Website use feature value assessment
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ABSTRACT
Which part of the website, content or use feature, is responsible for the revenues of a website is often unknown to the website manager. In this paper the tool UFVA, Use Feature Value Assessment, is presented to solve this problem. This tool identifies three main dimensions: organizational goals/revenues, user satisfaction and costs. The performance measures for these three dimensions are identified and used in two pilot case studies. The tool acknowledges user satisfaction performance measures differ for different website categories and advises using a user satisfaction tool which focuses on the website's category. UFVA requires further verification and primarily forms a base for further research on website use feature management.

Keywords
Website use features, website user satisfaction, website use feature value assessment.

1. INTRODUCTION
Billions of dollars are spent annually on new website use features such as search functions, rating options, user feedback, audio and video features. These features attempt to increase user satisfaction. Hof [1] found for example that the lack of search functions could lose business for online retailers. Too many features however does increase the website complexity. Nadkarni and Gupta [2] suggest providing a low-complex website to new visitors and a medium-complex website to experienced users. Most research focuses on user satisfaction overall [3-8], the research on individual use features is a largely uncharted territory. In our literature study on website effectiveness, use features and user satisfaction in renowned computer science information sources and on the common worldwide web no articles were found addressing website use features specifically.

This paper is an attempt to provide a methodological approach to assess which website features are most and least important from a website manager’s point of view. The knowledge problem on website use features is captured in our research question:

For commercial internet services, what information is needed to assess the value of website use features?

Common starting points in research on website success and user satisfaction are the Theory of Reasoned Action (TRA) [9] and Technology Acceptance Model (TAM) [10]. TRA has two factors that indicate user behavior intent: 1) attitude toward performing the behavior and 2) one’s subjective norm related to performing the behavior. TRA was intended to measure volatile behavior and excludes spontaneous, impulsive, habitual or behavior as the result of cravings [11]. Sheppard et al. [12] state there are three limiting conditions on the use of attitudes and subjective norms to predict intention: 1) distinction between goal and behavioral intent, 2) availability of alternatives and 3) intentions are not the same estimates. The Technology Acceptance Model is an extension on TRA and identifies the following two indicators for the user acceptance of IT: ease of use and usefulness. Some argue TAM is too limited and factors that are not measured by the two indicators influence the user behavior as well [6, 13-15].

An attempt was made to create a unified model on user acceptance of IT, the Unified Theory of Acceptance and Use of IT (UTUAT). It contains the following eight factors: performance expectancy, effort expectancy, social influence, facilitating conditions, gender, age, experience and voluntariness of use. In the study of Vanketesh et al. it could predict 69% of the variance in usage intention. [14]

The research model presented in this paper to assess the value of website use features acknowledges three main dimensions: organizational goals/revenues, user satisfaction and costs. It allows for other factors not captured in these dimensions to be added as well. Organizational goals/revenues is measured through a website manager assessment of the strength of the bond with the website use feature. User satisfaction is measured with usage, the intent to reuse and a TRA/TAM/UTUAT-like user satisfaction tool. Costs are measured in development and maintenance costs.

In the next section prior research on the main variables is discussed after which the full research model is presented. This is followed by the operationalisation of the research model in two pilot case studies. A discussion and conclusion formulate the findings.

The research model presented in this paper could not be verified thoroughly, primarily because of a very small sample in the first case study and a lack of time in the second case study to monitor the changes made after initial research. This paper does present a good starting point for further research on use feature value assessment.

2. PRIOR RESEARCH
2.1 Organizational goals/revenues
Schaupp et al. [15] identify two perspectives addressing website goals; the website user perspective and the organization’s perspective. They state most research has been done from the user’s perspective, the user’s expectations need to be met and the interaction with the website has to be positive. The user’s satisfaction determines the overall success of the website [16]. User satisfaction is considered a prerequisite for the user’s intent to (re-)use the website [17, 18].

From the organization’s point of view the organizational goals have to be met. Belanger et al. [5] created a taxonomy of website goals (see Table 1). A website can have more than one of these goals, for example an “Online learning” website may also have “Online community” characteristics.
Table 1: Belanger et al. taxonomy of website goals [5]

<table>
<thead>
<tr>
<th>Website goal</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informed decision-based</td>
<td>Gives product information with the goal of influencing the decision process of users.</td>
</tr>
<tr>
<td>Informed decision-unbiased</td>
<td>Helps the user make an informed decision but without bias towards a particular decision.</td>
</tr>
<tr>
<td>Life enrichment</td>
<td>Increases the general awareness of a topic, but not necessarily of a product.</td>
</tr>
<tr>
<td>Online learning</td>
<td>Offers a forum for educational purposes.</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Offers entertainment (games, music, etc.).</td>
</tr>
<tr>
<td>Knowledge enhancement</td>
<td>Quickly informs visitors of current events or a specific topic.</td>
</tr>
<tr>
<td>E-commerce</td>
<td>Allows transactions online with another party (supplier, customer, partner, government, etc.).</td>
</tr>
<tr>
<td>Online community</td>
<td>Gathers and shares information on a certain topic or area of interest and acts as a forum for people with similar interests.</td>
</tr>
<tr>
<td>Information specific search</td>
<td>Provides the ability to search and find relevant information on a particular topic.</td>
</tr>
<tr>
<td>Interactive service management</td>
<td>Allows individuals or organizations to service their accounts online.</td>
</tr>
<tr>
<td>Online application</td>
<td>Allows individuals or organizations to access applications on a web-based platform.</td>
</tr>
</tbody>
</table>

2.2 User satisfaction

Lots of research has been done to explain website effectiveness [8, 15, 17-21]. A problem in finding relevant performance measures are the types and categories of websites. For example, for e-commerce websites fulfillment and reliability will be important in customer satisfaction. For information services the quality and adequacy of information will be more important. The SERVQUAL [22] scale was developed as an industry-independent measure of service quality. It identifies five main aspects of service quality: reliability, assurance, tangibles, empathy and responsiveness. Although used frequently it suffers much criticism. Buttle [23] stated the SERVQUAL measures are not universal for all service industries. Another criticism is that consumer purchase behavior is decided on an even higher abstraction level, the primary reason why the SERPVAL [24] scale was developed. Because of the criticisms SERVQUAL has become a controversial method of measuring service quality.

Many service quality measures exist in more specific industry contexts. .comQ [25] focuses on retailing websites and identifies four service quality dimensions: website design, privacy/security, fulfillment/reliability and customer service. Palmer [8] found five measures for corporate websites: download delay, organization/navigation, information/content, interactivity and responsiveness.

Yang et al. [21] made a study on information web portals. Web portals provide information from different sources, functioning as a ‘portal’ to other websites. Yang et al. used the Technology Acceptance Model of Davis [10] as its starting point. The two TAM indicators of user acceptance of IT, ease of use and usefulness, were broken down in six performance measures; usefulness of content, adequacy of information, usability, accessibility, privacy/security and interaction. The study revealed privacy/security had to be merged with usability. The reason for this is they believe “consumers judge security/privacy based on elements such as the professional look and feel of the website, as well as functionality of a website, and company reputation” [20].

The WEBQUAL tool is a more general website tool and identifies twelve dimensions: informational fit-to-task, tailored information, trust, response time, ease of understanding, intuitive operations, visual appeal, innovativeness, emotional appeal, consistent image, on-line completeness and relative advantage. These twelve dimensions can be grouped in three categories: usefulness, ease of use and other factors (most notably entertainment). These all influence the intent to reuse which is the primary measure for website success. [6]

The tools discussed and a few more popular instruments are listed in Table 2.

Table 2: Website performance measure instruments

<table>
<thead>
<tr>
<th>Name</th>
<th>Category</th>
<th>Dimensions / categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVQUAL [22]</td>
<td>Industry-independent service quality</td>
<td>5</td>
</tr>
<tr>
<td>SERPVAL [24]</td>
<td>Industry-independent service purchase behaviour</td>
<td>3</td>
</tr>
<tr>
<td>Aladwani and Palvia [4]</td>
<td>Information services</td>
<td>4</td>
</tr>
<tr>
<td>.comQ [6]</td>
<td>Online retailing</td>
<td>4</td>
</tr>
<tr>
<td>ECUSI [26]</td>
<td>Online retailing</td>
<td>4</td>
</tr>
<tr>
<td>Yang et al. [21]</td>
<td>Web portals</td>
<td>5</td>
</tr>
<tr>
<td>Chang et al. [27]</td>
<td>E-commerce</td>
<td>4</td>
</tr>
<tr>
<td>SITEQUAL [28]</td>
<td>B2C e-commerce</td>
<td>11</td>
</tr>
<tr>
<td>Palmer [8]</td>
<td>Corporate websites</td>
<td>5</td>
</tr>
<tr>
<td>Kim and Chang [29]</td>
<td>Health information services</td>
<td>3</td>
</tr>
<tr>
<td>Grigoroudis et al. [30]</td>
<td>Corporate websites</td>
<td>9</td>
</tr>
<tr>
<td>Muylle et al. [7]</td>
<td>Websites in general, best for information services</td>
<td>13</td>
</tr>
</tbody>
</table>

Most of the tools in Table 2 deal with Perceived Website Complexity (PWC) by analyzing the user satisfaction on website design, accessibility, usability and/or interaction. Most tools do not measure PWC separately. Nadkarni and Gupta [2] found in their research on PWC that the user satisfaction of goal-oriented users was highest on low-complexity websites. Experiential users have the highest satisfaction level with medium-complex websites. Nadkarni and Gupta advise to provide different functionality to both user groups. Providing many features to novices or goal-oriented users will influence the user satisfaction negatively.

2.3 Performance measure methods

Internet surveys are commonly used to find relevant information about user perceived satisfaction. Online surveys however receive low feedback, reliability of answers is...
unknown and the cause of the answers might remain unclear [31-35]. Short questionnaires with some form of reward yield better results than long questionnaires without reward, Deutskens et al. advise not to put more than 20 questions in online surveys [36].

Server log analysis can be used to measure website inflow and perform user path analysis. With log analysis user behavior can be analyzed, the reasons behind the user behavior however remain unclear. For this reason user surveys remain necessary.

Third party tools like Alexa [37], Google Analytics [38] and Insights [39] can be used to track download speeds, search keyword trends, and other performance measures. Particularly on website inflow these tools provide information unavailable in server log analysis.

3. RESEARCH MODEL

This chapter presents the research model used in the two case studies (see Figure 1).

3.1 Organizational goals

The website goals in Table 1 are limited to a descriptive nature, the website’s strategy on how it is trying to achieve success is not clear. In the case studies in this paper revenues could not be linked directly to individual website use features. For this reason the website managers were asked to incorporate revenues in their organizational goal.

3.2 User satisfaction

Users first locate a website, they interact with the website and leave. These three stages have their own unique performance measures (see Figure 2).

Figure 2: website performance measures

Inflow and outflow can be measured using log analysis or in the case of new features with user surveys. Which performance variables should be used to measure interaction depend on the type of website, see Table 2. Interaction performance measures require user surveys.

Since interaction influences the intent to reuse [17, 18] which can be measured with log analysis, the question raises whether it is useful to perform a user survey to measure user satisfaction at all. Measuring only outflow parameters should provide a good idea of the use feature’s value. This lead to the following hypothesis:

Hypothesis 1: Detailed user satisfaction information is invaluable to the website manager, measurements based on usage data, costs and organizational goals alone do not reflect the true value of individual use features.

Secondly it is hypothesized more active or involved users of the website tend to complete the survey more often than inactive users. This would result in a higher website use indicated in the surveys than actual website use measured through log analysis:

Hypothesis 2: Survey usage of website use features is considerably (> 5%) higher than actual usage of website use features.

It is assumed that if hypothesis 2 is found true the survey use expectancies for new website use features are higher as well and should be corrected to reflect a more realistic estimate.

Figure 1: Research model
3.3 Costs
Development costs are less important in managerial decisions for existing features than for new features. Maintenance costs are important for both types of features. Development costs for new features can be omitted from the final result but do provide historical reference data.

3.4 Other factors
Not all performance measures may be captured within the three dimensions. Circumstantial limitations can limit the value of website use features. As an example, in one of the case studies suitability of use features is not captured in the organizational goal or user satisfaction. In the other case study the organizational goal was more specific and suitability of website use features was captured in the organizational goal.

4. METHODOLOGY
Two pilot case studies were conducted using the research model. Both case studies followed the following steps:

1) Set organizational goal.
2) Perform management survey. Relation of use feature to the organizational goal and revenues are made clear and an assessment of development and maintenance costs for each use feature is made.
3) Perform user survey. Use, reuse, use expectancies and user satisfaction data is gathered.
4) Analyze results.
5) Draw conclusions.

In the first case study the following extra steps were taken:
6) Change website according to conclusions.
7) Repeat steps 3-5.

This chapter discusses the first three steps, steps four, five and six are discussed in the next two chapters.

4.1 Yo.nl
The first case study is a custom-build link exchange website for entertainment content (games, images, news, movies or other). On yo.nl 43 students were asked to participate six weeks by visiting the website occasionally, only 10 of the 43 visited the website regularly and filled in the surveys.

4.1.1 Organizational goal
Using Belanger et al.’s taxonomy of website goals (see Table 1) the organizational goal of yo.nl is entertainment. A broader organizational goal that describes how revenues are to be made and describes the target audience is: maximize profit through advertisements by delivering popular entertaining content to as many adolescents as possible.

4.1.2 Yo.nl management survey
For yo.nl the relationship of features to the organizational goal and the costs were estimates made by the author, time spent building the use features was measured and used to indicate costs. Both performance measures are measured on a scale from one to ten in which one is lowest and ten highest.

4.1.3 Yo.nl user survey
For yo.nl two interviews were conducted under participants to generate ideas for new features. For the first survey three existing features and eight new features were chosen to be part of the survey, see Appendix C for an explanation of all use features.

Based on the first survey two new features were added. A second survey was performed three weeks later containing an extra question on use feature usefulness. This extra question was added to test hypothesis 1: is measuring only usage and intent to reuse enough for a user satisfaction assessment of use features? See appendix B for a list of all survey questions.

For both existing and new features all likely influences on visitor behavior were presented in the survey and the participant was asked whether or not he would be affected on a scale from one to five. These questions provided the use and reuse data.

4.2 Paiq.nl
The second case study was conducted on the Dutch dating website www.paiq.nl. Paiq.nl uses an Artificial Intelligence (AI) bot to find user matches using user characteristics. The reason Paiq.nl was chosen for this research is most use features require payment each time a registered user uses them. The website’s success is highly dependent on successful individual use features.

4.2.1 Organizational goal
The paiq.nl organizational goal used in the manager survey was chosen by its two website managers and is the following: “As many as possible active (preferably paying) users”. The organizational goal leaves much room to what type of content and features the website should provide, this is compensated by adding a suitability dimension in the user survey. Using Belanger’s taxonomy of website goals (see Table 2) paiq.nl can be classified as an online community and information specific search. Users are looking for a date with whom they share similar interests and have certain specified characteristics.

4.2.2 Paiq.nl management survey
While estimating the costs the two website managers were asked to select the cheapest and most expensive feature in both maintenance and development costs and assign those costs first on a scale from one to ten. The rest of the features were assigned relative to both extremes.

4.2.3 Paiq.nl user survey
The paiq.nl user survey was developed in cooperation with the website managers. They chose seven use features to be investigated primarily because the usage of these features is below expectations. Four new features were added which the website managers were considering to implement at the time. To limit the length of the survey, an online survey should not contain much more than 20 questions [36], for this reason the survey was split in two separate surveys. One survey investigated four existing features and two new ones, the other three existing features and two new ones. A single user surveys would still contain approximately 80 questions in total. A lottery price worth €120,- was rewarded to a random participant to increase the response rate.

The performance tool used to measure user satisfaction is WebQual [6]. WebQual is a general website user satisfaction tool (see Table 2). A tool focusing on dating websites was not found in the literature study. An important reason why WebQual is favored over the other tools is it includes entertainment as one of its dimensions, a dimension in which the website managers are particularly interested in. The suitability dimension was added to compensate the broad organizational goal set by the website managers.

The main WebQual dimensions were translated into survey questions, see Appendix B. The WebQual dimensions trust, response time and all complementary relationships (consistent image, on-line completeness, relative advantage) were dropped from the survey because they focus on the website as a whole and could not be applied to individual use features.
5. DATA ANALYSIS AND RESULTS

5.1 Yo.nl

5.1.1 First survey

Ten surveys were submitted. 100% of the users are male and all were attending a university study at the time. All participants are between the ages 19 and 23.

In Table 3 the results of the first survey are presented. All variables have a range of 0 (worst) to 1 (best).

Table 3: Scores yo.nl use features 1st survey

<table>
<thead>
<tr>
<th>Feature</th>
<th>Goal</th>
<th>Dev</th>
<th>Maint</th>
<th>Usage</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>readFurther</td>
<td>0.4</td>
<td>0.8</td>
<td>0.9</td>
<td>0.37</td>
<td>0.556</td>
</tr>
<tr>
<td>categories</td>
<td>0.8</td>
<td>0.6</td>
<td>0.9</td>
<td>0.50</td>
<td>0.733</td>
</tr>
<tr>
<td>addLink</td>
<td>1</td>
<td>0.8</td>
<td>0.9</td>
<td>0.37</td>
<td>0.757</td>
</tr>
<tr>
<td>rating *</td>
<td>0.8</td>
<td>0.4</td>
<td>0.9</td>
<td>0.83</td>
<td>0.744</td>
</tr>
<tr>
<td>popularity *</td>
<td>0.8</td>
<td>0.7</td>
<td>0.9</td>
<td>0.56</td>
<td>0.712</td>
</tr>
<tr>
<td>mostActive *</td>
<td>0.5</td>
<td>0.4</td>
<td>0.9</td>
<td>0.11</td>
<td>0.403</td>
</tr>
<tr>
<td>react *</td>
<td>0.3</td>
<td>0</td>
<td>0.6</td>
<td>0.28</td>
<td>0.273</td>
</tr>
<tr>
<td>categorySel *</td>
<td>0.8</td>
<td>0.6</td>
<td>0.9</td>
<td>0.56</td>
<td>0.692</td>
</tr>
<tr>
<td>mostPop *</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
<td>1.00</td>
<td>0.880</td>
</tr>
<tr>
<td>externLinks *</td>
<td>1</td>
<td>0.6</td>
<td>0.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>search *</td>
<td>0.6</td>
<td>0.7</td>
<td>0.9</td>
<td>0.50</td>
<td>0.627</td>
</tr>
</tbody>
</table>

Avg existing feat. = 0.73, Avg feat. ideas = 0.70, Sexisting feat. score = 0.110, Snew feat. score = 0.230

* feature does not exist

A short explanation of the table columns:

- Goal: Organizational goal strength.
- Dev: Development costs. 0 indicates high costs and 1 indicates low costs.
- Maint: Maintenance costs. 0 indicates high costs and 1 indicates low costs.
- Usage: Usage dimension, includes total usage and intent to reuse.
- Score: A weight adjusted average of all involved performance variables. For the score calculation the following weights were used:
  \[ w_{goal} = 1 \]
  \[ w_{dev new features} = 0.6 \]
  \[ w_{maint new features} = 0.4 \]
  \[ w_{dev existing features} = 0 \]
  \[ w_{maint existing features} = 1 \]
  \[ w_{usage} = 1 \]

These weights for costs of existing and new features differ because development costs are irrelevant for continuation decisions on existing use features.

Four observations can be made using the results in Table 6.

First the feature externLinks does not contain any usage data. This is because the target audience for externLinks is not the same as the other features, externLinks is to be used only by other webmasters.

Secondly the most popular new features are content rating and the mostPop feature. The most popular features also have the highest final score. The popularity feature came in as the third new feature with a score of 0.712.

Thirdly if the usage column is excluded the highest weighted score of new features would be externLinks with a final score of 8.4. The one feature for which no usage data is available.

And finally the feature readFurther has the lowest score of all existing features. This feature is a separate page for each link containing the full description of a link. This option is hardly used since almost all descriptions are short enough to be fully displayed on the homepage. The reason this page exists in the first place is to allow certain feature ideas, for example a commenting feature.

5.1.2 Changes made after first survey

A favorites feature was installed which allows users to add a link to their favorites list. This feature tries to incorporate two features investigated: a voting system and popularity measure. This feature idea came from a participant as a comment in the first survey. Since the relation to the goal and costs for this feature were estimated the same as a normal rating feature the participants were asked which of both features they’d prefer. Of the seven responses five preferred the favorites feature and two preferred the rating feature.

A mostFavorites feature was added which shows a list of five links with the highest favorites count in the last seven days. A visual presentation of the website containing the new features can be found in Appendix A.

5.1.3 Second survey

Nine participants submitted the survey successfully. Personal details are the same as in the first survey. The results can be found in Table 4.

The same weights are used to calculate the use feature score as in the first survey.

Table 4: Scores yo.nl use features 1st survey

<table>
<thead>
<tr>
<th>Feature</th>
<th>Usage</th>
<th>Score</th>
<th>Score change</th>
<th>Usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>readFurther</td>
<td>0.33</td>
<td>0.543</td>
<td>-2.6</td>
<td>-</td>
</tr>
<tr>
<td>categories</td>
<td>0.45</td>
<td>0.717</td>
<td>-2.4</td>
<td>-</td>
</tr>
<tr>
<td>addLink</td>
<td>0.28</td>
<td>0.727</td>
<td>-3.0</td>
<td>-</td>
</tr>
<tr>
<td>favorites</td>
<td>0.46</td>
<td>0.720</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>mostFavorites</td>
<td>0.45</td>
<td>0.617</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>rating *</td>
<td>0.77</td>
<td>0.723</td>
<td>-2.8</td>
<td>22</td>
</tr>
<tr>
<td>popularity *</td>
<td>0.67</td>
<td>0.750</td>
<td>+5.3</td>
<td>33</td>
</tr>
<tr>
<td>mostActive *</td>
<td>0.11</td>
<td>0.403</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>react *</td>
<td>0.17</td>
<td>0.237</td>
<td>-3.6</td>
<td>33</td>
</tr>
<tr>
<td>categorySel *</td>
<td>0.44</td>
<td>0.653</td>
<td>-5.6</td>
<td>78</td>
</tr>
<tr>
<td>mostPop *</td>
<td>0.89</td>
<td>0.843</td>
<td>-4.2</td>
<td>33</td>
</tr>
<tr>
<td>search *</td>
<td>0.44</td>
<td>0.720</td>
<td>+15.8</td>
<td>78</td>
</tr>
<tr>
<td>Avg existing feat.</td>
<td>0.38</td>
<td>0.677</td>
<td>2.7**</td>
<td>-</td>
</tr>
<tr>
<td>Avg feature ideas</td>
<td>0.50</td>
<td>0.618</td>
<td>5.3**</td>
<td>41</td>
</tr>
</tbody>
</table>

Sexisting features score = 0.0817, Snew features score = .217

* feature does not exist ** uses absolute values

The score changes in Table 4 are not significant considering the small sample of 9. The average score for new features hardly changed: 0.618 as opposed to 0.619 in the first survey.
Figure 3 shows the difference between expected usage and perceived usefulness. Three features show over 50% smaller perceived usefulness than expected use. These seemingly conflicting results can be attributed to the new favorites feature. Since the favorites feature is already a rating and popularity measure and a list of most favorite links is displayed on the homepage, the usefulness of the rating, popular and mostPop features is small. This result cannot be found in the current score but is most likely of great value to the website manager, making hypothesis 1 true; using only use data and reuse data to measure user satisfaction is not sufficient, detailed user satisfaction data is required.

5.2 Paiq.nl

5.2.1 Survey
The Paiq survey was split in two separate surveys to limit the time it would take to complete a survey. General survey details can be found in Table 5.

The second survey was sent to 400 users more than the first survey because response rate was considerably lower. The results of both surveys are presented in Table 6.

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**Table 5: General Paiq.nl survey data**

<table>
<thead>
<tr>
<th>Feature</th>
<th>First survey</th>
<th>Second survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sent to</td>
<td>1.000</td>
<td>1.400</td>
</tr>
<tr>
<td>Complete responses</td>
<td>118 (11.8%)</td>
<td>96 (6.8%)</td>
</tr>
<tr>
<td>Male</td>
<td>56%</td>
<td>56%</td>
</tr>
<tr>
<td>Single</td>
<td>78%</td>
<td>87%</td>
</tr>
<tr>
<td>Higher education</td>
<td>56%</td>
<td>60%</td>
</tr>
<tr>
<td>Active at least 1 month</td>
<td>78%</td>
<td>75%</td>
</tr>
<tr>
<td>Active at least 1 year</td>
<td>32%</td>
<td>23%</td>
</tr>
<tr>
<td>Age &lt; 20</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Age 20-29</td>
<td>47%</td>
<td>47%</td>
</tr>
<tr>
<td>Age 30-39</td>
<td>27%</td>
<td>34%</td>
</tr>
<tr>
<td>Age 40-49</td>
<td>16%</td>
<td>13%</td>
</tr>
<tr>
<td>Age &gt;= 50</td>
<td>7%</td>
<td>3%</td>
</tr>
<tr>
<td>Daily visitor</td>
<td>21%</td>
<td>19%</td>
</tr>
<tr>
<td>2/3 visits a week</td>
<td>33%</td>
<td>34%</td>
</tr>
<tr>
<td>Weekly visitor</td>
<td>19%</td>
<td>18%</td>
</tr>
<tr>
<td>Less than 1 visit a week</td>
<td>14%</td>
<td>21%</td>
</tr>
<tr>
<td>Inactive</td>
<td>13%</td>
<td>8%</td>
</tr>
</tbody>
</table>

The following list explains the table columns found in Table 6:

- **WebQual factors**: The user satisfaction performance measures of the WebQual instrument.
- **Survey total use**: Total number of users who have used or expect to use the feature.
- **Survey reuse**: Total number of users who have used or expect to use the feature more than two times.
- **Real total use**: For existing features the total number of users who used that feature.
- **Real reuse**: For existing features the total number of users who used that feature more than two times.
- **Total use**: The difference between survey use and

---

**Table 6: Paiq.nl use feature results**

<table>
<thead>
<tr>
<th>Feature</th>
<th>WebQual factors</th>
<th>Survey total use %</th>
<th>Survey reuse %</th>
<th>Real total use %</th>
<th>Reuse discrepancy %</th>
<th>Adjusted total use %</th>
<th>Final score</th>
<th>Advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>photoCheat</td>
<td>0.69</td>
<td>59</td>
<td>73</td>
<td>35,6</td>
<td>66,9</td>
<td>23</td>
<td>6</td>
<td>0.711</td>
</tr>
<tr>
<td>timeCheat</td>
<td>0.69</td>
<td>34</td>
<td>50</td>
<td>19,5</td>
<td>46,2</td>
<td>14</td>
<td>4</td>
<td>0.540</td>
</tr>
<tr>
<td>invite</td>
<td>0.76</td>
<td>56</td>
<td>52</td>
<td>23,7</td>
<td>57,8</td>
<td>31</td>
<td>-6</td>
<td>0.637</td>
</tr>
<tr>
<td>oneLiner</td>
<td>0.69</td>
<td>37</td>
<td>54</td>
<td>23,0</td>
<td>60,4</td>
<td>16</td>
<td>-6</td>
<td>0.580</td>
</tr>
<tr>
<td>sms</td>
<td>0.63</td>
<td>11</td>
<td>64</td>
<td>3,1</td>
<td>41,9</td>
<td>8</td>
<td>22</td>
<td>0.507</td>
</tr>
<tr>
<td>need2Meet</td>
<td>0.68</td>
<td>8</td>
<td>50</td>
<td>4,4</td>
<td>36,4</td>
<td>4</td>
<td>14</td>
<td>0.527</td>
</tr>
<tr>
<td>offlineCheat</td>
<td>0.64</td>
<td>13</td>
<td>38</td>
<td>2,5</td>
<td>44,0</td>
<td>11</td>
<td>-6</td>
<td>0.520</td>
</tr>
<tr>
<td>dealBreakers*</td>
<td>0.68</td>
<td>62</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>35</td>
</tr>
<tr>
<td>replyByEmail*</td>
<td>0.69</td>
<td>44</td>
<td>41</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>22</td>
</tr>
<tr>
<td>videoAndVoice*</td>
<td>0.40</td>
<td>46</td>
<td>41</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>24</td>
</tr>
<tr>
<td>Avg existing feat.</td>
<td>0.68</td>
<td>31</td>
<td>54</td>
<td>16,0</td>
<td>9,2</td>
<td>15</td>
<td>4</td>
<td>0.574</td>
</tr>
<tr>
<td>Avg feat. ideas</td>
<td>0.64</td>
<td>48</td>
<td>44</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>27</td>
</tr>
</tbody>
</table>

* feature does not exist. $S_{existing\ features\ score} = 0.626$, $S_{new\ features\ score} = 0.564$
discrepancy real use for existing features.
Reuse discrepancy The difference between survey reuse and real reuse for existing features.
Adjusted total use An adjusted total use estimate for new use features based on the total use discrepancy and total use.

All values in the total use discrepancy column are positive meaning for survey answers usage is higher than real usage. On average survey use is 15% higher than real use, fulfilling the requirement of hypothesis 2. Because of this use expectancy needs to be adjusted to reflect more realistic use expectations.

The total use discrepancy increases when real total use is higher, see Figure 4. A Pearson correlation $r = 0.93$ is considered strong.

![Figure 4: Total use and total use discrepancy](image)

$r = 0.93$, $r^2 = 0.87$

Based on the results in Figure 4 an adjusted use expectation for feature ideas was made using the following formula:

$$\text{Adjusted total use} = -2.73 + 0.61 \times \text{survey use}$$

The results of this formula can be found in the column ‘Adjusted total use’. Due to this adjustment use expectancy of new features dropped from 48% to 27%. This is still considerably higher than the average of real total use (16%).

Another observation made from Table 6 is two features have a very large reuse discrepancy, $sms$ and $need2Meet$. A possible explanation is the low validity of these answers, less than 6 persons indicated they were going to reuse that feature. For the features with a larger sample (> 25) reuse discrepancy is much lower, ranging from 6 to 6 percent difference with real reuse.

The final score is the average of all performance measures adjusted by the weights found Appendix D. This score is the main indicator for the advice given to the Paiq webmasters (see Table 6).

6. DISCUSSION

This paper started by identifying a gap in knowledge on individual website use features. The research model proposed in this paper attempts to fill this gap. In two case studies the research model was used as a method for investment decisions for new use features and continuation decisions for existing use features. The verification is limited but it has shown potential, the paiq.nl website managers have incorporated the results of the paiq.nl case study in their development roadmap. The paper’s contribution is primarily a first step to a methodological approach on website use feature management.

Both hypothesis formulated in this paper were found to be true:

H1. Detailed user satisfaction information is invaluable to the website manager, measurements based on usage data, costs and organizational goals alone do not reflect the true value of individual use features.

H2. Survey usage of website use features is considerably (> 5%) higher than actual usage of website use features.

H1 shows the model cannot be used without user surveys on user satisfaction. From H2 we assume that use expectations in surveys are higher by approximately the same amount as the difference between survey use answers and real usage of website use features.

It was found necessary to include other factors in the research model. Arguably this could have been avoided in the paiq.nl case study if the organizational goal was defined with a narrower scope. Using other factors should be used as a last resort, an attempt should be made to adjust the organizational goal or choosing a different user satisfaction tool if possible.

6.1 Limitations

The research model does not provide a single set of user satisfaction performance measures. Concentrating on a single tool would limit the usability of the model to a smaller industry context. The tool used in one of the case studies, WebQual, had to be adapted to be used for individual use features. This raises the question whether a single user satisfaction for individual use features would be more applicable. Any such tool would likely suffer the same criticisms as all industry independent user satisfaction/behavioral measurement tools do, the measures are not found universal.

Another problem are the limited amount of performance measures that apply to use feature ideas. In both pilot studies a short description of the feature idea was all the participant could go on. Performance measures like website complexity, aesthetic value or interaction cannot be measured. Optionally a pre-release version of the new features could be given to the participant but in our pilot studies the costs would have been too high.

The third problem encountered is UFVA does not incorporate side-effects on other use features. Adding one feature might influence the use of another feature. There are two problems when incorporating side effects, 1) there is no guarantee all side-effects are covered in the survey and 2) how the side-effects are to be translated to the use feature value. Does the originating use feature value change, the target use feature or perhaps both?

Currently revenues have been merged with the organizational goals dimension. We assumed the effect of a single use feature on the revenues is impossible to measure. For this reason the revenues were incorporated in the organizational goals.

6.2 Further research

The model was not thoroughly verified due to a low sample size in the first case study and a lack of time in the second case study. Further verification is needed in which the changes made after an initial research are monitored over a longer period of time. Ideally in a large sample of cases the benefits of the use of a UFVA-like tool are measured.

The UFVA model was not used to measure content value. For information services especially website content is the primary concern. Most user satisfaction tools include dimensions on information usefulness and adequacy of information, a case study on content value assessment should therefore be possible with the same research model.

As already noted in the limitations further research can be done towards a user satisfaction tool for individual website use features.
7. CONCLUSIONS
This study presents a tool that can be used by website managers to evaluate existing use features and use feature ideas. The main research question in this paper is: which information is needed to assess the value of website use features? First a clear organizational goal should be defined and compared with the use features, secondly a user satisfaction tool fitting to the website’s category should be applied in a user survey, thirdly the usage and reuse data for existing features and use expectancies for new features should be collected and finally a cost estimate for each individual feature is to be made. Adjusted by weights which reflect the importance of the individual performance measures the website manager can make a value assessment of website use features. Although not thoroughly verified the tool provides a good base for further research and shows an example of a methodological approach on use feature management.

ACKNOWLEDGMENTS
The author would like to thank Professor Fons Wijnhoven for his invaluable input throughout the project and the website managers of Paq.nl for the opportunity they provided to conduct this research.

REFERENCES
APPENDIX A: YO.NL SCREENSHOT

The yo.nl website containing the two new use features: favorites feature and most favorites list. See figure 5.

![Figure 5: Screenshot yo.nl use features](image-url)
APPENDIX B: USER SURVEYS

Yo.nl user survey
For existing features the following question was asked to retrieve usage data:

1) How often have you used <feature> in total?
For feature ideas the following question was asked to retrieve usage expectancy:

2) How often do you think will you <action> because of <feature>?
   a) Never
   b) Not much, perhaps once or twice
   c) A couple of times
   d) Frequently
   e) Very frequently

All of the user satisfaction performance measures are measured on a scale from 1 to 5:

1) **Usefulness**
   Do you perceive the <feature> to be useful?
   1 = No, not useful at all
   5 = Yes, very useful

*a action is to be replaced by some user behavior, for a single use feature this question can be repeated with different kinds of behaviour.

Paiq.nl user survey
For existing features the following question was asked to retrieve usage data:

1) How often have you used <feature> in total?
For feature ideas the following question was asked to retrieve usage expectancy:

2) How often do you think you will use this feature?
   a) Never
   b) Not much, perhaps once or twice
   c) A couple of times
   d) Frequently
   e) Very frequently

All of the user satisfaction performance measures are measured on a scale from 1 to 5:

3) **Usefulness**
   Do you perceive the <feature> to be useful?
   1 = No, not useful at all
   5 = Yes, very useful

4) **Entertainment**
   Is <feature> visually appealing and entertaining?
   1 = No, not at all
   5 = Yes, very much so

5) **Ease of use**
   Do you think <feature> is intuitive, is it easy to use?
   1 = No, not at all
   5 = Yes, very easy

6) **Ease of use (accessibility)**
   Could you locate the <feature> easily?
   1 = No, very difficult
   5 = Yes, very easy

7) **Suitability**
   Do you think <feature> is a fitting addition to Paiq.nl?
   1 = No, it doesn’t fit Paiq.nl at all
   5 = Yes, it fits Paiq.nl very well

For new features the following additional question was added:

8) I understand how this feature works. ***
   1 = No, I don’t understand at all
   5 = Yes, I understand perfectly

* answer b is interpreted as low use, c, d and e as several times.
*** responses with a 1 or 2 were excluded from the results, approximately 3% of all responses.

APPENDIX C: USE FEATURE DESCRIPTIONS
An explanation of the website use features investigated in the two pilot studies.

Yo.nl use features
readFurther Separate page showing full link description.
categories Categorization of links in games, movies, images, news and other.
addLink Possibility to add a link without being logged in.
rating * Allow users to assign a rating to individual links and displays the rating on the homepage.
popularity * Displays on the homepage how often a link has been visited.
mostActive * Displays the 5 most active (registered) users on the homepage.
react * Allows registered users to add comments on links.
categorySel * Allow user to select which link categories are to be displayed on the homepage.
mostPop * Displays the 5-7 most popular links on the homepage.
externLinks * Allows other websites to display the most popular and newest links on their website.
search * A search function on link titles and descriptions.

Paiq.nl use features
photoCheat Displays all photos of a particular user.
timeCheat Immediately adds a new contact as opposed to one new contact every 4-8 days (depends on the number of active contacts a user already has).
invite Send friend invitation, successful invitations are rewarded with credits.
oneLiner Send a user a request for further contact.
sms Send a SMS message to offline users.
needToMeet Suggest two Paiq users should contact each other.
offlineCheat Displays the online/offline status to offline for a particular user.
dealBreakers * Set hard requirements on user traits.
dosAndDonts * Search on users likes and dislikes and optionally send oneLiners to them.
replyByEmail * The possibility to reply to new message notification emails.
voiceAndVideo * Contact Paiq users with microphone and webcam.
* features do not exist
APPENDIX D: PAIQ.NL WEIGHTS
Weights used in Paiq.nl use feature score, see Figure 6.

Figure 6: weights used to calculate the use Paiq.nl feature score