



# Analysis of User’s Behavior in Business Application Systems with Methods of the Web Usage Mining

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## ABSTRACT

Navigation opportunities in modern business application systems<sup>1</sup> are various and complex. While navigating users leave traces, which can be used as an initial data for behavior analysis. Based on results of the analysis the application systems can be (re-) configured or (re-) customized in order to be more favorable for a user. The behavior analysis in the field of web application is supported by methods of Web Usage Mining. These methods can be assumed as a basis for the analyses in the field of business application systems. Proceeding from this, an aim of the present paper is a definition of approaches for a user behavior analysis in the field of business application systems. These methods should be derived from differences between web applications and business application systems. As a research in this field is not finished, this article is a research-in-progress paper.

## 1 INTRODUCTION

Today ERP-Systems<sup>2</sup> cover all task areas inside an enterprise. Besides, the systems continue to grow in size and complexity. The systems become more incomprehensible because of the functions and capabilities surplus. ERP-Systems offer a high amount of navigation opportunities, which enable users to perform tasks purposeful. Nevertheless, navigation through this system is not trivial. In an operating time users leave traces in the form of log-, protocol and trace data. These data can be pulled up and used as a main data source for user behavior analysis. The main purpose of the analysis is an extraction of a behavior patterns. The results of the user behavior analysis should support the correctness of the business processes structure examination of the enterprise on the ERP-System and the system settings (Customizing<sup>3</sup>). They also should simplify the personalization<sup>4</sup> of the system and enable the investigation of user’s behavior with regard to work efficiency. In the field of web applications<sup>5</sup> the methods of Web Usage Mining [Ber02] are successfully used for investigation of user’s behavior. The overall objective of users’ behavior analysis is to support system designers in customization and personalization of systems.

Therefore, it might be possible to apply these methods in the field of business application systems, because here the same principles are used. To separate the examination of the user’s behavior in the business application systems and web area, the concept of “Application Usage Mining” is introduced here. At the same time it indicates the relationship and similarity of both research fields. In order to designate the approaches for a user behavior

analysis in the field of business application systems the description of the Application Usage Mining and comparison between web applications and business application systems take place in chapter 2. In chapter 3 a summary and perspective of future research activities in this field are given.

## 2 APPLICATION USAGE MINING

The attempt to apply basic approaches and methods of the Web Usage Mining in the field of business application systems and especially in ERP-Systems shows some significant differences, which have direct influence on aims of user’s behavior analysis in the area of business application systems. These differences base on the fact that there are some fundamental logical as well as technical differences between a web application e.g. electronic shopping and a business application system. In a web application the connection between a guest and provider is not binding. The visitor is free to navigate on the providers’ web pages. Moreover, he can access information and contents of the site and perhaps buy goods and services. However, there are some differences when a business application system is used. Here, the system user is not a visitor or customer, he is an employee of the enterprise and operates in the company’s interests. Along with the usage of a business application system an employee should optimally perform assigned tasks and do not prevent business operations in the whole enterprise. These differences in intercommunications influence the application concept.

The following essential differences were identified during the comparison of the applications (see table 1):

- System access

In the business application systems a user identification takes place every time. Nevertheless, in the web area the user stays anonymous while accessing web pages. In web Usage Mining area it is very important to recognize users in order to be able to examine the traces in a long-run. The recognition can be done in the following way. The users’ IP addresses can be identified, for example, by registration and with the help of the HTTP protocols. However, it is not simple because a computer can be used by several workers or a Proxy server is used for the allocation of temporary or dynamic IP addresses. Another solution is to check cookies. Although, there are some disadvantages: cookies can be deleted each time and also legal regulations about cookies usage are not completely clear.

Table 1: Technical and logical differences between the application types

| Attribute              | Web application   | Business application system   |
|------------------------|---|---|
| System access          | The visitor can stay anonymous                          | The user must be identified   |
| Authorization          | Usually, the visitor does not need an authorization     | In the enterprise user receives an authorization according to performed functions |
| Protocol               | Standard http   | No standards  |
| Software               | Web application; (most of them) based on HTML-documents | Different software platforms are used   |
| User’s behavior        | Free  | Execution of predefined tasks and business processes                              |
| User’s objective       | Not defined   | Optimal performance of tasks and business processes                               |
| Purpose of application | Reach a lot of visitors and customers                   | Efficient execution and automation of business processes                          |

- *Authorization*

In a provider/customer relationship within a web application the role of the user is defined from the beginning, i.e. all visitors get the same authorization. In exceptional cases only some certain actions and sites, which the user can perform or see correspondingly, are allowed. In some cases a group of users can execute several actions or visit additional pages e.g. if they have been registered. Usually, a web page is a shop window, which is available for all users that want to get information or buy goods or services of a provider. In business application systems, for example in SAP R/3, each user must receive a certain authorization profile according to his functions or roles in the enterprise.

- *Protocol*

In the web area the HTTP protocol is a dominant application that serves the transfer of HTML pages. Besides it has a special meaning in the Web Usage Mining analysis. It presents data, which describe the user online behavior. In the business application field such information can be mainly collected from trace-, log- data and various protocol files. However in business application systems several protocols can be implemented, hence the information content and format of the data differ from system to system. Today there are no standard formats for such data in the field of business applications.

- *Software*

Web engineering methods [Mur01], which are applied for the web application development, are usually based on HTML, Java and XML technology. In the area of the business application systems different software platforms, software technologies and different system providers can be used. Therefore, it might be difficult in the future to obtain standardized software technologies for business application systems.

- *User's behavior, objectives and the purpose of application*

While reviewing a web page of a certain provider customer shows his interest in the content of the site. At this point it is not possible to determine what objectives the customer pursues and what pushed him to open the appropriate site. This can be only a curiosity or, for example, the customer bumped into the site just by chance. However, the goal of the provider is clear and unambiguous. By the supply of the web pages he wants to wake customer interest to the goods and services in order to sell them in the future. Thus, structure and presentation of the web pages play an important role. By the application of the Web Usage Mining methods one tries to analyze and value the patterns of customer behavior in order to design customized web pages.

There is another situation in the application field. While accessing a business application system a user declares his intention to perform tasks or business operations defined in the enterprise. The business processes of an enterprise, which have to lead the user in a proper way, is the center of the system.

The differences specified above influence the objectives and the procedure of the user's behavior analysis in the area of business application systems. As the user should perform tasks serviceable and purposefully, two aspects should be considered here.

1. Behavior of the users during the work performance

One tries to analyze the user's behavior by the application of the Web Usage Mining methods in order to enable the user to perform his tasks serviceable and purposeful. For example, an application personalization is one of the possible solutions in this area.

2. Correctness of the execution of a business process and its activities

Another important goal of the analysis is the examination and if necessary an optimization of the business processes. By observation of the users' navigation the business process trend can be analyzed and valued.

It must be considered during the analysis what levels of the business processes are examined and whether it concerns the partial or the whole business processes.

### 3 SUMMARY AND PERSPECTIVE

Our decision to use the Web Usage Mining methods in the field of business application systems is based on the following fact: During the last years modern business application systems like SAP/R3 were introduced to the market. The business application systems offer users a lot of navigation opportunities in order to support users during performance of tasks and business operations. Hence, examination of the user's behavior can help to understand user needs and adjust the system, just like in the Web Usage Mining. However, at the beginning of our research we found out (chapter 2) that web application and business application systems differ logically and technically. Therefore, the objectives of the behavioral analysis in the Application Usage Mining and in the Web Usage Mining differ.

We are at the beginning of the research, thus it is a research-in-progress paper. The next stage of this research is the collection and examination of data about student's behavior during the usage of SAP R/3 at the Otto-von-Guericke-Universität Magdeburg, Germany.

### ENDNOTES

1 Business application system means an installed software product, which supports the task settings in the business field [URL1].

2 The abbreviation "ERP" means Enterprise Resource Planning. This includes the application spectrum of the considered software for economical task settings in an enterprise and the public administration [Huf00].

3 Customizing [Kel99] enables for the customer to select and parameterize, on the basis of his aims and demands, the desired processes with the appropriate functionality from the various solutions of functions and processes.

4 Personalization means adjustment of a system so that it meets the work requirements of a specific user or user group. Personalization is aimed to accelerate and simplify the business transactions of the system processes [URL2].

5 Applications in the field of E-Commerce are called here web applications.

### REFERENCES

- [Ber02] Berendt, B.: Detail and Context in Web Usage Mining: Coarsening and Visualizing Sequences - Lecture notes in computer science. Springer, Berlin 2002.
- [Huf00] Hufgard, A.: Definition und Abgrenzung des Begriffs ERP/ERM-Standardanwendungssoftware. IBIS Prof. Thome AG, Würzburg 2000.
- [Kel99] Keller, G: SAP R/3 prozessorientiert anwenden: Iteratives Prozess-Prototyping mit Ereignisgesteuerten Prozessketten und Knowledge Maps. Addison-Wesley, Bonn 1999.
- [Mur01] Murugesan, S.; Web Engineering: Managing Diversity and Complexity of Web Application Development. Springer, Berlin 2001.
- [URL1] <http://www-is.informatik.uni-oldenburg.de/lehre/Impl-IS/WS99-00/implementation13/sld001.htm>. 11.11.2002.
- [URL2] <http://help.sap.com>. 23.09.2002.

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