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# Towards Success Evaluation: Multiple-Criteria Analysis of Benefits and Costs for Non-Profit Web Portals

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## ABSTRACT

Evaluating the success of non-profit portals is an important task for managers and major stakeholders to estimate the utility of the invested and usually limited resources. A meaningful evaluation is only feasible by considering all relevant measurement criteria and by comparing the outcomes with existing benchmarks. This is a very common approach to evaluate products or services like e.g. cars or computers. In this research-in-progress paper we propose such an approach for the evaluation of non-profit portal performance from the perspective of benefits and costs, based on *Multiple-Criteria Decision Analysis* (MCDA). For that task suitable measurement criteria and the MCDA method *Simple Additive Weighting* (SAW) are proposed. The underlying idea is that performance measurement based on all relevant criteria and a comparison with existing benchmarks allows finding the portal's weak points and estimating its success. Future work will include the empirical investigation of the proposed approach.

## Keywords

Non-profit portals, benefits and costs, multiple-criteria decision analysis.

## INTRODUCTION

Portals provide the user within an integrated environment with information, various tools and services, and community supporting functions. Non-profit portals are usually delivered by non-profit organizations like e.g. governmental institutions, private organizations or communities. Their aim is not to make profit but to give the user some kind of help within a certain subject area. Usage of non-profit portals usually is for free and non-mandatory, so that users stay or even come back only if it adds some kind of value. Despite the non-commercial character, success evaluation is an important task to estimate the utility of the invested resources and to identify possibilities for improvement. Since non-profit portals do not generate monetary revenues and neither encounter monetary costs only, other performance indicators from the perspective of benefits and costs have to be considered.

In order to get a picture that's more complete, the corresponding evaluation criteria are drawn from diverse research streams: (1) impacts of IS used outside the traditional work environment (D'Ambra and Rice, 2001), (2) e-commerce usage evaluation (Cutler and Sterne, 2001), and (3) IT cost analysis (David, Schuff, and Louis, 2002). This necessitates the inclusion of multiple measurement instruments, i.e. questionnaire surveys, log file analysis, and cost analysis. For a performance measurement based on the relevant criteria, we propose the MCDA method SAW (cf., Figueira, Greco and Ehrgott, 2005; Lenz and Ablovatski, 2006). SAW is suitable for that task, for it allows consistent preference decisions about a set of available alternatives based on multiple criteria. In order to apply this approach, a set of existing benchmarks is needed. Those can be based on existing standards, the evaluation outcomes of other portals, or predefined goals such as e.g. a certain number of visitors per month. Which of them suit best depends on their availability and the actual evaluation task and its context.

Related work had been done to evaluate the user satisfaction with portals (Sampson and Manouselis, 2005), or to measure the quality of Web sites (Moustakis, Litos, Dalivigas and Tsironis, 2004).

First we describe the development of measurement criteria. Then a brief introduction to the performance measurement process with SAW is given. Finally, we make some conclusions about our current research status and future work.

**DEVELOPMENT OF CRITERIA**

The development of MCDA criteria usually starts with the definition of rather intangible measures (e.g., *net benefits*) which then are operationalized to measurable criteria (e.g., *number of visits*). The result is a goal hierarchy (Figure 1). In our case its root node is labeled *net benefits* which represents “the balance of all positive and negative impacts” (DeLone and McLean, 2003, p. 25) on the concerned stakeholder groups.

**Benefit and Cost Criteria**

Three questions have to be answered: which stakeholder groups are to be included, what evaluation perspective(s) is (are) to be taken, and what criteria are to be chosen (DeLone and McLean, 2003). We propose two main groups of stakeholders: the portal users and the portal providing organization (further referred to as *provider*). It is clear that the portal provider again is a group of different stakeholders (e.g., staff or management) with differing goals. As we are interested in goals associated with the desired impacts on users, we refer to those goals as goals of the portal provider. The evaluation criteria are developed from the perspectives of these two groups and will be described in detail in the following sections.

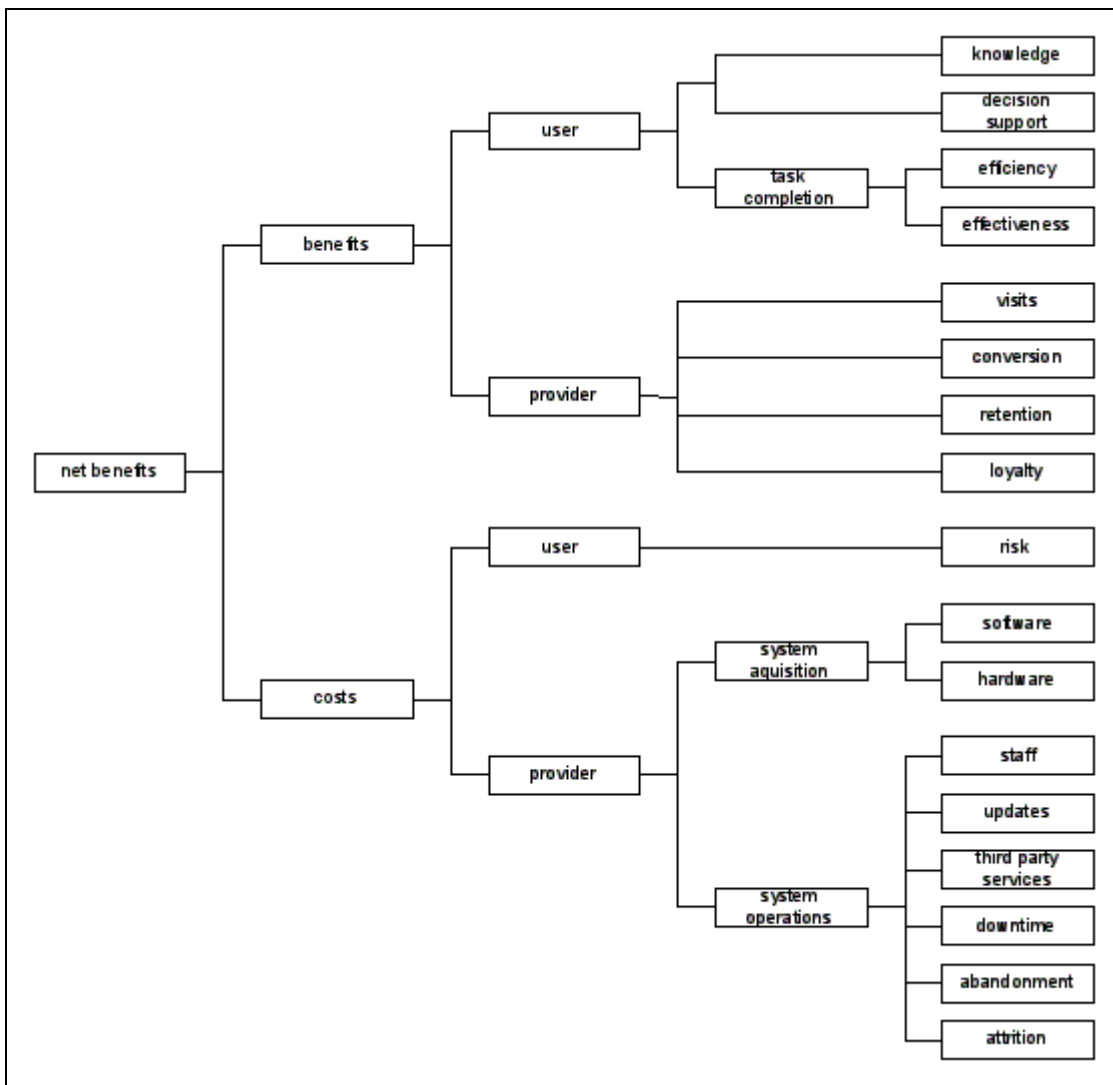


Figure 1. Goal Hierarchy for Net Benefits

### Benefits for the Provider

Common e-commerce evaluation criteria (e.g., Cutler and Sterne, 2000) can be adapted for non-profit portals:

- § The *total number of non-member visits*, indicating the portals capability to attract new visitors.
- § The *conversion rate*, indicating the portals capability to interest new visitors in registering themselves to the portal.
- § The *retention rate*, indicating the portals capability to motivate already registered members to revisit the portal.
- § User *loyalty*. Loyalty is based on trust and can be described as “a feeling or attitude of devoted attachment and affection” ([www.dictionary.com](http://www.dictionary.com)). It is an important benefit factor (cf. Gefen, 2002), because loyal users most likely visit the portal on a regular basis, participate in community activities, act based upon the ideas propagated at the portal, and are willing to support it and refer it to others.

The total number of non-member visits, conversion and retention rate can be derived from log data analysis. For the assessment of a user’s loyalty for the portal and its portal community we propose usage of an adapted version of the Loyalty Acid Test Survey questionnaire (Reichheld, 2001) for consumers in business relationships.

### Costs for the Provider

The costs can be divided into two kinds of costs: acquisition and operations costs (David, Schuff and Louis, 2002). Acquisition costs are all costs associated with purchasing the system hardware and software. Operations costs are all costs associated with the ongoing operation of the system:

- § *Expenditures for staff*, as all costs associated with the system maintaining organizational staff.
- § *Expenditures for system updates*, as all product costs associated with system updates (e.g., software updates).
- § *Expenditures for third party services*, as all costs associated with services from external parties (e.g., server housing).
- § *Downtime*, as the total amount of elapsed time during which the portal was unreachable due to, e.g., system problems or updates.
- § *Abandonment* (Cutler and Sterne, 2000), as the rate of users who quit the registration process before having it completed, which indicates a problem with this process.
- § *Attrition* (Cutler and Sterne, 2000), as the rate of registered users who do not return after a certain period of inactivity, which indicates a loss of interest in the portal.

Acquisition costs as well as the operations costs for staff, system updates, and third party services can be derived from cost analysis. Abandonment and attrition rates can be derived from log file analysis. The downtime can be derived from other log records in case they exist.

### Benefits for the User

The proposed criteria are based on research of IS usage impacts (cf. D'Ambra and Rice, 2001; DeLone and McLean, 1992; Money, Tromp and Wegner, 1988):

- § The *impact on knowledge*, indicating whether the provided information content by the portal and its community is helpful in increasing the user’s knowledge about the topics of interest.
- § The *decision support quality*, indicating the portal’s utility for taking decisions concerning the topics of interest.
- § The impact of portal usage on task accomplishment, measured as (1) *task completion efficiency* and (2) *task completion effectiveness*.

To measure the benefits we propose usage of questionnaire items adapted from the aforementioned literature.

### Costs for the User

Privacy and security concerns are important cost factors a user has to take into account when being involved with the portal and its community. User perceived *risk* (cf., Gefen, 2002) can be applied as a criterion to measure this concerns. Risky behavior includes (1) sharing personal information with the portal system or its community, (2) interacting with the portal system or its community, (3) acting on information provided by the portal system or its community (adapted from McKnight, Choudhury and Kacmar, 2002). To measure the perceived risk we propose usage of questionnaire items based on the listed criteria.

**MCDA WITH THE SAW METHOD**

A MCDA problem consists of a set  $A = \{a_1, a_2, \dots, a_n\}$  of alternatives and a set  $C = \{c_1, c_2, \dots, c_m\}$  of often conflicting criteria with usually incommensurable measurement units (like the described criteria in the previous section). In our case, additionally to the portal which is to be evaluated, the further considered alternatives can be other real portals, or generic figures based on standard values or predefined goals. The decision problem can be expressed in a decision matrix (Figure 2). In this context a criterion  $c_j$  is also referred to as *decision attribute* (e.g. *conversion rate*) and its corresponding outcome value  $x_{ij}$  as *attribute value* (e.g. *10%*). The goal is to obtain a ranking of the alternatives according to the attribute values  $x_{ij}$  based on the considered criteria  $c_j$ . In order to do so a utility score  $U(a_i)$  for each alternative is calculated which represents its relative overall performance compared to the other alternatives. The procedure of calculating utility scores is as follows: first, the attribute values  $x_{ij}$  are normalized by applying a value function  $u_j(\cdot)$ . This results in partial utility values  $u_j(x_{ij})$  which are usually bounded to the interval  $[0,1]$ . Next, according to its relative importance each  $u_j(x_{ij})$  of the alternative is multiplied with its corresponding weighting coefficient  $w_j$  ( $w_j \geq 0, \sum_j w_j = 1$ ), and finally, those products are summed up to an overall utility score:

$$U^{SAW}(a_i) = \sum_{j=1}^m w_j \cdot u_j(x_{ij}), \forall a_i \in A.$$

Due to the normalization this score is usually bounded to the interval  $[0,1]$ . The portal  $a^i$  with the highest utility score  $U^{SAW}(a^*)$  thus has the best overall performance based on the given criteria and weights ( $U^{SAW}(a^*) \geq U^{SAW}(a_i), a^* \neq a_i$ ). The score differences between two portal alternatives indicate the extent of differences in performance outcomes.

	$w_1$	$\succ$	$w_j$	$\succ$	$w_m$
	$c_1$	$\succ$	$c_j$	$\succ$	$c_m$
$a_1$	$u_1(x_{11})$	$\succ$		$\succ$	$u_m(x_{1m})$
$\vdots$	$\vdots$		$\vdots$		$\vdots$
$a_i$	$u_1(x_{i1})$	$\succ$	$u_j(x_{ij})$	$\succ$	$u_m(x_{im})$
$\vdots$	$\vdots$		$\vdots$		$\vdots$
$a_n$	$u_1(x_{n1})$	$\succ$		$\succ$	$u_m(x_{nm})$

**Figure 2. Decision Matrix D**

The calculation of the overall utility score based on a goal hierarchy (cf. Figure 1), starts at the bottom level. For each subtree at this level the corresponding utility score is calculated. These figures serve as utility values for the utility score calculation of the subtrees at the next higher level. That procedure is continued until the top of the hierarchy is reached and an overall utility score of the alternative is derived (cf. Sampson and Manouselis, 2005).

Although SAW is simple, some limitations exist: the attribute values must be at least of an ordinal scale, and their preference order relation must be complete and transitive, i.e. the decision maker must be able to indicate its preference upon two attribute values ( $x_{ij} \succ_0 x_{ik}$  for all  $j, k$  with  $j \neq k$ ). The weights are formed based on the decision maker’s subjective reflections of the relative importance of each attribute. The overall utility score of an alternative can change dramatically when a new alternative—even an outsider—is added, which can lead to a rigorous change of the previous ranking result (cf.

Schneeweiß, 1991).

## CONCLUSION

We propose a success evaluation approach for non-profit portals based on a relative performance measurement from the perspective of benefits and costs. The evaluation process includes multiple criteria and a comparison with other portal “alternatives”. The quality of the evaluation results depends on the set of selected criteria, the quality of the outcome data, and the quality of the benchmark data. The possibility to include different data from different sources into the analysis process extends the evaluation perspective and thus has a positive impact on the quality of evaluation results. The presented goal hierarchy constitutes a proposal. It can be easily adapted depending on the specific context and need.

Future work includes the development of a questionnaire based on the proposed criteria for questionnaire items above. The questions have to be answered by indicating the level of agreement or disagreement on a Likert-type scale. The questionnaire will be tested in a pretest phase for validity and reliability. Following, the proposed MCDA approach will be applied to at least three portals. Therefore an e-mail containing a link to an online form of the questionnaire will be sent to the registered portal members. Also the corresponding log data and cost data will be analyzed. The results will be incorporated in the MCDA model and the utility scores of the portal alternatives will be derived. To protect the privacy of the participating users, there will be no identification required to fill out the online questionnaire. Additionally all identifying information from the log data will be removed.

There are some limitations to the approach: standard values may not exist for all criteria, other portal providers may not be able or willing to give the required data or parts of it, and predefined goal values may be unrealistic. In such cases the measurement criteria for which the data cannot be gathered correctly have to be removed. This could lead to a reduced quality of evaluation results.

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