



UNITED
NATIONS
INDUSTRIAL
DEVELOPMENT
ORGANIZATION

August 2012
ENGLISH

Eighteenth Session of the
LEATHER AND LEATHER PRODUCTS INDUSTRY PANEL
Shanghai, Peoples Republic of China 1-5 September 2012

e-Learning **in the Leather-based Industries^{*}**

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^{*}This document has been edited. The views presented are not necessarily shared by UNIDO.

Table of Content

Explanatory Notes	3
INTRODUCTION	5
TERMINOLOGY	6
Knowledge	6
Information.....	7
Data	8
Skill	8
Experience.....	9
Learning	9
Teach[ing]	10
Training.....	11
THE LEARNING PROCESS.....	12
The learning framework.....	12
Learning theories.....	13
The learning domain	13
The learning cycle.....	13
Learning styles	14
Learning efficiency	15
Lifelong learning.....	15
DEVELOPMENT OF LEARNING AND TRAINING.....	17
Traditional learning/training practice.....	17
New tools	18
Online learning.....	19
Learning contents	20
THE e-Learning TECHNOLOGY	22
The e-Learning context	22
The e-Learning environment.....	23
Learning content development.....	25
Learning management systems	29
Benefits of e-Learning	31
e-Learning APPLICATIONS IN LEATHER-BASED TRAINING	33
Footwear e-Learning projects	33
Conversion of traditional training materials	35
e-Learning of footwear pattern engineering.....	40
RECOMMENDATIONS.....	42

Appendix

Sample handout/outline: mens Oxford shoe pattern engineering



Explanatory Notes

CAD	computer-aided design
CAM	computer-aided manufacturing
CBL	computer-based learning
CD[-ROM]	compact disk [read-only memory]
CAI	computer-assisted instruction
CIM	computer-integrated manufacturing
ČOKA	ČESKÁ OBUVNICKÁ A KOŽEDELNÁ ASOCIACE (Zlin/Czech Republic)
CSCL	computer-supported collaborative learning
CTIC	CENTRO TECNOLÓGICO DAS INDUSTRIAS DO COURO (Alcanena/Portugal)
DVD	digital versatile/video disc
ECEB	EUROPEAN CENTRAL BANK
EU	European Union
FTP	file transfer protocol
GMP	good manufacturing practice
GPL	general public license
HRD	human resource development
HTML	hypertext markup language
IBL	internet-based learning
IBT	internet-based training
ICT	information and computer technology
LCDS	learning content development system
LCMS	learning content management system
LLL	lifelong learning
LMS	learning management system
LP	UNIDO Leather and Leather Products Industry Panel (<i>in short</i> : Leather Panel)
LPM	UNIDO Leather and Leather Products Industry Panel meeting (<i>in short</i> : Leather Panel meeting)
NB	<i>nota bene</i> (remark)
OJT	on-the-job training
OSH	occupational safety and health
PC	personal computer
PDA	personal digital assistant
PDF	portable document format
PISIE	POLITECNICO INTERNAZIONALE PER LO SVILUPPO INDUSTRIALE ED ECONOMICO
QA	quality assurance
R&D	research and development
SaaS	software as a service
SCORM	shareable content object reference model
SQL	structured query language
UK	United Kingdom (of Great Britain and Northern Ireland)
UN	UNITED NATIONS ORGANIZATION
UNIDO	UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
USA	United States of America
VET	vocational education and training

VoIP	voice over Internet protocol
vs.	<i>versus</i> (against, in opposition to)
WBL	web-based learning
WBT	web-based training
[W]LAN	[wireless] local area network
WWW	world-wide web
ZKOP	ZVÄZ KOŽIARSKÉHO A OBUVNÍCKÉHO PRIEMYSLU SLOVENSKEJ REPUBLIKY (Bratislava/Slovakia)
~ or ≈	approximately
©	copyright
®	registered trade mark
€ or EUR or Euro	the monetary unit of the EUROPEAN UNION
US\$ or USD	United States dollar
	1.00 € = US\$ 1.23 or US\$ 1.00 = 0.81 € (20 August 2012 – www.ecb.int)

Mention of firms or brands does not mean endorsement of UNIDO.

INTRODUCTION

Professional education and training in the leather and derived products industries were on the agenda of the 13th session of the *UNIDO Leather and Leather Products Industry Panel* (Bologna, 1997), as well as of the 17th session (Addis Ababa, 2010). Rapid development in the educational technology, growing needs for self- and distant learning and the challenge of reducing professional education and training costs called for the compilation of the present paper.

UNIDO has always been committed to professional training as most of its technical assistance projects included study tours, fellowship and group training activities. Moreover, quite some of such projects were concerned with establishing, upgrading or assisting institutions dealing primarily or partially (e.g. R&D) with professional education and/or training in the footwear trade. The methodology of constructing shoe uppers and linings (components) practically remained unchanged in the past three decades and constitutes the technical knowledge required even when modern CAD/CAM/CIM technology is dominating design and product development practice in both industrialized and developing countries.

One of the practical efforts was the creation of a complete training package (instructors' and trainee's guidelines, diaspikes, transparencies for overhead projectors, drawings and diagrams in real size for ten basic shoe styles) prepared by the POLITECNICO INTERNAZIONALE PER LO SVILUPPO INDUSTRIALE ED ECONOMICO (PISIE).¹ 90 such kits (in English, French and Spanish) were distributed to educational, training and developmental institutions or trade associations, 60 instructors participated in two week seminars in which an Italian designer explained the content of training the training sets and demonstrated practical processes of developing shoe upper patterns.

The recently launched UNIDO INSTITUTE FOR CAPACITY BUILDING intends to offer training on key issues relating to sustainable industrial development and will serve as a catalyst for innovative solutions, ideas and partnerships.² It will serve as a „virtual resource centre” for developing countries and countries with economies in transition. Though exact (legal, technical, financial) modalities and conditions of operating this new UNIDO facility are being formulated it may well be a depository for professional training materials – with special references to electronically accessible courses – that can be used worldwide.

The **objective** of the present study is to analyze the actual scenario of using modern (non-traditional, beyond the textbook and classroom based) training methods and related tools. Special attention is paid to the new UNIDO effort in building a library of electronic training materials for the leather, footwear and other leather products industries. As the first attempt the PISIE footwear pattern engineering training kit transferred into e-Learning tools are presented in order to demonstrate capabilities and the potential of this technology.

¹ UNIDO obtained the full right for utilizing and distributing these packages, whereas final beneficiaries (institutes in developing countries) had (and still have) the right to use this tool in their activities without any limitations.

² [http://www.unido.org/index.php?id=7881&tx_ttnews\[tt_news\]=955&cHash=0521b044ecc2c1284abe987f6d901738](http://www.unido.org/index.php?id=7881&tx_ttnews[tt_news]=955&cHash=0521b044ecc2c1284abe987f6d901738)



TERMINOLOGY

Knowledge

The term **knowledge** has several definitions – the most adequate to the subject of this study are the following:

- the fact or condition of having *information* or of being *learned* [www.merriam-webster.com/dictionary/knowledge];
- familiarity, awareness, or understanding gained through experience or study; the sum or range of what has been perceived, discovered, or *learned*; specific *information* about something [www.thefreedictionary.com/knowledge];
- acquaintance with facts, truths, or principles, as from study or investigation; general erudition; familiarity or conversance, as with a particular subject or branch of *learning*; acquaintance or familiarity gained by sight, *experience*, or report [<http://dictionary.reference.com/browse/knowledge>];
- familiarity with someone or something, which can include fact, *information*, descriptions or *skills* acquired through *experience* or *education* [<http://en.wikipedia.org/wiki/Knowledge>];
- facts, *information*, and *skills* acquired through *experience* or *education*; the theoretical or practical understanding of a subject; awareness or familiarity gained by *experience* of a fact or situation [<http://oxforddictionaries.com/definition/english/knowledge>];
- human faculty resulting from interpreted *information*; understanding that germinates from combination of data, *experience*, and individual interpretation [www.businessdictionary.com/definition/knowledge.html];
- a fluid mix of framed *experience*, contextual *information*, values and expert insight that provides a framework for evaluating and incorporating new *experiences* and *information* [Dav-enport, T., Prusak, L. (1998): Working Knowledge. HARVARD BUSINESS SCHOOL PRESS: Boston, MA];
- *information* that changes something or somebody – either by becoming grounds for actions, or by making an individual (or an institution) capable of different or more effective action [Peter F. Drucker in The New Realities].

The common denominators of all above (and the overwhelming majority of other) definitions are *information*. Skills may be regarded as a specific (mostly understood as practical) forms of the knowledge. Another important aspects are *learning* and *experience*: in a simplified interpretation they are processes of acquiring the knowledge.

Knowledge is not born with the individual: it is acquired by the person through her/his life (period) – consciously or unconsciously. The unconscious knowledge is developed by experience, i.e. just because things are happening around the individual and they are felt (watched, heard, touched, smelled, tasted or body position/balance) – even though passively. The conscious knowledge development is in fact *learning* (see below) as it is intentional and/or involves active participation of the subject. *Education* will be used in this study as institutional and organized systems for generating knowledge and/or skills.

The functional position of knowledge in relation with its content and understanding is demonstrated on **Fig. 1** below.

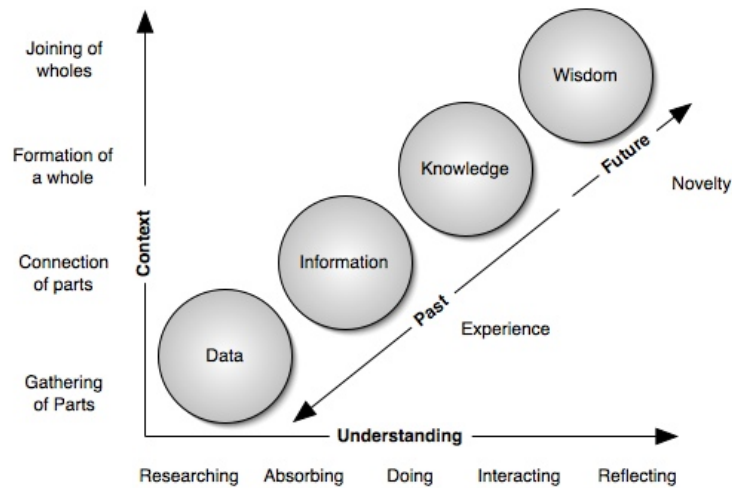


Fig. 1

Place of knowledge in understanding and its content.

The knowledge typology chart (**Fig. 2**) demonstrates its main components (information, tacit and explicit knowledge) and how it can be converted into useful tools – both for the society (company, country etc.) and the single human being.

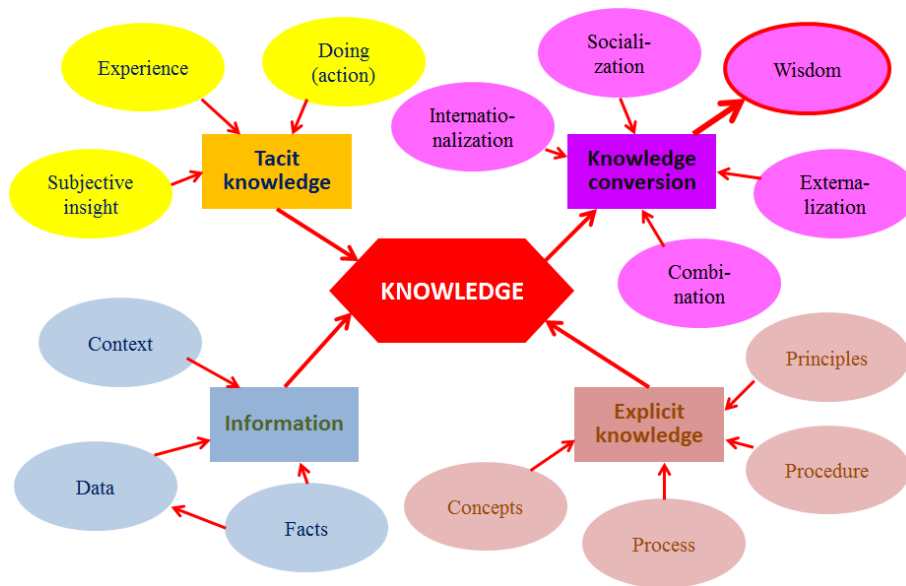


Fig. 2

Knowledge typology chart.

Information

Knowledge and information are almost the same. However, following definitions reveal the differences and similarities of these two domains. So **information** is

- knowledge *communicated* or received concerning a particular fact or circumstance; knowledge gained through study, communication, research, instruction, etc.; factual data [<http://dictionary.reference.com/browse/information>];
- knowledge of specific events or situations that has been gathered or received by *communication*; intelligence or news [www.thefreedictionary.com/information];
- data that (i) has been verified to be accurate and timely, (ii) is specific and organized for a purpose, (iii) is presented within a context that gives it meaning and relevance, and (iv) that can lead to an increase in understanding and decrease in uncertainty [www.businessdictionary.com/definition/information.html];
- facts provided or *learned* about something or someone; what is *conveyed* or represented by a particular arrangement or sequence of things [<http://oxforddictionaries.com/definition/english/information>];
- *message* (utterance or expression) being *conveyed*; a sequence of symbols that can be interpreted as a message [<http://en.wikipedia.org/wiki/Information>].

From these definitions it is clear that information is closely associated with *communication*, i.e. *conveying* knowledge.

Data

Knowledge and information are set of real and imaginary things – they may be valid (verified, proven) and assumptions. **Data** are

- factual *information*, especially information organized for analysis or used to reason or make decisions [www.thefreedictionary.com/data];
- individual facts, statistics, or items of *information*; a body of facts [<http://dictionary.reference.com/browse/data>];
- acts and statistics collected together for reference or analysis [<http://oxforddictionaries.com/definition/english/data>].

The terms data, information and knowledge are frequently used for overlapping concepts. The main difference is in the level of abstraction being considered. Data is the lowest level of abstraction, information is the next level, and finally, knowledge is the highest level among all three. Data are values of qualitative or quantitative variables, belonging to a set of items. Simply put, it's an attribute or property or characteristics of an object. Point to note here is, data can be both qualitative (e.g. brown eye color) and quantitative (20 cm long). [www.dwbiconcepts.com/data-warehousing/12-data-modelling/101-classifying-data-for-successful-modeling.html]

Skill

From knowledge definitions one can derive that one of its practical appearance in everyday life is **skill**, i.e.

- art, trade, or technique, particularly one requiring use of the hands or body; developed talent or ability [www.thefreedictionary.com/skill];
- the ability *to do* something well; expertise; a particular *ability* [<http://oxforddictionaries.com/definition/english/skill>];
- the *ability*, coming from one's knowledge, *practice*, aptitude, etc., to do something well; competent excellence in performance; expertness; a craft, trade, or job requiring manual

dexterity or special training in which a person has competence and experience

[<http://dictionary.reference.com/browse/skill>];

- learned *capacity* to carry out pre-determined results often with the minimum outlay of time, energy or both; *abilities* that one possesses [<http://en.wikipedia.org/wiki/Skill>];
- *ability* and capacity acquired through deliberate, systematic, and sustained effort to smoothly and adaptively *carry out* complex activities or job functions involving ideas (cognitive skills), things (technical skills) and/or people (interpersonal skills) [www.businessdictionary.com/definition/skill.html].

Skills are certain abilities, capacity, potential of a person (or their groups) to do something in practice. Skills may also be learned and developed.

Experience

Humans – like all living subjects of the universe – are parts/participants of the real life (surrounding world and its events), whereas they sense things that happen, store (remember) impressions events, are able to reuse such information when reacting in new (later) situations. **Experience** may be defined as follows:

- direct observation of or *participation* in events as a basis of knowledge; the fact or state of having been affected by or *gained* knowledge through direct observation or participation; practical knowledge, skill or *practice* derived from direct observation of or participation in *events* or in a particular activity [www.merriam-webster.com/dictionary/experience];
- active *participation* in *events* or activities, leading to the accumulation of knowledge or skill; an *event* or a series of events *participated* in or lived through; totality of such events in the past of an individual or group [www.thefreedictionary.com/experience];
- knowledge or practical wisdom *gained* from what one has observed, encountered, or undergone [<http://dictionary.reference.com/browse/experience>];
- knowledge and skill that is *gained* through time spent doing a job or *activity* [www.macmillandictionary.com/dictionary/british/experience];
- comprises knowledge of or skill of some thing or some event *gained* through *involvement* in or exposure to that thing or event [<http://en.wikipedia.org/wiki/Experience>].

Thus experience is gained (derived, accumulated) from practical participation in events rather than learned from deliberate teaching process.

Learning

While knowledge – including experience (i.e. gained knowledge) – is a(n actual) status (reserve, resource) at a point of time, learning is a process changing – normally developing – the volume and/or the value (usefulness) of the knowledge. The widely accepted definitions³ of **learning** are as follows:

- the act, *process* or *experience* of gaining knowledge or skill; knowledge or skill gained through schooling or study [www.thefreedictionary.com/learning];
- knowledge acquired by systematic *study* in any field of scholarly application; the *act* or *process* of acquiring knowledge or skill [<http://dictionary.reference.com/browse/learning>];

³ Psychology defines learning as behavioral modification especially through experience or conditioning.

- *acquiring* new, or *modifying* existing, knowledge, behaviors, skills, values or preferences and may involve synthesizing different types of information [<http://en.wikipedia.org/wiki/Learning>];
- measurable and relatively permanent *change* in behavior through experience, *instruction* or *study* [www.businessdictionary.com/definition/learning.html].

Learning is a *process*, rather than a collection of factual and procedural knowledge. The *ability to learn* is possessed by humans, animals and some machines. Human learning may occur as part of education, personal development, schooling or training.⁴

Organizations – including training providers and manufacturing plants – are also subject to learning: their development and improved performance depends very much on what and how they learn (e.g. from experience, management theory, technology development, changing market conditions, experts and advisors/consultants). In this respect benchmarking and good manufacturing practice (GMP)⁵ are essential tools for determining needs for organizational learning.

The most efficient and effective learning is the one that build competencies

Teach[ing]

The usual way of conveying knowledge is to learn (by the person[s] or organization[s] acquiring it) that is facilitated or assisted by a teacher/instructor (possessing the knowledge and capable of passing it to others). Learning is concerned with absorbing and obtaining knowledge, whereas teaching is the activity oriented for providing the knowledge (together with checking the success by getting feedback). The term **[to] teach** means

- to cause to know something, to cause to know how; to *impart* the knowledge; guide studies, to *instruct* by precept, example, or experience; to make known and accepted [www.merriam-webster.com/dictionary/teach];
- to *impart* knowledge of or skill in; give instruction in; to impart knowledge or skill to; give instruction to [<http://dictionary.reference.com/browse/teach>];
- to condition to a certain *action* or frame of mind [www.thefreedictionary.com/Teach];
- *impart* knowledge to or instruct (someone) as to how to do something; cause (someone) to learn or understand something by example or experience [<http://oxforddictionaries.com/definition/english/teach>];
- teaching is the *imparting* of knowledge by a teacher or other knowledgeable person [<http://en.wikipedia.org/wiki/Teach>].

Teaching is an [instructive] action in which *knowledge is imparted with learners* so the latter would have it available in their activities.⁶

⁴ Education and training, as well as respective institutions (including schools) and their role in the leather-related industries are discussed in details in *Schmél, F: Professional Education and Training in the Leather-based Industries* submitted to the 17th session of the UNIDO LP held in Addis Ababa in 2010.

⁵ For details refer to the study *Clothier, A.: Benchmarking, Good Manufacturing Practice and Performance Assessment in the Footwear Industry* submitted to the 15th Session of the UNIDO LP held in León/Mexico in 2005 and *Buljan, J: Benchmarking in the Leather Industry* submitted to the 16th Session of the UNIDO LP held in Gramado/Brazil in 2007.

⁶ However, “we can be knowledgeable with other men's knowledge, but we cannot be wise with other men's wisdom” [*Michel de Montaigne*].

Training

Professional education and training are very close terms. **Education** means regular, systematic personal development within formal conditions (schools, colleges, universities) and provides legally stipulated certification documents (diplomas, degrees) testifying the achievement of the required knowledge and/or skill standard. As such normally education is organized in a hierarchical structure of various schools and usually lasts several years. Basic meanings of **training** are as follows:

- the process of bringing a person, etc., to an agreed standard of proficiency, etc., by practice and instruction [www.thefreedictionary.com/training];
- the action of teaching a person or animal a particular skill or type of behavior [<http://oxforddictionaries.com/definition/english/training>];
- organized activity aimed at imparting information and/or instructions to improve the recipient's performance or to help him or her attain a required level of knowledge or skill [www.businessdictionary.com/definition/training.html];
- the acquisition of *knowledge*, *skills* and competencies as a result of the teaching of vocational or practical skills and knowledge that relate to specific useful competencies [<http://en.wikipedia.org/wiki/Training>].

Training has specific goals of improving one's capability, capacity and performance. It is a process in which learning takes place that may be

- a) **formal**: in education and training institutions, leading to recognised diplomas and qualifications;
- b) **non-formal**: alongside the mainstream systems of education and training and does not typically lead to formalised certificates;⁷
- c) **informal**: a natural accompaniment to everyday life.

Unlike formal and non-formal learning, *informal learning* is not necessarily intentional learning, and so may well not be recognised even by individuals themselves as contributing to their knowledge and skills.

⁷ It can also be provided through organisations or services that have been set up to complement formal systems (e.g. tutoring to prepare for examinations).

THE LEARNING PROCESS

The learning framework

As follows from the definition of learning (and teaching) the learning framework (*Fig. 3*) is fairly complex. From the perspective of professional education and training, i.e. understanding conditions and processes of [professional] learning it is highly desirable to consider most of the elements of this framework.

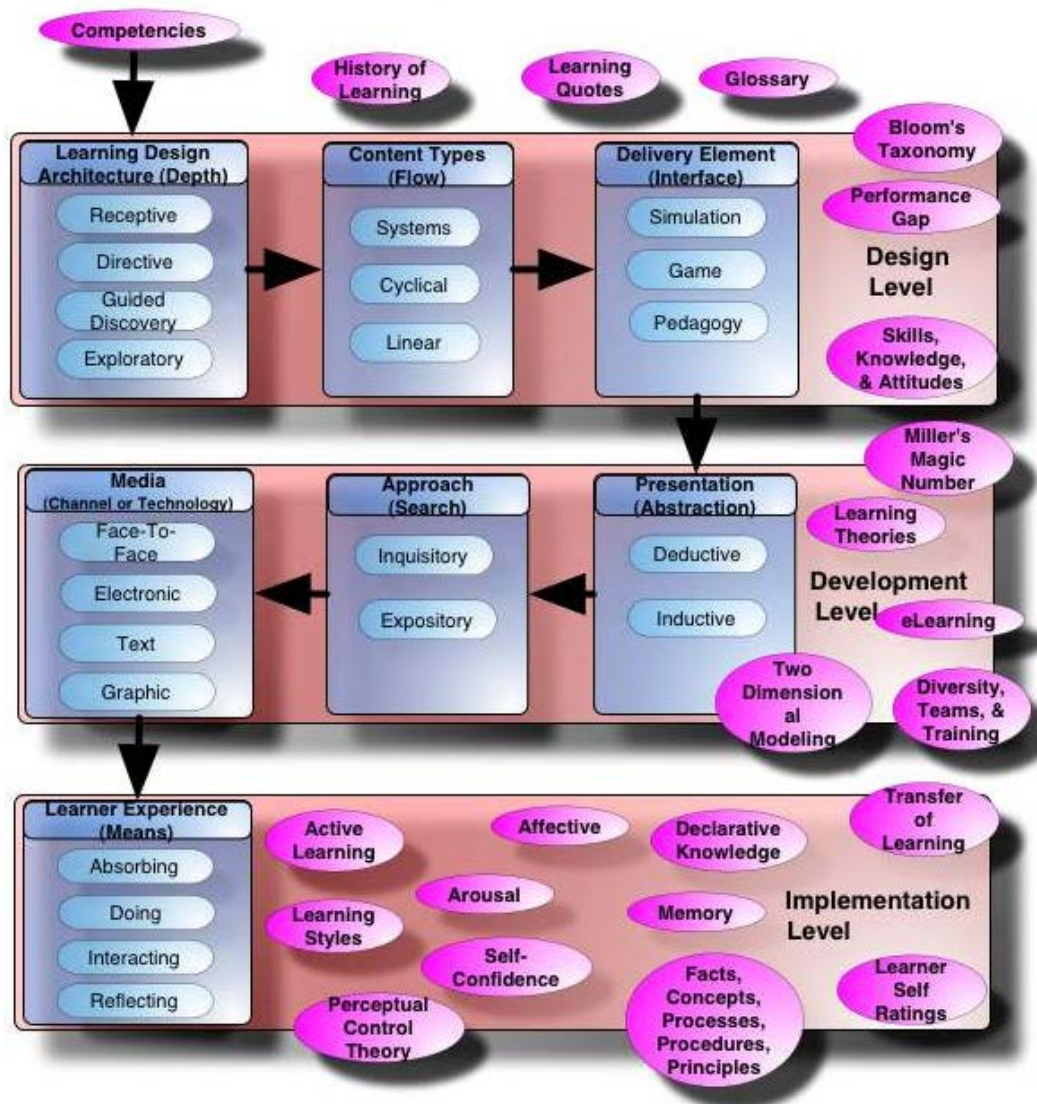


Fig. 3
Learning framework

Learning theories

Learning theories are conceptual frameworks that describe how information is absorbed, processed and retained during learning. Learning brings together cognitive, emotional and environmental influences and experiences for acquiring, enhancing, or making changes in one's knowledge, skills, values, and world views.

There are three main categories of learning theory:

- a) **behaviorism** focuses only on the objectively *observable aspects* of learning;
- b) **cognitive** theories look beyond behavior to explain *brain-based learning*;
- c) **constructivism** views learning as a *process* in which the learner actively constructs or builds new ideas or concepts.

While in education for and training in industrial activities (direct labour, technical and managerial) all these theories may be reflected, apparently constructivism plays a dominant role and deserves special attention.

The learning domain

Learning is a complex intellectual (psychological) process associated with three major components (**Table 1**).

Table 1

Learning domains			
Domain		Content	Sophistication
Cognitive	Knowledge	What will learners <i>know</i> ?	Remembering, understanding, applying, analyzing, evaluating, creating
Psychomotor	Skills	What will learners be <i>able to do</i> ?	Imitation, manipulation, precision, articulation, naturalization
Affective	Attitudes, values or habits of mind	What will learners <i>value</i> or <i>care about</i> ?	Receive, respond, value, organize, characterize

The learning cycle

Beside recognizing that learning is a process, it was discovered⁸ that it has even a cyclic character (**Fig. 4**).

⁸ Kolb, D. A.: Experiential learning – experience as the source of learning and development. PRENTICE-HALL, New Jersey, 1984.

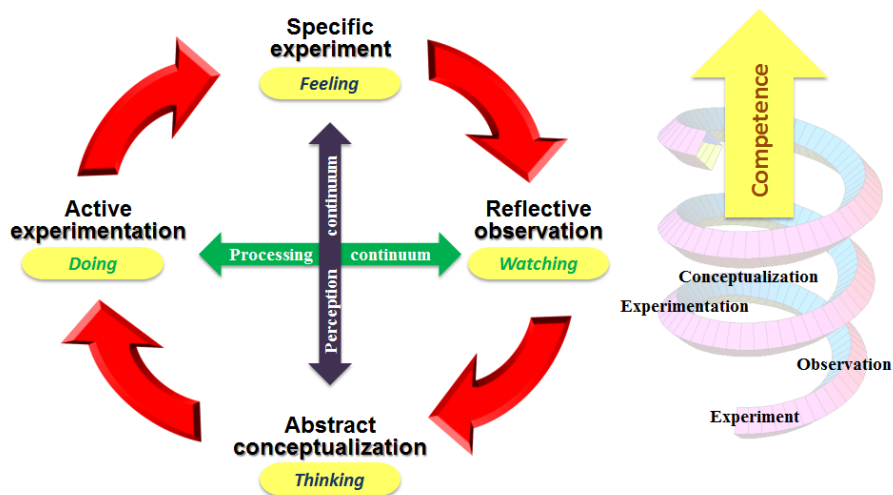


Fig. 4
Kolb's learning cycle

There are four stages in learning which follow from each other: specific (concrete) *experience* is followed by *reflection* on that experience on a personal basis. This may then be followed by the derivation of general rules describing the experience, or the application of known theories to it (*abstract conceptualization*), and hence to the construction of ways of modifying the next occurrence of the experience (*active experimentation*), leading in turn to the next *specific experience*. All this may happen in a flash or over days, weeks or months, depending on the topic and there may be a “wheels within wheels” process at the same time. In this context the **competence** is the ability of an individual to do something (e.g. a job) properly.

The most direct application of the model is to use it to ensure that teaching and tutoring activities give full value to each stage of the process. This may mean that for the tutor or mentor (or in the modern e-Learning context: the learning module and the electronic learning system) a major task is to „chase” the learner round the cycle, asking questions which encourage *reflection*, *conceptualization* and *ways of testing* the ideas. (The *specific/concrete experience* itself may occur outside the tutorial/mentoring session.)

Learning styles

Each person prefers different learning styles and techniques. Learning styles group common ways that people learn and they are concerned with tools/aids/methods used:

- *visual (spatial)*: pictures, images, and spatial understanding;
- *aural (auditory)*: sound;
- *verbal (linguistic)*: words – both in speech and writing;
- *physical (kinesthetic)*: body, hands and sense of touch;
- *logical (mathematical)*: logic, reasoning and systems;
- *social (interpersonal)*: learning in groups or with other people;
- *solitary (intrapersonal)*: work alone and use self-study.

Everyone has a mix of learning styles. Some people may find that they have a dominant style of learning, with far less use of the other styles. Others may find that they use different styles in different circumstances.

Learning efficiency

Actual styles and methods of learning have different efficiency. Dale demonstrated the retention rate of common knowledge/information gathering approaches in graphic form⁹ (**Fig. 5**).

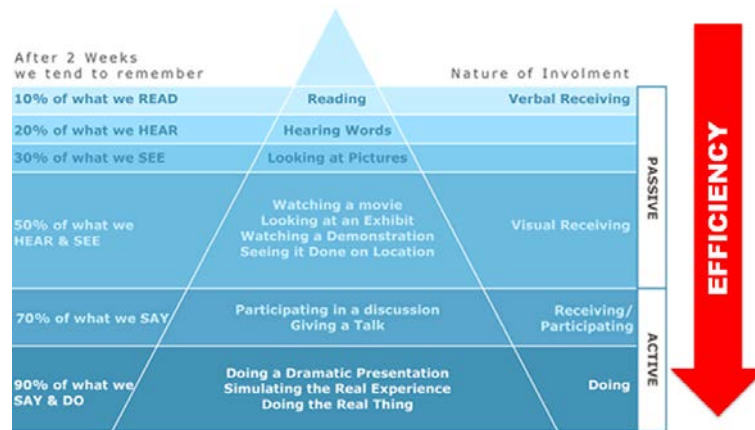


Fig. 5
Dale's cone of learning

This is fact is the contemporary interpretation of *Kung Fu Tze (Confucius)* well known proverb:

What I hear, I forget.
What I see, I remember.
What I do, I understand.

People learn better¹⁰ (i.e. with higher efficiency) when they

- have personal passion for a subject – whether it can help them on the job or not (everyone has a pet subject);
- see a co-relation between the skill and their paycheck (i.e. financially motivated);
- there is peer pressure to learn;
- are eager to learn: (intrinsic motivation always scores over external compulsions);
- get (moral, social, professional, personal etc.) recognition;
- see the learning result in career advancement;
- are under threat (e.g. losing income, job, status, competition);

Lifelong learning

Lifelong learning (LLL) is a more and more frequently propagated and referred term. Its meaning is described by the following definitions:

⁹ Dale, E.: Audio-Visual Methods in Teaching (3rd ed.). HOLT, RINEHART & WINSTON, New York, 1969.

¹⁰ <http://bprao.wordpress.com/2008/10/12/7-ways-to-facilitate-learning/>

- the provision or use of both formal and informal learning opportunities *throughout people's lives* in order to foster the continuous development and improvement of the knowledge and skills needed for employment and personal fulfillment [<http://dictionary.reference.com/browse/lifelong+learning>];
- a process of gaining knowledge and skills that continues *throughout a person's life* [www.macmillandictionary.com/dictionary/british/lifelong-learning];
- pursued throughout life: learning that is flexible, diverse and available at different times and in different places [www.llcq.org.au/01_cms/details.asp?ID=12];
- “lifelong, voluntary, and self-motivated” pursuit of knowledge for either personal or professional reasons [http://en.wikipedia.org/wiki/Lifelong_learning];¹¹
- encompasses all learning activity undertaken *throughout life*, with the aim of improving knowledge, skills and competence, within a personal, civic, social and/or employment-related perspective [http://ec.europa.eu/education/lifelong-learning-programme/doc78_en.htm].

Obviously lifelong learning opens *opportunities and avenues* for, at the same time invites cooperation from the potential target audience, i.e. all members of the society. **Benefits** offered are [www.selfgrowth.com/articles/Top_10_Benefits_of_Lifelong_Learning.html]:

- leads to an enriching life of self-fulfillment;
- helps making new friends and establish valuable relationships;
- keeps everyone involved as active contributors to society;
- helps finding meaning in our lives;
- helps people to adapt to change;
- makes the world a better place;
- increases/contributes people's wisdom;
- creates a curious, hungry mind;
- opens the mind;
- helps fully develop natural abilities.

¹¹ As such, it not only enhances social inclusion, active citizenship and personal development, but also competitiveness and employability.

DEVELOPMENT OF LEARNING AND TRAINING

Traditional learning/training practice

Conventional or (historically) **traditional learning** styles are dominated by the rather passive attitude of the intended beneficiary – the learner (trainee, student). The well-known forms are as follows:

1. **Face-to-face¹² learning** arrangements are based on the teacher (instructor, lecturer, moderator) directing and/or managing the learning process, whereas all of them are present (i.e. in contact with each other). This is still the most widely used method which may be one of the followings:
 - a) *[classic] classroom*: the teacher deals with a number (usually 6-300) of trainees by delivering/communicating the subject knowledge and sometimes getting feedback (in form of questions, test, examines);
 - b) *[personal] tuition* involves a tutor (teacher, mentor, a more knowledgeable learner fellow or another person) and an individual (or very small group of 2-5) learner, whereas the former provides direct instructions and answers immediately questions;
 - c) *workshop, seminar, small group discussion* may or may not have a teacher or mentor present; the knowledge is transferred by participants themselves (e.g. by preparing themselves for imparting a certain portion of the knowledge or simply discussing it);
 - d) *conferences or congresses* may be considered as special forms of classroom training but without feedback options;
 - e) similarly *meetings* (e.g. at work), *trade fairs* and *exhibitions* also serve as learning opportunities as they also facilitate knowledge transfer.
2. With **on-the-job training (OJT)** or **job-embedded learning** employees receive training whilst remaining in the workplace and learn about and participating in the job tasks. This is one of the best ways for a person to learn new *skills* and gain valuable *experience*.
The above two setups ensure *synchronous* knowledge communication as learners are getting access to new knowledge elements at the moment those are released (by teachers, instructors, lecturers, speakers, demonstrators, presenters, moderators etc.).
3. **Self-study training** is the educational process where *individuals learn independently*, often in terms of their own unique objectives and at their own pace; the study of something by oneself, as through books, records, etc., *without direct supervision or attendance in a class*.
4. **Distance learning** (or **distributed learning**) focuses on teaching methods and technology with the aim of delivering knowledge, often on an individual basis, to students who are not physically present in a traditional educational setting such as a classroom. In other words it is a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both.

¹² Earlier and in most of the cases today face-to-face learning means that both the teacher and learners are in the same place (classroom, lecture hall, office etc.). With the rapid and widespread development of information technology it is not necessary today

The latter two approaches belong to *asynchronous* imparting training as the knowledge source is (practically) constantly available to the learner, but acquiring it takes place according to the learner's activities in this regards.

Traditional *means/media* storing and used for imparting knowledge and – to a limited extend – skills include

- a) paper (hard copies of books, catalogues, journals, magazines, guidelines, user's manuals etc.) normally containing textual and graphic (including schemes, flowcharts, pictures, photos etc.) information;
- b) audio-visual tools such as slide, overhead, film and video projections and recorded voice;
- c) samples, models, mock-ups and real (functional) objects used for demonstrating practical aspects of the knowledge to be conveyed.

Many **constraints** of the conventional/traditional learning/training systems were realized by parties concerned quite some time ago. Particularly [physical] *classroom training*

- lacks learner focus, instead it inherently places the most value on standards, curriculum and passing tests;
- lacks emphasis on critical thinking as it emphasizes the role of teachers as knowledge dispensers and students as repositories; it doesn't encourage critical thinking skills, the ability to actively apply information gained through experience and reasoning
- lacks process oriented learning as it emphasizes passing tests, whether or not students under testing material;
- lacks emphasis on larger concepts or structures as it focuses on basic skills and gradually builds to a whole;
- lacks interactivity: learners receive few opportunities to practice group dynamics and teamwork;
- pulls results around averages as it cannot devote sufficient times and efforts to those advancing slower and/or provide better learners with more and higher level resources to develop their specific capacities;
- timely and geographically limited that requires synchronization of physical presence of all parties concerned;
- provides limited potential for developing *competencies* that would enable learners further enhancing their abilities.

All these lead to high costs, low efficiency and effectiveness. Moreover, refreshing knowledge base to be imparted – especially in case of using static (document-oriented) media – requires involves additional expenses, whereas residuals from earlier issues causes storage and recycling problems.

New tools

The range of these conventional styles and media are now being substantially expanded by the rapidly developing information and computer technology (ICT). Traditional (learning, text) books lose their importance and are now being replaced by their electronic versions such as documents produced on computers (mostly in PDF format), presentations, videos and e-books. Communication between teachers and learners is now possible by using mobile telephones, computerized networks (the world-wide web – WWW and e-mail). Using the same channels learners are able to establish real-time or conserved (off-line) contacts both in sounds and pictures. In many cases self-learning may be assisted by depositories – including traditional

libraries – of electronic versions of knowledge bases and learning aids so personal presence and physical contacts are not always necessary.

Internet and *Intranets*¹³ deserve special attention. Resources that may be utilized in both traditional, distance and self-learning are virtually infinite and expanding.¹⁴ Useful sources may be on-line dictionaries, publications, archives, as well as suppliers and other organizations web-pages. Furthermore, *social networking sites*¹⁵ are valuable assets in keeping contacts, exchanging targeted information, organizing specific (e.g. learning oriented) groups.

Similarly, *mass media* such as radio and television (TV) broadcasting (including those available only on the Internet) carry valuable knowledge content and may be able even assist in developing certain skills. While relying on real-time programmes is rather complicated – especially in the framework of traditional training – recorded and stored versions (on magnetic tapes, CDs, DVDs, computer hard disks, pen drives or on the Internet) can be useful parts of archives to be mobilized in the learning process.

Schools, colleges, institutions and organizations – including those inside of manufacturing and trading companies – engaged with [professional] education and training gradually adapt ICT in their operations. Beamer and electronic boards are becoming usual equipment in classrooms, electronic network facilities are used more and more in communication among teachers, learners and even parents, teachers use projected presentations in delivering courses and use computers for tests or even examinations.

Online learning

Education in which instruction and content are delivered primarily over the Internet is referred today as **online learning**, virtual learning, cyber earning or **e-Learning**¹⁶ (see details later in this study). The term does *not* include printed-based correspondence education, broadcast television or radio, videocassettes, and stand-alone educational software programs that do not have a significant Internet-based instructional component.

There is a terminology¹⁷ closely related to and associated with e-Learning that needs clarifications as follows:

- *Blended learning* (sometimes referred as hybrid learning) is any time a student learns at least in part at a supervised brick-and-mortar location away from home and at least in part through online delivery with some element of student control over time, place, path, and/or pace.

¹³ The Intranet is a private network using the Internet within an enterprise for authorized users.

¹⁴ NB. Though the volume of information is continuously expanding on the internet, its validity is subject to the reliability of its source (if that is clear at all) and ought to be checked. At the same time contents are also changing and elements may disappear for good.

¹⁵ The most widely known such social networks are Facebook , LinkedIn , Netlog  and Twitter . However, there is a large number of similar global, international or local, specific (e.g. devoted to certain domains, subjects, topics, businesses) and organizational networks.

¹⁶ *eLearning*, *Elearning*, *elearning*, *internet-based learning (IBL)* and *internet-based training (IBT)*, *web-based learning (WBL)* and *web-based training (WBT)* are also met in the technical literature and on the WWW. However, essentially all of them refer more or less to the same domain of **e-Learning**: the latter is used throughout this study.

¹⁷ The Online Learning Definitions Project. INTERNATIONAL ASSOCIATION FOR K-12 ONLINE LEARNING (iNACOL), October 2011.

- *Computer Assisted Instruction (CAI)* is the use of educational software to enhance the mastering of educational concepts or standards without the involvement of a teacher.
- The *content repository* is a venue for saving and sharing content. A digital content repository is an online venue for saving and sharing digital content.
- *e-School*: a formally constituted organization (public, private, state, charter, etc.) that offers fulltime education delivered primarily over the Internet (sometimes also referred to as *virtual school*, *online school* or *cyber school*).
- *Home-grown content* is developed by a teacher, school, or district for use in instruction, as compared to content developed by outside companies or other vendors.
- The *instructional media* is the materials that teachers use to teach and students use to learn (for example, printed text, digitized text, software, speech, images).
- The *online facilitator* is used in two ways:
 - (i) For part-time online programs is the person working face-to-face with the online student to monitor student progress and attendance, providing training, assist in motivating the student, etc. The person may or may not be a certified teacher but works in conjunction with the certified online teacher.
 - (ii) Used interchangeably with online teacher or online educator.
- *Seat-time*: The amount of instructional time to earn a credit and in online learning is indicated by amount of time engaged in coursework.
- Self-paced online courses in which students work at their own pace within an overall timeframe.
- *Video conferencing* is interactive communication technologies which allow two or more locations to interact via two-way video and audio transmissions simultaneously.
- The *blog* is
 - (i) as a noun: a website or a section of website used for expressing ideas and opinions of users in multiple modalities, often maintained by one leader;
 - (ii) as a verb: maintaining or adding content to an ongoing asynchronous discussion housed at a target website.
- The *chatroom* is a website or part of a website or an online service that offers communities a synchronous venue for discussing specific topics.
- *Webinar* is a seminar which is conducted over the WWW. It is a type of web conferencing. A webinar is “live” in the sense that information is conveyed according to an agenda, with a starting and ending time.

Computer-supported collaborative learning (CSCL) is one of the most promising innovations to improve teaching and learning with the help of modern ICT. Most recent developments in CSCL have been called e-Learning 2.0, but the concept of collaborative or group learning whereby instructional methods are designed to encourage or require students to work together on learning tasks has existed much longer. It is widely agreed to distinguish collaborative learning from the traditional “direct transfer” model in which the instructor is assumed to be the distributor of knowledge and skills, which is often given the neologism e-Learning 1.0, even though this direct transfer method most accurately reflects *Computer-Based Learning (CBL)* systems.

Learning contents

The material base and the processing/manufacturing technology has gone a long way in the past century. Related training contents (i.e. the knowledge base and range of skills) have also

changed – though by at far slower pace than the technology – but their structures and related training systems seem to be more rigid.

Medium level *educational and training institutions* (colleges, technical secondary schools) imparting knowledge and providing certificates to those successfully completing their courses try hard to cope with technical development. Quite naturally, they are always somewhat behind in incorporating most advanced and newest (especially technical) development as innovative solutions are coming from suppliers (e.g. materials, equipment/hardware, software) and R&D organizations or developed within the manufacturing environment (e.g. production and management systems, marketing methods). Validation of new technology, as well as collection and systematization, elaboration of respective didactic methodology takes time that causes delay in delivering the most up-to-date knowledge and skills as part of the training. At the same time *suppliers of new materials and technology* (including R&D institutions and developmental projects¹⁸) are taking over a great deal of professional training when they introduce and (assist to) implement their new products or services.

When making available any content – whether digitized old materials or newly developed courses, modules, lessons, illustrations, learning games etc. – the *copyright* (©) issue should be properly addressed. Publishers should normally reimbursed for further distribution of their products or a legal license should be obtained from them within the time established by law.¹⁹ Authors need to be mentioned even after the expiry of the copyright time. Registered *trademarks* (®) should also be used/published with obeying to the respective legal requirements.

¹⁸ Developing new solutions for manufacturing and trade (but also in science, medicine, environmental protection etc.) is organized around specific projects initiated and supported by regional and/or national funding schemes (e.g. Governments, EU). Practically all such projects (should/must) have components geared for validation (in practice), dissemination, exploitation of and training in achievements.

¹⁹ In most of the world the default length of copyright is the life of the author plus either 50 or 70 years.

THE e-Learning TECHNOLOGY

The e-Learning context

As it was already defined in the previous chapter the term e-Learning (2.0) is fairly new and interrelated with ICT. Real **e-Learning** is

- *training that resides on a server or host computer that is connected to the WWW [Rossett, A. & Sheldon, K.: Beyond The Podium – Delivering Training and Performance to a Digital World. JOSSEY-BASS/PFEIFFER, San Francisco, 2001];*
- *the use of internet technologies to deliver a broad array of solutions that enhance knowledge and performance that is based upon three fundamental criteria such as networking, delivering to the end-user via a computer using standard internet technology and focusing on the broadest view of learning [Rosenberg, M.: e-Learning: Strategies for Delivering Knowledge in the Digital Age. MCGRAW-HILL, New York, 2001];*
- *the use of internet or wireless technologies to deliver a broad array of training solutions [www.herridgroup.com/pdfs/eLearning%20a%20Definition.pdf];*
- *a new education concept by using the Internet technology, it delivers the digital content, provides a learner-orient environment for the teachers and students [www.chengzhi.net/english/];*
- *learning that is accomplished over the Internet, a computer network, via CD-ROM, interactive TV, or satellite broadcast; any learning that utilizes a network (LAN, WLAN or Internet) for delivery, interaction, or facilitation [<http://elearningtech.blogspot.hu/2007/10/elearning-defined.html>];*
- *use of network technologies to create, foster, deliver, and facilitate learning, anytime and anywhere [www.linezine.com/elearning.htm];*
- *the business of providing courses on the Internet for students so that they can study and learn at home [<http://dictionary.cambridge.org/dictionary/british/e-learning>];*
- *learning that is delivered, enabled or mediated using electronic technology for the explicit purpose of training, learning or development in organization [www.cipd.co.uk/hr-resources/factsheets/e-learning.aspx].*

In short **e-Learning** is a computer and electronic network (Internet) enabled transfer of knowledge and skills. In other words e-Learning assumes

- a) availability of computers (terminals, workstations, laptops or notebooks, PDAs²⁰) having minimum a color graphic display, a keyboard and a mouse (not necessary in case of tablets with touch screens), mass storage (hard disk, pen drive);
- b) Internet or Intranet connection with acceptable data transfer speed (for graphics) and access right to electronic learning resources;
- c) learner's basic knowledge and skills of handling hardware and using computer (programs),
- d) availability of electronic learning materials such as courses, lessons, tests etc.

e-Learning highlights are the following distinguished features of the new electronic educational and/or training technology:

²⁰ Personal digital assistants that are also referred to as intelligent (cell) phones.

- Learning in the Internet age – real-time, 24/7²¹, anywhere, anytime.
- Learner-centered - personalized to the individual and customized to the organization.
- Network-assisted - often assembling learning experiences real time, “on the fly”.
- A mix of learning methods – including virtual classroom, simulation, collaboration, community and more.
- The whole learning experience – from assessment through testing and, optionally, certification.
- Online administration – learning management systems (LMS) handle administrative tasks like security, registration, payment, and monitoring learner progress.

On one hand e-Learning offers flexibility (in terms of time, place and pace), on the other hand it requires all above *conditions*. However, today's ICT offer low-cost and fairly universal equipment integrating communication, computing and media devices. Similarly, [wireless] local area network ([W]LAN) with broadband internet services are becoming available virtually everywhere and free – at very reasonable prices or even free of charge. More and more e-Learning contents are offered by training providers – including prestigious universities – for free to the wide audience.

The e-Learning environment

The space of e-Learning roots from and build on available resources such as training methods and contents. Most of the knowledge providers (organizations) typically take existing educational materials, add various media, sequence them and use the “transferred” product in online environment. Thereafter new or specifically tuned for e-Learning conditions contents are developed that gradually utilize capabilities of this technology. **Fig. 6** demonstrates categories of e-Learning and their relationship.

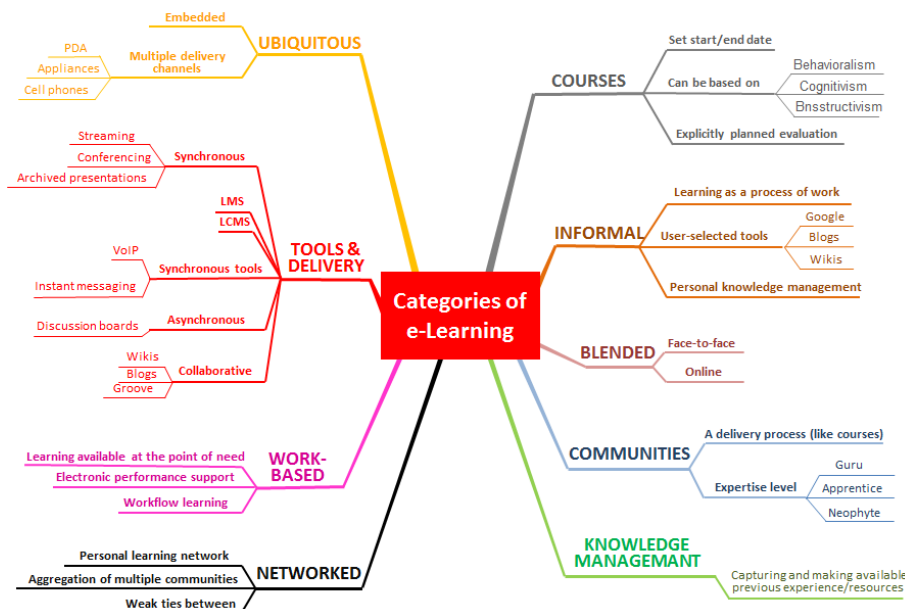


Fig. 6
e-Learning categories

²¹ 24 hours/day, 7 days/week, (365 days/year) – i.e. all time.

The *e-Learning environment* (**Fig. 7**) is fairly different from that of conventional face-to-face and self-training. Learning content (objects) and the training community (composed of teachers and learners, as well as other resourceful persons accessible through the WWW) come to the parser engine – in reality a computer server-based electronic system – that personalizes the set of knowledge according to the recipient profile (including actual needs, abilities and availability). The learner invokes content at her/his liking – of course, within the planned and organized framework ensuring logic and information logistics required for achieving the intended results (e.g. competence, certificate) – and may also be forced to provide appropriate feedback (e.g. for getting access to the next stage of learning, surveys or exams). The personal front end is the ICT gateway connected to the learning network, whereas learning resources are available to the incumbent from depositories, by interacting with the supporting and/or participating community. All activities, achievements, feedbacks and rewards are monitored and registered (stored) by the computer network system.

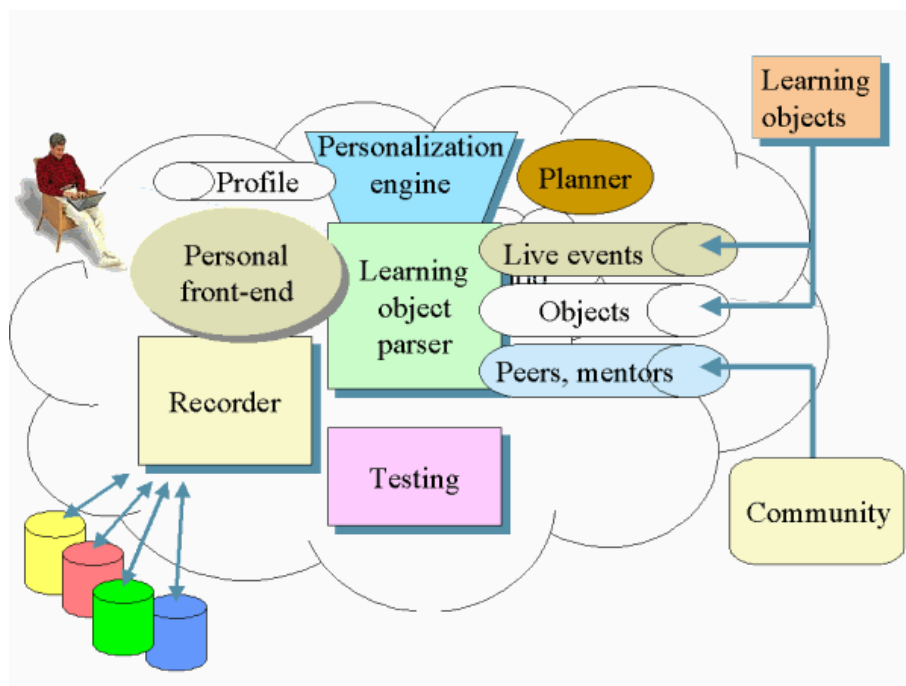


Fig. 7
e-Learning structure

The complexity of e-Learning operation requires an entirely new structure stretching between experts, teachers and the accumulated/archived knowledge base (as resources) on one side and learners (target recipients) on the other side (**Fig. 8**). This mechanism is composed of two major parts:

- a) the *learning content development [system] (LCD[S])*²² engaged with production of (collecting, transferring from traditional forms, generating, systematizing, editing, upgrading and updating etc.) the actual learning material;

²² Strictly speaking the learning content management system (LCMS) may be concerned only with arranging and providing existing/available knowledge resources. However, terms LCMS and LCDS are used in practice as synonyms.

- b) the *learning management system (LMS)* organizing and recording all activities (of both learners and teachers), administrating the learning process, storing learning contents, facilitating interactions and feedbacks.



Fig. 8
e-Learning structure

Learning content development

Starting e-Learning services does not need entirely new set of training materials (content) – it may well be launched by using the existing knowledge base but converted into electronic formats. In practice this means *digitizing*²³ [paper-based, analog] documents, i.e. scanning (text)books, handouts, slides, transparencies etc. Results will be files that can retrieved by computers, communicated (sent) through or downloaded from networks. The following file formats²⁴ of digitized contents are handled by a wide range of computer hardware and operating systems:

- documents: .txt, .rtf, .doc, .pdf, .ps;
- images (graphics, pictures): .png, .jpg, .tif, .gif, .bmp, .pcx, .psd, .cgm (raster/pixel) and .hpg, .plt, .dwg, .dxf, .svg, .wrl, .stl (vector);
- audio: .wav, .mp3, .wma, .mid;
- video: .avi, .flv, .mpg, .wmv, .mov, .mp4;
- spreadsheets: .xls; .xlm, .xla;
- presentations: .ppt, .pps;
- databases: .dba, .dbf, .mdb, .sql, .pst;
- websites: .htm, .html, .css;
- compressed/archieved: .zip, .rar, .arj, .gz.

²³ Available documents developed or created by using any computer programs (e.g. MS Office or Open Office, Auto-CAD) or electronic audio-visual devices (e.g. digital photo or video cameras); obtained data carriers or storages (e.g. CDs, DVDs, Blue-ray disks), files received from others or downloaded from the internet (documents, e-Books, presentations, pictures, videos etc.)

²⁴ Newest versions of some software may use the same extensions but with an additional 'x' as the fourth character.

NB. As it was pointed out earlier simple sending/publishing electronic versions of any documents does not mean e-Learning, unless they are incorporated in electronic courses or made available through organized systems such as LMS.

Teachers of all kinds of educational and training institutions, as well as speakers and lecturers addressing meetings and conferences normally use presentations prepared by MS Power Point²⁵ (or its clones). Such files may be attached to e-mails or published through the Internet using file transfer protocol (FTP) servers or downloadable objects from websites. At the same time the ICT industry offers programs developed specifically for converting MS Power Point or similar presentations into videos that are easier and – from copyright point of view – safer and/or more convenient to distribute in the Internet (*Table 2*). However, experience shows that many of these programs (some of them act as add-ons, i.e. they appear as an additional menu option within the MS Power Point presentation developer) are not able to convert highly animated graphic slides into video files showing exactly what the presentation does when delivered.

Table 2

Power Point to video converters

Product	US\$	Website
4Media	50	www.mp4converter.net
Acoolsoft	40	www.acoolsoft.com
DigitalOfficePro	99	www.digitalofficepro.com
FlashPoint	180	www.flashdemo.net
Impatica Power Point	200	www.impaticize.com
iSpring Free	Free	www.ispringsolutions.com
Moyea PPT4Web	40	www.dvd-ppt-slideshow.com
OpenOffice	Free	www.openoffice.org
PowerCONVERTER	149	www.crystalgraphics.com
veryPDF.com	50	www.verypdf.com
veryDOC.com	49	www.verydoc.com
Wandershare	200	www.sameshow.com
Xilisoft	50	www.xilisoft.com

Remark: Free – freeware, available free of charge.

For the very purpose of generating e-Learning content specific program packages are available on the market: they are referred as *learning content development (LCD) systems*. Unlike conventional presentation software (e.g. MS Power Point and all its clones) LCDs offer facilities tuned for (self-)learning such as

- grabbing and annotating application/media screens,
- navigation within the given course/module/lesson or enforced sequence,
- possibilities of attaching resources (any electronic documents or media),
- test/quizzes and feedback on them,
- publishing the material on the Internet or as a stand-alone learning course/module/lesson,
- incorporating the resulting e-Learning material in LMS (see standard compliance under LMS later in this chapter).

²⁵ MS stand for MICROSOFT – the manufacturer of MS Windows, MS Office etc. software packages.

The source of the actual content (of individual slides) may be any electronic file: when they are added (inserted, edited and/or animated) they are also attached – normally in compressed formats – to the file or directory that will be delivered. Publishing may offline (e.g. from CD, DVD) or online (through Internet or Intranet).

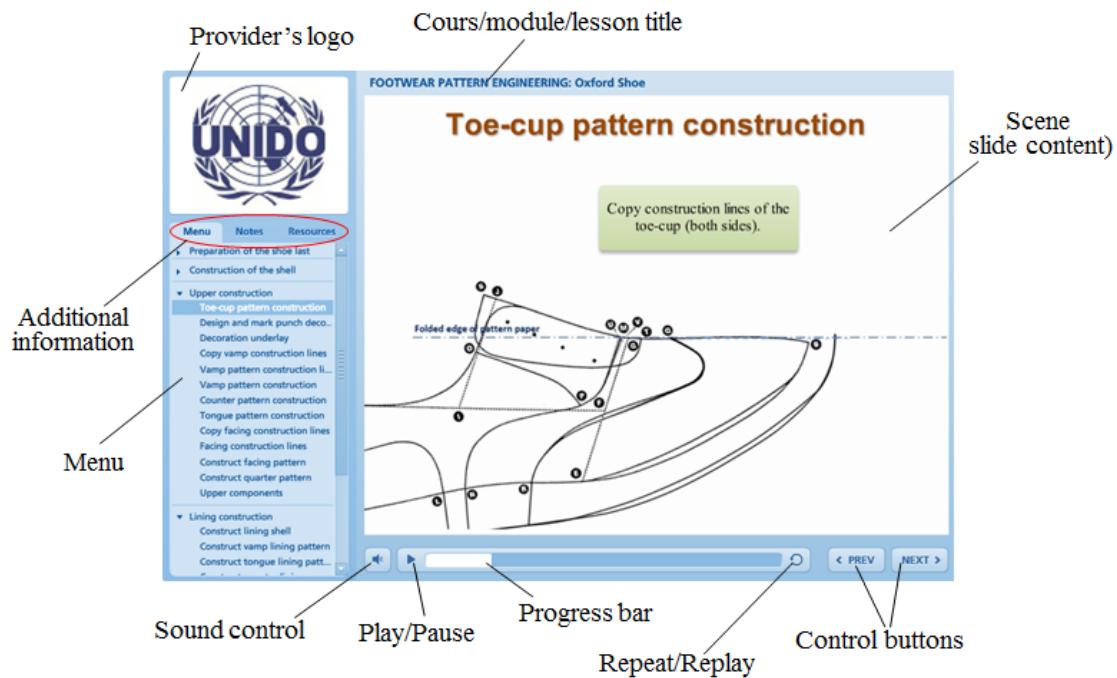


Fig. 9
e-Learning user interface

The user interface of e-Learning materials created by an LDC when used resembles very much an enhanced slide show (**Fig. 9** demonstrates the interface created by Articulate Storyline). Each LDC has its own template (with options for changing colors and proportions, showing/hiding elements etc. (**Fig. 10** shows some other examples).



Fig. 10

Examples of e-Learning user interfaces

Though no in-depth computer programming experience is required for building e-Learning content, all related software need some time to learn/practice utilizing their features and tools. **Table 3** (see overleaf) provides an overview of the most popular LCDs available on the market.

Table 3

Learning content development programs/ systems

Product	US\$	Website
Articulate	999	www.articulate.com
Acontent	Open	www.atutor.ca
authorPOINT	299	www.authorgen.com
Captivate	399	www.adobe.com/products/captivate.html
CourseBuilder	SaaS	www.lumesse.com
CourseLab	899	www.courselab.com
DokeosPRO		www.dokeos.com
eLab	451	www.elearningapplicationbuilder.com
Elicitus	2,699	www.elicitus.com
Everest	1,995	www.insystem.com
eXact LCMS		www.exact-learning.com
eXe	Open	www.exelearning.org
iSpring Suite	499	www.ispringsolutions.com
Jackdaw	1,499	www.jackdawcms.com
KeneXa		www.outstart.com
Learner WebCAP		www.maxit.com
Lectora Inspire	2495	www.trivantis.com
MS LDCS	Free	www.microsoft.com/learning
Raptivity	1,499	www.raptivity.com
SumTotal		www.sumtotalsystems.com
TACTIC!	2,350	www.tacticssoftware.com
Xerte	Open	www.nottingham.ac.uk/xerte
Wondershare	470	www.sameshow.com

Remarks: **Free** – freeware: available free of charge.

Open – open source: use is free, source code available for developer.²⁶

SaaS – software as a service: paid according to actual use.

Learning management systems

Availability of electronic training contents (develop by LCD tools and those knowledge items existing in electronic forms) have the potential to be accessed through networks – primarily on the Internet and/or Intranet(s). The set of such information needs to be organized into courses, training programmes, curriculum etc. – just like in formal educational organizations. For the administration of the entire training process from enrollment to awarding appropriate certificate, including incorporation of new and upgrading existing contents, as well as organizing interactions among all participants of the training system were developed LMS. Such systems are server-based and operate as specific (dedicated to training management) administrative tools through networks. Their **main functions**²⁷ include:

²⁶ Copyright and legal aspects of using and distribution are governed by *general public license* (GPL).

²⁷ Actual LMS may not have all the listed function or may have additional features not listed here.

- *user management*: (self)registration and (self)enrollment – manual and automatic, assigning roles (e.g. learner, trainer, assistant); user groups;
- *course features*: catalogue, categories (e.g. restricted, secondary), access levels, availability periods, maximum attendance, completion criteria, certificates, templates, export/import;
- *course materials*: uploading and managing contents and file resources (documents/text, audio, video, HTML etc.), material availability calendar, hierarchical document structure, file library, planned release of course materials, building learning paths;
- *quizzes*: creation of surveys and quizzes, question categories and pool, number of attempts, quiz statistics and reports, configuration of feedback, customized certificates;
- *communication tools*: course forums and chats, announcements, live conferences, rating and commenting courses;
- *learners performance management*: tracking and grades, users activity tracking, learning material usage statistics, assigning homework, export collected data;
- *reporting*: criteria and filters for reports, export reports;
- *e-Commerce*: selling subscription to courses, invoicing, payments.

There are LMS software that has built in LCD facilities, others have separate systems for LCD and LMS.

Fig. 11 shows the menu structure of the Moodle LMS (one of the most widely used open source program) as a good example of functionalities of such software.



Fig. 11

The menu structure of the Moodle LMS

Table 4 lists the most popular LMS programs available on the market and most frequently used in managing e-Learning providers' training activities.

Table 4

LMS packages

Product	US\$	Website
Atlantic Link		www.kaplanlt.com
Camtasia		www.techsmith.com
Claroline	Open	www.claroline.net
CourseBuilder		www.lumesse.com
Docebo LMS	SaaS	www.docebo.com
eFront	Open	www.efrontlearning.net
eLeaP		www.eleapsoftware.com
Inquisiq R3	9,950	www.inquisiq3.com
JoomlaLMS	SaaS	www.joomlalsms.com
KeneXa		www.outstart.com
Learner Web		www.maxit.com
Litmos	SaaS	www.litmos.com
Moodle	Open	http://moodle.org
open e-LMS	Open	www.openelms.org
SumTotal		www.sumtotalsystems.com
TACTIC!	2,350	www.tacticssoftware.com
TopClass		www.wbtsystems.com
TrainCaster		www.traincaster.com
Xyleme		www.xyleme.com

Remarks: Open – open source: use is free, source code available for developer.

SaaS – software as a service: paid according to actual use

Normally LMS have or assume the presence of two software components: database management and hypertext preprocessing. The freely available XAMPP package comprising – among others – the MySQL database management and the PHP general-purpose scripting language and interpreter was created for serving LMS so it installed along with most LMS applications.

In order to ensure ICT level compatibility of these systems, i.e. to provide a uniform platform for learning contents developed by using any program languages and tools, the shara-ble content object reference model (SCORM) was constructed. In reality SCORM is a collec-tion of *standards* and specifications for web-based e-Learning. The most recent SCORM ver-sion 1.2 (<http://scorm.com/>) is widely used by LMS.

Benefits of e-Learning

Compared to traditional learning methods and practice e-Learning offers the following ad-vantages and benefits:

- **Cost efficiency**
 - More efficient delivery through the Internet.
 - Wider utilization of learning resources.

- Updating is far cheaper than paper-based resources.
- Reduction of travel-related costs.
- Facilitates wider collaboration among trainers (e.g. in content development and co-ordination) trainees (e.g. tutoring).
- Due to use of various and interesting (for learners) the e-Learning produces higher **efficiency (retention rate)** than other methods.
- **Time savings**
 - Learners can go at their own pace, not at the pace of the slowest member of a group.
 - Time in classrooms can be spent on questions/topics introduced by other delegates that are irrelevant to the needs of the individual learner.
 - There is less social interaction time.
 - It takes less time to start and wind up a learning session.
 - There is less travel time to and from a training event.
 - Learners learn what they need to learn, they can skip elements of a program they do not need.
 - Some concepts can be explained more easily and quicker using computer based instruction.
- **Flexibility** – personalized learning:
 - Learners can proceed through a training program at their own pace and at their own place.
 - Learners can access the e-Learning course and all related training materials at any time and only as much as they need.
 - Individual courses/training programmes can be provided.
 - No separate distribution mechanism is needed for learning contents.
 - Any changes can be made on the server hosting the the e-Learning program and everyone can instantly access the update.
 - Easily adapts to different learning styles
- Provides appropriate facilities for **LLL**.
- **Environmental protection**
 - Radical reduction in using paper, thus saving natural resources required for cellulous production.
 - Waste disposal: no physical waste (used books, notes) is generated.

e-Learning APPLICATIONS IN LEATHER-BASED TRAINING

The number of documents, pictures, videos and other sets of leather- and derived products industry related information sources is growing, whereas more and more of these resources are becoming publicly available on the Internet. Suppliers of materials, technology and services are leaders in publication of electronic materials, though these are not necessarily objective. Training institutions are more conservative in disseminating electronic content – firstly because of their own interest, secondly due to copyright restrictions. Unfortunately, by the relocation of leather processing, footwear and other leather products industries to developing countries (especially to South-East Asia) that has taken place in the past three decades, many of the highly reputed professional education and training institutions in Europe and USA radically reduced their activities for this trade.²⁸ The vast knowledge base and experience accumulated by these institutions seem to vanish, at the same time only a few new training providers started their services in the new manufacturing regions – without the experience of the old ones. These circumstances have a negative impact on generating e-Learning contents on the basis of the knowledge collected in the past. Furthermore, new production bases are not eager to spend time and efforts on training their labour and staff, that again narrows the demand for training services – including developing electronic content and publish them through LMS.

Footwear e-Learning projects

Thanks to the EU initiative some initial results have been achieved in introducing at least the concept of e-Learning in the leather based industries, though all meaningful efforts were taken in the footwear design and technology training.

1. E-shoe learning

The E-shoe learning project (www.shoe-learn.com) was successfully completed under the *EU Leonardo da Vinci programme* and. It was led by ZAVOD IRCUO, the industrial development centre for leather and footwear industry of Slovenia. Contributing partners were the CZECH FOOTWEAR AND LEATHER ASSOCIATION²⁹, the Faculty of Technology (footwear department) of the UNIVERSITY THOMAS BATA³⁰ in Zlin/Czech Republic, the LEATHER TECHNOLOGY CENTRE³¹ in Alcanena/Portugal, the ASSOCIATION OF LEATHER AND FOOTWEAR INDUSTRY OF THE SLOVAK REPUBLIC³² and the IZOBRAŽEVALNI CENTER CENE ŠTUPAR in Ljubljana/Slovenia. One of the outcome is the website containing information on the entire shoe manufacturing: its home page (www.shoe-learn.com) is show on *Fig. 12*.

²⁸ Some institutions with long traditions, respected programs and high appreciation (by both trainees and the industry) closed completely their operation.

²⁹ ČESKÁ OBUVNICKÁ A KOŽEDĚLNÁ ASOCIACE (ČOKA – www.coka.cz).

³⁰ <http://web.utb.cz>

³¹ CENTRO TECNOLÓGICO DAS INDUSTRIAS DO COURO (CTIC – www.ctic.pt).

³² ZVÄZ KOŽIARSKÉHO A OBUVNÍCKÉHO PRIEMYSLU SLOVENSKEJ REPUBLIKY (ZKOP).



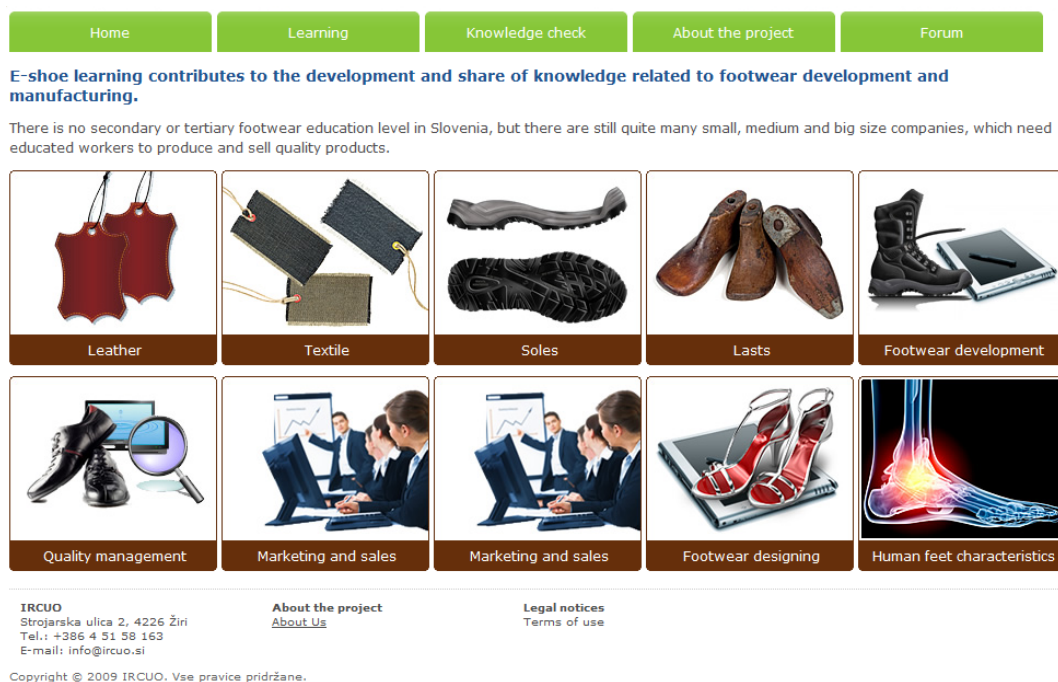


Fig. 12
The home page of the Shoe-lean project

The access to this depository is restricted to participating organizations. The continuation of this project has been conceived under the name of Shoe-Future.

2. Footwear design

So far the most comprehensive attempt to creating real e-Learning content for the footwear industry is the VTC-Shoe project (<http://vtc.shoe-design.ro> – **Fig. 13**). It was developed by three partners: “GHEORGHE ASACHI” TECHNICAL UNIVERSITY OF IASI³³ – Faculty of Leather, Textile and Industrial Management in Romania, the SELÇUK UNIVERSITY, TECHNICAL SCIENCE COLLEGE³⁴ in Turkey and the TECHNICAL UNIVERSITY OF CRETE³⁵ in Chania/Greece thanks to the educational grant provided by the European Commission’s LLL programme.

The VTC-Shoe website offers a very detailed, professionally built set of e-Learning modules that cover practically the entire footwear pattern engineering domain from foot anatomy through measurements, shoe lasts up to upper lining and bottom components construction. The bulk of lessons are concerned with developing shells and component patterns for typical shoe uppers (ladies court, Derby and Oxford, loafers, trainers, children boots, ladies sandals and high boots). At the same time techniques of pattern size grading and use of CAD technology are missing. Otherwise mobile slides of the e-Learning lessons are well organized, properly annotated and explained, they are correct from didactic point of view as well.

Access to the site is restricted to universities and polytechnics, vocational and secondary technical schools (colleges), professional training centers in EU (i.e. member and candidate states) for teaching/training their own registered pupils/students/trainees/staff. The training material is available in English and Romanian.

³³ UNIVERSITATEA TEHNICĂ “GHEORGHE ASACHI” DIN IAȘI (www.tuiasi.ro).

³⁴ SELÇUK ÜNİVERSİTESİ, TEKNİK BİLİMLER MESLEK YÜKSEKOKULU (<http://alaeddin.cc.selcuk.edu.tr>).

³⁵ Τμήμα του Πολυτεχνείου Κρήτης (www.tuc.gr).



Fig. 13
Home page of the VTC-Shoe e-Learning site

After the EU project completion, starting from September 2010 the “GHEORGHE ASACHI” TECHNICAL UNIVERSITY OF IASI has taken over the responsibility for maintaining and further developing the site content. They also administrate access rights of prospective registered users, whereas a “Partnership/Training Agreement” needs to be signed by the legal representative of the requesting institution/organization.

The **Tied Shoe** project was initiated for extending the innovation of the training approach of the VTC-Shoe platform to other countries, namely Portugal, Spain and Croatia and to incorporate new modules (innovation, internationalization, entrepreneurship and new design tools). It was also planned to extend the concept of the VTC-Shoe project into a “community of practice” that would allow footwear companies, stakeholders and professionals to share experience and present a common approach to non-European competition.³⁶

Conversion of traditional training materials

Institutions, suppliers, even manufacturing companies (tanneries; footwear, leather goods, gloves, leather garment, upholstery, sports goods producers) have today quite some electronic content that could easily be converted into e-Learning resources. Typical items and first choices may be templates and samples, guidelines, instructions, regulations, presentations, publications, videos etc. available on servers, on intranets, in individual PCs, mass storages (e.g. CDs, DVDs). They can easily be collected in central depositories and used in induction training of new employees, when staff is promoted or redirected within the organizations. Such an approach is especially useful in case of training providers where a great deal of time and costs may be saved if electronic training content is systematically developed in a collaborative atmosphere, shared and upgraded. They may also serve as effective bases for production handouts and teaching notes, supplemented by illustrative videos and other illustrations communicated through computer networks.

³⁶ There is no information available on the faith of this new project initiative.

A practical example is the complete **footwear patter engineering training kit** developed by PISIE specifically for UNIDO. The intention was to have detailed instructions/guidelines both for trainers and trainees that can be used in practical training/skill development of pattern cutters to be employed in shoe manufacturing plants. The kit also contained real size drawings and demonstration tools in form of colored transparencies³⁷ and slides demonstrating the pattern construction process (step-by-step) and manual tricks used by experienced designers. PISIE was selected because its experience in shoe design training, as well as for the potential of presenting GMP of leading Italian designers. The kit was composed of the following volumes (*Fig. 14* – see next page):

Trainer's Aid	320 slides
Trainer's Aid	64 transparencies
Trainer's Aid	29 drawings (original sizes)
Trainer's Guide	181 pages
Trainee's Aid	159 pages with drawings
Trainee's Knowledge	241 pages

Beside some information designer's tools, shoe materials, the human foot structure and shoe sizing systems³⁸ the bulk of the kit contained the step-

Under the same UNIDO project 90 kits were distributed to educational, training and development institutions in developing countries around the globe (30 in English, 30 in French and 30 in Spanish). In addition 3 practical seminars of 10 full working days each were organized (in the three languages) with the participation of 20-25 instructors from target beneficiary institutes. An Italian instructor (a highly experienced shoe designer/pattern engineer) demonstrated the practical process of pattern construction and cutting along with the introduction of the kits and providing guidelines on how to use them in the training process. There are 10 typical styles/shoe upper constructions that are presented and explained – they represent the most frequently met and cover the majority of production, at the same time can serve as a firm basis for developing other styles. The didactic approach is adequate, the drawing and slides are sufficiently illustrative, presented styles reflect aesthetic values of Italian shoes. The closing part of the PISIE training material deals with pattern grading by using Linham type pantographs (as the kit was prepared before CAD technology arrived in footwear manufacturing).

Principles and the process of developing shoe upper and lining constructions, engineering their components and patterns have not changed much in the past three decades. Though today CAD technology is widely used, knowledge of pattern making methods (that are the same as in case of doing it manually) is the prime requisite for applying computerized pattern engineering. In other words training of traditional methodology of footwear pattern making is still necessary or even a must. Therefore, transforming the PISIE training kit into electronic resources and later into e-Learning course(s) has a real perspective.³⁹ At the same time application of e-Learning is a challenge, i.e. if this is done successfully then using this approach in other aspects of the technology related knowledge and skill development should not be difficult.

³⁷ The PISIE training kit was developed in 1980s when the most widely used demonstration devices were overhead projectors capable of screening drawings on transparent media.

³⁸ These knowledge elements are very sketchy and are certainly insufficient for training newcomers to the footwear trade.

³⁹ UNIDO obtained the full right for freely reproduction, distribution and utilization of the subject PISIE training kit for professional education and training, so there is no legal limitation on reusing its content – especially graphics and pictures.

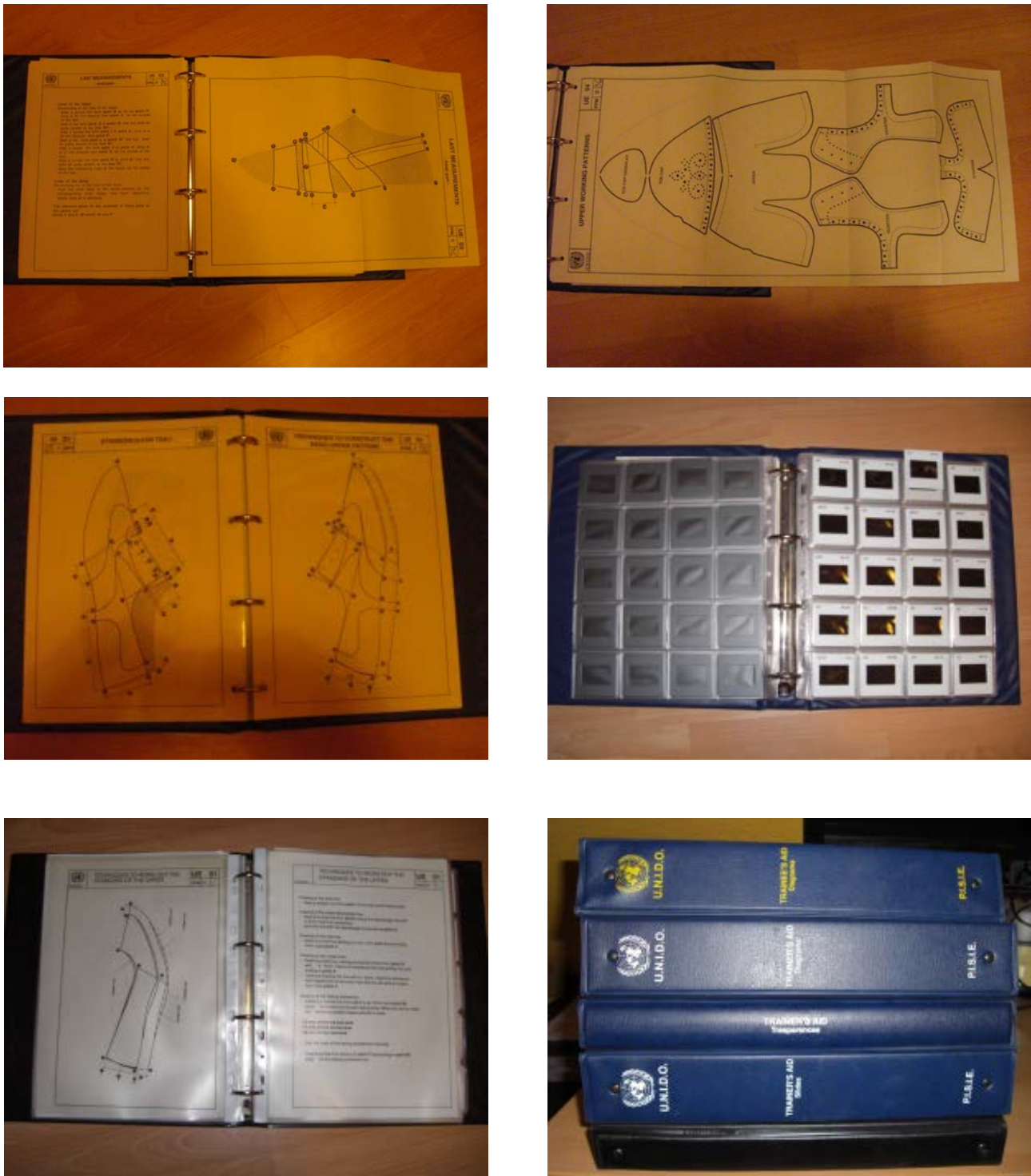







Fig. 14
PISIE training kit

The first step in digitizing the PISIE training kit was scanning its content. Thereafter the ten basic style development processes were transformed into presentations by using the Power Point program of the MS Office package.⁴⁰ Ten highly animated presentations were prepared for the ten

⁴⁰ The selection of this computer software was governed by the fact that it is the de facto industry standard: practically all institutions, offices and companies use this package in both industrialized and developing countries. In order to

basic styles: they may be used by teachers in classroom environment or by trainees in case of distance or self-learning conditions. Shoe styles as basic models of upper and lining constructions for pattern engineering training used in the ten presentations are listed in **Table 5**.

Table 5**Presentation contents**

No.	Denomination	Style	Slides
1	Ladies court		25
2	Ladies sandal		74
3	Mens sandal		25
4	Mens Derby		45
5	Mens Oxford		34
6	Slip-on		34
7	Casual/dress		40
8	Sports/trainer		39
9	Turbolar boots		55
10	(Real) Moccasin		25
	Total		396

Presentations starts with definition and some explanations of functions of the given shoe type, then an overview of the component structure is provided. The majority of slides are demonstrating the pattern engineering method and sequence. Finally variants and some aspects of the style specification are shown. The **Appendix** (as an example) demonstrates the structure of the presentation prepared for the Oxford shoe construction.

Each slide is self-explanatory, i.e. the technique used is properly demonstrated by the animated graphics and very short textual instructions appearing in clouds. In addition detailed expla-

ensure applicability of the resulting presentations in the widest possible range of establishments files are saved in the MS Office 97-2003 format that is compatible with latest issues.

nations of respective geometric constructions and some background information are attached as notes to slides where it is deemed necessary.

Since printed versions of slides would show animation engines as well, handouts/outlines would be rather confusing (*Fig. 15* shows the example of constructing vamp pattern in case of the Oxford shoe). In order to provide more meaningful handouts such slides were split into 2-5 stages so all important details of the graphic representation would be clear (*Fig. 16*).

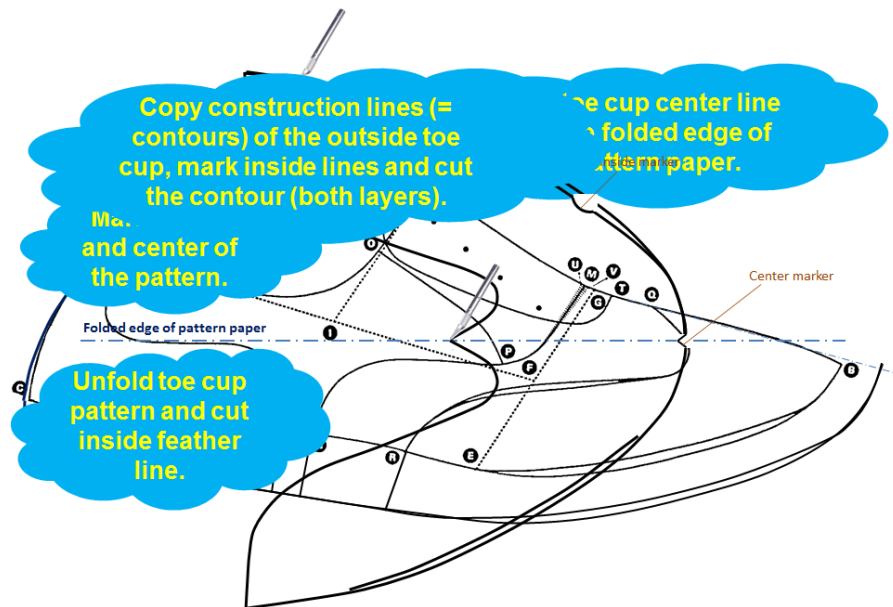


Fig 15

Static slide for toe-cap construction

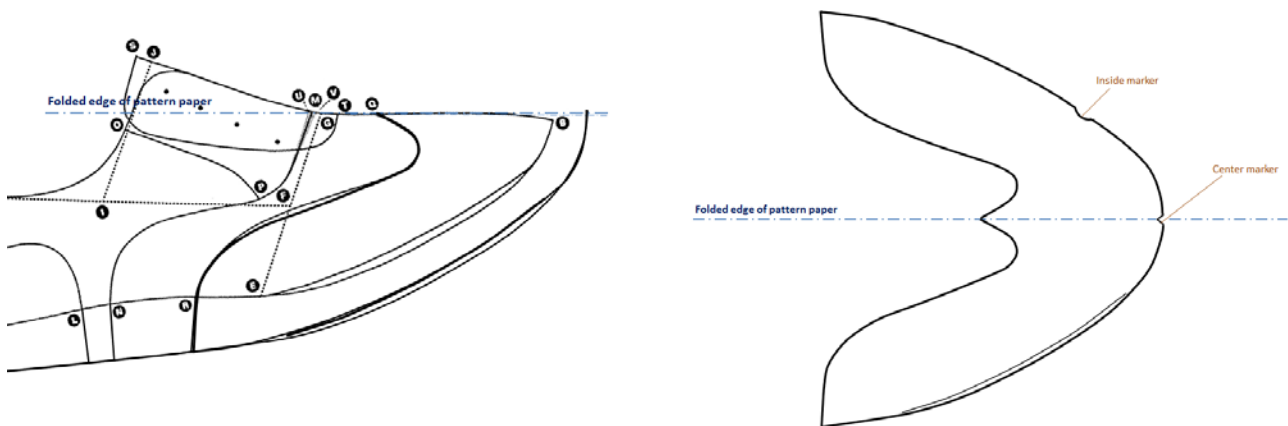


Fig. 16

Stages of constructing toe-caps

The complete handout (including explanatory notes) produced from the respective MS PowerPoint presentation (mens Oxford shoe) is attached in the **Appendix**.

e-Learning of footwear pattern engineering

Based on the MS Power Point presentations of PISIE/UNIDO training kit an attempt was made to transfer them into real e-Learning contents. The overall structure of the envisaged footwear design and pattern engineering **course** is the following:

1. Introduction (course subject, knowledge prerequisites, general instruction on using the course material, legal/copyright aspects).
2. Aesthetic aspects of shoe design (sketching, proportions, color harmony, CAD).
3. Fashion (trends and related information, apparel and clothing harmony, role of clothing accessories, short history of footwear and fashion).
4. Foot anatomy (bones/muscles/joints, standing and walking physiology, foot comfort, foot deceases and orthopedics).
5. Foot measurements (units, sizing systems, basic measurements, measuring devices).
6. The shoe last (geometry, measurements, CAD for serial shoe last production and for made-to-measure shoemaking).
7. Basic shoe upper and [inter]lining constructions:
 - (i) preparation of shoe last forms and shells, stylines,
 - (ii) ladies court,
 - (iii) ladies sandal,
 - (iv) mens sandal,
 - (v) Derby,
 - (vi) Oxford,
 - (vii) slip-on,
 - (viii) casual,
 - (ix) sports/trainers,
 - (x) boots,
 - (xi) moccasins,
 - (xii) children,
 - (xiii) working boots.
8. Shoe bottom components (insole, stiffener, toe-cap, shank, heel and top-piece, sole, runner etc.).
9. Pattern grading (CAD: basic, restricted, central, coordinated).
10. Shoe style and engineering documentations (archives, specifications, pattern properties).

The sample e-Learning module was made for the Oxford shoe by using the Articulate Story-line LCD software. It consists 35 highly animated slides whereas the user (learner) may

- pause and restart slide animation, repeat playing the slide;
- lookup detailed instructions on building the geometry of components;
- jump back to previous slides if clarification is needed or some points are forgotten;
- stop any moment and resume to the same stage later;
- do/imitate practical pattern making in accordance with the module (explanations on the screen);
- print the outline of the pattern engineering process and stages.

Fig. 17 shows a moment in using the e-Learning module.

An additional e-Learning (sub)module was prepared to demonstrate the potential of **quizzing** associated with or built in the training course. Depending on the result achieved by learner the module may or should be repeated. Upon successful completion of each module and the related tests a certificate is produced that may be printed or sent (by e-mail) to the LMS.

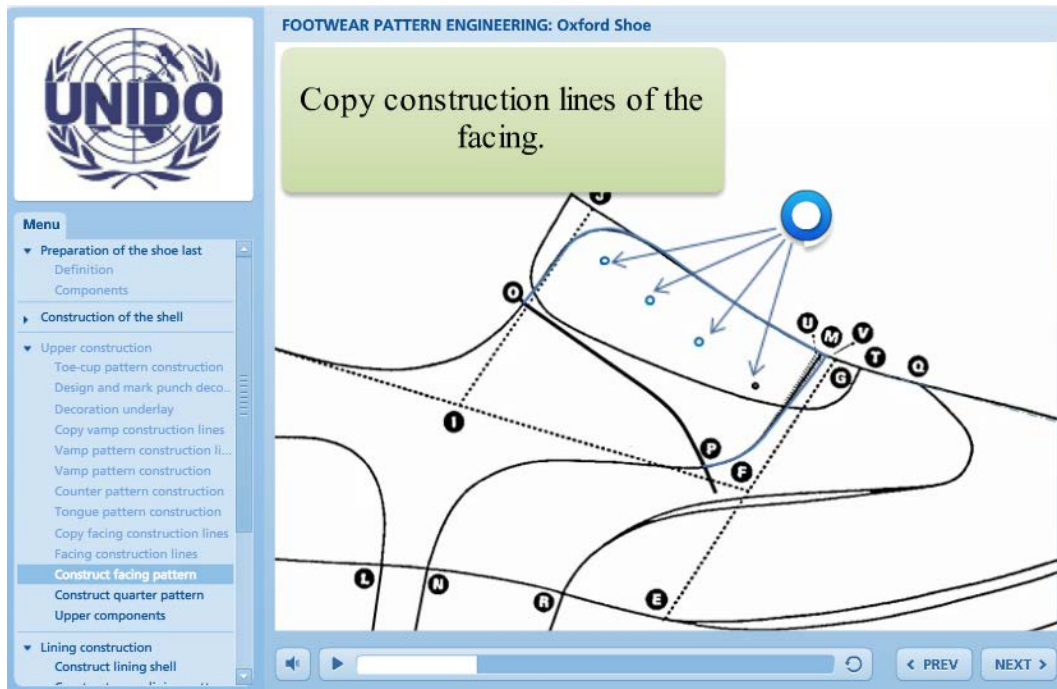


Fig. 17
e-Learning of Oxford shoe (facing) construction

RECOMMENDATIONS

1. Obtain an LCD software (Articulate Storyline may be considered as first choice) for UNIDO and use it for developing e-Learning courses/modules/lessons through technical assistance projects implemented in developing countries.
2. Complete Power Point presentations and respective e-Learning modules by adding missing elements of the complete shoe design and pattern engineering course.
3. Implement the Power Point presentations and e-Learning modules in a selected institute in one of the developing countries. For this local instructors should be trained, so they could monitor the self-learning process.
4. Transfer existing UNIDO resources (produced earlier) into e-Learning courses and/or modules to gradually build a repository that may be reused in technical assistance projects. (NB. Several documents submitted to the UNIDO LP would qualify for this purpose: e.g. papers dealing with tannery pollution control, value chain management, benchmarking, OSH.)
5. Review possibilities, pre-requisites, conditions and required resources for establishing a world-wide cooperation (or at least among developing countries) in collaborative generation of e-Learning content for the leather-related industries.
6. Study the potential and market for generating – desirably in cooperation with respective suppliers – e-Learning contents for most modern technologies and solutions penetrating into manufacturing systems.
7. Investigate the possibility of publishing e-Learning content in cooperation with the upcoming UNIDO INSTITUTE.