

Survey on the UCD integration in the industry

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ABSTRACT

The primary contribution of this paper is investigating how the User Centered Design approach is integrated into the industry. Employing a structured web-survey, targeted to the usability practitioners, we find out that UCD is particularly employed in big companies, but with a relatively low ratio: practitioners represent less than one percent of the company employees. User interviews and both low and high fidelity prototyping are the most frequently used techniques. We eventually validate our hypothesis that UCD integration is facilitated by factors related to management support, infrastructure and communication; companies interested in producing better usable and fit-for-use products should take all of these issues into serious consideration.

Author Keywords

Computer Human Interaction, User Centered Design, UCD Integration, Web Survey.

ACM Classification Keywords

D.2.10 [Software Engineering] Tools and techniques – user interfaces; H.5.2 [User Interfaces] - User-Centered Design, Benchmarking, User Interface – Theory and Methods.

INTRODUCTION

Not a lot of effort has been spent in the investigation of the actual User Centered Design (UCD) practices; the UCD approach is advocated by the whole research community from 20 years on, but was this dissemination effort effective? To what extent has UCD been integrated into the business model of the enterprises? What can the research community learn out of the UCD practitioners' experience?

The UCD integration problem

What is still missing today is the widespread UCD adoption and integration in the industry. Several reasons have been

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identified and documented: among the others, Nielsen [1] argues that many developers do not use usability engineering approach. It is considered intimidating in its complexity, too time consuming and expensive; Bias and Mayhew [2] clearly point out the obstacles linked to organization issues and cultural prejudices.

Past surveys on the UCD practice

Few enquiries on this topic are grounded on the actual experience of UCD practitioners.

Rosenbaum et al. [3] surveyed 134 HCI professionals and identified some problems that hinder usability from playing a strategic role into the company. The analysis shows that the major obstacles to a greater strategic impact are resource constraints, which were mentioned by 28.6% of the respondents, resistance to user-centered design or usability (26%), lack of knowledge and ineffective communication on UCD (combined: 30,6%).

Vredenburg et al. [4] investigated UCD practices, focusing on their success in the company. The respondents rated it through a number of objective and subjective metrics, as impact on sales, improved customer satisfaction, design team satisfaction and so on. The outcomes of this study show however clearly that, while practitioners believed to have a major impact on the company, they had difficulties in estimating the importance of their contribution through clear, effective metrics.

As the former authors, we want also to investigate on the impact of the UCD approach, but focusing on how it has been integrated into the business approach. Our hypothesis is that UCD integration improves its impact on the company business and that UCD infrastructure, communication and manager commitment play a major role in establishing the UCD maturity into the company.

METHODOLOGY

Definition of the construct

We consider UCD integration as a multi-dimensional construct, with the following definition: “UCD integration” is achieved when *every phase of the product lifecycle follows the principles of User Centered Design, when UCD team is provided with the proper skills and experience, it is supported by the management commitment and a proper*

UCD infrastructure and when awareness and culture are properly disseminated in and out of the organization.

Following this definition UCD integration is a construct made up by the following dimensions: employment of UCD methods in the product life cycle, UCD team skills and experience, manager commitment, UCD infrastructure (incentives, resources, cyclic improvement), UCD communication. These dimensions were also similarly defined, together with other constructs concerning company and project characteristics, which could relate with these components. The questionnaire items have been eventually developed from these working definitions and grouped into meaningful sections. We expected to test the validity of its dimensions and to understand to what extent each of them contributes to the overall integration.

The questionnaire

The survey questionnaire¹ is made up by 30 items and divided into 5 sections: *Organization and practitioner profile* (characteristics of the company, practitioner experience, UCD group characteristics), *Representative UCD project profile* (UCD project features, practitioner role in the project), *systems developed* (typology of systems), *UCD practices* (UCD methods and techniques), *UCD management and infrastructure* (life cycle involvement, manager commitment to UCD, user involvement) and *UCD communication* (communication and reuse of UCD results, cultural and global awareness of UCD). In order to avoid errors of measurement due to lack of concentration we introduced each section with a brief explanation and we asked the respondents to think about a single, representative UCD project; wording, formatting and style were consistently used throughout the questionnaire. Moreover, filling the personal data fields was not mandatory.

DESCRIPTIVE ANALYSIS

Some categories of nominal variables were grouped into clusters, in order to get an equilibrate distribution. For ordinal variables, having most of the time non-normal distributions, we relied only on the characteristic values of mean, median and inter-quartiles range.

Definition of the Sample

Research sample includes UCD practitioners in the industry, spanning from large companies and corporations (Computer, Financial, Telecommunications, etc.) to small specialized consultancies. We gave the communication of the web survey via e-mail, to the major newsgroups and forums related to usability and UCD (ACM-SIGCHI, IDX, UK-usability, BCS-HCI among the others). 83 practitioners successfully completed the web survey in a time frame of

40 days. Most of them are human factor specialist (34%) or user interface designer (33%) and have between 5 and 13 years of UCD experience, with a minimum of 1 and a maximum of 45 years. They come from different business sectors (table 1), but most of them from “HCI/Usability consulting” (N=16).

Organization and practitioner profile

The HCI/Usability consultancies differ from “non-HCI” companies (N=67), since for the firsts usability is their core business, for the others is just one of the many business aspects.

“Non-HCI” are corporations or large companies, with more than 1000 employees (54%) and they have introduced UCD recently: most of them (47%) in the past 4 years and only 15 percent from more than 12 years. The ratio of UCD practitioners versus the total number of employees (UCD_R) is relatively low: in 53 percent of the companies UCD practitioners represent less than 1 percent of all employees. This means that most of the big companies employ between two and six UCD practitioners. The UCD group is organized in a central department (33%), in teams (21%) or both (25%) and is funded through the research and development budget (35%), bill-back by project (30%) or annual budget (28%); more than 30% of the respondents have two or more funding resources.

HCI consultancies have similar figures, but they employ less than 50 people (100%) and have a high ratio of UCD employees instead. More than half of them are organized in teams and are funded at the project level.

Methods and techniques employed in the lifecycle

We asked to UCD practitioners to select on a multiple

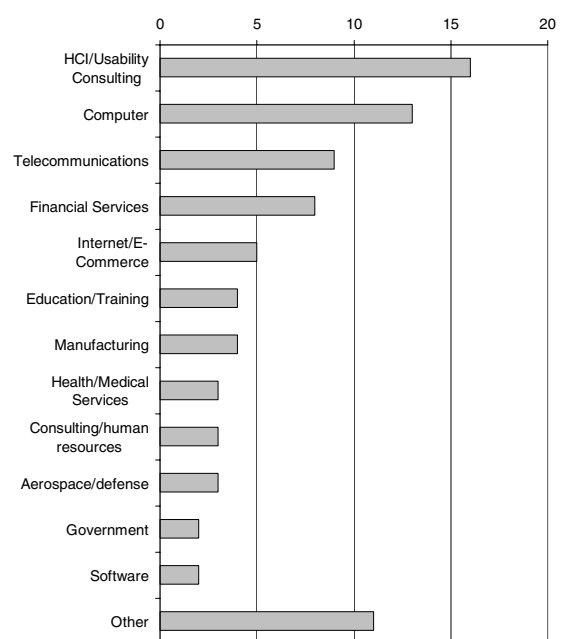


Table 1. Sample frequencies respect to business sector

¹ The questionnaire and the raw data are not attached due to space limitations, but they are available on request from the authors.

choice question the methods that they used in a representative project and in which phase of the product lifecycle; we gave business analysis, requirements, analysis, design, development, test and deployment as choices. Most often used methods are user interviews (80 percent of the respondents used it at least once), high and low fidelity prototyping (respectively 75 and 72 percent), expert and heuristic evaluation (70%), qualitative, “quick and dirty” usability test (69%) and observation of real usage (67%). These results show a definite trend, consistent with results reported in [3,4], towards an increasing usage of prototyping techniques.

We can also calculate which phases the UCD methods were mostly used in: they were frequently employed in the requirements, analysis and design phase; less than one third used UCD methods in the deployment phase. From this aggregate data we build up a new variable (a dichotomy), “UCD employment in the product lifecycle” (UCD_{PL}): we assign to each case a positive value if one or more techniques were applied in at least 6 of the 7 phases and a negative value otherwise. This variable shows that about half of the respondents (49%) throughout employed UCD in the representative project, according to this criteria.

UCD management and infrastructure

According to UCD practitioners management usually understands that usability and User Centered Design must be part of the business strategy (table 2: factor M₁, 61%) and takes action to maintain/improve user-centered design skills, resources and technology, awareness and culture into the organisation (M₅, 51%). However, it doesn't set

usability goals nor provides incentives for reaching them (M₂, 68%).

UCD communication

Most of the companies have developed common terminology, templates and tools for the exchange of data between the different professions involved in UCD (table 2, factor C₁, 69%); they also understand and apply UCD outcomes like design solutions and error reports (C₂, 61%). Effective communication on UCD is made more inside of the company (C₃, 68%) than outside (C₄, 42%).

BI-VARIATE ANALYSIS

We want to validate our hypothesis that management, infrastructure and communication factors are related; we must therefore reject the null hypothesis (they are not related).

In detail, we apply a Chi-squared test of association on the items of table 2; the table of contingency (table 3) shows a high number of significant covariances. Eliminating the less influential factors, C₁ (common terminology, templates and tool), C₂ (UCD outcomes and solutions) and M₆ (tracking of UCD business benefits), we obtain that more than 2/3 of the covariances, 16 over 21, are positive and statistically significant (4 with $p < 0.05$ and 12 with $p < 0.01$ of type I error). Null hypothesis is therefore rejected.

Our definition of UCD integration also includes life-cycle involvement of UCD (UCD_{PL}), but our analysis doesn't show enough significant covariances. On the other side, we discovered statistically significant covariances with the ratio of UCD practitioners in the company (UCD_R).

	ITEM	Yes (%)	No (%)	not sure/ no resp. (%)
M ₁	Does business management understand that usability and User Centered Design must be part of the business strategy?	61	21	18
M ₂	Does business management set usability goals on usability for systems? Is there a reward mechanism for reaching these goals?	25	68	7
M ₃	Is UCD focus addressed in acquisition activities? Are usability goals shared with the customer?	42	35	23
M ₄	Does business management take action to know how the usability of their product compares to that of their competitors?	40	46	14
M ₅	Does senior management take action to maintain/improve user-centered design skills, resources, technology, awareness and culture in the organisation?	51	40	9
M ₆	Are direct/indirect, short-term and long term business benefits tracked by business management?	40	33	27
C ₁	Have common terminology, templates or tools for the exchange of data between the different professions involved in UCD been developed and used?	69	24	7
C ₂	Are UCD outcomes (e.g. design solutions, error reports) understood and applied inside the company?	61	28	11
C ₃	Is effective communication made to raise the awareness and culture of UCD inside your company?	68	22	10
C ₄	Is effective communication made to raise the awareness and culture of UCD outside your company?	43	42	15

Table 2. Frequencies for each factor related to management, infrastructure and communication issues

C ₁	1									
C ₂	.240	1								
C ₃	-.036	.284	1							
C ₄	.087	.090	.402	1						
M ₁	.014	.385	.532	.300	1					
M ₂	.107	.140	.143	.356	.215	1				
M ₃	-.071	.215	.123	.396	.275	.381	1			
M ₄	.138	.046	.272	.523	.325	.521	.365	1		
M ₅	-.055	.132	.331	.274	.487	.278	.230	.373	1	
M ₆	.038	.295	.227	.251	.232	.213	.146	.240	.369	1
	C ₁	C ₂	C ₃	C ₄	M ₁	M ₂	M ₃	M ₄	M ₅	M ₆

■ p<0,05
■ p<0,01

Table 3. Table of contingency between management, infrastructure and communication factors

Data reduction is eventually carried out through factor analysis with principal component extraction: we want to understand how much each dimension contributes to the overall UCD integration. Results confirm as expected a strong weight of each of the chosen dimensions on the main factor, apart from UCD_{PL}; Overall, UCD integration (component 1, raw) explains about 40% of the total variance and the dimensions that most load it are M₁, M₃, M₄, C₄ and UCD_R (Table 4).

DISCUSSION

We investigated the UCD practice in the industry with a web survey especially focusing on the definition and the validation of the UCD integration concept. Overall the web survey worked quite well, but we got a couple of negative feedback from our respondents saying that it was too long. Thanks to the acquired experience the questionnaire can be however reused, shortening it to 15-20 items, without losing in analytical power.

We discovered that most of the chosen factors for the management, infrastructure and communication issues were relevant and that they influenced the ratio of UCD practitioners in the company. We didn't find anyway, as expected, a statistical validation for the inclusion of global product lifecycle (UCD_{PL}) in the UCD integration concept, but we believe that it could be due to a measurement error, since it was indirectly measured from the methods frequencies. Further study should be therefore dedicated to this issue.

CONCLUSIONS

As a matter of fact, surveying the usability practice brings a lot of insight on how UCD is applied in the business world

	Raw		Rescaled	
	component		component	
	1	2	1	2
C ₃	.142	.126	.357	.316
C ₄	.301	.238	.597	.472
M ₁	.229	.135	.554	.327
M ₂	.157	.289	.312	.572
M ₃	.307	.232	.619	.467
M ₄	.247	.135	.495	.270
M ₅	.204	.102	.404	.201
UCD _{PL}	.065	.264	.131	.529
UCD _R	.828	-.373	.906	-.408
% of variance	40.186	17.392	27.958	17.051

Table 4. Factor loadings for each relevant UCD integration dimension

and, as a community, we should do more in this area: if we assess regularly the overall situation we can learn how our field develops and changes. Our results show that usability has still a minor impact in the industry and that if the companies want to successfully gain its benefits they should seriously take into account the factors related to management, infrastructure and communication of the UCD process.

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