

IST PROGRAMME



Action Line: IST-2002-8.1.2



End-User Development

**Empowering people to flexibly employ advanced
information and communication technology**

Contract Number IST-2001-37470

D4.2 Analysis of EUD Survey Questionnaire

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Summary

This document was not planned in the list of deliverables specified in the project, since it describes some activity that were not planned in the project proposal. During the network activity, we realised it could be useful to get more feedback about EUD concepts, products, awareness, etc. EUD-Net has designed, administered, and analysed a survey questionnaire, whose aim is to evaluate the knowledge of various aspects of EUD in both research and industrial communities. This questionnaire and the performed analysis is reported in this document.

October 2003

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Executive summary

This document is a further deliverable not included in the list planned in the project, since it describes further activities that were not planned in the original proposal. It has been an initiative of UNIBA, on which all EUD-Net members agree, to design and administer a survey questionnaire to evaluate the knowledge of various aspects of EUD in both research and industrial communities, involving organizations outside the network in order to get more feedback about EUD concepts, products, awareness within the European community.

This document describes the motivations behind this activity, the design of the questionnaire, the modalities to administer it, and the results of the analysis of the questionnaires that have been returned to UNIBA by October 15th 2003.

More specifically Section 1 presents an introduction to this document; Section 2 describes how the questionnaire is composed; and Section 3 reports the analysis of the results obtained from the 65 survey questionnaires returned.

Finally, last section provides the conclusion.

1. Introduction

As a further activity not planned in the project proposal, EUD-Net members set up a “survey questionnaire” that is described in this document. Indeed, during the network activity, we realised it could be useful to get more feedback about EUD concepts, products, awareness, etc. Following a proposal of UNIBA, on which all EUD-Net members agreed, a survey questionnaire was designed, administered, and analysed. The main motivation of this questionnaire has been to collect information about the knowledge and the opinion on various aspects of EUD in research as well as in industrial communities.

The questionnaire has been designed by people of the University of Bari EUD.Net node. It has been revised with the contribution of all EUD-Net members. In particular, we acknowledge the contribution of UMST people, who provided some questions of Part C. The questionnaire is reported in Appendix A.

The questionnaire was first administered by members of University of Bari during Interact 2003 conference, held in Zurich (Switzerland) last September 1-5. Some days later, with the contribution of Catherine Lethondal of Pasteur Institute in Paris, who implemented the questionnaire on the Web, it was available on-line on the EUD-Net Web site to be filled by various organizations that might have interest in EUD, and thus speeding up the process of collecting it.

2. Survey questionnaire

To cover various aspects of EUD, the questionnaire is divided into three parts:

- Part A requires data about the organization of the person who is filling the questionnaire;
- Part B provides, firstly, some explanations about the concept of EUD; then it is asked to indicate products with EUD features, and finally the remaining questions address the proposed definition of EUD;
- Part C includes several questions to know about possible interests and opinions on EUD (promising application domains for EUD, specific user needs for EUD, etc.).

This questionnaire helped the Network to reach various objectives, such as:

1. to get feedback about the EUD concept itself and awareness on EUD;
2. to provide feedback about current state of the art of EUD;
3. to get information about current and future interests in EUD in Europe, thus providing suggestions for improving the roadmap and the research agenda.

Considering objective 1, we expect the questionnaire to provide indications for increasing the communication among organizations that, even having a common interest in EUD, are not aware of it due to a lack of a shared language.

The deadline for returning such questionnaires was established on October 15. At that date, we collected 65 questionnaires. However, the survey questionnaire is still available online at the URL: http://www.pasteur.fr/~letondal/eud_survey.html for possible further processing.

3. Result Analysis of Survey Questionnaires

This section reports the analysis of the results obtained from the 65 survey questionnaires returned to UNIBA during the last two month of the EUD-Net activity. As we said above, the questionnaire is organised into three parts.

In the following, the analysis will be divided according to these three parts.

3.1 Part A: About your organization

In this part, was asked information about the type of organization in which the person primarily works.

12 people belong to Computer Industry. They work in various fields:

- one person works in a Hardware/Software Manufacturer
- three persons belong to Software Manufacturers
- two people work in a Software Services company
- four people belong to an organization in the Consulting (Computer-Related) area
- four persons belong to other Computer Industry (“Consumer electronics”, and “Telecommunication network providers”)

37 people belong to education organizations.

6 people from government organizations filled the questionnaire, all from Federal or International organizations.

13 persons belong to Research Institutes: 4 from Public Research Institutes, and 9 from Private Research Institutes.

The remaining five people said to belong to “Other organizations”, such bank, consulting (financial), financial services,

The people answering the questionnaires belong to organizations of various sizes: from 0-25 people (12,31 %) to 10,000 or more people (21,54 %). The rest is in between.

3.2 Part B: Definition, products and features of EUD

In this part of the questionnaire, after introducing the concept of EUD and some example of commercial software tools that present EUD features, e.g. MS Office products, it was required to list other products with EUD features.

Some of the mentioned products and their EUD features are shown in Table 1.

Question B.2 reports the definition of EUD provided by EUD-Net: “*End-User Development is a set of activities or techniques that allow people, including non-professional developers, at some point to create or modify a software artefact*”. It is asked to agree or not on this definition. The results are reported in Figure 1.

Product	Features
ACL	
AgentSheets	End-user programming
Auctex-Emacs	It provides menu entries linked to lisp macros that will automatically record Latex documents into several other formats (PDF)
Boxer	Fully programmable, but also usable as text/work environment without any programming. Thus, a "gray box" model (fully integrated black boxes, that can be opened, inspected, changed or built from scratch)
CAD Systems	
COCOA	Building new games from examples or from rules
ERPs SAP	Customization algorithms
Eudora	Junk mail
FileMaker Pro	Database tailorable; design layout of fields e functions in database
FrameMaker	Has an end-user XML styling "language" called an "EDD"
Gnome	
Hypercard	Set up "status" of cards, change order, presentation, etc
IKEA planning	It is an application allowing to set furniture modules in an environment to design the interest of a space
Indoor climate controls	
KDE recent documents	
LIMS	Laboratory Information Management Systems
Lotus Notes	
Macromedia Director	Multimedia Authoring
Macromedia Flash	Web authoring
Micromedia Authorware	Multimedia authoring
MOOs e MUDDs	Chat room users create test-based environments
Natural in pictures	Map driven development
Nintendo games	Choose level of difficulty, characters, story environment, etc
Operating systems	Create, modify, cancel files
Oracle frames	
OSX	
Philips Pronto Remote Control	
Plone	Web application customization, free soft
Programmorphism	Transform programming into customization
Refrigeration and heating controls	
Scitegic Pipeline-Pilot	"Chaining" bioinformatics analyses together using a GUI
SharePoint Team Services	
Stagecast	End-user programming by demonstration
Teln	Map & database driven development
Teporting Tools (Business Objects for example)	
ToonTalk	End-user programming by example (for kids)
Various CASE tools	Interface adjustments, new plugins...
wiki	Allow users to create/modify web content
Zope	Help customize web applications;

Table 1. EUD products and their EUD features.

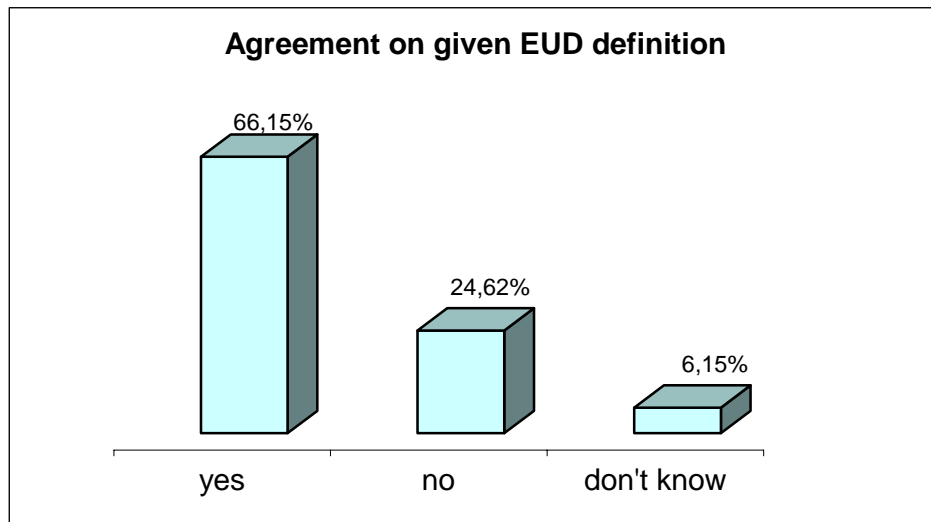


Figure 1. Answers to question B.2 on the agreement on the proposed definition of EUD.

Some motivations why some people did not agree on the given definition (Question B.3) were:

- ““Software artefact” is too vague”
- “Just thinking of developers is fallacious: end-users don't intend to "modify a software artefact". End-users intend to use technology. They don't intend hustle with software or any other related bull-shit. This is the reality. Forget about your academic definition”
- “Too technical → gap between the unspecific title and the highly specific explanation is too big”

A number of other definitions of EUD, or modification of the given definition, were provided by people that either agree or disagree on the given one:

- “...that with other easily available tools allow the people ...”
- “an EUD tool should enable people, including non professional developer, to tailor their own application”
- "EUD enables everybody to add or change functionality to/in a computer program" and perhaps append "much more than a few configuration options".
- Delete the words "at some point"
- “End-User Development is a set of activities or techniques that allow people [...] at some point to create or modify a software artefact for their own and individual situated purpose”
- “End-user development is a set of activities or techniques that allow people to accomplish their goals through the incidental creation or modification of a software artefact”
- “End-User Development is a set of activities or techniques that allow people to create electronic artefacts.”
- “End-User Development is a set of activities or techniques that allow people, including non-professional developers, at some point to create or modify a software tool or process.”
- “End-User Development is a set of activities or techniques that allow people, including non-professional developers, at some point to create or modify some software artefact or some software artefact features.”

- “End-user development is a set of activities or techniques that allow users of software systems at some point to act as non-professional developers and to create or modify a software artefact.”
- “End-User Development is a set of activities or techniques that allow non-professional developers, to custom, adapt, modify, enhance or even create software.”
- “Giving non-technical people the ability to modify, disassemble, interconnect or create dynamic and interactive "documents"”.

In our opinion, the above definitions provide new indications to improve the definition.

Moreover, after the discussion at the Symposium in Bonn, a new, modified, definition was given: “*End-user development is a set of activities or techniques that allow people, who are non-professional software developers, at some point to create or modify a software artefact*”.

3.3 Part C: Interests and opinions on EUD

Question C.1 is about the interest in EUD of the person, his/her organization and work group. The results are summarized in Figure 2.

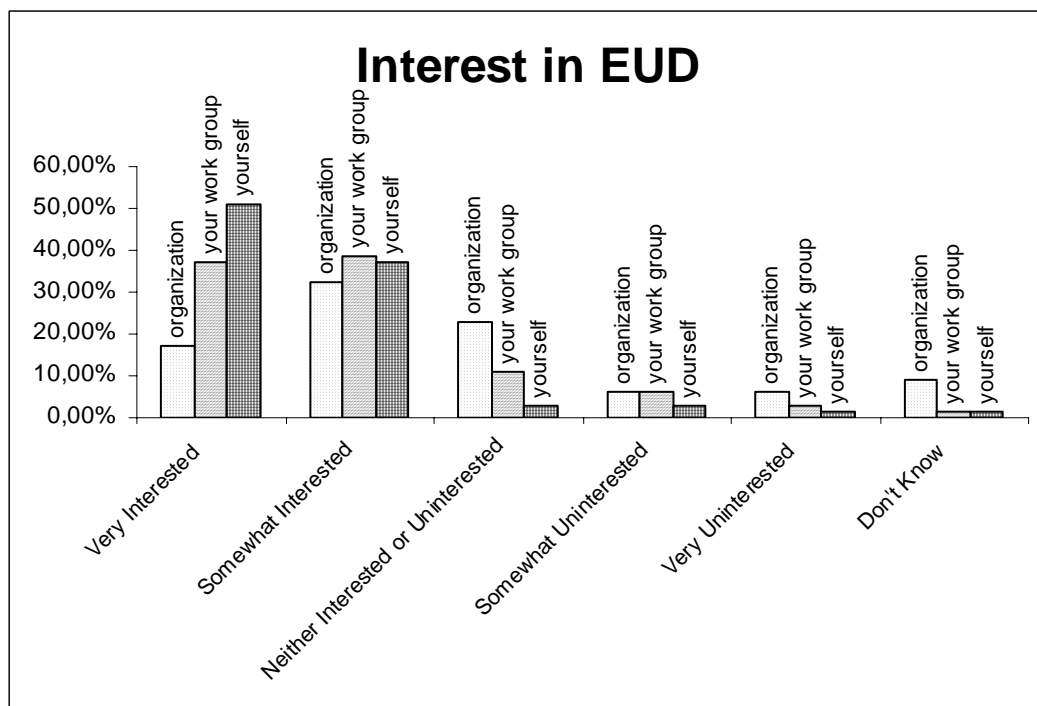


Figure 2. Interest in EUD of each person, his/her organization and work group.

As we can see from Table 2, people answering the questionnaires are active in various areas and/or application domains.

AI	Multimedia DBMS
Architecture	Multimedia software development
Bioinformatics	Museum applications
CAD	Network and graph theory
Computer science research	Nomadic computing
Computer vision	Office
Databases	P2P
Domestic technology	Parsing of visual languages
Educational applications for use in the classroom. Domestic technology-usability issues with VCRs & other domestic products	Personalization
E-government, workflow, data warehouse	Publishing industry infrastructure/technology
E-learning	Risk management
End User Development	Scientific software
EOP for teachers and students in the K-12 environment;	Software development effort prediction models
ERP systems	Software engineering formal methods
Financial	Technical support
HCI	UI development
Healthcare	Unanticipated software evolution
Information systems	User interaction design/research
Middleware	Visual languages
Mobile	Web design
Multimedia appliances	Workflow management systems

Table 2. Answers to question: “Application domains in which you are active”

Figure 3 shown the percentage of the various answers to the Question C.3 asking if they developed products of EUD. People who answered “yes”, indicate the following application domains in which they developed EUD products:

- interactive multimedia
- bioinformatics
- CAD (mechanical) user interfaces design
- consumer electronics
- documentation,
- web publishing,
- e-learning and software reuse
- email
- SharePoint,
- database
- office applications
- GIS
- collaborative systems
- mainframe teleprocessing applications
- mechanical domain
- medical domain

- refrigeration and heating controls
- science and mathematics learning environments, teach and student constructible or modifiable
- text editing
- TiVo
- visual languages
- Web
- courseware

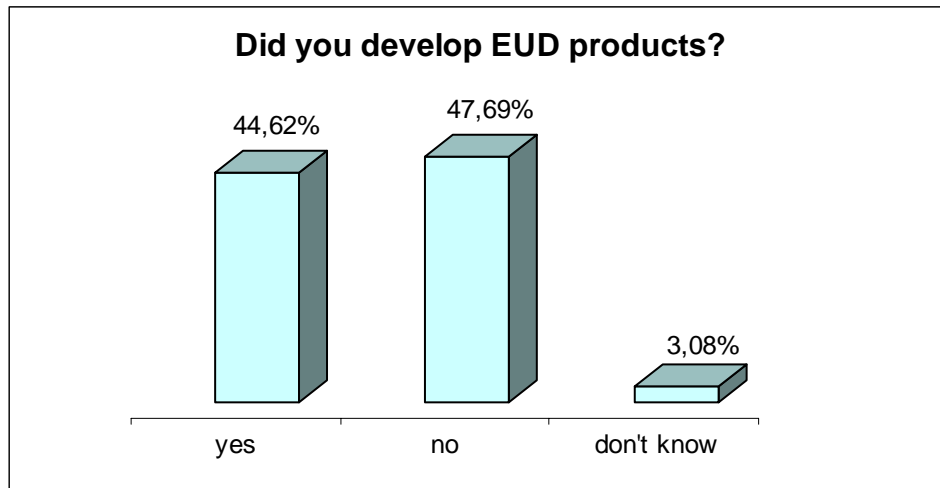


Figure 3. Answers to Question C.3 “Have you already developed products of EUD?”

About the application domains more promising for EUD (Question C.4), the answers are summarized in Figure 4. Other application domains, not listed in the question, but indicate by people are: decision analysis, education (indicated by most people), and medical domain.

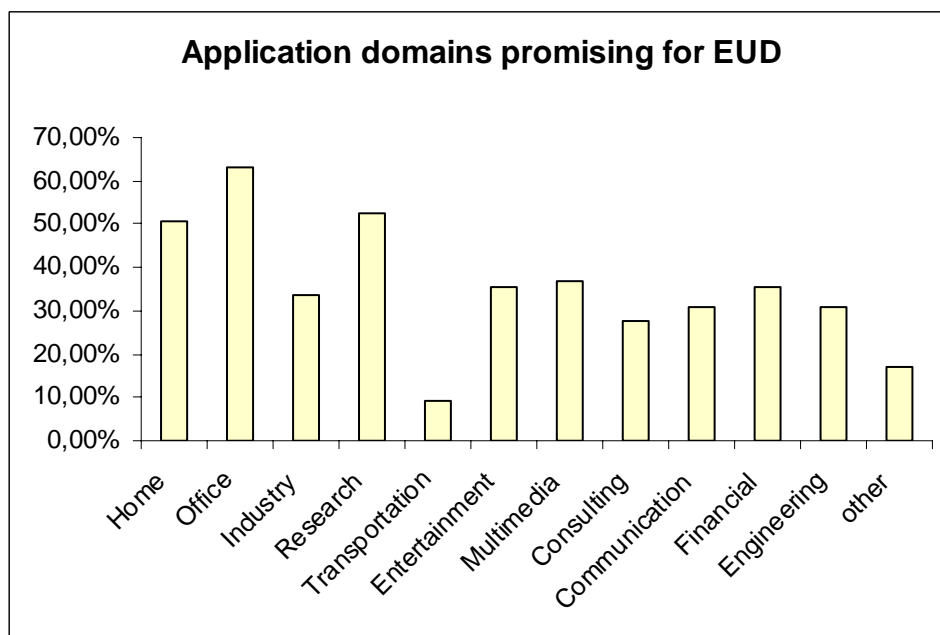


Figure 4. Application domain more promising for EUD.

Question C.5 required to express an opinion on specific user needs for EUD. Figure 5 shows the answers (in percentage). In the “other” field, the following other needs were indicated:

- access to the source code and permission to modify it and publish modified versions.
- automation of tedious or repetitive tasks relying on his/her own domain expertise
- changing context, domain information
- implementing business process
- preferred access to certain information/functionalities
- tailor activities to particular usages
- to assist in highlighting errors
- to change the behaviours of existing functionalities
- to help people to form cognitive maps of abstract functions

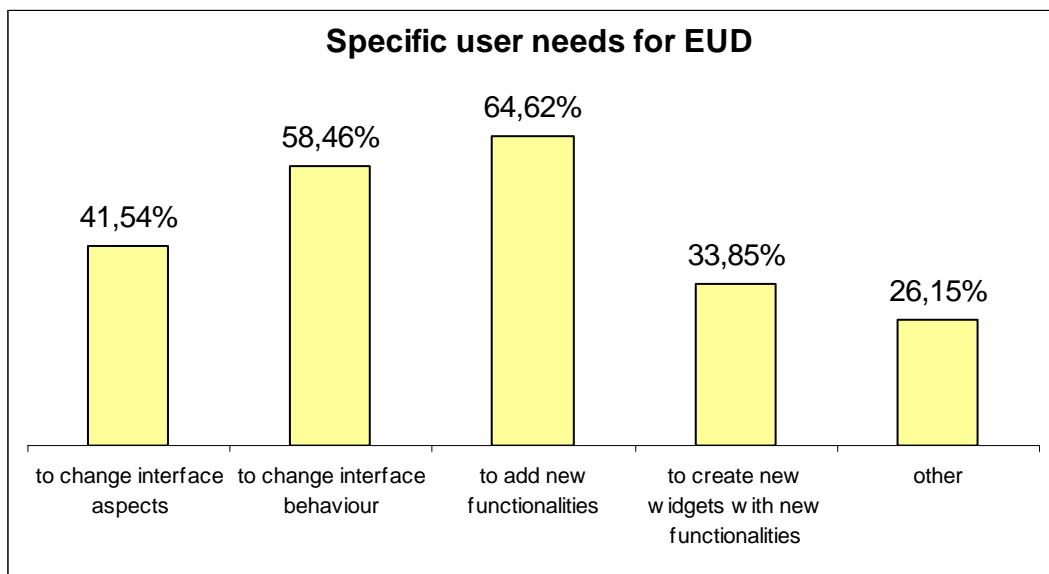


Figure 5. Percentage of answers on the specific user needs for EUD.

Figure 6 reports the overall opinion on the matter if the current technology is suitable for EUD or not (C.6). People who responded “no” to the question, reported the following lacks:

- a good interface to understand a person's wishes
- a still not flexible, easier enough for average user
- development techniques and methods oriented towards active participation of end users; effective languages for user and end-user developer communication and programming; established and easy-to-use development tools supporting general software development; sophisticated technological platforms, e.g. plug-and-play software components
- it's not the technology, it is the user who is not ready
- methodology, means for quality assurance

- more effective languages, reusable conceptual models, shareable solution and components/agents
- proprietary technologies represent a barrier to EUD development (software products are black boxes)
- reusability is poor.
- the ability to de-construct (and subsequent re-construct&modify) applications and modules based on concepts from the application area
- there is always a trade off between adaptability and adaptivity
- to help people to form cognitive maps of abstract functions
- training
- we do not have components that might allow to add EUD facilities in software in a easy way
- we need better metaphors for programs, so that users don't have to learn about loops interaction variables in order to write a program

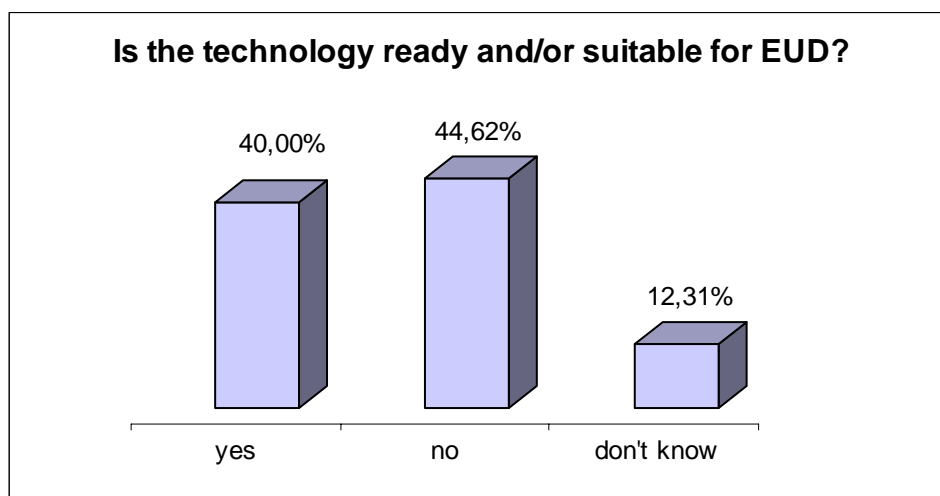


Figure 6. Answers to Question C.6.

Last Question C.7 presents 15 statements, asking the degree of agreement about each statement in a 5 point Likert scale. The number of checks in each cell is reported in Table 3.

Looking at this table, some interesting considerations can be done. If we focus on statements S2, S4, S5, S7, and S8, we see that they express a positive attitude towards EUD. From our point of view of scientists interested in EUD, we were pleased to see that most opinions about such statements were "Agree" and "Agree strongly". This means that people **agree** on the fact that EUD:

- makes people more efficient in their job tasks, make the work more interesting,
- may speed up software development,
- exploits domain expertise thus creating more effective software,
- the perceived benefits out-weighs the perceived costs.

In Figure 7 are graphically reported the average values for each of such statements, after assigned a value from 5 to 1 respectively from "Agree strongly" to "Disagree strongly".

If we consider the remaining statements, we may see that most people **do not agree** on the fact that:

- programming is too hard for the non specialists (S9),
- EUD can undermine managerial authority (S10),
- EUD is too expensive for organizations to implement (S12),
- EUD tools will consume time that would be better to spend on main job tasks (S2).

Figure 8 shows the average values for each of the negative statements.

Statement	Agree strongly	Agree	Indifferent	Disagree	Disagree Strongly
(S1) Software development is the responsibility of software specialists	4	25	7	20	4
(S2) Using EUD tools will make me more efficient in my main job task.	13	29	16	3	3
(S3) Using EUD tools will consume time which I should be spending on my main job task	5	16	12	23	9
(S4) Using EUD tools could make my work more interesting.	9	33	14	9	0
(S5) EUD could speed up software development.	7	32	8	15	1
(S6) EUD creates a software quality issue.	16	30	10	2	5
(S7) The domain expertise of end-users can create more effective software to support their activities	24	27	8	3	1
(S8) EUD success in the organisation depends primarily on the perceived benefits outweighing the perceived costs	12	26	19	5	1
(S9) Programming will always be too hard for the non-specialist.	6	15	3	30	10
(S10) EUD can undermine managerial authority	3	12	22	18	7
(S11) EUD can be dangerous (e.g. Data security)	7	28	11	13	5
(S12) EUD is too expensive for organisations to implement	1	5	26	25	7
(S13) EUD work should focus on solving the cognitive issues first	8	21	21	9	3
(S14) EUD work should focus on socio-technical issues first	6	21	21	13	2
(S15) EUD work should focus on organisational issues first	3	26	17	15	1

Table 3. Answers received to Question C.7 on the returned 65 questionnaires

However, people are still afraid that EUD can create some problems about data security (S11) and about software quality. This means that further research needs to be carried out to solve such problems.

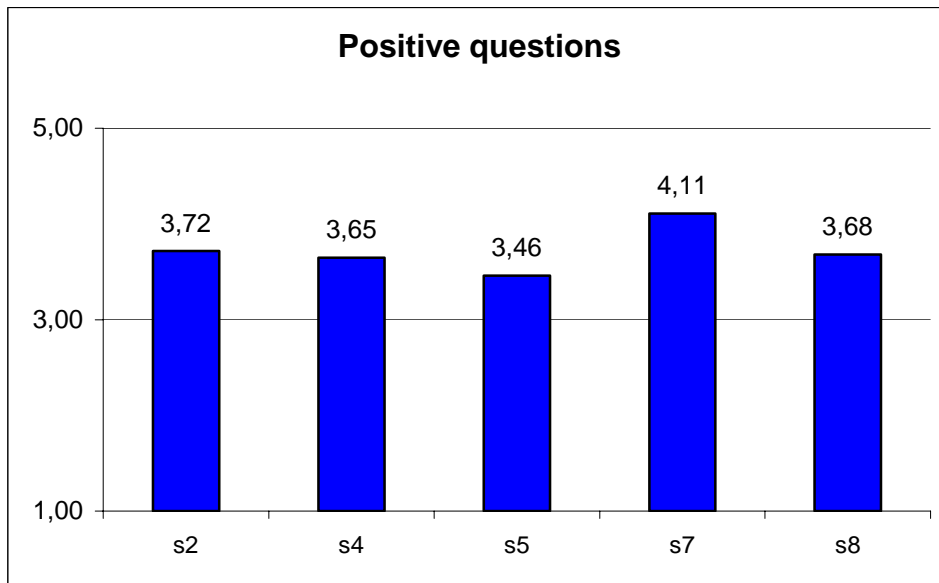


Figure 7. Average values on negative questions.

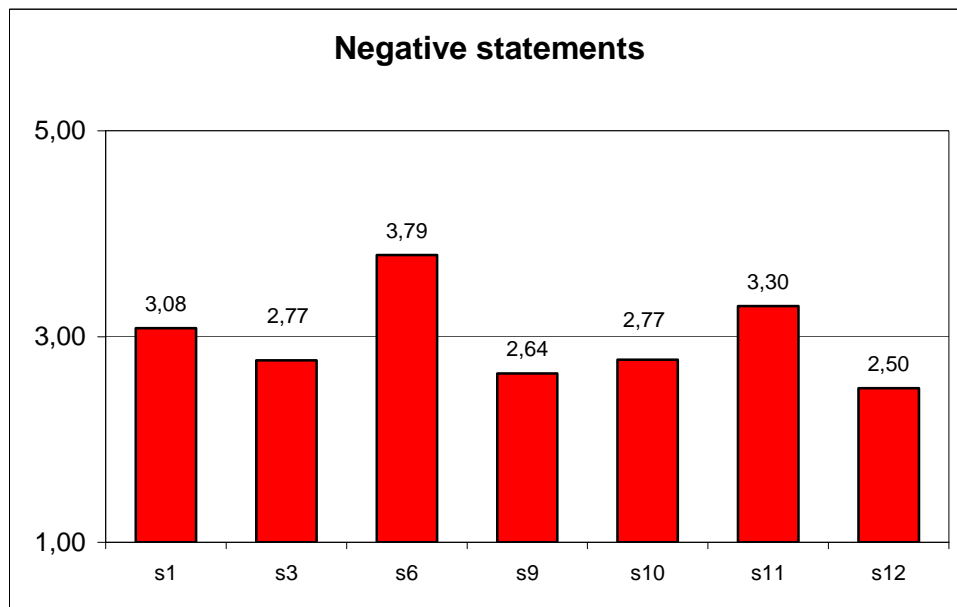


Figure 8. Average values on negative questions.

Conclusions

This document describes the motivations and the activities performed to design, administer and analyse a survey questionnaire to evaluate the knowledge of various aspects of EUD in both research and industrial communities.

The questionnaire has been administered both on paper and on-line on the EUD-Net web site, in order to also involve organizations outside the network, with the aim of getting more feedback about EUD concepts, products, awareness within the European community.

The analysis was performed on 65 questionnaires that were returned to UNIBA up to October 15th 2003. Our idea is to keep collecting other questionnaires in order to further get information on EUD that proved to be a promising area for future research and product development.

Acknowledgements

All EUD-Net members are acknowledged for their important comments and suggestions that were extremely useful for improving this document.

Appendix A: Survey Questionnaire



End-User Development Empowering people to flexibly employ advanced information and communication technology

Contract Number IST-2001-37470

Survey Questionnaire

EUD-Net is a thematic network that aims at helping the European Commission to prepare a research agenda in the **End-User Development (EUD)** field for the future programs, and to increase contacts among highly-qualified research centres, both academic and industrial, in order to speed-up the production of innovative ideas and approaches.

We ask your cooperation in order to get information from organizations about various aspects of EUD: the concept itself, the features of EUD environments, the market for EUD, the technologies for EUD, etc.

Your answers are very important and will be held in strict confidence. In reporting the results, we will present summary data, and specific answers will not be attributed to any specific organization or individual by name.

This survey has three parts. Part A asks two questions about your organization. Part B is about definition, products and features of EUD. Part C asks questions about your interests, involvement and opinions on EUD.

Thank you for your help.

The EUD-Net Evaluation Committee

=====

Part A: About your organization

A.1 What type of organization is your primary employer? *(Please check the appropriate box)*

a) Computer Industry:

- | | |
|---|--|
| <input type="checkbox"/> Hardware/Software Manufacturer | <input type="checkbox"/> Software Manufacturer |
| <input type="checkbox"/> Hardware Manufacturer | <input type="checkbox"/> Software Services |
| <input type="checkbox"/> Hardware Services | <input type="checkbox"/> Consulting (Computer-Related) |
| <input type="checkbox"/> Other Computer Industry _____ | |

b) Education:

- | | |
|--|--|
| <input type="checkbox"/> University/College | <input type="checkbox"/> Two-year College |
| <input type="checkbox"/> Pre-College | <input type="checkbox"/> Industrial/Professional |
| <input type="checkbox"/> Other Education _____ | |

c) Government:

- | | |
|--|--------------------------------------|
| <input type="checkbox"/> Federal/International | <input type="checkbox"/> Local/State |
|--|--------------------------------------|

d) Research Institute

- | | |
|--|---|
| <input type="checkbox"/> Public Research Institute | <input type="checkbox"/> Private Research Institute |
|--|---|

e) Other Organizations: _____

A.2 How large is your organization? *(Please check the appropriate box)*

- | | |
|--|---|
| <input type="checkbox"/> Less than 25 people | <input type="checkbox"/> 500 - 999 |
| <input type="checkbox"/> 25 - 99 | <input type="checkbox"/> 1,000 - 9,999 |
| <input type="checkbox"/> 100 - 499 | <input type="checkbox"/> 10,000 or more |

Part B: Definition, products and features of EUD

One fundamental challenge for the coming years is to develop environments that allow people, who do not have a particular background in programming, to tailor and even develop their own applications. The ultimate goal is empowering people to flexibly employ advanced information and communication technologies within the future software environments.

Features of EUD environments are already provided in commercial products. Some examples are:

- macros recording in Microsoft Office products as Excel and Word;
- automatic filling in Excel;
- creation, modification (content and/or layout) of toolbars in Microsoft Office;
- e-mail filtering in applications such as Eudora, Outlook, and so on.

These products permit to create and/or modify software artefacts (toolbars, button associated to macros, e-mail filter, etc.) without requiring the user to know any programming language.

B.1 Can you provide examples of other products with EUD features?

PRODUCT	FEATURES
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

B.2 In order to clarify the concept of EUD, EUD-Net has proposed the following definition:

Def. “End-User Development is a set of activities or techniques that allow people, including non-professional developers, at some point to create or modify a software artefact”.

Do you agree on this definition?

YES

NO

DON'T KNOW

B.3 If not, why? _____

B.4 Can you provide a better definition? _____

Part C: Interests and opinions on EUD

C.1 How much are your organization, you, and your work group interested in EUD? *(Please check the appropriate box for each item)*

	Very Interested	Somewhat Interested	Neither Interested Or Uninterested	Somewhat Uninterested	Very Uninterested	Don't Know
ORGANIZATION	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
YOUR WORK GROUP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
YOURSELF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2 In which application domain are you active?

C.3 Have you already developed products of EUD?

- YES NO DON'T KNOW

If yes, in which application domain?

C.4 In your opinion, which are the application domains more promising for EUD? *(Please check all the appropriate boxes; specify new possible domains in the OTHER row)*

- | | |
|---|--|
| <input type="checkbox"/> HOME | <input type="checkbox"/> MULTIMEDIA |
| <input type="checkbox"/> OFFICE | <input type="checkbox"/> CONSULTING |
| <input type="checkbox"/> INDUSTRY | <input type="checkbox"/> COMMUNICATION |
| <input type="checkbox"/> RESEARCH | <input type="checkbox"/> FINANCIAL |
| <input type="checkbox"/> TRANSPORTATION | <input type="checkbox"/> ENGINEERING |
| <input type="checkbox"/> ENTERTAINMENT | <input type="checkbox"/> OTHER _____ |

C.5 In your opinion, which are specific user needs for EUD? *(Please check all the appropriate boxes; specify new possible needs in the other row)*

- to change the aspect of the interface
- to change the behaviour of the interface
- to add new functionalities
- to create new widgets with new functionalities
- other _____

C.6 Is, in your opinion, the current technology ready and/or suitable for EUD?

 YES

 NO

 DON'T KNOW

If not, briefly write what is lacking:

C.7 In the following statements, place a mark in the box of the option which best describes your opinion:

Statement	Agree strongly	Agree	Indifferent	Disagree	Disagree Strongly
(S1) Software development is the responsibility of software specialists					
(S2) Using EUD tools will make me more efficient in my main job task.					
(S3) Using EUD tools will consume time which I should be spending on my main job task					
(S4) Using EUD tools could make my work more interesting.					
(S5) EUD could speed up software development.					
(S6) EUD creates a software quality issue.					
(S7) The domain expertise of end-users can create more effective software to support their activities					
(S8) EUD success in the organisation depends primarily on the perceived benefits out-weighing the perceived costs					
(S9) Programming will always be too hard for the non-specialist.					
(S10) EUD can undermine managerial authority					
(S11) EUD can be dangerous (e.g. Data security)					
(S12) EUD is too expensive for organisations to implement					
(S13) EUD work should focus on solving the cognitive issues first					
(S14) EUD work should focus on socio-technical issues first					
(S15) EUD work should focus on organisational issues first					