

## Performance Indicators for Usability Measures – Striving for a working framework beyond Return on Investment

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### Abstract

Return on Investment (ROI) is the most prominent concept for cost-benefit analyses to proof the profitability of software development efforts. However, current frameworks with focus on the financial ROI are not suitable to demonstrate the value of usability measures or to improve their performance. Hence we propose a new framework with specific Usability Performance Indicators (UPI), using the basic components cost and benefit with a broader perspective and aiming to promote usability by providing additional value for product improvement to all stakeholders.

### Introduction

Developing any software is a complex project in its own right. It is very difficult and requires a lot of time, resources and (mostly) a large budget. Creating usable software is even harder, because it takes additional effort to accommodate user needs. These extra, usability-focused activities are often not part of the planned development process. The benefit of such investment in usability, such as higher product quality, user satisfaction, less risk of failure and savings of development time, is obvious for usability professionals. It is less prominent for software developers, software managers or software buyers though. "When we were making the budget for this year, the question was: why spend resources on this (usability)? It costs money when people participate in this; they spend time on that. What can you get out of this?" a development manager was quoted (Rajanen & Iivari, 2007, p.520). Speaking the management's language helps usability professionals to convince it to approve a budget for usability measures. Managers usually require detailed numbers for cost-benefit analyses to decide on their budgets and to control the success of their investments, and won't make an exception for usability (Richeson, Bertus, Bias, & Tate, 2011). In Business Administration one of the most common performance measures of investments is the Return on Investment (ROI). Over 90% of the companies use the ROI as a performance measure in their investment centres (e.g. Reece & Cool, 1978). The ROI is defined as the ratio of profit to cost usually expressed as a percentage. For example a ROI of 6:1 (600%) means that you earned six times the money you invested. Therefore the Return on Investment is a metric indicating the profit earning capacity of a business (Thukaram, 2007). Companies are compared based on their ROI. It supports and justifies investment decisions and quantifies the decision outcomes.

Unfortunately the ROI of usability measures cannot be captured easily in business numbers as illustrated by our following literature review. Profound problems emerge in most studies, preventing the transfer of the business ROI concept to usability measures.

## Return on Investment for usability measures: A brief literature review

In literature most (case) studies about cost-benefit analysis and Return on Investment of usability measures are quite old, lack valid data and hardly comply with scientific standards. The major publication containing most of the relevant usability cost-benefit analysis models (c.f. Rajanen & Livari, 2007) and which is citing findings of a significant part of available studies is the book "Cost-Justifying Usability" (Bias & Mayhew, 1994). This book was slightly updated in 2005, but no substantial new empirical data were published then. Current empirical studies are missing except for the domain of e-commerce. Other contributions are practitioner's opinions and experiences discussing the use of ROI for usability measures or how to do a cost-benefit analysis in usability engineering (c.f. Rajanen, 2012). Many studies are case studies that don't provide a lot of context information and are published in whitepapers or on websites. Karat (2005) provides a good example by stating: "In a de-identified case study, a company employed usability engineering to improve the ability of its customers to find what they were looking for on the Web site. [...] the completion rate increased by 15%" (p.120). This description does not deliver context information about when, where and how usability engineering was employed or how long it took. It can be concluded that available studies and reports cannot (empirically) prove the value of usability measures for business success, and therefore will not help usability practitioners to convince their management to invest in usability. However, they may contain some tips helping them to be more effective and insights supporting the development of a working solution for usability cost-benefit analyses,

e.g. relevant parameters for cost and benefit in Mayhew & Tremaine's (2005) framework for cost-benefit analyses.

The easiest way of determining a ROI for usability measures is to rely on one's own experience to simply estimate ROI-ratios. One of the most popular quotes puts up a cost-benefit ratio for usability-measures of \$1(investment):\$10-\$100(profit) (Gilb, 1988). Again, these experience-based figures are used to justify usability engineering. The accuracy and source of these figures are questionable. Managers therefore will not accept them easily. Rosenberg (2004) disregards them as voodoo economics. Voodoo economics often lead to an exaggerated ROI and will not convince stakeholders to employ usability measures. For example Karat (1989) calculated the ROI of a security applications re-design comparing the original software with the usability-optimized version. The study provided real figures for the actual costs but an estimate of the benefits of usability engineering, e.g. the time saved with the optimized version was multiplied with personnel costs, a productivity ratio and the number of users. Using this method Karat (1989) estimated a cost-benefit ratio of \$20,700:\$41,700 which is a usability-ROI of 2\$ for every dollar invested. Simulating the outcome of usability studies with different parameters, Lewis (1994) found the magnitude of maximum ROI was strongly affected by the assumption how large the costs of undiscovered usability problems would be, their avoidance through usability measures factoring into ROI as benefit. This demonstrates that calculating or assuming these potential costs/risks is the weak point of all usability ROI-predictions. Mayhew and Tremaine (2005, p.74) call them "[...] the crux of the whole cost-benefit analysis".

The only viable transfer of the ROI concept in usability is in e-commerce. E.g. the redesign of the navigational structure of Dell.com resulted in a website revenue increase from \$1 million to \$34 million per day 18 months later (Tullis & Albert, 2008; see also Nielsen & Giltz, 2003 for an overview). In e-commerce the classical ROI can apparently be easily calculated for usability measures. Costs can often be determined by budget and time used for the usability project and benefits are defined by increasing performance figures, like number of sales or conversion rates on websites. It is generally possible to track both factors closely and convert them into financial numbers.

## Problems with the usability-ROI

Unfortunately even in e-commerce commercial success after a website modification cannot always be attributed to single usability measures. Many factors contribute to user behaviour and sales figures. Web-success could also be driven from a good marketing campaign, a general rise in product-demand, etc. With other software products it's even more difficult to relate usability-investment to a product's success. In addition, it is not always possible to define short-term financial goals for usability activities. Complexity of software projects is one reason. Projects usually consist of several development stages, final completion and software sales being a long way off for most of the time, especially in early stages when usability

activities should begin. Usability goals are often long-term, product-centred or strategic as well (e.g. user research or complex personas). Attributing the contributions of these usability activities to features or qualities of the final product or even to financial impact is virtually impossible. Moreover determining costs of usability measures can be difficult for software projects without a fixed usability budget. Costs need to be calculated then, using time spent on usability per collaborator and product and the internal cost rate, with data that is sometimes hard to obtain, e.g. for internal teams working on several projects at the same time or long-term data for tracking success over time. In practice the necessary effort is often perceived as too high, because companies rarely have the right data collection mechanisms ("hooks") in the right places to measure ROI (Karat and Lund, 2005, p. 301).

## Beyond ROI: Towards a working framework for usability measures

As shown above calculation of a financial ROI for usability measures in its current approach is methodological flawed, difficult to perform in practice and does not have the necessary power of persuasion to promote usability in organizations and software development process. To support usability professionals in their work with management, developers and other stakeholders in software development the benefits of usability activities need to be measured, evaluated and communicated more elaborately than in a single financial figure for management only. A better tool needs to be based on the fundamental motivation for usability activities and, at the same time, the most important goal for all stakeholders in software development: improving software quality for its users. Stakeholders have different interests and goals during the software development process; each group has its own understanding of product improvement and its priorities and success criteria. To promote usability activities effectively each stakeholder needs to have easy access to their own Usability Performance Indicators (UPI), which answer the specific questions about product improvement they have at this point of the development process. Consequently a tool for promoting usability needs to be a framework consisting of a set of UPI, complemented by detailed instructions how to use and interpret each indicator and a model how to introduce and implement such Usability Performance Indicators into an organization. To develop such framework several steps are necessary.

### 1) Stakeholder analysis for software development:

Stakeholders are relevant groups, inside or outside the organization, that have an interest in projects (see definition „Project stakeholder“, 2015). Main goal of the stakeholder analysis is to find all stakeholders for software development projects and to identify their specific goals and interests to be able to discover accordant UPI. Since stakeholder analyses, as part of requirement engineering, have been an important part of software development for some time, approaches

and methods from this domain should be used, such as Stakeholder Identification (Sharp, Finkelstein, & Galal, 1999) or StakeMeter (Babar, Ghazali, Jawawi, & Zaheer, 2015). Focus always needs to be on determining the specific interests and goals each group has in improving the product.

## 2) Defining specific Usability Performance Indicators:

Each performance indicator's essential function is to address a stakeholder's goal. UPI must help stakeholders to perform their specific tasks in product development and improvement better. Acquisition of UPI and their use must be easy for users and organization. By adding value to stakeholders' work for a small investment, acceptance and usage of UPI will increase. Potential performance indicators could be found in ROI-literature (e.g. Bias & Mayhew, 2005) and by surveying companies which performance indicators they currently use and which data are easily available. Selecting the final set of UPI from all potential performance indicators is the last step. Selection criteria must be defined in the model how to introduce UPI into an organization (see next section).

## 3) Designing an implementation model:

Introducing UPI needs to be simple for the user and the organization. In reference to the UseTree Stage Model for introducing usability measures (Stade, Reckin, Brandenburg, & Thüring, 2013), implementation in organizations should start with simple UPI which are easy to acquire and easy to understand. First to be addressed should be Stakeholders that are expected to benefit quickly and the most. Once they start to communicate positively about their experience and benefits are becoming visible, introduction of suitable UPI to more stakeholders and eventually more complex UPI can begin. The implementation model needs to define introduction stages and their appropriate activities as well as requirements for selecting UPI.

## Summary and future work

The major problem for adopting the classical financial ROI concept for usability measures is acquiring and interpreting valid cost and benefit data. Only few studies report those data, mainly in e-commerce (Karat & Lund, 2005). We suggested an alternative framework with less financial focus and the use of specific Usability Performance Indicators for each stakeholder in software development. The framework should include an implementation model for introducing the framework into organizations as well. Goal is to make usability and its benefits assessable for more stakeholders and to expand the present function of usability-ROI,

effectively promoting usability and thus helping to improve product quality and development process. Stakeholder analyses, UPI-research and modelling the implementation process are necessary steps to develop the framework. Future work needs to develop the details of each step and complete a first draft of the complete framework. This should be followed by an evaluation study with software companies and iterative improvement.

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