

Usability Goals Setting Tool

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Abstract. Usability goals are often the basis on which usability evaluations are done. Multi-disciplinary software development teams, interaction designers, software engineers and business analysts among them, need to agree on a common set of goals before they design and evaluate interactive products. However, teams often struggle to set clear, measurable usability goals and all members may not be on the same page even late in the project. This paper proposes Usability Goal setting Tool (UGT), a tool meant to help design teams set, prioritise and evaluate usability goals. UGT helps the designer to create profiles for the product and its users. Based on these inputs, UGT provides examples and guidelines to prioritize the usability goals. UGT also suggests evaluation ideas for each goal. Prototypes of UGT were improved through formative evaluations by using it for 15 interaction design projects. Summative evaluations were done by applying UGT on 49 industry projects. Participants found UGT to be useful and systematic and said they would use it in their next project.

Keywords: Usability goals, design tools

1 Introduction

Setting goals is an important step early in the design process. Setting goals before design gives the team a target to achieve. Goals help guide the design process, make the design activity tangible and help evaluate the designs. In interaction design, often multi-disciplinary teams are involved, so setting goals early and getting an agreement from all stakeholders is all the more important.

In this paper, I differentiate between *user goals* (“enjoy a peaceful vacation” or “ensure a secure future for children”), *business goals* (“capture the youth market”, or “save distribution costs”) and *product goals* (“the website will support planning a vacation end-to-end” or “the electronic voting machine should enable all voters to vote without help”). Product goals set out benchmarks against which the design will be evaluated. This paper is about product goals. Further, product goals may be about functionality, costs, reliability, time as well as about usability and user experience. This paper is about the subset of product goals related to the usability and user experience of the product.

In my interactions with software development teams, I have observed that designers are often unclear about the usability goals of the product they are designing.

In some cases designers are clear, but other stakeholders are not. Several teams need help in setting goals. This happens not only in new, unfamiliar projects, but also in cases where goals are being set retrospectively.

The second section of this paper discusses prior work related to usability, user experience and goals. The third section introduces the initial design of the UGT. A low-fidelity prototype of the UGT was developed and evaluated in 15 think-aloud sessions. The fourth section describes the formative evaluations and the fifth section describes UGT in its current form. After the UGT had stabilized, two summative evaluations were done with help of 49 industry projects. The sixth section describes these, followed by the last section on conclusions and future work.

2 Related Work

There is so much related work about goals, usability and user experience that any 'one-page' review is bound to be incomplete. Here I mention only the work that has directly influenced UGT.

Design for a 'need' has been a part of traditional industrial design thinking. Charles Eames reportedly said, "Design is a plan for arranging elements in such a way as best to accomplish a particular purpose" [5]. This emphasis on goals probably dates back to the days of Bauhaus school for design (1920s), and certainly from the days of the Ulm school (1950s). Archer [1] explains that since design is necessarily associated with change, identifying goals means "defining the needs and pressures which constitute the driving force for change". The first step is to determine the goals of the design effort together with "the essential criteria by which a 'good' solution will be distinguished from a 'not so good' solution".

It may not be possible to meet all goals and it is necessary to prioritize. Archer [1] talks about 'rank ordering' sub-problems as a method of prioritizing goals and resolving conflicts. More recently, Cross [4] talks about an objective tree method – organizing objectives into a hierarchy of higher and lower level objectives.

The closely related fields of usability, interaction design and information architecture also emphasise the importance of goals. ISO 9241 defines usability as the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use [7]. Shneiderman [13] and Nielsen [12] agree on five high-level usability goals of a product – learnability, speed of use, error-free use, retention over time and subjective satisfaction. Mayhew [10] categorizes usability goals as qualitative and quantitative, and also as performance goals, preference goals and satisfaction goals. ISO 9126-1 describes usability in terms of understandability, learnability, operability and attractiveness [6]. Cooper and Reimann [3] emphasise the importance of goals in usability and interaction design. Bevan [2] summarises several other ways of organising usability measures which could be looked upon as goals.

Relatively recent research interest in human emotions has broadened the traditional focus of researchers from 'usability' to 'user experience'. But approaches to user experience goals are not universal. There is no single accepted definition of what user experience is, and some researchers wonder whether it could be designed at all.

McCarthy and Wright [11] prefer to look at people's experience in terms of 'felt life'. They believe that people actively construct their experiences and that each person's experience is unique, rich and difficult to communicate, let alone design. It is unclear in this approach, what the goals of the design efforts that create technology-mediated experiences ought to be. In a recent (2009) survey, Law et al [9] concluded that the concept of user experience is dynamic, context-dependent and subjective. While there may be no agreement on a complete list of user experience goals, most researchers and practitioners are for a 'goal-driven' approach in design. While the first concern of this UGT is to set usability goals, it also helps set a few common user experience goals.

3 Initial Design of UGT

A goal is a commitment that a designer makes to his client or his management. The designer approaches UGT when he / she is clear about the product brief and has sufficient understanding about the domain, the problems, the context and users.

UGT is envisioned as a part recommender system and a part social-networking tool. It helps break down high-level goals into more concrete, measurable goal parameters by assigning each goal parameter a weightage. UGT has four steps: initiate, set goals, review goals and set guidelines and share.

3.1 Initiate

UGT begins by helping the designer create a product and user profiles. These form the input for UGT. The designer creates a product profile by answering the following:

- Name, version and industry domain of the product.
- Work practice domain: Life critical; business critical; goal-oriented; casual; enabling technology; e-learning; information product; entertainment product.
- Expected cost to the user: Premium product; low-end product; not free but I don't pay; free with another product / service; free to use.
- Platform(s): Desktop; web; mobile phone; IVR / call centre; TV; custom.
- How many types of users will use the product? Which ones?

The designer creates a user profile per user type, by answering the following:

- Age (pick a range)
- Tech-savviness: (pick the lowest level targeted) Low (*e.g. can't save a contact, but can make a call*); moderate-low (*e.g. can save a contact on a phone*); moderate (*e.g. checks mail every day*); moderate-high (*e.g. can install applications*); high (*e.g. writes programs, loves Linux*).
- Frequency of use: (pick a range) Once; once a year; once a month; once a week; once a day; few times a day; continuously.
- Product complexity: Very complex; complex; moderate; simple; very simple.
- Nature of the market: Mass market; wide market; niche market; internal application for trained staff; thick domain product for experts.

- Value addition of this product in user's life / Motivation to use the product: (pick all that apply) no intrinsic motivation; I have many options; socialize; it entertains me; it's my hobby; I have been using it; saves my time, informs me, helps me do my job better; makes things accessible; makes / saves money for me; I have no choice, I have to use it as a part of my job.

3.2 Set Goals

The designer then sets goals by assigning weightage to a list of goals. Depending on the context of the project, some goals may be very important for the project, while others might be irrelevant. UGT presents a list of potential goals and goal parameters. In the first version of UGT, the suggested goals and goal parameters were the ones shown in Table 1. These were derived from Shneiderman [13] and Nielsen [12], supplemented by the authors' experience and brainstorming with practitioners [8]. The goals were not meant to be comprehensive and are not meant to cover all aspects of user experience. They were suggestive of the kind of goals that the designer *could* consider. At all times the designer has the freedom to add goal parameters, edit or reword the suggested goal parameters, and to group goal parameters differently if they preferred.

Table 1. Initial set of goals and goal parameters used for UGT.

Learnability	Ease of use
Conceptual model clarity	Minimal user task load
Language understandability	Automation of routine tasks
Minimal learning time	Error free use
Consistency with earlier version	Good feedback
Visibility of choices and data	Error tolerance
Consistency with other products	Error recovery
Speed of use	Retention
User control and freedom	Retention / memorability
No memory and cognitive load	Subjective satisfaction
Internal consistency	Visceral appeal
Customization	Behavioural appeal
Automation and shortcuts	Reflective appeal

The designer sets goals by assigning one of the following weightages: Irrelevant (0); Somewhat relevant (1); Usual relevance / hygiene factor (2); Important (3); Very important (4); Extremely important / unique selling proposition (5). In the first version of UGT, all goal parameters had the default relevance of 2. As UGT collected data from projects, its later versions started giving recommendations for weightages based experience with similar product and user profiles. Of course, the designer may use the recommendations or choose to ignore them. These decisions are captured and fed back to enrich UGT further.

3.3 Review Goals and Set Evaluation Guidelines

The list of goal parameters is re-presented to the user, this time sorted by their weightages. Goal parameters with weightages that deviate substantially from the recommended range are highlighted. The designer reviews the weightages and tweaks them. This step was introduced because it was observed during the formative evaluation that designers over-assigned weightages in the first pass, but preferred to tone them down during a review. At this step, the designer is also asked to suggest ideas for how the eventual design will be evaluated against each goal parameter. These decisions are mined and fed back into UGT. The granularity of the goal parameters is such that it is easy to define how the product will be evaluated against it and yet generic enough to be applicable in a wide range of projects. Sometimes, this is called “sea-level granularity” (as against fish-level or bird-level).

3.4 Share

Once the designer is satisfied with his goal parameters and evaluation guidelines, he can share this data with others in his team. They give their inputs and after negotiations, the goals are finalised. This step of UGT has been envisaged, but not prototyped or evaluated at this time.

4 Formative Evaluation

A paper prototype of UGT was developed and is available at [**Error! Reference source not found.**]. Designers were invited to use the prototype to define the product and user profiles and set and review goals for a project that they had recently completed, while thinking aloud. Designers were given the freedom to add or edit choices at each step. Once the designers had finalized the goal parameters and weightages, they were asked to describe a usability test that they will use to evaluate their design against the important (3+) goal parameters. Then, the designers were asked to comment about UGT and probed on whether UGT expressed their ideas sufficiently and whether the step was useful.

A total of 15 designers participated in the formative evaluation of UGT. Of these, 4 were industry projects by professional designers and 11 were masters thesis projects by interaction design students. Designers suggested many changes. UGT was continuously modified during and after each session to incorporate these changes. Goal parameters were added, re-worded, split, merged or regrouped to fit the contexts. Yet, goal parameters were kept general enough to apply to a wide range of products and expressive enough to suit the needs of the individual products.

The high-level goals had two important changes from Table 1. Retention / memorability did not turn out to be important enough for most projects for it to be an independent high-level goal. So it was merged as a goal parameter under the high-level goal of learnability. A new high-level goal was introduced – “ease of communication”. This emerged to be important in cases of the information and communication oriented products such as web sites and learning tools. After the

formative evaluation, the total number of goal parameters went up from 20 to 30. Most changes were discovered in the early projects. No major changes happened in the last two projects and only two new changes happened in the last four projects. Table 2 lists the modified goal parameters that emerged from the formative evaluation.

The formative evaluation also generated qualitative feedback about UGT. Many participants had a positive response to the activity. Participants agreed that information required for product and user profiling is almost always available early. One participant remarked “These were some of the things that I should have done earlier. Had I done them, the product might have been better.” Several participants also thought that the activity helped them prioritize goals, made many things clear and gave many insights. It helped them consider goal parameters that they had not considered earlier. A participant remarked “though I had set goals for these projects earlier, it was not so systematic”.

Table 2. The set of goal parameters after the formative evaluation of UGT.

Learnability	
1	Findability: options / data / information should be visible / easy to find
2	User should take less time to learn: (e.g. in < 10 minutes, in < 2 hours practice, in < 2nd attempt)
3	Users should be able to learn on their own
4	Product should be internally consistent
5	Product should be consistent with other products , older methods / past habits of users
6	Product should be consistent with earlier version
7	User should remember / retain critical, but infrequent tasks
Speed of use	
8	User must be able to do the primary task / the most frequent tasks quickly, easily, at all times
9	User should be able to navigate quickly and easily
10	Product should not load user's memory / product should not put cognitive load on user
11	Flexibility: User should control the sequence of tasks
12	User should be able to complete frequent / critical tasks in specific time / no. of steps / in less efforts
13	Product should be personalised for the user automatically
14	Product should be localised for specific market segments
15	User should be able to customise the product for himself
Ease of use	
16	Interface should clearly communicate the conceptual model
17	Intuitiveness: User should be able to predict the next step / task
18	No entry barrier: user must be able to complete critical first tasks
19	Product should require no unnecessary tasks
20	Product should automate routine tasks / minimise user task load
21	Product should be always on , always accessible
Ease of Communication	
22	Information architecture: Information should be well aggregated, categorised, presented
23	Communication should be clear / user should easily understand text, visuals
Error-free use	
24	Product should give good feedback / display its current status
25	Product should not induce errors
26	Product should tolerate user's errors / forgiving interface / should prevent errors
27	Product should help user recover from errors / help users troubleshoot problems
Subjective Satisfaction	
28	User should feel in control of the product / behavioural appeal
29	User should feel emotionally engaged with product / brand / product should be fun / reflective appeal
30	User should find the product aesthetically appealing / product should have a visceral appeal

Participants also liked the activity of setting evaluation guidelines for each goal early. It made them think through the goal carefully at the initial stage and gave them better control over the project. None of the participants had thought of setting evaluation guidelines in this way. One participant was undecided about if he could share the goals with non-designers as he felt it required a lot of background about HCI. On the other hand, another participant remarked that “this will be helpful to bring the team on the same page”. Another participant thought she could use UGT to pitch for new projects, as it makes relevant interaction design activities tangible and communicates “why we are charging so much”.

5 Modified UGT

After the formative evaluation, product profiles, user profiles and goal parameters of the 15 projects were manually inspected to identify patterns that predict the weightage of goal parameters. Though not all, many goal parameters were found to be somewhat related to the product and user profiles. A detailed analysis of each goal parameter is not presented in this paper due to lack of space. However, qualitative recommendations for assigning weightage were developed for each goal parameter. A subset of 3 such recommendations is presented in Table 3. The entire set of recommendations for the 30 goal parameters is available at [**Error! Reference source not found.**].

Table 3. Recommended weightages to goal parameters arising from formative evaluation.

Goal Parameters	0 (irrelevant)	1 (somewhat relevant)	2 (usual relevance)	3 (important)	4 (very important)	5 (extremely important / USP)
5 Products should be consistent with other products , older methods / past habits of users	Games for children	Products for continuous use, if there is a high motivation for users to use the products (e.g. save money and time)		Products targeted to higher age groups (50+), products targeted to low-tech savvy users		
12 User should be able to complete frequent / critical tasks in specific time / number of steps	Most other products than of the type listed on the right – it tends to be on the lower side if the user doesn't care about saving time.			Products whose main promise is that they save time, complex products with frequent usage, products with repetitive micro-tasks (e.g. clicking input device)	Continuous use products with a few, repetitive tasks	
30 User should find the products aesthetically appealing / products should have a visceral appeal	Products that is invisible to the users, products with captive audience, where users have no alternative but to use it		Business critical or goal oriented products targeted to wide or mass markets		Branding oriented information website, socializing or entertainment products	

During the formative evaluation, participants were asked to describe a usability evaluation that they will use to test the design against goal parameters. Brainstorming was done to generate more evaluation ideas for each goal parameter. At least one

user-based test idea and one review-based evaluation idea was generated for each goal parameter. Table 4 lists 4 of these ideas. The entire set is available at [Error! Reference source not found.].

Table 4. Ideas to evaluate the design against goal parameters derived from an analysis of the evaluations suggested for the 15 projects.

5	Product should be consistent with other products, past habits Ask users to perform a set of tasks and probe for inconsistencies with what people do in real world or older habits. During a review, look for design elements in the product that might be inconsistent with users' current habits. These problems are hard to spot in a review unless the reviewers are very familiar with the users' current habits.
12	Complete frequent / critical tasks in specific time / no. of steps In a performance test, measure time of completion of benchmark tasks. In a review, look for number of steps involved, and whether each step is taking the user closer to achieving his goal. For detailed analysis, use GOMS.
17	Intuitiveness: User should be able to predict the next step / task During a think-aloud test, probe users for their expectation of the next task / step. Look for confusions, misunderstandings. In a review, look for steps that are not intuitive or are difficult to predict.
22	Information architecture: Well aggregated, categorised, presented During a think-aloud test, probe to see if users are lost or if users look for data in the 'wrong' place. During a performance test, find out if users can locate data / options without help. Count errors induced due to information architecture problems. In a review, look for potential information architecture problems.

6 Summative Evaluations of UGT

Two summative evaluations were done to evaluate UGT. The first was during a nine-day professional course on interaction design was conducted by the author. It was attended by 35 participants from mixed backgrounds such as graphic design, product design, web design, user interface design, e-learning, engineering, product management and ergonomics. Most had no prior formal education and relatively less experience in HCI. Among other concepts and techniques, participants were shown the modified UGT during the course. Each participant was then asked to set goals for an industrial project that they had worked on. After the goal-setting exercise, participants were asked to fill out a short post-test questionnaire. Participants were also asked to suggest more goal parameters relevant to their projects.

A second, similar summative evaluation was done with 15 participants who had more experience and formal background in HCI. These participants had an overall average experience of 7 years and interaction design related experience of 3.5 years. Only the goal-setting exercise and the post-test questionnaire were done with these participants. Table 5 summarizes responses to the two post-test questionnaires.

The D values of Kolmogorov-Smirnov test for all questions for inexperienced participants and questions 1, 2, 3, 5, 7, 8 for experienced participants are significant beyond $\alpha = .01$. While the mean ratings to all questions is positive, the inexperienced group consistently gave more positive mean ratings. We can conclude that both groups agreed that the exercise was useful (Q1), that it helped them understand the context of the project better (Q2) and that the exercise made them think about goals

that they had not considered earlier (Q3). The inexperienced group wished that they had done the goal-setting exercise during their projects (Q4) and it would have led to a better user experience (Q6), but the experienced group was inconclusive on these questions. Both groups believed that UGT could have helped them do their job better (Q5), wanted to use the technique in their next project (Q7) and felt that they could involve their colleagues in the exercise (Q8).

Table 5. Responses by 34 relatively inexperienced participants (lighter rows) and 15 more experienced participants (darker rows).

	Strongly disagree		Can't say		Strongly agree		Average	n	D	$\alpha <$
	(-2)	(-1)	(0)	(1)	(2)					
1. This was a useful exercise.	0	0	2	3	29	1.79	34	.65	.01	
	0	0	1	4	10	1.60	15	.53	.01	
2. This exercise helped me understand the context of my project better.	1	0	1	5	27	1.68	34	.59	.01	
	0	0	0	8	7	1.47	15	.60	.01	
3. This exercise made me think about relevant user experience goals that I had not considered earlier.	1	0	2	10	21	1.47	34	.51	.01	
	1	0	1	5	8	1.27	15	.47	.01	
4. I wish I had done this goal-setting exercise while I was doing my project.	0	0	0	8	25	1.76	33	.60	.01	
	0	2	6	2	5	0.67	15	.27	--	
5. Had I done this exercise during the project, it would have helped me do my job better.	0	1	2	6	24	1.61	33	.52	.01	
	0	0	2	4	9	1.47	15	.47	.01	
6. Had I done this goal-setting exercise during the project, it could have led to better user experience.	0	0	4	5	24	1.61	34	.52	.01	
	0	2	3	4	6	0.93	15	.27	--	
7. I will do this exercise when I am doing my next project.	0	0	0	10	24	1.71	34	.60	.01	
	0	0	2	5	8	1.40	15	.47	.01	
8. I think it is possible to involve my colleagues / boss / clients in this exercise.	0	0	4	9	21	1.50	34	.48	.01	
	0	1	1	8	5	1.13	15	.47	.01	

The overall reliability of the weightages set for goal parameters by the 34 participants in the first summative evaluation using Cronbach's alpha was 0.796. Each of the 30 goal parameters was deleted by turns and Cronbach alpha was calculated. The resulting alpha did not vary much (0.777 to 0.806). Thus we can conclude that all 30 goal parameters are internally consistent and therefore essential to measure the same construct.

7 Conclusions and Future Work

UGT provides goal setting guidance based on inputs from product and user profiles in terms of a weightage range for goal parameters that design teams can use to prioritise goals. While the 30 goal parameters presented in this paper are not claimed to be comprehensive, they provide a substantial starting point for goal setting. Participants found UGT useful and 'more systematic' than their current methods. It helped designers prioritize goals and pushed them to consider goals that they had not

considered earlier. Setting evaluation guidelines helped them think through their goals more thoroughly. While both experienced and inexperienced designers found the tool valuable; the inexperienced found it more so.

UGT could have several applications in the design process. It can bring a multi-disciplinary team on the same page as far as usability goals are concerned. Teams can focus efforts on design and evaluation of high-weighted goal parameters to optimise the design process. UGT can help estimate interaction design efforts – if there are too many high-weighted goal parameters, efforts required for the project might be higher. Another application is to use UGT to compute metrics [8]. Evaluations presented in this paper were done on projects retrospectively. Prospective evaluations are planned. At present UGT exists as a low-fidelity prototype. UGT will be developed as an online tool and automated to the extent possible. While collecting, sharing and mining data manually to identify patterns was the first step, automation in data mining to enrich UGT on an ongoing basis could prove to be challenging.

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