Development of an E-learning System for CME in Occupational Medicine

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Introduction

- In Italy, there is at present a certain drive in order to make e-learning for Continuous Medical Education (CME) to take off even though a normative framework for distance CME has not been completely defined yet.

- When dealing with the introduction of computer based systems for healthcare personnel, **user acceptance** is often quoted as a critical issue, and e-learning systems are not an exception.

- **User acceptance** is highly dependent on system usability.
Aim

To describe the process of development and implementation of an e-learning system for CME in the field of occupational medicine, with special focus on usability aspects.
The E-learning system for CME

http://fad.cbim.it

11 courses:
- professional asthma
- pneumonia caused by allergens
- patients handling
- noise
- video terminals
- mechanical vibrations
- manual motion of things
- industrial solvents
- ergonomics
- professional stress
- risk management

specific aspects of the routine activity of an occupational physician (job suitability, communication, legal issues...)
The E-learning system for CME

Patients handling

La MOVIMENTAZIONE manuali di PAZIENTI

1. Test di ingresso

2. Epidemiologia, anatomia, fisiopatologia, legislazione e consenzienza sanitaria

3. Valorizzazione del rischio e ambiente di lavoro

4. Movimentazione con ausili e previsione

5. Test

6. Questionario di gradimento

La MOVIMENTAZIONE manuali di PAZIENTI

Decente Edo Casadei

Inviare un messaggio al Tutor: Edo Casadei

Attenzione: per l'avviamento di tutti i moduli del corso è necessario aver eseguito il test di ingresso

1. Test di ingresso

2. Epidemiologia, anatomia, fisiopatologia, legislazione e consenzenza sanitaria

3. Valorizzazione del rischio e ambiente di lavoro

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5. Test

6. Questionario di gradimento
The educational model

The educational model has been designed in order to provide:

- Information transfer via **self-learning modules** for free navigation
- Schematic representations of **guide-lines based behavioural paths**, through **hyper-flowcharts** to improve knowledge transfer into clinical practice
- Ad hoc **case studies** aimed at testing the knowledge and the acquired ability in solving specific problems
- **Traditional tests** for the evaluation of the learning process (questions with multiple choice answer)

A **Tutor** supports the continuity of the learning process. He/she is available for questions/explanations via synchronous or asynchronous communication
The E-learning system for CME

- Open source course management system → Moodle (Modular Object-Oriented Dynamic Learning Environment)
- WBTExpress® for learning objects
- MSVisio® for schematic representations of behavioural clinical paths
Usability testing

2 phases

1) Analysis of ease of use and intelligibility of **basic functionalities**

2) Inspection of the **subjective usability perception**

10 users (occupational physicians, mean age 45 years, range 29 - 58) were enrolled for this evaluation
Basic functionalities

A usage test was structured in order to:

- Verify that the users have **understood**: the role of the pre-test, how to earn CME credits and get general courses information, the effects of web site registration, relationship between web site and course registration

- Check the **accomplishment** of the **tasks** as to: course registration, visualization and printing of one hyper-flowchart, interaction with the tutor, visualization of the educational offer and of the course content
Basic functionalities

- During the usage test session, each user, filled in a specifically prepared paper form in order to verify the completion of the tasks and the correctness of the information he or she had understood.

- In the meantime, an experienced observer recorded the comments of the user as well as personal observations.
Basic functionalities analysis

Rates of success

<table>
<thead>
<tr>
<th>Task</th>
<th>Initial test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Visualise the educational offer</td>
<td>100</td>
</tr>
<tr>
<td>2. Visualise course content</td>
<td>80</td>
</tr>
<tr>
<td>3. Enrol in a course</td>
<td>60</td>
</tr>
<tr>
<td>4. Visualise and print hyper-flowchart</td>
<td>40</td>
</tr>
<tr>
<td>5. Send a message to the tutor</td>
<td>20</td>
</tr>
</tbody>
</table>

Criticalities

Understanding

6. Basic rules and general information
7. Meaning of web site registration
8. Meaning of course registration
9. Role of the initial test
10. How to earn CME credits
Subjective usability perception

Software Usability Measurement Inventory (SUMI) [www.ucc.ie]

- It is a consistent tool to assess the quality of use of a software product from the user’s point of view.
- It consists of 50 questions.
- SUMI contains 5 sub-scales:
  1. **Efficiency** - support to enable users to get their work done.
  2. **Affect** - likeability, stress-free usage of the product.
  3. **Helpfulness** - degree of information about the product in the product itself.
  4. **Control** - amount of transparency as perceived by the end user.
  5. **Learnability** - ease with which a user can pick up how to use the software.

and a **Global scale**
Subjective usability perception analysis

SUMI scores

Initial test

>50: Good software
40-50: Poor usability
<=40: Poor usability & need of remedial actions
Hints from the results

The obtained results were, on average, acceptable

BUT

Ease of use and user satisfaction make the difference between usage and abandon of a system

AND

“on average”
could not be enough
Identification of criticalities

4 kinds of remedial actions have been identified:

- Lexical related actions (Lex) – changing words or sentences to better explain the relative meaning
- Layout related actions (Lay) – changing the page layout to improve resource access
- Procedure related actions (Pr) – modifying the path to access to a particular resource
- Poor information related actions (PI) – adding specific information to improve the explanation of images and symbols
Identification of criticalities

- In total 34 – respectively 13 (Lex), 4 (Lay), 10 (Pr) and 7 (Pl) – interventions have been identified as potentially useful.
Lexical related actions (Lex) and Layout related actions (Lay)

Before…
Lexical related actions (Lex) and Layout related actions (Lay)

...and after
Poor information related actions (PI)

Before...

Open flow-chart PDF
Poor information related actions (PI)

...and after

Print flow-chart from PDF
Procedure related actions (Pr)

Before...

...and after
The basic functionalities and the subjective usability perception tests were performed again, using the same sample of users, on the revised system in order to quantify the improvement.
Results
Basic functionalities analysis

Rates of success

Initial test

Final test

Rates of success for tasks 4 and 6 were still quite low due to misinterpretation of the requests on the paper form???
Subjective usability perception analysis

SUMI scores

Initial test

>50: Good software
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<=40: Poor usability & need of remedial actions

Final test

All scales are above the score of 50
Discussion

- Only the usability of the basic functionalities of the system have been evaluated.
- The small number of testing users (10) is commonly reported as “adequate” for usability studies. Next step: larger sample.
- The SUMI questionnaire has given good results, but it is quite long and many users have had uncertainties when answering some items. Next step: Software Usability Score (SUS) Questionnaire.
Conclusions

- The efforts aimed at improving usability of the prototype software has led to good results.
- Comments, by initially very skeptic users, have pointed out a positive attitude to use the e-learning system after improvement interventions.
- Investing in improvements of usability has proved to be useful, even when not strictly necessary.
- System perceived quality has been judged as good or excellent by 75% of an initial sample of 77 real users (data non available at the time of submission).
Hoping that e-learning takes off in Italy …