these processes,
- make it possible for organizers of vocational training courses to create offers in correlation with the requirements of economy's demand for new skills, qualifications and competences.

On the basis of most commonly used methods and research tools in the process of vocational competence diagnosis an in-depth analysis of them has been made and they have been evaluated from these points of view:

- a worker having a particular education and vocational qualifications,
- a group of workers (e.g. managers, mechanics, operators, etc.);
- a company, as an organization operating in a specific field.

The following criteria have also been taken into account:

- costs of applying the method,

- easy procedural mechanism linked to the implementation of the method,
- ease of use for various types of users (specificity of industry or sectors of industry),
- adjustment to the needs and expectations of potential customers and shifting demands of the economy.

The object of analysis were, among others, such methods and tools such as: direct interview, gathering opinion of specialists from particular professions (e.g. master in the profession, distinguished specialist, expert etc.), focused interview, a survey using methodology of designing standards of vocational qualifications, expertise method, method of functional and task analysis, method of forecasting trends in the profession, sociometric techniques (sociogram, participating observation), analysis of work effects, professional suitability tests, analysis of secondary sources of information (press industry, promotional materials, folders, reports, results of analyses, studies, reports), observation of work processes (e.g. "the photograph of the working day"), case study, diagnostic sheet and others.

It should be noted that relevant selection of methods and tools is extremely important in order to achieve adequate and appropriate to the requirements the working environment results determining workers' competency gaps and their proper transfer in order to create an opportunity to improve the competence of specialists for an innovative economy.

The results of analyses, carried out in the form of methods description and proven research tools, have been transformed to the computer system (Picture 1), which makes it possible to evaluate vocational competences, including monitoring and evaluating a workers' competence level.

The screenshot shows the homepage of a web-based system for monitoring and evaluating employee competences. At the top, there is a header with the text 'Long term programme PW-004 SP-5 IMPROVEMENT OF INNOVATION SYSTEMS IN MANUFACTURING AND EXPLOITATION IN YEARS 2004-2008'. Below this, there is a login section with fields for 'Login:' and 'Password:' and a 'Sign in' button. To the right of the login section, there are logos for 'INNOVATIVE ECONOMY NATIONAL GROWTH STRATEGY' and the 'EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND'. A large banner image shows a person's hands holding a mobile device in an industrial environment, with the text 'Monitoring and evaluation system of employees' competences' overlaid. Below the banner, there is a 'Main Page' section with a paragraph of text: 'We present you with a computerised system as a tool for monitoring and evaluation of the qualification requirements for employees, which was created within the framework of the Long Term Programme PW-004, Task SP-5 "Development of vocational improvement within advanced manufacturing and operation technologies". The Institute of Sustainable Technologies - National Research Institute in Radom is the main executor and coordinator of the programme. The developed information system is related to the European Qualifications Framework that is a new way to interpret qualifications in the whole Europe and it is a point of reference to the development of transparent qualifications structures in every country. The IT system refers also to National Vocational Qualification Standards and National Qualification System.' Below this text, there is another paragraph: 'The system was modified within the scope of the project "Advanced industrial and ecological technologies for the sustainable development of the country" in the task - "Qualifications and competences in the field of advanced industrial technologies" which was being conducted in 2009-2011 in the Innovative Economy Operational Programme Priority 1 - Research and development of new technologies, Action 1.1 - Support for scientific research for building knowledge-based economy.' On the left side, there is a vertical navigation menu with the following items: 'MAIN PAGE', 'Competence monitoring', 'Competence evaluation', 'Competence search', 'Competence database', 'Institutions database', 'Experts database', 'Knowledge database', 'Methods and research tools', 'Links', 'Help', 'Info', 'News', and '- Interior Drywall Systems Fitter'. At the bottom of the page, there is a footer with the text 'Instytut Technologii Eksploatacji - Państwowy Instytut Badawczy w Radomiu, Copyright © ITeE, 2008-2011'.

Picture.1. System of Monitoring and Evaluation of Employees Competence (Home)

The system of competence diagnosing for the needs of the economy enables monitoring requirements to the competence of workers and to identify training needs in high-opportunity professions and advanced technologies, including school professions under the department of economy.

The system on the one hand is a knowledge base of tasks, professional skills and psychophysical characteristics required in the real working environment, on the other hand it gives the ability to interact with the actual skills and competence in order to create development plans and programmes for vocational training and retraining of workers.

The computer system gives the possibility of testing (evaluating) their workers' competence levels and of generating reports setting out training needs, with focus on improving performance in specific tasks, professional skills and the evolution of psychophysical characteristics with which they have difficulties at that particular moment.

The tool for identifying training needs of an employee is a questionnaire survey, which is available for users as two options:

- Summary (then the competence testing process is open for viewing for all users, only in the area of professional tasks required in the profession). In this case the result only gives an overall view of the competence level of the person making the competence self-evaluation. In addition, users that are not logged in are able to access the data with the possibility of printing the catalogue of competence levels in the profession;
- Expanded (the process of testing the competence level is available for registered users and applies to all three ingredients of competence, i.e.: vocational tasks, skills and psychophysical attributes). In this case we get an enhanced result of testing the competence levels and more precise definition of the employee's training needs.

Designed system guarantees:

- Collecting and updating the information (knowledge) of the requirements of professional competence in professions operating in the economy, with the stress on the concentration on vocational tasks, professional skills, and psychophysical attributes characteristic for the profession. At the stage of building a prototype of a computer system there is data embedded in the database, particularly for professions: mechanical, construction, electrical and electronic and computer,
- It allows workers (and candidates) to evaluate the relative value of qualifications and competences, improves the capabilities of employers in the area of professional development of staff through an assessment of employees qualifications, in correlation with the requirements work stations,
- It allows educational and training facilities to compare their own offers with the requirements of the economy needs in terms of qualifications and competences.
- Generating reports from the tests and recording users logging in to the system

The main characteristics of the application in terms of solutions implemented are as follows:

- In the functional characteristics:
 - Modular architecture of the application, which should allow its possible further development,
 - The minimum requirements for software operating in the user's system,

- The ability to access to the database at any time and from any place regardless of the operating system and network configuration in the user's workstations,
- In the field of IT tools:
 - The implementation of MySQL standard as a platform of managing relation databases,
 - Usage of PHP language for the implementation of aforementioned IT system,
 - Usage of Smarty templates object-oriented library. The Smarty system is characterized by a high degree of efficiency thanks to compiling templates to PHP scripts, as well as built-in buffer system

For the design of user interface of the applications, there have been adopted following principles:

- 1 Access at any time and from any place through a web browser without the need for additional software in user's workstations.
- 2 Independence from the user's operating system - the access to the database does not change if the user is operating a PC+MS Windows computer, Unix workstation or a Macintosh
- 3 Dynamic web page generation according to user's demands
- 4 Application of the HTTP protocol as a platform for data transmission to or from the database.
- 5 Ensuring scalability due to the fact that Internet applications serve a much higher populations of end users than client/server applications. Internet applications must run a greater number of connections, which forces bigger scalability, productivity, capacity and data management
- 6 Placing the application on a central server in order to reduce the costs of operating, improve the application's module management, optimise network and internet services running on the server.
- 7 Applying the standards enabling the expansion of the application (adding new components), easy interface maintenance. Usage of proven technologies in the application, which are constantly being improved, should ensure eventual development of the application without the need of making it from the beginning.
- 8 We ensure data security at levels:
 - Database server,
 - Access to database as a result of procedures of coding and verification of user passwords.

Based on assumptions used it has been suggested to use an application consisting of a MySQL central database, to implement which there was a PHP script language used, along with Smarty templates object-based library. Remote access to resources database is provided by HTTP protocol designed for the world wide web. In the area of hardware solutions the system components are: a computer with APACHE software preinstalled, along with PHP script language support ver. 5 and MySQL relation database management system.

Information about the IT system

Because of its nature the database is located on the internet server at www.diagnozowaniekompetencji.pl. The database application is available for all users through an internet browser from a PC computer connected to the network Internet.
<http://www.diagnozowaniekompetencji.pl/>

System users

In the design of the computer system users are divided into four categories, which have been granted separate access levels:

- The database administrator, which creates and manages the structure and objects of the database, has the authority to create new industries, professions, manages the structure of surveys and system users as well as their rules of operation.
- Database operators, whose task is to cooperate with the database using applications which enable data input and update regarding qualification requirements for the professions.

The administrator designates a group of surveys in making of which a particular operator will take part. The operator will make suggestions regarding new questions that he thinks should be included in a survey and identify weighting factor for each of the questions. After counting all votes operators give to the all the questions test, there will be obtained final weight of the question. If the resultant weight is greater than the threshold weight designated by the administrator the question will automatically be included in the survey and will become visible for all users of as a component of a survey used in testing.

- Database users are fully authorized to do surveys based on full, final, approved by the operators and Administrator questions and receive detailed test results regarding their competence in the profession concerned.
- Users not logged in, have limited access to the questionnaires using which they may do the tests. They receive limited testing results.

Basic system functions

System users

New submission

For the user of the system it is necessary to create an account identifiable with unique login and password. A person who is interested in obtaining an account from the administrator with the appropriate level of authority is forced to complete the form from the section Competence monitoring:



Figure 1: menu applications - competence monitoring

The form should be filled with a detailed info on an *institution/expert*:

FORM

Institution application to the Employees' Competence Monitoring Team (all fields must be filled in)

User type: Expert Institution

Name of the institution:

REGON of the institution:

Abbreviated name:

Province:

City:

Street:

Suite number:

Postal Code:

Phone:

Fax:

WWW:

Figure 2: Form - competence monitoring

If all the required data is not included in the form, a notification will appear . Its content will indicate which fields have not been filled.

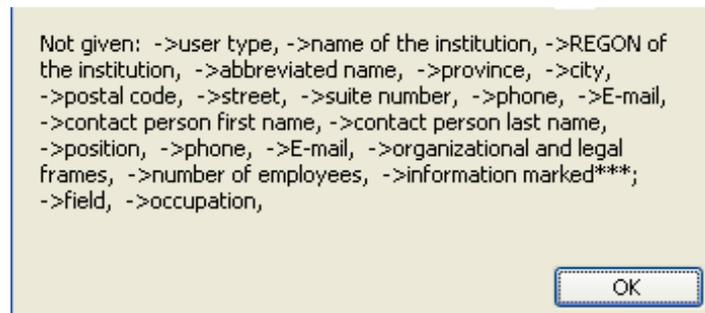


Figure 3: the notification about boxes not having been filled in the form

After all the necessary data is provided, there will be a notification that the operation has been carried out successfully:



Figure 4: The notification regarding successful form submission.

After the application form is sent by the user, the administrator receives a notification about this via email.

Surveys

Competence evaluation

Phases of survey processing

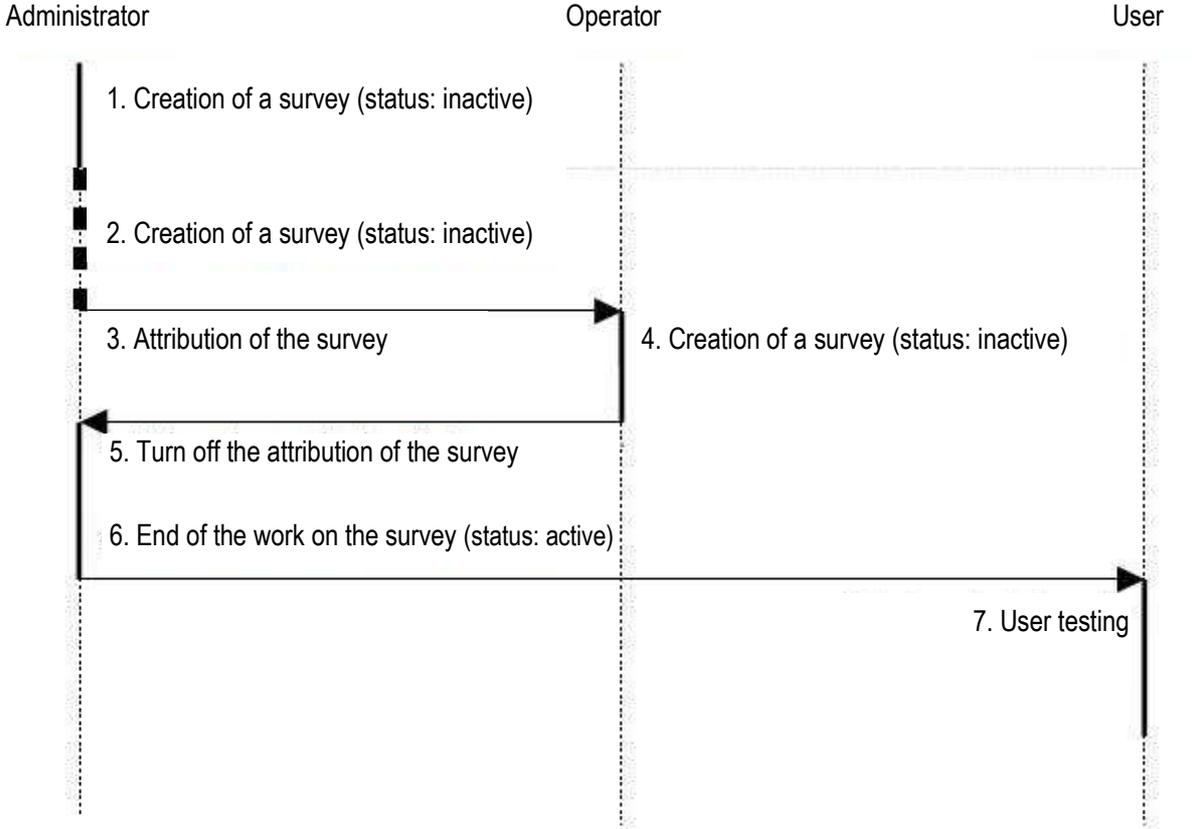


Figure 5: Phases of survey processing

Logged user is the final recipient of the surveys. When the system administrator marks a survey as "active", it joins the pool of surveys from which the users may pick to evaluate their competence level.

To proceed with testing, select this tab from a particular occupation: Competence testing.

Then, a list of surveys will appear. The list consists of surveys that *Operators and Administrators* have finished working on and their status has been changed to active (status: active).



Figure 6: Competence testing tab



Figure 7: Competence testing tab content

After selecting a profession's name (as displayed on *fig. 7*), the structure of the survey will be shown *figure 8*.

How can you perform the following occupational tasks – assess

No.	Occupational task	Very well	Well	Fairly well	Not well	Not at all
		5	4	3	2	1
A Technological tasks						
A-1	Identifying materials used in interior drywall systems	<input type="radio"/>				
A-2	Installation of partition wall systems	<input type="radio"/>				
A-3	Installation of wall facing systems	<input type="radio"/>				
A-4	Installation of dropped ceiling systems	<input type="radio"/>				
A-5	Installation of roof lining systems	<input type="radio"/>				
A-6	Installation of dry screed systems	<input type="radio"/>				
B Organizational tasks						
C Managing and cooperation tasks						
D Quality control and assessment tasks						
<input type="button" value="Check competences"/>						

Figure 8: Survey structure.

The user that logged in has the ability to complete the survey in its entirety. It has full access to vocational tasks, psychophysical attributes and skills. During the test it is not required to answer all the questions. Questions not answered will be treated as those with the lowest value answer possible, corresponding to "Not at all". Upon clicking "Check competence level" the user will receive a detailed report regarding their competence level.

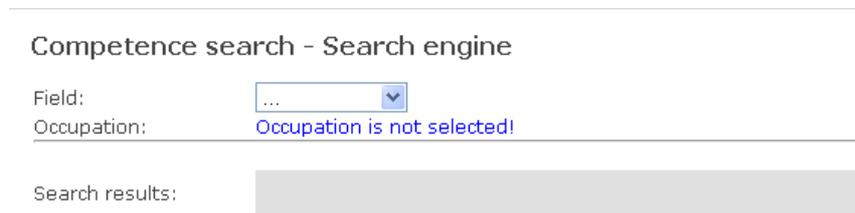
A user with no ability to log in can only do surveys regarding vocational tasks and will have to answer all the question to be verified.

4	Accuracy	<input type="radio"/>				
5	Self-control	<input type="radio"/>				
6	Ease of switching from one activity to another	<input type="radio"/>				
Sensory and motor skill						
1	Visual acuity	<input type="radio"/>				
2	Distinguishing colours	<input type="radio"/>				
3	Binocular vision	<input type="radio"/>				
4	Sense of balance	<input type="radio"/>				
5	Eye-hand coordination	<input type="radio"/>				
6	Quick reflexes	<input type="radio"/>				
7	Dexterity of hands	<input type="radio"/>				
8	No fear of height	<input type="radio"/>				
<input type="button" value="Check competences"/>						

Figure 9: Check competence level button.

Competence search

The search engine allows to search for surveys regarding particular professions in order to test competence level.



Competence search - Search engine

Field: ...

Occupation: Occupation is not selected!

Search results:

Figure 10: Search form.

For the survey to appear in search results, industry branches must be selected from above form. After selecting industry there will be displayed a list of professions which are a part of the industry. After selecting profession there will be displayed a survey. Clicking on a survey causes that survey to be displayed.

Testing/evaluating competence level

General Information

Competence evaluation is a process of evaluating (valuing) real competence level of an employee (or a candidate) in correlation with the competence level required in a given occupation, determined by vocational qualifications standards. Access to these competences is possible from the "Competence catalogue" tab. Computer system provides the opportunity to test (evaluate) employees' competence levels and generate reports containing training requirements focused on improving the performance within particular vocational tasks, skills as well as on forming specific mental and physical attributes that are particularly difficult for a self-evaluating employee.

The tool that enables the identification of training requirements is the self-evaluation questionnaire which is offered to the employees in two variations:

- Short (competence testing is widely available to all non-registered users, regarding only vocational tasks required in the occupation). This method only gives general information about the competence level of the self-evaluating person.
- Full (competence testing process is available to registered users and covers all three competence components: vocational tasks, skills and mental and physical attributes). This method gives better results of competence testing and a better assessment of training needs of an employee.

The system sums up the score based on the choices made by the person performing the test in a scale from 0 to 5.

Maximum possible score is 100% which means that the self-evaluating person has selected "5 - very well" in all the questions. According to the score there are six levels of competence:

- 1) 95-100%-You are very competent, you need not currently complement qualifications (provided that there was no evaluation of "0").
- 2) 90-94%-You are competent, but you must seek to perfection (provided that there was no evaluation of "0").
- 3) 85-89% - You are still competent, but you should arrange qualification improvement (as long as there were no "0"s selected).
- 4) 80-84% - You are about to become incompetent and should arrange qualification supplementation ("0" is acceptable).
- 5) 75-79% Your competences are on a critical level, you should supplement your qualifications immediately ("0" is acceptable)
- 6) Below 75% - You are incompetent and should supplement your qualifications immediately ("0" is acceptable.) Please check which skills and attributes you should improve.

Competence Monitoring

General Information

Competence monitoring is about performing regular reviews and updates of vocational tasks, mental and physical skills and attributes for each of the occupations included in the database. The process is executed in cooperation with employers, experts in various fields, discipline-specific organizations and science entities.

The main requirement for participating in such enterprises is a declaration made by an expert/institution of contribution in creating and updating vocational requirements for occupations and specialities that are in the scope of attention within certain field.

Any institutions interested in improving competences that are the main component of vocational qualifications standards as well as being a part of Employees' Competence Monitoring Team (ECMT) are required to fill in the attached form.

The system administrator will verify the data sent via internet and via mail. Then he will assign the Institution to appropriate ECMTs after a successful verification.

Consequently, the Institution will receive its unique login and password with which it will be able to participate in competence monitoring sessions and gain free access to the database resources.

Competence database

General Information

The competence database is a catalogue of the whole competence database. In it there is all the information regarding particular professions - tasks, skills and attributes - arranged in clear and intuitive tables.

VOCATIONAL TASKS CATALOGUE

No.	Category of the task
A Technological tasks	
A-1	Identifying materials used in interior drywall systems
A-2	Installation of partition wall systems
A-3	Installation of wall facing systems
A-4	Installation of dropped ceiling systems
A-5	Installation of roof lining systems
A-6	Installation of dry screed systems
B Organizational tasks	
C Managing and cooperation tasks	
D Quality control and assessment tasks	

Figure 11: Survey structure

No.	Sector/occupation scope	Occupation name
1	Construction	Interior Drywall Systems Fitter

Figure 12: Survey list

To access all the data regarding a particular profession, select one from the list that appears in the Competence Catalogue tab.

Institutions database

General Information

In this tab there is information about all the institutions and companies involved in the process of making this database. After clicking Institutions Database, a list of institutions will appear. To see detailed info on a company, click the selected element.

Institutions registered in the database:

No.	Institution	User
1.	Institut Technologii Eksploatacji - Państwowy Instytut Badawczy w Radomiu	Krzysztof Symela
2.	Krajowa Izba Gospodarcza Elektroniki i Telekomunikacji	Krzysztof Chełpiński
3.	Stowarzyszenie Elektryków Polskich - Oddział w Radomiu	Jacek Szydłowski
4.	Copy Con Sp. z o.o.	Piotr Czajkowski
5.	Amazis Sp. z o.o.	Arkadiusz Rotuski
6.	Warnet II	Norbert Pobereszko

Figure 13: List of institutions

Experts Database

General Information

In this tab there is information about all the experts involved in the process of making this database. After clicking Experts Database, a list of experts will appear. To see detailed info on an expert, click the selected element.

Experts registered in the database:

No.	Institution	User
1.	Institut Technologii Eksploatacji - Państwowy Instytut Badawczy	Jarosław Sitek

Figure 14: List of experts registered in the database

Knowledge database

General Information

This module aggregates knowledge (in the forms of articles) in the field of improving qualifications and competence of the employees.

Knowledge database

This module gathers knowledge (in the forms of articles) in the field of improving qualifications and competence of the employees.

[Classification of occupations and specialities for the needs of job market](#)

2008-09-18 16:20:00

is designed to unify the terminology of occupations and specialities present on the job market, to plan the job market maintenance and to determine its occupational structure (The ordinance of the Minister of Labour and Social Policy of 8 December, 1997 regarding the classification of occupations and specialities for the needs of job market and its spectrum of usage, as of 8 December 2004)

[more](#)

[National vocational qualifications standards](#)

2008-09-18 16:19:26

A norm accepted by employers' representatives, employees and other key social partners participating in the economy and job market regarding minimum qualifications, divided into five levels of qualification and according to typical job positions or vocational tasks, as well as four kinds of qualifications

[more](#)

[Competence](#)

2008-09-18 16:19:04

Proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development

[more](#)

[Mental and physical attributes](#)

2008-09-18 16:18:43

Individual (personal) attributes of employees performing particular tasks. These are: sensomotoric dexterity, skills, personality traits. Sensomotoric dexterity means well-developed skills or habits of performing sensor-motor moves as well as talents in performing them

[more](#)

After clicking the "Knowledge database" tab all knowledge collections will be displayed. There is always a title of a given collection displayed, along with a date and the beginning of the collection. After clicking "more" the user is presented with the entire knowledge collection..

Research Tools

General Information

This module aggregates research tools (in the form of articles) connected with improving qualifications and competence of the employees.

[1914 translation by H. Rackham](#)

2008-10-10 12:01:29

But I must explain to you how all this mistaken idea of denouncing pleasure and praising pain was born and I will give you a complete account of the system, and expound the actual teachings of the great explorer of the truth, the master-builder of human happiness. No one rejects, dislikes, or avoids pleasure itself, because it is pleasure, but because those who do not know how to pursue pleasure rationally encounter consequences that are extremely painful. Nor again is there anyone who loves or pursues or desires to obtain pain of itself, because it is pain, but because occasionally circumstances occur in which toil and pain can procure him some great pleasure. To take a trivial example, which of us ever undertakes laborious physical exercise, except to obtain some advantage from it? But who has any right to find fault with a man who chooses to enjoy a pleasure that has no annoying consequences, or one who avoids a pain that produces no resultant pleasure?

[File to download »](#)

The tools are presented in the form of articles with following components: title, date of submission, full text in editor and a downloadable file. Download link is available only to logged users.

Links

General Information

This section contains links to websites on similar topics and to institutions connected with this project.

Help

General Information

On the help pages there are Frequently Asked Questions along with answers to them

Info

General Information

Here can be found the most important information regarding the projects creators, as well as a way of communicating with them via an online form.

News

General Information

In the News tab there are most recent news published regarding events around the project and the database. News items are displayed in the form of articles. Upon clicking "more" the entire content is displayed.