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Assessing the Business Benefits of Usability in the Product Development Project – Analysing the Existing Models

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Abstract. There are few development organizations that have integrated usability activities as an integral part of their product development projects. One reason for this is that the benefits of better usability are not visible for the management. In this paper we analyse the characteristics of some published models for analysing usability business benefits in different product life cycles. The existing models have different approach for identifying, approaching and categorizing the business benefits of usability. Most models state that a member of usability team conducts usability business-benefit analysis. The target group of the analysis is mostly organizational management. In some cases the target group is development team or project management. Nearly all of the analysed models approach the usability business benefits through a cost benefit estimation of user centred design. We argue that none of the analysed models offer formulas for calculating the business benefits of usability in every identified area of potential benefits in all product life cycles.

1 Introduction

In the international standard, ISO 13407 usability is one of the important quality characteristics of software products. The usability has many potential benefits to the development organization such as increased productivity and customer satisfaction. Even today there are quite few product development organizations reportedly having incorporated usability activities in their product development process. One reason for this is that the benefits of better usability are not easily identified or calculated.

The business management support for usability activities is crucial in product development organizations. The development management is often seeing the usability activities as a potential risk to the deadline of their projects. It is difficult to implement the usability activities into development projects without the support of the business management. The business level support for usability activities in the development projects is better achieved if the business benefits of better usability can be identified and calculated. Our research focus in the KESSU-project is to analyse the usability business benefits in a product development project. Our research approach for this analysis is the traditional usability cost-benefit analysis with mathematical formulas. In the usability cost-benefit analysis of the usability activities in a product development project the expected costs (e.g., personnel costs) and the benefits (e.g., lower training costs) are identified and quantified (Karat 1994).

There are many published models for calculating the usability business benefits today. There are some differences in how those models approach the usability business benefits. There has been some discussion in publications about the potential business benefits of usability, but most of them are focused in case studies of usability business benefit or overall aspect of usability business-benefit analysis. Currently there are no publications analysing the existing usability business benefit models. In this research we analysed the differences and characteristics between some of the published models in different product life cycles.

2 Overview of Existing Models

There are surprisingly few published models for analysing the business benefits of usability in development projects. Most of the existing usability business benefit models analysed in this paper were selected from the book *Cost-Justifying Usability* by Bias and Mayhew. This book was published in 1994, but it is still the best source of different usability business benefit models. The analysed models from *Cost-Justifying Usability* were selected into this report because we view that they represent best the variety of different views for usability business benefits.

Bevan has published one usability business benefit analyse model in TRUMP-report. The model was selected for this analysis because it was the latest published business benefit model and it has slightly different point of view for different business benefits of usability. The model also estimates the potential usability business benefits in four different product life cycles while other analysed models do not have that clear point of view about benefits in product life cycles.

2.1 Ehrlich and Rohn

Ehrlich and Rohn analyse the potential business benefits of better usability from point of view of vendor company, corporate customer and end user. They state that by incorporating the usability activities into product development project both the company itself and its customers gain benefits from certain areas. When compared to other business benefit models analysed in this paper, Ehrlich and Rohn present the most comprehensive discussion about different aspects of usability business benefits. They do not clearly present an overall formula for calculating the value of usability benefits.

According to Ehrlich and Rohn the vendor company can identify benefits from three areas: increased sales, reduced support costs and reduced development costs. In some cases the link between better usability and increased sales can be found, but usually it can be difficult to relate the impact of

better usability directly to increased sales. One way to identify the impact of usability to sales is to analyse how important role does the usability have in buying decision.

The cost of product support can be surprisingly high if there is a usability problem in important product feature and the product has lots of users. Better usability has direct impact to the need of product support and therefore great savings can be made through less need for support. By focusing for better product usability and using usability techniques the vendor company can cut development time and costs. The corporate customer can expect benefits when more usable product reduces time the end users need training. In addition of official training there are also hidden costs for peer-support. End users often seek help from their expert colleagues, who therefore suffer in productivity.

End users are the final recipients of more usable product. According to Ehrlich and Rohn the increased usability can result higher productivity, reduced learning time and greater work satisfaction for end user. The end-user can benefit from higher productivity when the most frequent tasks take less time.

2.2 Bevan

Bevan estimates the potential business benefits of better usability to the organization during development, sales, use and support. The vendor can gain business benefits in development, sales and support. Customer can benefit in use and support. When system is developed for in-house use the organization can identify benefits in development, use and support. In each category, there are a number of possible individual benefits where savings or increased revenue can be identified. The total amount of benefit from better usability can be calculated by adding all identified individual benefits together. Bevan discusses mainly about usability benefits through increased sales, less need for training and increased productivity. Benefits through decreased development time are identified but they are not discussed in detail.

2.3 Karat

Karat is approaching the usability business benefits through cost-benefit calculation of human factors work. This viewpoint is different from other analysed usability business benefit models. There are some examples of identified potential benefits. They are increased sales, increased user productivity and decreased personnel costs through smaller staff turnover. The development organization can gain benefits when better usability gives competitive edge and therefore increases product sales. Customer organization can gain benefits when end user productivity is increased through reduced task time and when better usability reduces staff turnover. Karat describes a usability cost-benefit analysis of three steps. In the first step all expected costs and benefits are identified and quantified. In the second step the costs and benefits are categorized as tangible and intangible. The intangible costs and benefits are not easily measured, so they are moved into separate list. The third step is to determine financial value for all tangible costs and benefits.

2.4 Mayhew and Mantei

Mayhew and Mantei say that cost-benefit analysis of usability is best made by focusing the attention on the benefits that are of most interest to the audience for the analysis. The relevant benefit categories for the target audience are then selected and benefits are estimated.

Examples of relevant benefit categories are given for vendor company and internal development organization. Vendor company can benefit from increased sales, decreased customer support, making fewer changes in late design life cycle and reduced cost of providing training. The benefits for internal development organization can be estimated from categories of increased user productivity, decreased user errors, decreased training costs, making less changes in late design life cycle and decreased user support. To estimate each benefit, a unit of measurement is chosen for the benefit. Then an assumption is made concerning the magnitude of the benefit for each unit of measurement. The number of units then multiplies estimated benefit per unit.

2.5 UPAR

Cox, O'Neal and Pendley describe a process for analysing user errors. It is a specialized system for performing causal analysis on user errors. UPAR indicator can be used to compare usability between different products and different versions of a product. The UPAR analysis can be used to prioritise the focus of the usability activities.

UPAR process consists of two levels to measure usability: product level and task level. In the product level the user error service cost is divided by the number of product licenses. The resulting number is the UPAR ratio of that product. The task level analysis is used to find a problem in a portion of the user interface. The task level UPAR analysis consists of four steps: data collection, coding the data for analysis, analysing the coded data and conducting the causal analysis.

In the first step, raw data is collected from service database with problem descriptions and diagnosis information. In the second step, the raw data is coded into format that allows easier review and analysis. In the third step, the coded data is analysed by interdisciplinary team and sorted into clusters. In the fourth step, the causal analysis is conducted and the goal is to understand the exact causes of the user errors.

3 Analysing the Models

3.1 Usability business benefits in the product development project and phases of product life cycle

We are analysing the differences between models by using the following phases in the product life cycle: development, sales, installation and use (Rajanen 2002). Each phase of product life cycle is divided in few categories of potential usability business benefits (Jokela & Rajanen 2002). Every model is compared against benefit categories to identify different characteristics.

3.1.1 Benefits during development

We identify three different categories of usability business benefits in the development cycle: less need of resources, prioritisation of product features and less need of future redesign. By focusing for better product usability and using usability techniques the vendor company can cut development time and costs. There are reported cases where development time has been cut by 33-50% (Bosert, 1991). From the analysed existing usability business benefit models, Ehrlic & Rohn, Bevan and Mayhew &

Mantei identify the need of fewer resources as one potential benefit. Resources can be development time or personnel to be used. Benefits of less late changes were also identified in this category. Available resources should be used in optimal way. Ehrlich & Rohn, Bevan and UPAR identify the ability to prioritise the functionality that is important for customers as one benefit. Only Bevan identifies the reduced need for architectural redesign to make future versions of product easier to use as a potential benefit.

3.1.2 Benefits in sales

We identify two categories of usability business benefits in sales cycle: gaining competitive edge and increased customer loyalty. It is very difficult to estimate the impact of better usability to product sales. However, there are some reported cases, where link between better usability and increased sales can be identified. In one reported case, the revenues grew by 80% when the most serious usability problems were fixed in the second release of a product (Wixon, Jones, 1991). Also the product development usability can speed up the market introduction and acceptance (Conklin, 1991). The benefits of gaining competitive edge by marketing the product easier to use than other products is analysed in all models except UPAR. Increased customer loyalty can result more repeat customers and therefore increased sales. Ehrlich & Rohn and Bevan identify the benefits of customer loyalty.

3.1.3 Benefits in introduction

We identify one category of usability business benefits in installation cycle of the product: less need for end user training. The difference between training for usability-engineered system and a system designed without usability engineering can be even several days (Karat, 1993b). Training of the end user includes official training conducted by development organization or customer organization and unofficial training by skilled peers. Ehrlich & Rohn, Bevan and Mayhew & Mantei identify less need for end user training through better usability as a potential benefit.

3.1.4 Benefits in use

We identify two categories of usability business benefits in the product use: increased productivity and less need for support. The end user can benefit from higher productivity when the most frequent tasks take less time. It is estimated that productivity within the service sector would rise 4-9% annually if every product were designed for usability (Landauer, 1995). Productivity is increased when using more usable products by decreased task time, less rework and greater work satisfaction. All models except UPAR identify the increased productivity as one benefit. Some savings can be made in there is less need for active product support in development or customer organization. All models except Karat identify the less need for product support as a potential benefit.

3.1.5 Summary

Life cycle	Benefit area	E & R	Bevan	Karat	M & M	UPAR
Development	Resources	XX	X	-	XXX	-
	Prioritisation	XX	X	-	-	X
	Redesign	-	X	-	-	-
Sales	Competition	XX	XX	XX	XXX	-
	Loyalty	XX	XX	-	-	-
Introduction	Training	X	XX	-	XXX	-
Use	Productivity	X	XX	XX	XXX	-
	Support	XX	X	-	XXX	X
XXX = there is an mathematical formula for calculating the benefit XX = there is some discussion about benefit X = potential benefit is mentioned - = benefit is not identified						

Table 1. Summary of existing usability business benefit models in different phases of product life cycle

Mayhew & Mantei have many example formulas for calculating usability business benefits, but there is little discussion about the basis of how those formulas are formed.

3.2 Other aspects of existing models

There are some differences in the analysed existing models about who does conduct the usability business-benefit analysis. In some of the models it is clearly stated that usability person does the analysis, but Bevan and Mayhew & Mantei don't bring that subject up at all. There is also variation in the target group of the usability business-benefit analysis. Bevan and UPAR mention the development team as a receiver of the analysis. Karat and Mayhew & Mantei state that the usability business-benefit analysis is made for the management of the development organisation. Ehrlich & Rohn bring up both development team and management as possible target groups. We argue that it is important that the target group of the usability business-benefit analysis is the management to get the managerial support for usability activities in a development project.

	E & R	Bevan	Karat	M & M	UPAR
Conductor of the analysis	U	?	U	?	U
Target group of the analysis	M, D	D	M	M	D
U = usability person M = management D = member of development team or project manager ? = unknown					

Table 2. Conductors and target groups of analysis in existing models (Rajanen 2002)

All models except UPAR have a cost-benefit analysis approach for usability business benefits. None of the analysed models identify when the usability business-benefit analysis should be conducted in the product development project.

4 Conclusions

The analysed models have a slightly different approach for identifying, categorizing and assessing the usability business benefits. Therefore it can be assumed that they are build from different basis and that they are made to fit different specific purposes. Models also have differences in who does the business benefit analysis and what is the target group of that analysis. Three models out of five mention clearly that members of usability team make the analysis. Two of the models do not voice out who is supposed to conduct the analysis. Two models out of five describe clearly that the management level of the development organization is the target group of the analysis. Two models have development team or project level manager as their target group of the analysis (Table 2).

All models excluding UPAR addressed the increased sales of more usable product as one of the benefits. Only Ehrlich & Rohn and Bevan include the increased customer loyalty as a potential business benefit. From all analysed models, only Bevan identifies the savings from reduced cost of future redesign of the architecture to fix usability problems for future versions of the product (Table 1).

The all analysed models approach the usability business benefits through come sort of cost-benefit analysis. The identified benefits of better usability are put against estimated costs of usability activities. Every model except UPAR analyse the costs and benefits of using the user centred design and not the over all benefits of better usability of the product.

We therefore come into conclusion that none of the analysed usability business benefit models cover all identified areas of usability business benefits in product life cycles. Also none of the analysed models provide example formulas to calculate all potential benefits of usability business benefits in different product life cycles. The analysed models see the usability personnel as the conductor of the usability business-benefit analysis and the management as the target group of the analysis.

5 Discussion

Analysing the business benefits of better usability is not an easy task. Some of the potential benefits can be estimated quite easily. For example the benefit from less need of product support is rather straightforward to calculate. Some of the potential benefit areas are however quite abstract and therefore it is difficult to estimate those benefits. For example it is very difficult to estimate what impact does better usability have in improved company reputation or reduced staff turnover.

Some of the existing models analyse the business benefits of better usability also from the end user viewpoint. The potential benefits for end users are much more difficult to calculate than benefits for development or customer organizations. The potential benefit areas for end users are harder to assess economically. For example it is hard to estimate the benefit of increased work satisfaction through better usability. It is also very difficult to accurately calculate the amount of benefit from this area.

Some of the analysed models include the increased work productivity as a benefit for end user. It can be argued that the benefits from increased productivity can be calculated more easily from the viewpoint of the customer organization.

In some existing usability business benefit models the viewpoint for benefits are from point of view of a development project. We view this approach a bit problematic because some of the potential benefits are clearly directed to whole organization. For example it is not very important to reduce support costs to a development project because they are not directly affected by the cost of product support. When the potential business benefits are analysed from organizational point of view, all areas of possible benefits can be fully taken into account.

5.1 Limitations

There are some limitations to be taken into account when making conclusions about this report. First, we analysed the usability business benefit models on the basis of product life cycles. The type of the product and the nature of the business around the product may have effect for the areas of important usability business benefits. These factors were not taken into account in this report when analysing characteristics of the existing models.

Second, one important function of the usability business-benefit analysis is to gain management support for usability activities in development projects. This function was not included into this analysis.

Third, the analysis of the existing models is very much based on the experience and interpretation of the analyser. Some other researchers may have done the analysing in a different way.

5.2 New research topics

There are some new research topics that we found during our research. First, one very interesting challenge is to identify the indirect effect of better usability when better usability in mission-critical system reduces problems in other systems using it. The analysed models do not identify such benefits, but our experience is that this kind of benefits can be identified in many development organizations.

Second, it is our experience that the further development of an existing system is an area where potential business benefits of better usability could be found. None of the analysed models in this report identify the further development as a possible product life cycle and area of possible benefits.

Third, another interesting area of future research is to find formulas to measure the impact of better usability to development time and resources. The reduction of development time through better usability is reported in some case studies (Jokela & Rajanen 2002), but the analysed usability business-benefit models did not brought up any clear formula for calculating that impact.

Fourth, the existing models do not take into account that the product support can be important part of the business of the development organization. If the development organization can gain profit by providing product support for end users, the benefit of better usability in product support area is not that straightforward. The published literature does not contain example cases where the product support is part of the business of the development organization.

Fifth, the best time and conductor for the business benefit analysis are not quite clear. The analysis should be conducted before or during the early phases of the development project, because later it is difficult to include the usability activities into already running project. The analyse can be conducted

either by a usability person, project member or organizational management. Each of them has a slightly different interest about usability and that can have some effect in the results. It can be argued that the best effect for introducing usability activities in development project is achieved when requirements about better usability are handed down to development project by an organizational management.

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