

USING GOOGLE ANALYTICS, CARD SORTING AND SEARCH
STATISTICS FOR GETTING INSIGHTS ABOUT METU
WEBSITE'S NEW DESIGN: A CASE STUDY

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MUSTAFA DALCI

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Approval of the Graduate School of Informatics

Prof. Dr. Nazife BAYKAL
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

Prof. Dr. Yasemin YARDIMCI
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

Assist. Prof. Dr. Tuğba Taşkaya Temizel
Supervisor

Examining Committee Members

Assist. Prof. Dr Sevgi Özkan (METU, IS) _____

Assist. Prof.Dr. Tuğba Taşkaya Temizel (METU, IS) _____

Assist. Prof. Dr. Aysu Betin Can (METU, IS) _____

Dr. Murat Perit ÇAKIR (METU, COGS) _____

Assist. Prof. Dr. Pınar Şenkul (METU, CENG) _____

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Name, Lastname : Mustafa DALCI

Signature :

ABSTRACT

USING GOOGLE ANALYTICS, CARD SORTING AND SEARCH STATISTICS FOR GETTING INSIGHTS ABOUT METU WEBSITE'S NEW DESIGN: A CASE STUDY

DALCI, Mustafa

M.S., Department of Information System

Supervisor: Assist. Prof. Dr. Tuğba Taşkaya Temizel

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Today, websites are one of the most popular and quickest way for communicating with users and providing information. Measuring the effectiveness of website, availability of information on website and information architecture on users' minds have become key issues. Moreover, using these insights on website's new design process will make the process more user-centered.

There is no consensus on how to define web site effectiveness, which dimensions need to be used for the evaluation of these web sites and which problems will be solved by these insights during the design process. The existing studies include usability tests with think-aloud procedure and session and user path analysis with simple software. There is limited study on web analytics tools which can be used for gathering users' navigation behaviours, lostness in website and information availability.

In this thesis, METU Website which has different user groups like students, prospective students, academicians, staff and researchers, has been evaluated in terms of information architecture and information availability. Three methods and tools have been used for evaluation. Google Analytics reports used for landing page optimization and information availability. With the help of card sorting, information architecture on user's mind measured. Search statistics give insight about users' information search trends. The results obtained using these methods have been utilized in the new design process.

Keywords: *Information Architecture, Google Analytics, Landing Page Optimization, Lostness Factor, Card Sorting,*

ÖZ

GOOGLE ANALİTİK, KART GRUPLAMA VE ARAMA İSTATİSTİKLERİNİ KULLANARAK ODTÜ WEB SİTESİNİN YENİ TASARIMI HAKKINDA BİLGİ EDİNMEK: ÖRNEK OLAY ÇALIŞMASI

DALCI, Mustafa

Yüksek Lisans, Bilişim Sistemleri Bölümü

Tez Yöneticisi: Yard. Doç. Dr. Tuğba Taşkaya Temizel

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Günümüzde geniş kitlelere ulaşmanın ve bilgi iletmenin en kolay ve hızlı yolu web sayfalarıdır. Bu sayfaların etkinliğini, sayfalarda bilginin bulunabilirliğini ve kullanıcıların kafasındaki bilgi mimarisini ölçmek önemli bir konu haline gelmiştir. Bunun yanında, yapılan değerlendirmelerin yeni tasarım sürecine dahil edilmesi ve sürecin başındaki araştırma kısmında kullanılması tasarım sürecini daha kullanıcı

odaklı hale getirecektir.

Bugüne kadar yapılan çalışmalarda bu ölçümlerin nasıl tanımlanması gerektiği, web sayfalarını değerlendirirken hangi boyutların kullanılması gerektiği ve bu ölçümlerin sayfanın yeniden tasarlanırken hangi problemleri çözdüğü konusunda fikir birliği yoktur. Mevcut çalışmalarda sesli düşünme protokolü ile kullanılabilirlik testleri yapılmakta ve kullanıcıların site üzerindeki hareketlerinin basit yazılımlarla incelenmektedir. Web analitik araçları kullanılarak kullanıcıların gezinme davranışları, bilgiyi bulma ve sayfada kaybolma durumlarının ölçülmesiyle alakalı kısıtlı çalışma bulunmaktadır.

Bu tez çalışmasında, mevcut öğrenciler, aday öğrenciler, akademisyenler, üniversite personeli ve araştırmacılar gibi farklı kullanıcı gruplarına sahip ODTÜ web sitesi bilgi mimarisi ve bilginin bulunabilirliği açısından değerlendirildi. Değerlendirme sırasında üç farklı araç kullanıldı. Google Analitik raporları ile varış (landing) sayfalarının optimizasyonu ve bilgi bulunabilirliği ölçümlendi. Kart gruplama çalışmasıyla kullanıcıların kafasındaki bilgi mimarisi çıkarıldı. Arama istatistiklerinden kullanıcıların zamana bağlı olarak web sayfasında aradığı bilgiler çıkarıldı. Bütün bu ölçümlerden çıkan sonuçlar web sayfasının yeni tasarım sürecine dahil edildi.

Anahtar Kelimeler: *Bilgi Mimarisi, Google Analitik, Açılış Sayfası Optimizasyonu, Kart Gruplama, Kaybolma Faktörü,*

To my family and my lovely girlfriend...

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CHAPTER I

INTRODUCTION

Today, users mostly prefer to engage with the websites which provide high quality information with a user friendly interface. Thus measuring the effectiveness of website, quality of information on website and information architecture constitutes an important factor in designing a successful web site. Using the results of these insights on a website's design process aids to produce a more user-centered and usable website. However, in the literature, there is no consensus on how to define web site effectiveness, which dimensions need to be used for the evaluation of these web sites and which problems can be solved by these insights during the design process.

The motivation of this study is to discover the problems of the current website of METU and use this knowledge in the design of a new website. Since Informatics Group (IG) who is responsible from METU Website's technical infrastructure and content for 11 years, decided to form a new website, evaluation of current web site in terms of information architecture and information availability will help to utilize these findings in new design process.

In this thesis, METU Website which has different user groups like students, prospective students, academicians, staff and researchers, has been evaluated in terms of information architecture and information availability. Google Analytics has been chosen as a web analytics tool to get detailed custom reports about users' preferences, landing page optimization and lostness factor analysis. These methods

help METU Website to have better information architecture and information availability.

Landing page optimization using Google Analytics help to improve information architecture of a website which is one of the new issues about websites. In this study, a methodology is used to define problematic keyword clusters landed on web pages. These keywords and landing page pairs are analyzed one by one.

This study differs from other studies in terms of lostness factor analysis with Google Analytics. Users' sessions are analyzed to determine users' lostness while searching information on the website. The existing studies measured the lostness factor with think aloud procedure during usability tests. This study includes lostness factor analysis with live user data gathered from custom Google Analytics report.

Furthermore, mobile page effectiveness is analyzed to determine users' preferences when they are redirected to text-version of website. Also error page statistics are analyzed to find pages including broken links.

Search statistics have given insight about users' information search trends. In-site search statistics are analyzed to find the seasonal changes in users' search queries in METU website. These search query data will be used to provide fresh and updated content in METU website before people start to search about an activity.

Results gathered from these methods have been utilized in the design process of the new page which is explained in conclusion section.

CHAPTER II

LITERATURE REVIEW

In this study, improvement on information architecture and information availability is aimed. In this chapter, firstly literature on usability and evaluation methods of web sites are summarized. As an evaluation method, Web analytics tools and Google Analytics are explained. Then, literature on information architecture and card sorting is given. Finally, current literature on landing page optimization and lostness factor evaluation are described.

2.1. USABILITY AND WEBSITE EVALUATION

According to Nielsen (2003) usability is a quality attribute of interfaces which states how easy user interfaces are to use. Nielsen (2003) states that usability is composed of five quality components:

- Learnability
- Efficiency (task completion time)
- Memorability
- Errors
- Satisfaction

There are two ISO standards about usability: ISO 9241-11 and ISO 13407. ISO 13407 provides guidance for designing usability; however ISO 9241-11 provides a definition of usability (Jokela, 2003). Process oriented definition of usability is: “The

extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” (ISO 9241-11, 1998). Despite of Nielsen’ definition, ISO 9241-11 definition focuses on three main metrics:

- Effectiveness
- Efficiency
- Satisfaction

Effectiveness is the rate of users which can complete certain tasks in a website. Frokjaer et al. (2000) gave programming problems to users for evaluating usability. Quality of solution to that programming problem indicated effectiveness of a website (Frokjaer et al. ,2000). Moreover, Park (2000) evaluated effectiveness of digital library website in terms of task completion. According to Rubin & Chisnell (2008) for effectiveness in a usability test, benchmark can be expressed as “95 percent of all users will be able to sign up to a website on the first attempt”.

According to Stolz et al. (2005) the effectiveness of information driven web depends on successfully leading the user to pages providing the relevant information.

Efficiency is defined as measurement of resources like time, effort and cost, used by a user while performing a task (Dillon, 2006). For information driven web page, Stolz et al. (2005) states that efficiency indicates the time the user stays on each web page. The duration depends not only on the user, but also on the text length. According to Rubin & Chisnell (2008) for efficiency in a usability test, benchmark can be expressed can be defined as “95 percent of all users will be able to sign up to a website within 3 minutes”.

Tullis & Albert (2008) stated that the most common way to evaluate efficiency is looking at the number of actions or clicks of users while completing a task. They also gave lostness factor evaluation as another way to measure of efficiency. Literature about lostness factor evaluation is described in section in 2.3.2.

Satisfaction indicates users’ attitudes towards the use of the system. Users’

satisfaction can be measured by attitude rating scales (Frokjaer et al. ,2000). However, Nielsen & Loranger (2006) stated that the subjective attitude rating scales does not represent satisfaction since users give higher ratings even when they have big difficulties while using a website.

Muyllle et al. (2004) analyzed web site user satisfaction construct and derived 11 dimensions underlying web site user satisfaction which are information relevancy, information accuracy, information comprehensibility, information comprehensiveness, ease of use, entry guidance, web site structure, hyperlink connotation, web site speed, layout and language customization.

Usability evaluation methods can be mainly categorized into two categories: qualitative methods and quantitative methods. Qualitative methods consist of observations, think-aloud, questionnaires and eye tracking while quantitative methods are comprise questionnaires, web log data and web analytics tools (Atkinson, 2007).

Eye tracking studies started in 1900's mostly to observe reading patterns of humans. Edmund Huey (1908), who built an eye tracker with an optic lens, provided a base for researchers to gather reading patterns of humans. In 1950's Alfred L. Yarbus did important eye tracking research and his book 'Eye Movements and Vision' became one of the most quoted eye tracking publications ever. In the 1970s, eye tracking research expanded rapidly, particularly reading research and information research (Rayner, 1978). After personal computers became common in offices and houses, eye tracker devices have started to be used to measure usability of websites and software.

Nowadays, eye tracking technology is accepted as a tool for improving user interface (Robert & Jacob, 2003). Eye tracking is mostly used to evaluate web usability, application usability and web advertising usability. (Nielsen & Pernice, 2010). With the help of an infrared video camera and infrared light sources, eye tracker can track users' eye movements and fixations.

Eye tracking method helps to extract user metrics that can be used in usability studies (Ehmke & Wilson,2007). Time to first fixation on a section on website defines attention getting section on website (Byrne et al., 1999). Number of fixations shows search efficiency (Goldberg & Kotval (1999). Moreover, fixation duration shows difficulty on information retrieval or engagement of a section (Just & Carpenter (1976). According to Byrne et al. (1999), time to first fixation on a section on website shows better attention-getting sections. These metrics can be used to evaluate and compare different sections of a web page.

Think aloud methodology is used for usability studies, finding evidence about cognitive processes of users and discovering general patterns about users' behavior while interacting with a document or application (Krahmer & Ummelen, 2004). *Think aloud usability testing* is mostly used evaluation method to test a website, software, system or prototype with real participants according to the survey conducted by Gulliksen et al. (2004).

While users are trying to accomplish tasks which are created by usability professionals, their mouse movement and faces are recorded. To efficiently use this technique, users must verbalize their thoughts while performing tasks (Rubin & Chisnell, 2008).

To improve the quality and effectiveness of websites, heuristic expert evaluation and think-aloud usability testing are the most current laboratory approaches (Elling, Lentz & de Jong, 2007). Heuristic expert evaluation is an informal method for evaluating websites where evaluators comment about an interface presented to them (Nielsen & Molich, 1990). In the academic literature 3 different heuristics evaluation checklist to evaluate website, can be found. Nielsen (1994) who has most quoted heuristics evaluation checklist, explores the following 10 heuristics to evaluate a website:

- Visibility of system status
- Match between system and the real world
- User control and freedom

- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognize, diagnose, and recover from errors
- Help and documentation

Pierotti (1995) extended Nielsen's checklist and created heuristics checklist which can be used not only for websites but also for systems. Third heuristics checklist was created by Gerhardt-Powals (1999). Gerhardt-Powals' heuristics include the following 9 principles:

- Automate unwanted workload
- Reduce uncertainty
- Fuse data
- Present new information with meaningful aids to interpretation
- Use names that are conceptually related to function
- Limit data-driven tasks
- Include in the displays only that information needed by the user at a given time.
- Provide multiple coding of data when appropriate.
- Practice judicious redundancy.

Although Nielsen's and Gerhardt-Powals' heuristics have common factors like control of user, cognitive-load reduction, handling of error, guidance and support, Nielsen's heuristics based on practical studies while Gerhardt-Powals' based on cognitive principles which are related with human- computer performance. (Hvannberg et al., 2007)

In addition to heuristic evaluation, questionnaires can be used to evaluate overall quality of websites. However, in literature, there is no agreement on dimensions, metrics or items which questionnaire must contain (Elling, Lentz & de Jong, 2007).

Kirakowski, Claridge & Whitehand (1998) created a questionnaire consisting of 60

questions, named as Website Analysis Measurement Inventory(WAMMI). These questions answered on seven-point Likert scales. Website usability is divided to five categories the degree to which users:

- feel efficient
- like the system
- find the system helpful
- feel in control of the interactions
- can learn to use the system

In another study, Van Schaik and Ling (2005) developed a website evaluation questionnaire consisting of five categories. Their dimensions are:

- perceived ease of use
- disorientation
- flow
- perceived usefulness
- aesthetic quality

Muyllé et al. (2004) developed a questionnaire named “Website User Satisfaction questionnaire” (WUS). 837 sample website users filled out this questionnaire. Questionnaire included 60 item questionnaire consisting four main dimensions of user satisfaction and eleven sub dimensions:

- connection
 - ease of use
 - entry guidance
 - structure
 - hyperlink connotation
 - speed
- quality of information
 - relevance
 - accuracy
 - comprehensibility
 - comprehensiveness

- layout
- language

Elling et al. (2007) aimed to develop and validate Website Evaluation Questionnaire (WEQ). In this study, Muylle et al. (2004) took advantage of three studies to determine dimensions: Kirakowski et al. (1998), van Schaik & Ling (2005). WEQ uses 3 dimensions and 9 sub dimensions which are:

- Content
 - Relevance
 - Comprehensibility
 - Comprehensiveness
- Navigation
 - Ease of use
 - Structure
 - Hyperlinks
 - Speed
 - Search Engine
- Layout

2.2. WEB ANALYTICS

Web Analytics Association defines web analytics as “the measurement, collection, analysis, and reporting of Internet data for the purposes of understanding and optimizing Web usage” (cited in Jansen, 2009). According to Norguet et al. (2006) the focus of web analytics is to improve web experience of users by analyzing users’ behavior data to gather patterns of usage and discover interesting metrics.

In most studies, web analytics is defined as a key point for customer experience for e-commerce web sites. According to Waisberg & Kaushik (2009) web analytics helps to increase companies profit with the help of improvement on the customer’s website experience. Phippen et al. (2004) stated that web analytics is an approach for evaluation of online strategies of a company. On the contrary, for information driven web page, Fang (2007) stated that Google Analytics tools help to track users’ behaviors to learn about users’ motivation to seek information in a library website.

Web analytics tools are started to be used in 1990's by collecting the data with web server called as logfile method (Kaushik , 2007). Server logs captured information about all requests made to web-server including pages, images and PDF (Portable Document Format)'s (Clifton, 2008b; Clifton, 2010). Every request from a web server is called a hit (Kaushik , 2007). Analog, Wusage and Tabulate are examples of web server logfile analyzing tools using logfile method. (Haffner et al.,2007)

Logfile method has some disadvantages like unavailability of event tracking , multiplied visits with search engine robots, limited outsourcing for data storage and archiving (Clifton (2008b). Moreover, Kaushik (2007) stated that logfile method also has some challenges on page caching by Internet Service Provider and visitors from proxy servers.

With the help of development on web scripting languages, another method called page tagging helped marketing departments analyze analytics data instead of IT departments (Croll & Power, 2009). This method which is also known as client-side data collection uses data collected by user's browser. In this technique, users' behaviour is captured by Javascript code which added on every page of a website. Since, this method allows for hosted solutions, Quantified, Omniture and SiteCatalyst started to serve hosted solutions in late 1990's (Croll & Power, 2009).

Page tagging method has some advantages like providing more accurate session information, real time visitor data and program updates which can be done by the service provider (Clifton, 2008b). However, this method has some disadvantages like data loss because of set up errors of tracking code, firewalls which can restrict tagging, lack of download and bandwidth information and necessity of Javascript and cookie on users' hardware (Clifton, 2008b).

2.2.1. *Google Analytics*

Google Analytics which is one of the free hosted web analytics solutions is used in this study. Google Analytics uses page tagging method and it is based on Urchin v6. Urchin was a San Diego based company and has been acquired by Google in 2005.

Fang (2007) claimed that Google Analytics is the most sophisticated web analytics tool.

In the academic literature, two studies have been found which used Google Analytics to improve effectiveness and efficiency of information driven web sites.

Fang (2007) used Google Analytics to improve the content and design of the Rutgers-Newark Law Library (RNLL) main website. In the study, they used Google Analytics features like The Trend Reporting to compare the data with different date ranges, Site Overlay to get the list of popular items on the website and to get click information on a specific page and The Visitor Segmentation to add pre-defined segments to Google Analytics reports.

By using these features, they discovered findings about users' internet connection type, screen resolution, browser choice, usage of links on right sidebar, visits to Research Portals on the left menu and geographical patterns. With the help of these findings, they redesigned their library page. They also used Google Analytics to test the new design. They compared old and new website by using these metrics:

- new visitors
- returning visitors
- return visits
- number of page views
- page depth
- number of people who viewed more than three pages

Google Analytics is used to evaluate a library web site in the second study that we have found in the academic literature. Arendt & Wagner (2010) explained how Google Analytics was used by Morris Library at Southern Illinois University Carbondale on its web site and how Google Analytics helped to redesign the library website. Google analytics code added to template of Library website to capture data. They created reports from May 1, 2008 to April 30, 2009.

With the help of Google Analytics features, they created four reports which are Basic

Report, Most Popular Content, Navigation Summary and Keywords. Basic Report is used to gather user data like screen resolutions and bounce rate. Most Popular Content report is used to rearrange links on main page according to their popularity. Navigation Summary report analyzed to examine the paths of users after they landed a page on website. Keyword report contained top keywords searched in both Google and University website.

In addition to studies related with information driven website, three studies can be found about Google Analytics.

Plaza (2009) aimed to develop a new tracking methodology with Google Analytics to analyze the effectiveness of users' visit data in terms of their traffic source. In the study, direct visits, referring site entries and search engine visits are analyzed as traffic sources. Time series analysis of Google Analytics data helped to find insights about effectiveness of direct visits, referring site entries and search engine visits. Plaza (2009) concluded that direct visits are the most effective visit type, followed by search engine visits and referring site entries.

In another study, Plaza (2010) used time series analysis of Google Analytics to the effectiveness of entrance data depending on traffic source: direct visit, referral visits and search engine visits. Plaza (2010) concluded that Google Analytics analysis would be helpful for tourism related websites.

Hasan, Morris & Probets (2009) proposed using Google Analytics metrics to evaluate the overall usability of e-commerce sites and to compare Google analytics findings with heuristics evaluation findings. In the study, five experts evaluated e-commerce websites with the help of heuristics guideline according to six major categories: *navigation, internal search, architecture, content and design*. They identified thirteen web analytics metrics to provide an alternative evaluation method to heuristic evaluation. These Google Analytics metrics are:

- Average page views per visit
- Percentage of time spent visits

- Percentage of click depth visits
- Bounce rate
- Order conversion rate
- Average searches per visit
- Percent of visits using search
- Search results to site exits ratio
- Cart start rate
- Checkout start rate
- Checkout completion rate
- Information find conversion rate

In their research, they concluded that web analytics provide quick, easy and cheap indications of general potential usability problem areas on e-commerce websites.

2.3. INFORMATION ARCHITECTURE

Rosenfeld & Morville (1998) have four different definitions of information architecture. These definitions are:

- “1. The combination of organization, labeling, and navigation schemes within information system.
2. The structural design of an information space to facilitate task completion and intuitive access to content.
3. The art and science of structuring and classifying web sites and intranets to help people find and manage information.
4. An emerging discipline and community of practice focusing on bringing principles of design and architecture to the digital landscape.”

Rosenfeld & Morville (1998) claimed that the relationship between words and meanings is tricky, so they provided four definitions for information architecture. They stated that no document can fully and accurately represent their authors intended meaning. Because of this, it is hard to design good websites.

According to Dickson and Wetherbe (1985), information architecture is “a high-level map of the information requirements of an organization”. Brancheau et al. (1989)

defines information architecture as “a personnel , organization, and technology independent profile of the major information categories used within an organization.” According to Davenport (cited in Gullikson et al., 1999), information architecture is “simply a set of aids that match user needs with information resources”. Wurman (1996) cited in Gullikson et al. (1999) defines information architecture as “structure or map of information which allows others to find their personal paths to knowledge”. Moreover, Gullikson et al. (1999) explains information architecture as “How information is categorised, labelled and presented and how navigation and access are facilitated”.

Rosenfeld & Morville (1998) explained the importance of information architecture in terms of following costs and value propositions:

- The cost of finding information
- The cost of not finding information
- The value of education
- The cost of construction
- The cost of maintenance
- The cost of training
- The value of brand

Gullikson et al. (1999) explained that information architecture plays an important role on website usability. After many usability tests Nielsen (1999) concludes that users come to the website for information instead of an experience. Moreover, according to Gullikson et al. (1999) many website designers focus on design and interface of website and pay little attention to website’s information architecture which helps users to navigate. Study of Spool et al. (1998) supports Gullikson et al. (1999)’s idea. Spool et al. (1998) ’s study shows that although graphics had big effect on websites’ marketing and visual impact, graphics elements had neither positive nor negative effect on users’ success in finding information. Gullikson et al. (1999) claims that categorization, labeling and presentation, navigation and access of information determine not only users’ success in finding information but also user satisfaction which affects returning visits positively.

In this study lostness factor, landing page optimization and card sorting methods are used to improve information architecture and usability of METU website. For lostness factor, landing page optimization Google Analytics is used as web analytics tool.

Web analytics can be used to improve information architecture and analytics data can be a verification method for information architecture heuristics. (Wiggins, 2007). Hallie Wilfert who is a senior Information Architect at SRA International, states that information architect should care about web analytics because it allows to broaden the scope of the architect's research (Wilfert, 2008). Wilfert (2008) also gives the key metrics of web analytics data which can be helpful to information architects:

- Visits and page views
- Site navigation preferences
- Entry and Exit pages
- Keywords
- Referrers
- Conversion

2.3.1. *Landing Page Optimization*

Landing page is defined as the page that visitors land on when they clicked a link on search result page (Clifton,2010). Clifton (2010) advises to focus on landing pages whose effects can be dramatic for the optimal user experience. Moreover, Ash (2008) states that well-optimized landing pages can change the economics of business and can make huge improvements on online marketing programs.

Ash (2008), proposes the following methods which are audience role modelling, web analytics, onsite search, usability testing, usability reviews, focus groups, eye-tracking studies, customer service representatives, surveys to detect and uncover the problems about landing pages. Among the web analytic features, the following ones can be used to discover common problems about landing pages:

- Visitors
- Map
- Languages
- Technical capabilities
- Visible browser window
- New vs. returning visitors
- Depth of interaction,
- Traffic sources
- Content

For information driven web pages, Stolz et al. (2005) defines as the effectiveness of an information driven web site depends on successfully leading the user to pages providing the sought after content.

2.3.2. *Lostness Factor*

In the academic literature, two studies have been found which used lostness factors to improve efficiency of websites.

Tullis & Albert (2008) claims that lostness is an efficiency metric which can be used to evaluate navigation and information architecture. Lostness is calculated by looking the number of steps the participant took to complete a task.

Smith (1996) uses the number of web pages visited in a session (N); the number of unique web pages visited (U); the number of web pages required to complete a task which can be called as optimal path (O) to calculate Lostness Factor (LF1).

$$\text{Lostness Factor (LF1)} = \sqrt{\left(\left(\frac{U}{N}\right) - 1\right)^2 + \left(\left(\frac{O}{U}\right) - 1\right)^2} \quad (2.3.2.1)$$

According to Smith (1996), perfect lostness score would be 0. Smith (1996) found that participants with lostness factor score less than 0.4, did not have any sign of

being lost. However, participants with a lostness score greater than 0.5, definitely appears to be lost. Tullis & Albert (2008) advises the percentage of participants who exceed the number of actions can also indicate efficiency of a web design.

According to Paula (1999), Lostness (LF2) equals the optimal path (O), divided by the number of pages visited during a session (N). After this calculation, LF2 which is a number between 0 and 1, determine the level of users' lostness. The closer the value is to 0, the more lost the user was. The closer the value is to 1.0, the less lost the user was.

$$\text{Lostness Factor (LF2)} = \frac{O}{N} \quad (2.3.2.2)$$

Smith (1996) and Paula (1999) used usability test data to calculate lostness factor values. On the contrary, in this study lostness factor evaluation is used with live user data gathered from Google Analytics reports.

2.3.3. Card Sorting

Nielsen & Sano (1995) as cited in Faiks & Hyland (2000) describe card sorting as a “common usability technique that is often used to discover users’ mental models.” Dong et al. (2001) describes card sorting as “one user-oriented approach to acquire user input to site structure design”. Fincher & Tenenberg (2005) define card sorting as a knowledge elicitation technique which is notable for its simplicity of use, its focus on subjects’ terminology and its ability to elicit semi-tacit knowledge. In their most quoted information architecture book, Rosenfeld & Morville (1998) claims that card sorting is the most powerful information architecture research tool in the world.

Spencer (2009) who is the writer of “Card Sorting” book reveals that card sorting can be used in three situations:

- A new information scheme is needed;
- The current information scheme is not working but the reason is not clear;

- One particular information scheme is wanted to be compared with another.

For information driven websites, Sinha (2003) claims that card sorting can be used to understand users' mental models for better design since understanding information need and mental models of user are important in information driven websites.

Advantages of card sorting are explained by Fincher & Tenenberg (2005) as: comparison of objects, words or fragments, simplicity of administration scales, no special cognitive burdens on research subjects, such as time pressure or memory limitations, user centered research method in open card sorts.

There are two methods of card sorting: open card sort and closed card sort. In open card sorts, users can create their own card and categories (Rosenfeld & Morville, 1998). Open card sort can be used to discover and get ideas on groups of content (Spencer, 2009). In closed card sort, users group provided cards (content) under pre-defined categories. (Spencer, 2009).

Closed card sort can be used to validate categories and category names (Rosenfeld & Morville, 1998). These two methods can be used together (Sinha & Boutelle, 2004). In Sinha & Boutelle (2004)'s study, open card sorting is used to understand users' mental models. After open card sorting, prototype information architecture scheme is created. Finally, closed card sorting is used to evaluate candidate structures and choose most suitable one. Before card sorting sessions, Sinha & Boutelle (2004) used free-listing method to generate a full list of tasks that users can accomplish on the web site.

Card sorting sessions can be held manually or with the help of a software (Spencer, 2009). Optimal Sort, WebSort, OpenSort and TreeSort are software for online and location independent use, xSort and SynCaps are software for sessions held on a computer (Spencer, 2009). Card sorting sessions can be held manually or with the help of a software (Spencer, 2009). Optimal Sort, WebSort, OpenSort and TreeSort are software for online and location independent use, xSort and SynCaps are software for sessions held on a computer (Spencer, 2009).

CHAPTER III

MOTIVATION OF THE STUDY

In this chapter we will describe aims and motivation of this study. We start this chapter by introducing our case study website and Informatics Group (IG) who are responsible from that website. In the second step we will give the results of interview with IG about problems of website's (<http://www.metu.edu.tr>) current design. We will conclude this chapter by explaining our motivation, aims and methods used in this study to accomplish these aims.

3.1. INFORMATION ABOUT METU WEB-SITE

Our case study is based on our university website which is content based. METU web site contains lots of information and lots of pathways to groups of information sources. It aims to facilitate communication with prospective students, current students, staff, alumni and research groups. It also provides information about graduate and undergraduate programs, departments, offices and history of the university.

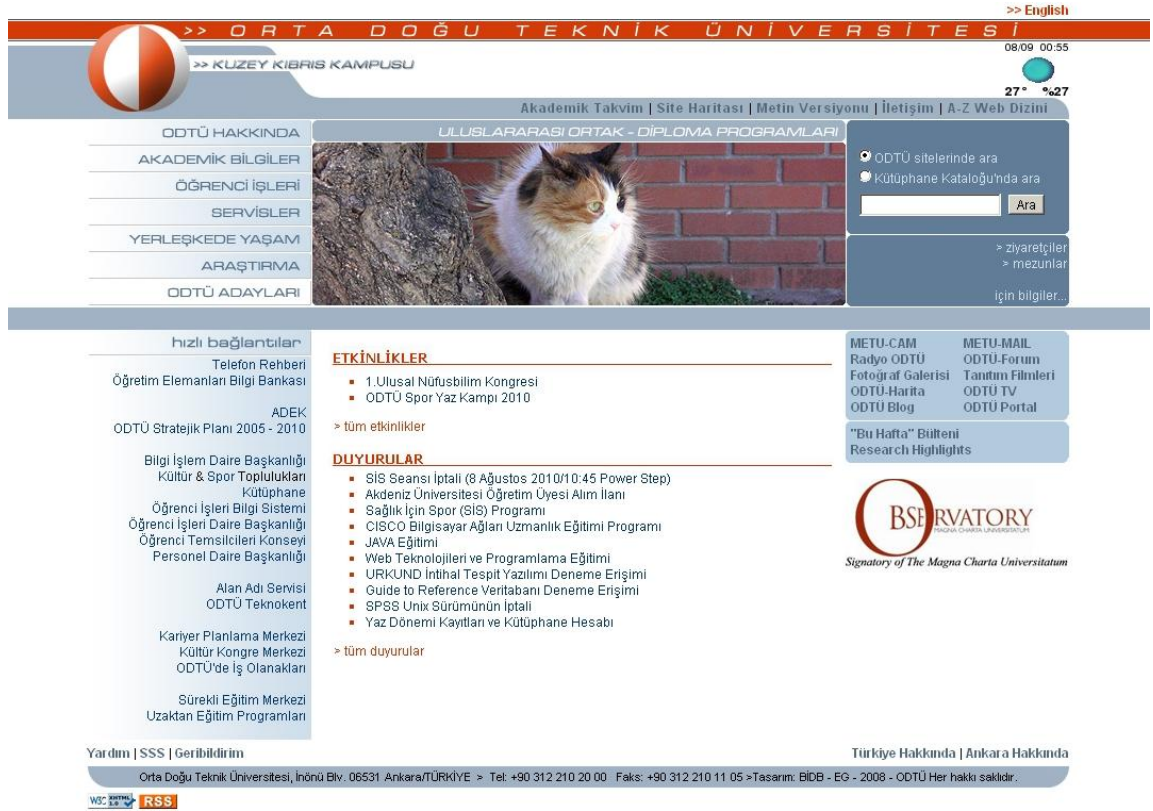


Figure 1 – METU Website Interface

Current design was established in February 2005 and recently, IG decided to design a new web site. Most important motivation of this study is to gather information about problems of the current website to help IG with the design process.

Our case study website is a two level information driven web site, it is composed of about 70 web pages and our aim in this thesis study is to improve its information architecture.

3.2. INFORMATICS GROUP

IG is the web design team at METU Computer Center. The mission of the team is to provide information about METU to the users from METU, Turkey and all around the world. IG also provides information to users with various alternatives for obtaining knowledge and building communication with web tools such as METU

Blog, METU Portal and METU Forum. IG is responsible from METU Website's technical infrastructure and content for 11 years.

3.3. CURRENT PROBLEMS

To decide on the methodology which will be used in the thesis study, an interview session with IG has been held. In this part of the chapter, we will give the results of the interview about problems of website's current design.

3.3.1. *Static Website*

METU Website does not respond activities in academic calendar. Web page has activities and announcements part, however it is text based and cannot be seen by all people visiting website.

3.3.2. *One Landing Page For All User Groups*

METU Website has no sub-pages for user groups and it tries to include all important information for all user groups. For example, METU Web page includes a quick link part including links of academic and administrative units, research groups, student activity clubs, online education programs and phonebook.

3.3.3. *Limited Distribution Channels*

METU Web page has RSS (Really Simple Syndication) service to distribute its activities and announcements which is helpful to follow the content. However METU has no social media coverage on social media websites like Twitter, Flickr, Youtube, Friendfeed, Facebook to help people easily follow and share information about activities in the university.

3.3.4. *Content Update Frequency*

Sub pages of METU website are updated twice in a whole academic year by IG in Computer Center. Most of the time, IG is not the owner of the content and it has to check the validity of the content with its owner. For example, when new academic

year starts, IG has to ask “Directorate of Dormitories” for new prices of dormitories to update information on the related page (<http://www.odtu.edu.tr/clife/accomodate.php>).

3.3.5. *Mobile Access*

Since the use of Smartphone’s and mobile devices which have internet access is increasing, METU website has to have a mobile friendly interface. IG decided to redirect users from Apple iPhone, BlackBerry, Android based Smartphone’s, Palm and Windows Mobile devices to the text version of website. `mobile_device_detect.php` script detects users’ browser and redirect users to <http://www.odtu.edu.tr/tov/>. If user wants to use graphical version instead of text version, s/he clicks on ‘Graphical Version’ and reach home page which is at <http://www.odtu.edu.tr/?mobile=off>. Figure 2 shows the mobile friendly page of METU website.

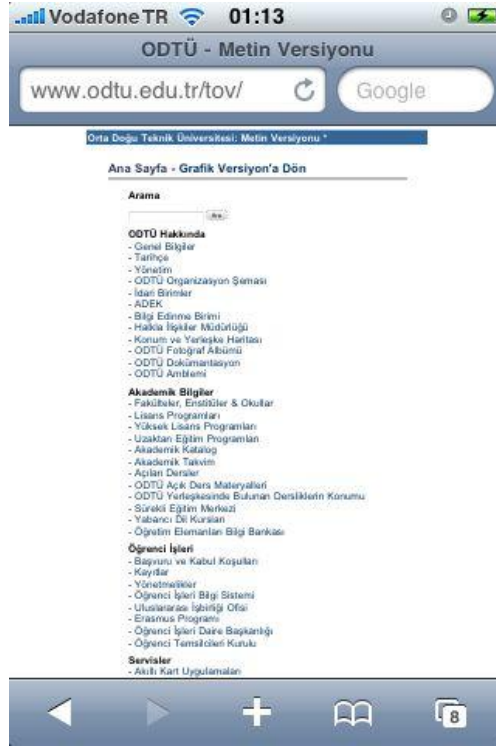


Figure 2 – Redirect to Text Version With Safari Mobile Browser

3.4. AIMS OF THE STUDY

This study aims to gather insights about new METU website design in the light of current website's problems. Current website's problems are:

3.4.1. *Information Architecture*

Google Analytics reports will be used for landing page optimization to gather problematic keywords and landing page optimization. To improve the information architecture of information driven web sites, landing page optimization is one of the valuable methods (Stolz et al., 2005). Landing page optimization can be done with the help of Google Analytics. Moreover lostness factor method helps to understand users' path, search pattern and lostness while they are searching for specific information. Using both these methods can improve information architecture of METU website.

3.4.2. *General User Preferences*

Google Analytics reports will be used for gathering general user statistics like browser type, operating system and screen resolution. This information will be useful during the new website design and test process.

3.4.3. *Mobile Access*

Google Analytics reports will be analyzed to gather users' path, when they reach website with a mobile device. This information will be useful for mobile users' choice between graphical and text version of website.

3.4.4. *Seasonality In Search*

Current web page does not respond to activities in academic calendar. Text based "Activities and Announcements" part does not help users to get information of universities agenda unless they explicitly check the "Academic Calendar" page which includes a complex text-only calendar.

Search statistics will be analyzed to learn users' search frequency and start date about an activity in academic calendar. This information will be used for new website design's "News" part which will be more active than "Activities and Announcements" links.

3.4.5. *User Groups*

METU Website tries to include all important information for all user groups which decreases information architecture. User group identification and card sorting study will help to gather information about related content for each user groups. Moreover, card sorting study will give information about relationship between different content types.

CHAPTER IV

METHODOLOGY

In this thesis study, we use a Web Analytic tool (Google Analytics), search statistics and card sorting study to get insights about new University web page design.

4.1. GOOGLE ANALYTICS

Google Analytics is a web analytics tool which uses tagging visitor data collection method. By adding a Javascript tracking code to each page in a website, Google Analytics can be used. As a hosted solution, all users' data are tracked at Google servers which can be reached by using the web interface or the Application Programming Interface (API).

After tracking code is added to the website, in order to get users' data properly:

- User must not block cookies since Google Analytics passes data to its servers through cookies,
- Javascript in the visitor's PC must be enabled since Google Analytics is Javascript based,
- Other javascript codes in the page must not conflict with Google Analytics' Javascript methods

Table 1 - Google Analytics Dimension and Metric Abbreviation List

Dimension	Abbreviation
City	C
Date	Dt
Day	D
ExitPagePath	EPP
Hour	H
Keyword	K
LandingPagePath	LPP
NetworkLocation	NL
NextPagePath	NPP
PageDepth	PD
PagePath	PP
PreviousPagePath	PPP
ReferralPath	RP
Source	S
TargetLandingPage ¹	TLP
VisitorType	VT

Metric	Abbreviation
Bounces	B
Entrances	E
ExitPagePath	EPP
Exits	EX
NewVisits	NV
PageViews	PV
TimeonPage	ToP
TimeonSite	ToS
UniquePageViews	UPV
Visits	V

¹ *TargetLandingPage* is not a dimension defined by Google Analytics. We created and used this dimension and its abbreviation in our analysis .

4.1.1. Google Analytics Dimensions and Metrics

Once data is collected properly by Google Analytics, it is processed for the reports and it can be seen in two primary formats: *metrics* and *dimensions*. **A metric is a numeric summary** of users' behavior on website (Google, 2010b). For example *entrance* shows the number of entrance to the website. If metrics are selected and viewed without a dimension, it shows site-wide information.

A dimension is a data key or field typically in the form of a string. Dimensions cannot be used without metrics. They can be paired with metrics to divide users into segments. For example *browser* shows the browser information of user like Chrome, while *browserVersion* shows the version of browser which users uses like 9.0.1.

To show the usage of metrics and dimensions, an example of *entrance* (metric) and *browser* (dimension) can be given. Table 2 shows the number of *entrance* during the time period from **01.01.09** to **30.06.10**.

Table 2 - Entrance (Metric) Data Taken From Google Analytics

Website	Entrance
www.odtu.edu.tr	4,367,584

When browser dimension is added to this data, entrance number is divided to segments according to users' browser information. Table 3 shows the number of users' browser information during the time period from **01.01.09** to **30.06.10**.

Table 3 - Entrance and Browser Information Taken From Google Analytics

Browser	Entrance
Internet Explorer	2,776,805
Firefox	1,222,698
Chrome	268,45
Safari	47,021
Opera	46,956
Mozilla	1,859
Opera Mini	1,375
Mozilla Compatible Agent	535
NetFront	365
SAMSUNG-GT-S5233W	194

4.1.2. Explanations of Used Google Analytics Dimensions and Metrics

Dimensions and metrics used in this study, will be explained in this section.

4.1.2.1. Dimensions

PagePath, LandingPagePath, PreviousPagePath, NetworkLocation, PageDepth, Keyword, Hour and Date are the dimensions used in this study.

PagePath dimension is defined by Google (2010) as “A page on a website specified by path and/or query parameters.” In lostness factor analysis, page path information will be used to gather users’ session info.

LandingPagePath dimension is defined by Google as “The path component of the first page in a user's session, or "landing" page (Google, 2010)”. In landing page optimization, landing page and keyword pairs will be used.

PreviousPagePath dimension is described by Google as “A page on the website that was visited *before* another page on the website (Google, 2010)”. In a session, If page is the first page of user, PreviousPagePath information will be as “(entrance)”.

NetworkLocation dimension is defined by Google (2010) as “The name of service providers used to reach your website.” In METU, default service provider is “middle

east technical university(metu)”.

PageDepth dimension is described by Google as “The number of pages visited by visitors during a session (visit) (Google, 2010)”. In a session, number of page views must be equal to page depth value.

Hour dimension is defined by Google as “A two-digit hour of the day ranging from 00-23 in the time zone configured for the account (Google, 2010)”.

Day dimension is described as by Google as “The day of the month from 01 to 31 (Google, 2010)”.

4.1.2.2. Metrics

Entrances, Pageviews, Exits, Bounces and NewVisits are the metrics used in this study. Entrances metric is defined as “The number of entrances to the website” (Google, 2010)”. Pageviews metric is defined as “The total number of pageviews for the website when aggregated over the selected dimension” (Google, 2010)”. Exits metric is defined as “The number of exits from your website.” (Google, 2010)”.

4.1.3. Google Analytics Reports

Google Analytics data can be reached from both web interface and API. From web interface basic statistics like browser type, screen resolution, region, date, time, most visited pages, bounce rate can be obtained, as it can be seen in - Google Analytics Web Interface.



Figure 3 - Google Analytics Web Interface

Google Analytics web interface also allow users to *customize the reports* to get more complicated reports.

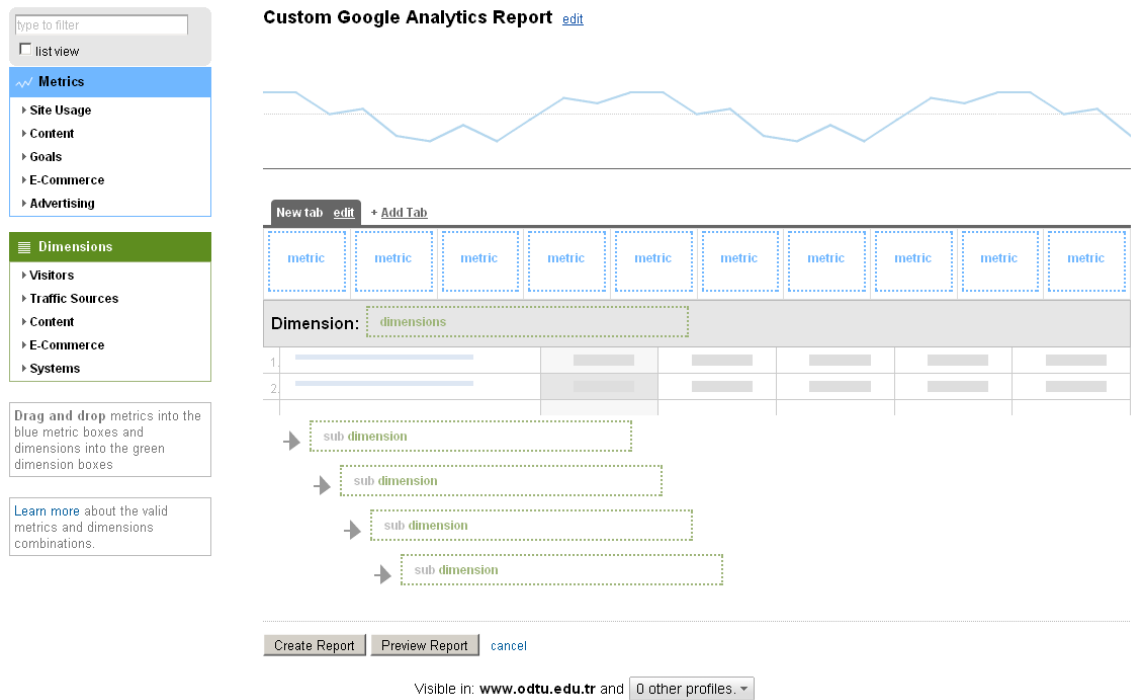


Figure 4 - Google Analytics Custom Reporting Interface

Google Analytics custom reporting interface allows users to add 5 dimensions and 10 metrics for each dimension. Left menu helps users to add metrics and dimensions to report. Interface has drag and drop feature. Although user friendly interface help users to easily create custom reports, there are some limitations of this interface. Maximum 500 rows and 2 dimensions can be shown on each report and that restricts data export.

Moreover, users can create custom reports by using Google Analytics API. Firstly, a service created by Google Analytics, *Data Feed Query Explorer* which can be accessed at <http://code.google.com/apis/analytics/docs/gdata/gdataExplorer.html>, can be used. *Data Feed Query Explorer* allows users to create reports using the API. This tool which can be seen at Figure 5, allows users to choose a maximum of 7 dimensions and 10 metrics. Moreover, 10,000 rows can be reported for each query.

Data Feed Query Explorer

Sometimes you just need to explore. With this tool you can play with the Data Export API by building queries to get data from your Google Analytics profiles. You can use these queries in any of the [client libraries](#) to build your own tools. If you want to learn more about the how the API works, checkout the [interactive examples](#).

Data Feed URI [PermaLink](#) Logout

`https://www.google.com/analytics/feeds/data?start-date=2010-12-01&end-date=2010-12-17&max-results=50`

* ids	=	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
dimensions	=	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
* metrics	=	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
segment	=	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
filters	=	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
sort	=	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
* start-date	=	<input type="text" value="2010-12-01"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
* end-date	=	<input type="text" value="2010-12-17"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
start-index	=	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
max-results	=	<input type="text" value="50"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

ids
(Required)
The table id of the profile to request data from. Table ids you can access are listed in the account feed.
example
ga:1174

[Read the reference for ids](#)

Figure 5 - Data Feed Query Explorer Interface

Secondly, by the help of an application written with a programming language like PHP, Java or Python, custom reports can be created. The Analytics Data Export API can return 10,000 entries per request like Data Feed Explorer.

4.1.4. *Google Analytics Report Preparation With Java Application*

In this study, Java programming language has been chosen and NetBeans IDE 6.8 has been used to create custom reports by using Google Analytics API. Reports have been exported to Microsoft Windows 2007 Excel for analysis. The code generates reports in text files. Later, text files are imported in to Excel by selecting the “File Origin” as “1254 Turkish (Windows)”.

4.1.5. *General Statistics*

In this study, general usage statistics are gathered from Google Analytics both using web interface of Google Analytics and custom reports. To identify website’s general statistics statistical information like visits, page views, bounce rate, Average Time on

Site, New Visits are gathered.

Also the 10 most popular keywords, total keyword numbers which Search engine traffic includes and the top 30 landing pages with their Entrances, Bounces and Bounce Rate (BR) values are gathered.

Moreover, since Google Analytics reports help to identify the visitors' hardware, network properties and software preferences, statistical information about the visitors like Operating System Statistics, Browser Statistics, Screen Resolution Statistics, Connection Speed Statistics are gathered during the time period from 01.01.2009 to 31.12.2009.

4.1.6. *Landing Page Optimization*

Stolz et al. (2005) defines that effectiveness of information driven web depends on successfully leading the user to pages providing the relevant information. In this study, we applied landing page optimization using Google Analytics reports on METU Website to increase the effectiveness of the website and to improve its information architecture. As in Kütükçü's study (2010), in order to find landing pages with higher bounce rate, a custom report was extracted from the Google Analytics using NetBeans IDE 6.8 for which the dimensions were specified as Keyword, LandingPagePath and metrics were specified as Bounces, Entrances, PageViews. Table 4 shows examples of landing page and keyword pairs.

Table 4 - Example Custom Report for Landing Page Optimization

K	LPP	B	E	PV
özgün fotoğraf odtü	/clife/shopping.php	44	44	44
odtü	/	1224	2166	3461
erasmus odtü	/tov/metusite/sitemap.php	107	163	264
oddü	/	446	976	1356

Clifton (2008a) used keywords to learn visitor’s expectations before arriving on website. Since non-generic keywords like ‘odtü’, ‘odtu.edu.tr’, ‘metu’, ‘otdü’ and ‘oddü’ gave no idea about user’s expectations, we add a filter to gather keywords and landing page pairs which includes keywords like ‘erasmus’, ‘hocam piknik’ and ‘özgün fotoğraf odtü’. Table 5 shows examples of these landing page and keyword pairs.

Table 5 - Filtered Custom Report for Landing Page Optimization

K	LPP	B	E	PV
özgün fotoğraf odtü	/clife/shopping.php	44	44	44
erasmus odtü	/tov/metusite/sitemap.php	107	163	264

When we have list with generic keywords, we consider usage frequency of the keywords. For example, if a keyword is used in only one search throughout the selected time period and that visit bounced, the *Bounce Rate* for that keyword will be 100%. We ordered list according to pageview values and select top 500 keyword and landing page pairs to analyze. We calculated bounce rate values for each pair. Table 6 shows examples of these landing page and keyword pairs with bounce rate information.

Table 6 - Filtered Custom Report for Landing Page Optimization

K	LPP	BR	B	E	PV
özgün fotoğraf odtü	/clife/shopping.php	100%	44	44	44
erasmus odtü	/tov/metusite/sitemap.php	65.64%	107	163	264

Then we heuristically decided problematic keywords by looking at the keyword and their landing pages. To determine problematic keywords, we look at the landing pages to find whether that page include information about this keyword or not. For example, users who searched for the ‘hocam piknik’ keyword, landed at ‘/clife/shopping.php’ page. When we look at ‘/clife/shopping.php’ page, we can see

that page includes information about ‘hocam piknik’. Although bounce rate value is 97% for this situation, we can say that this keyword has no landing page problem. However, when we look at ‘erasmus’ case, we can determine a problem about landing page since users landed on ‘/tov/sitemap.php’ which is the sitemap of the website. Finally, problematic keywords and keyword clusters are analyzed to determine the reasons why users landed on that page with selected keyword.

Landing page optimization can be done with the following steps:

1. Create a custom Google Analytics report for which the dimensions were specified as Keyword, LandingPagePath and metrics were specified as Bounces, Entrances, PageViews in order to find landing pages with higher bounce rate.
2. Eliminate non-generic keywords in custom report.
3. Consider the frequency of keywords and select top 500 keywords and landing page pairs to analyze.
4. Identify problematic keywords by examining keywords and their respective landing pages.
5. Select keyword and landing page pairs when landing page does not include information about the keyword.
6. Analyze keywords and landing pages to determine the reasons of why users landed on that page with selected keyword.

4.1.6.1. Landing Page Optimization

Our motivation in this study is to define the general problems about landing page optimization. Moreover we want to include three semesters to analyze more analytics data. Since, Google Analytics code was added to METU website at 13 November 2008, we decided to retrieve report of the period from **01.01.09** to **30.06.10**.

4.1.7. *Lostness Factor*

In this study we applied lostness factor method to analyze user paths and lostness of users. Tullis & Albert (2008) states that lostness value can indicate efficiency of a web page. There are two lostness factor values to determine user lostness which we mentioned at Section 2.3.2.

In order to calculate Lostness factor values, problematic keyword clusters with high *pagedepth* values are selected since the percentage of participants who exceed the number of actions can also indicate efficiency of a web design according to Tullis & Albert (2008). Since METU website has two level navigation, keywords whose *pagedepth* values of more than 1 are selected to calculate lostness factors. During the selection process, non-generic keywords like “odtü”, ”odtu.edu.tr”, ”www.odtu.edu.tr”, ”odtü üniversitesi”, “odtu” were eliminated. In order to find keywords with higher *pagedepth* values, a custom report was taken from the Google Analytics using NetBeans IDE 6.8 for which the dimensions were specified as Keyword, LandingPagePath,PageDepth and metrics were specified as Entrances, PageViews. Example custom report result can be seen at Table 7.

Table 7 - Example Custom Report for Lostness Factor Evaluation

K	LPP	PD	PV	E
odtü yüksek lisans	/academic/grad.php	3	388	139
odtü yüksek lisans	/academic/grad.php	4	247	64
odtü uzaktan eğitim	/academic/online.php	3	176	62
odtü bölümleri	/metusite/help.php	3	144	54
odtü uzaktan eğitim	/academic/online.php	4	120	30
odtü uzaktan eğitim	/academic/online.php	5	129	28
odtü bölümleri	/metusite/help.php	4	84	28
odtü adres	/	3	89	28
odtü yüksek lisans	/academic/grad.php	5	128	26
odtü kafeterya yemek	/	4	107	26
odtü eğitim fakültesi	/academic/units.php	3	73	26
odtü erasmus	/tov/metusite/sitemap.php	3	62	26
odtü eğitim fakültesi	/academic/units.php	4	88	25

For calculating Lostness factor values for selected keywords, user sessions must be analyzed. Obtaining the complete session information of a user is not possible with standard Google Analytics reports, however it is possible with Data Feed Query.

A custom report has been prepared using Data Feed Query Explorer to retrieve the complete path information of the users. Keyword, LandingPagePath, PagePath, Hour, Day, NetworkLocation, PageDepth are chosen as dimensions and Entrances, Bounces, Exits and PageViews are chosen as metrics, start-date and end-date is 06.08.2010. We also filtered to gather keywords including “erasmus” term. We sorted the data according to Day, Hour, NetworkLocation and PageDepth in ascending order. Table 8 shows all visitor’s session information from this custom report.

To gather each user session, we have to decide which of the rows in our custom report belongs to the same session or not. If two rows belong to the same session, *NetworkLocation*, *PageDepth*, *Keyword* and *LandingPagePath* are expected to be the same. Moreover if *Day* and *Time* are also same, we certainly decide that both rows belong to the same session.

Table 8 - Visitor Information Source: google, Keyword: Erasmus, Starting Date: 06.08.2010, Ending Date: 06.08.2010

K	LPP	PP	Hour	Day	NL	PD	PV	B	E	Ex	UPV
erasmus odtü	/	/	23	8	tt adsl-meteksan dynamic_ulu	1	1	1	1	1	1
erasmus odtü	/	/	20	8	tt adsl-meteksan dynamic_ulu	3	2	0	1	1	1
erasmus odtü	/	/academic/units.php	20	8	tt adsl-meteksan dynamic_ulu	3	1	0	0	0	1
erasmus odtü	/	/	18	8	tt adsl-meteksan dynamic_ulu	2	2	0	1	1	1
erasmus	/	/	10	8	turk telekom ttnet national backbone	4	1	0	1	0	1
erasmus	/	/academic/grad.php	10	8	turk telekom ttnet national backbone	4	1	0	0	0	1
erasmus	/	/academic/units.php	10	8	turk telekom ttnet national backbone	4	1	0	0	0	1
erasmus	/	/academic/undergrad.php	10	8	turk telekom ttnet national backbone	4	1	0	0	1	1

Also to calculate Lostness factors, user has to visit more than one page and one unique page in a session. A filter was added to gather sessions which *pagedepth* is greater than 1. Table 9 shows all visitors' session information for 'erasmus' keyword.

Table 9 - Visitor Information Source: google, Keyword: Erasmus, Starting Date: 06.08.2010, Ending Date: 06.08.2010, PageDepth > 1

K	LPP	PP	Hour	Day	NL	PD	PV	B	E	Ex	UPV
erasmus odtü	/	/	20	8	tt adsl-meteksan dynamic_ulu	3	2	0	1	1	1
erasmus odtü	/	/academic/units.php	20	8	tt adsl-meteksan dynamic_ulu	3	1	0	0	0	1
erasmus	/	/	10	8	turk telekom ttnet national backbone	4	1	0	1	0	1
erasmus	/	/academic/grad.php	10	8	turk telekom ttnet national backbone	4	1	0	0	0	1
erasmus	/	/academic/units.php	10	8	turk telekom ttnet national backbone	4	1	0	0	0	1
erasmus	/	/academic/undergrad.php	10	8	turk telekom ttnet national backbone	4	1	0	0	1	1

We can define a session when total pageviews in this session equals to pagedepth. We can determine two different sessions by comparing NetworkLocation, PageDepth, Keyword and LandingPagePath values in Table 9.

In the first session user searched "erasmus odtü" keyword from "tt adsl-meteksan dynamic_ulu" network and landed on main page ("/"). Then he visited "/academic/units.php" page. After that he returns to main page ("/"). Total pageviews in this page is 3 which is equal to the pagedepth value. Total number of unique web page viewed is equal to 2.

In the second session the user searched "erasmus" keyword from "turk telekom ttnet national backbone" network and landed to the main page ("/"). Then he visited "/academic/grad.php" and "/academic/units.php" pages. Then user visited "/academic/undergrad.php" page and exited from that page. The total pageviews in this page is 4 which is equal to the pagedepth value. The total number of unique web page is equal to 4.

To find the optimal path value, we considered each session case by case. When user searched “erasmus” keyword and landed on the main page (“/”), there is no information about erasmus page at main page, so the optimal path value is 2. However, if user searched “erasmus” keyword and landed to “/tov/metu/sitemap.php” page, there is erasmus page information on that page, then optimal path value is 1. To determine optimal path value, we will look at landing page and target page.

Table 10 - Visitor Session Information With Optimal Path Values Source: google, Keyword: Erasmus, Starting Date: 06.08.2010, Ending Date: 06.08.2010, PageDepth > 1

K	LPP	PP	Hour	Da y	NL	PD	PV	B	E	Ex	UP V	O P
erasmus odtü	/	/	20	8	tt adsl-meteksan dynamic_ulu	3	2	0	1	1	1	2
erasmus odtü	/	/academic/units.php	20	8	tt adsl-meteksan dynamic_ulu	3	1	0	0	0	1	
erasmus	/	/	10	8	turk telekom ttnet national backbone	4	1	0	1	0	1	2
erasmus	/	/academic/grad.php	10	8	turk telekom ttnet national backbone	4	1	0	0	0	1	
erasmus	/	/academic/units.php	10	8	turk telekom ttnet national backbone	4	1	0	0	0	1	
erasmus	/	/academic/undergrad.ph p	10	8	turk telekom ttnet national backbone	4	1	0	0	1	1	

In Table 10, sessions are splitted with solid border. When we analyze user sessions, we can see that in both sessions optimal path values are equal to 2.

In lostness factor calculations, we take into consideration another value: Target Page Visit. There are differences between sessions when user visits target page or not. If user visits target page of the keyword, we set “Target Page Visit” value to 1. If user does not visit target page of the keyword, we set “Target Page Visit” value to 0.

Table 11 - Visitor Session Information With Optimal Path and Target Page Visit Values Source: google, Keyword: Erasmus, Starting Date: 06.08.2010, Ending Date: 06.08.2010, PageDepth > 1

K	LPP	PP	Hour	Day	NL	PD	PV	B	E	Ex	UPV	OP	TPV
erasmus odtü	/	/	20	8	tt adsl-meteksan dynamic_ulu	3	2	0	1	1	1	2	0
erasmus odtü	/	/academic/units.php	20	8	tt adsl-meteksan dynamic_ulu	3	1	0	0	0	1		
erasmus	/	/	10	8	turk telekom ttnet national backbone	4	1	0	1	0	1	2	0
erasmus	/	/academic/grad.php	10	8	turk telekom ttnet national backbone	4	1	0	0	0	1		
erasmus	/	/academic/units.php	10	8	turk telekom ttnet national backbone	4	1	0	0	0	1		
erasmus	/	/academic/undergrad.php	10	8	turk telekom ttnet national backbone	4	1	0	0	1	1		

In Table 11, TPV values are analyzed. In both session users did not visit target page which is “/tov/metu/sitemap.php” for “erasmus” keyword.

After all values like number of web pages visited in a session (N); the number of unique web pages visited (U); the number of web pages required to complete a task which can be called as optimal path (O) in lostness factor formulas calculated, lostness factor values will be calculated for each session.

Table 12 - Lostness Factor Values of Selected Sessions

Session	K	LPP	NL	PD	N	U	OP	TPV	LF1	LF2
Session 1	erasmus odtü	/	tt adsl-meteksan dynamic_ulu	3	3	2	2	0	0,333	0,667
Session 2	erasmus	/	turk telekom ttnet national backbone	4	4	4	2	0	0,500	0,500

For Session 1, LF1 is calculated as 2,333 and LF2 as 0,667. For Session 2, LF1 is calculated as 0,500 and LF2 as 0,5. The total Lostness factors are calculated by taking average of all LF values. The average LF1 is 1,863 and Average LF2 is 0,583.

We propose the following procedure for calculating lostness factor:

1. Create a custom Google Analytics report for which the dimensions are specified as Keyword, LandingPagePath, PageDepth and the metrics are specified as Entrances, PageView in order to find the problematic keyword clusters with high *pagedepth* values.
2. Eliminate non-generic keywords in the custom report.
3. Consider the frequency of the keywords and select the keywords with higher pagedepth and entrance values.
4. Create a custom Google Analytics report in which the dimensions are specified as Keyword, LandingPagePath, PagePath, Hour, Day, NetworkLocation, PageDepth and the metrics are specified as Entrances, Bounces, Exits and PageViews in order to analyze session information.
5. To gather each user session, decide which of the rows in our custom report belongs to the same session by using the following steps:
 - a. *NetworkLocation, PageDepth, Keyword* and *LandingPagePath* are must be same.
 - b. *Day* and *Time* must be same.
6. Define a session where the total pageviews in this session equals to pagedepth.
7. Determine the optimal path for the selected session.
8. Calculate the lostness factor values with formulas as given in Section 2.3.2.
9. Analyze average lostness factor values to specify the problems in keyword clusters. Smith (1996) states that sessions with a lostness score greater than 0.5, definitely appears to be lost.

4.1.7.1. Time Period Selection For Lostness Factor

For Lostness Factor methodology, we analyzed data from June 2010 to include more visits from prospective student visits. Therefore we decided to take Google Analytics

reports of the period between 01.06.2010 and 31.08.2010 to apply Lostness Factor method .

4.1.8. Error Page Optimization

In this study, we applied error page (404) optimization analysis using Google Analytics reports on METU Website. 404 is the code of error pages where users try to reach a page that has been moved or deleted. Metu web page has a custom 404 page (“/metusite/404.php”) which can be seen in Figure 6.

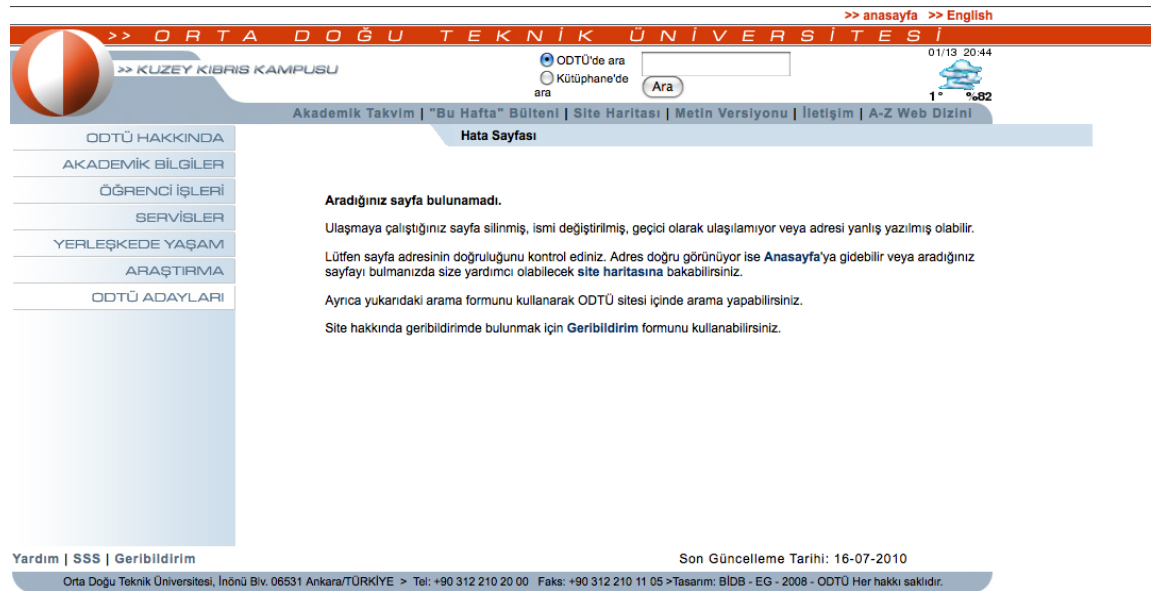


Figure 6 - Screenshot of METU Website's error page

In order to analyze the broken links, a custom report was taken from the Google Analytics. This report was created to find the broken links and prevent user's to reach to error page. The report was created using NetBeans IDE 6.8 for which the dimensions were specified as PagePath, PreviousPagePath, Source and metrics were specified as Bounces, Entrances, and PageViews. To gather pages including broken links, special filtering method were used:

- Source: direct

- Keyword: (not set)
- PagePath or PreviousPagePath: “/metusite/404.php”

The result table was analyzed for determining pages including broken links.

4.1.9. Mobile Access Analysis

In this study, the mobile access analysis has been applied using Google Analytics reports on METU Website. Our case study website redirected the users who use Apple iPhone, BlackBerry, Android based Smartphones, Palm and Windows Mobile devices to the text version of website.

In order to analyze the effectiveness of this method, a custom report was taken from the Google Analytics using NetBeans IDE 6.8 for which the dimensions were specified as NextPagePath, PagePath, PreviousPagePath, Source and metrics were specified as Bounces, Entrances, PageViews and Exits. Custom Google Analytics report was created for the users redirected to ‘/tov/’ page. To gather user path after redirection, special filtering method was used:

- Source: direct
- Keyword: (not set)
- NextPagePath or PagePath or PreviousPagePath: ‘mobile=”off”’
- PagePath or PreviousPagePath: “/tov/”

The result table was analyzed for the users’ mobile redirect preferences.

4.1.9.1. Time Period Selection For Mobile Access Analysis

For mobile access analysis, we decided to take Google Analytics reports of the period between 01.06.2010 and 31.08.2010.

4.2. CARD SORTING

In this study, card sorting method is used to discover information architecture on user's mind. Rosenfeld & Morville (1998) claims that card sorting is the most powerful information architecture research tool. Spencer (2009) states that card sorting can be used when a new information scheme is needed. In this study, card sorting is used to gather information about the new website's information structure. According to Sinha (2003), understanding the information need and mental models of users is important in information driven websites and card sorting can be used to understand user mental models for better design.

In this study, first user groups of Middle East Technical University are heuristically selected. In order to prepare cards, free-listing method is used to generate full list information need that users searched on METU Website as in Sinha & Boutelle (2004)'s study.

Open card sort is used to discover and get ideas on groups of content (Spencer, 2009). In this card sorting method, users can create cards and group names. Card sorting sessions held with the help of online software called OptimalSort.

In open card sort panel of OptimalSort, the left menu contains a list of cards to be sorted. Users can drag and drop cards to the right panel. They group the cards which are related according to user and name each group. Optimalsort open card sort instruction can be seen in Figure 7.

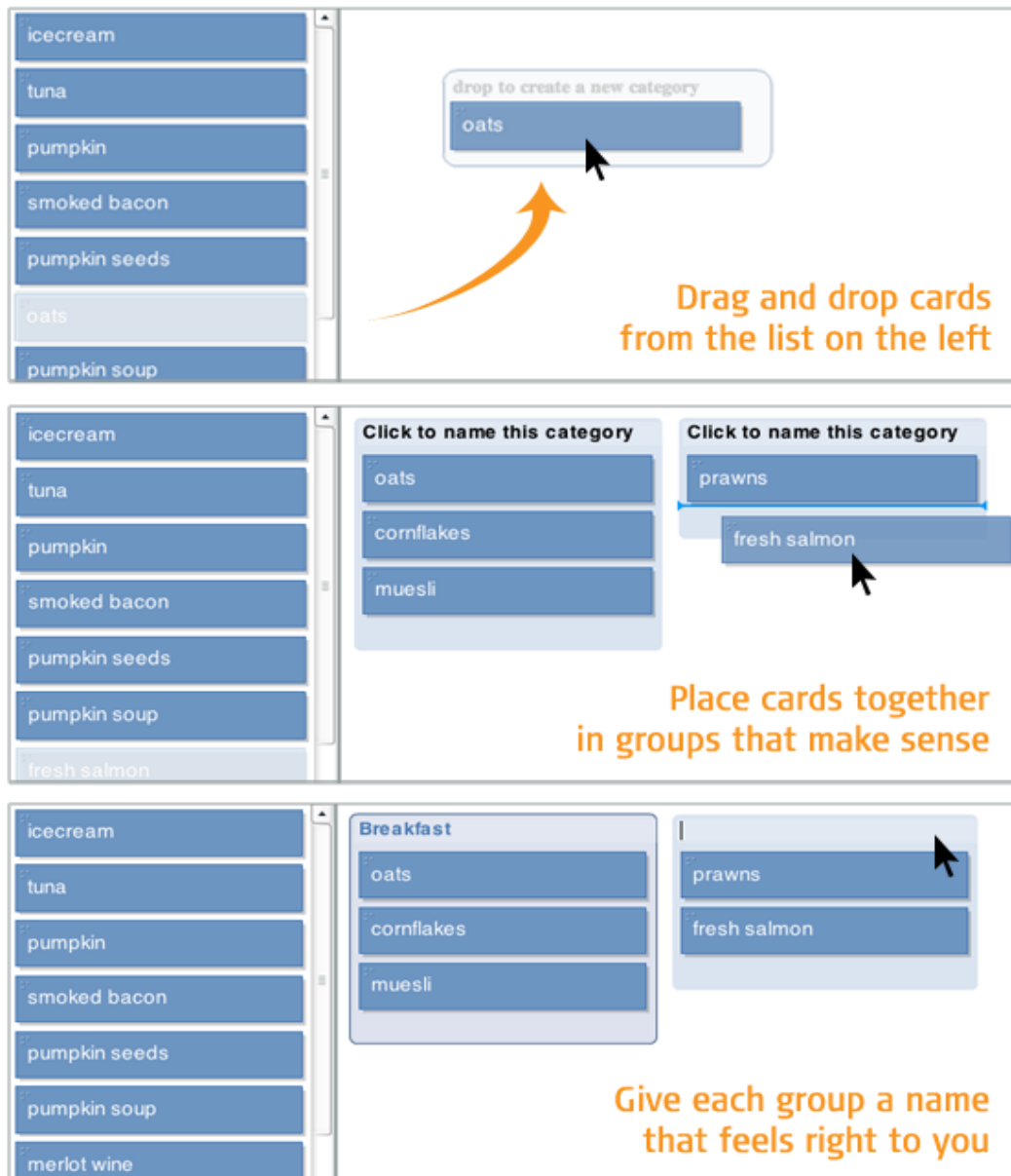


Figure 7 - Open Card Sort Instruction Created By Optimalsort

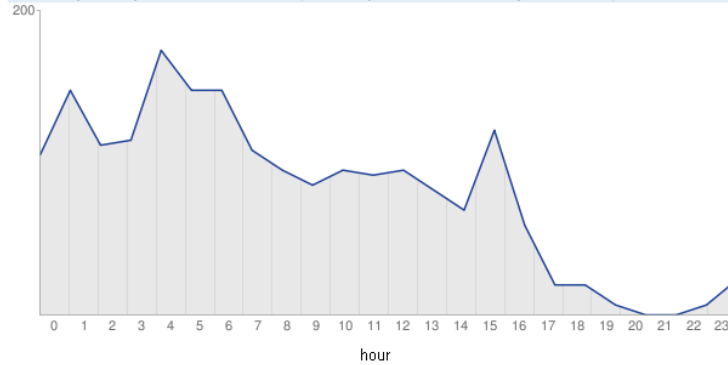
4.3. SEARCH STATISTICS

In this study, the search statistics are analyzed using Google Custom Search reports on METU Website. In-site search statistics are analyzed to find the seasonal changes in users' search queries on METU website. This search query data will be used to provide fresh and updated content on METU website before people start searching about an activity.

4.3.1. *Search Statistics Report Preparation*

Web interface of Google Custom Search is used to get reports in html files. Top queries in these reports are imported in to Excel week by week. Web interface of Google Custom Search can be seen in Figure 8.

Distinct queries per hour: Jan 7, 2011 (distinct queries: 1965, total queries: 2096)



Popular queries: Jan 7, 2011

Query	Instances
metu online	31
online	28
kafeterya	28
dbe	19
ce241	18
mail	16
ma219	15
student page	13
yemekhane	13
yüksek lisans	12
online metu	11
evaluation	11
erasmus	10

Popular queries code

Add the popular queries for this search engine to your website:

Sample

[metu online](#) [online](#) [kafeterya](#) [dbe](#) [ce241](#) [mail](#) [ma219](#) [student page](#) [yemekhane](#) [yüksek lisans](#)
[online metu](#) [evaluation](#) [erasmus](#)

```
<div id="queries"></div>
<script src="http://www.google.com/cse/query_renderer.js"></script>
<script src="http://www.google.com/cse/api/011418946324636299173/cse/jgqma"></script>
```

You can also subscribe to the popular queries RSS feed: [Subscribe](#)

Figure 8 - Web Interface of Google Custom Search

4.3.2. Seasonality In Search Statistics

Google Custom Search tool is used to provide a customized site search on Metu website. In this customized search engine users can search content through www.metu.edu.tr and www.odtu.edu.tr . This tool gives the most popular 20 search queries in a week or a month. For example, the most popular 20 queries in June 2010 can be seen in Table 13.

Table 13 - Top 20 Keywords Received From Google Custom Search From 01.06.10
to 30.06.10

	Popular Queries	Instances
1.	dbe	1819
2.	yaz okulu	1297
3.	öyp	1260
4.	metu online	628
5.	student page	451
6.	online metu	403
7.	kafeterya	366
8.	oyp	298
9.	summer school	240
10.	mld	222
11.	math 120	212
12.	akademik takvim	179
13.	referans mektubu	174
14.	ma 120	171
15.	math 119	168
16.	ma120	161
17.	proficiency	160
18.	math 116	154
19.	is100	151
20.	modern diller	148

Also the most popular 20 queries in a week can be gathered from Google Custom Search. The popular queries between 06.06.2010 and 12.06.2010 can be seen in Table 14.

Table 14 - Top 20 Keywords Received From Google Custom Search From
06.06.2010 to 12.06.2010.

	Popular Queries	Instances
1.	öyp	351
2.	dbe	275
3.	metu online	192
4.	math 120	152
5.	online metu	146
6.	kafeterya	126
7.	ma120	123
8.	math 119	118
9.	106	86
10.	physics 106	74
11.	ma 120	72
12.	oyp	60
13.	math120	51
14.	student page	47
15.	bap	44
16.	is100	43
17.	is100	41
18.	physics	38
19.	math119	37
20.	phys 106	32

In order to analyze seasonality in search trends, the weekly search statistics gathered from Google Custom Search Engine. All keywords searched by users are imported in to Excel Sheet with their weekly search statistics. Weekly search statistics of the keywords “akademik takvim”, “af” ,” dbe” , “erasmus” , “kafeterya”, “metu online”, “proficiency” and ” yatay geçiş” can be seen in Table 15.

Table 15 Weekly Search Statistics of Selected Keywords

Keywords	Nov 16, 2008 - Nov 22, 2008	Nov 23, 2008 - Nov 29, 2008	Nov 30, 2008 - Dec 6, 2008	Dec 7, 2008 - Dec 13, 2008	Dec 14, 2008 - Dec 20, 2008	Dec 21, 2008 - Dec 27, 2008	Dec 28, 2008 - Jan 3, 2009	Jan 4, 2009 - Jan 10, 2009	Jan 11, 2009 - Jan 17, 2009	Jan 18, 2009 - Jan 24, 2009	Jan 25, 2009 - Jan 31, 2009
akademik takvim	0	0	0	20	21	0	10	0	22	27	94
af	71	103	46	0	95	135	36	35	0	0	0
dbe	46	33	0	14	35	22	21	34	22	103	77
Erasmus	51	47	47	22	59	0	41	120	99	92	118
kafeterya	0	25	44	0	55	45	39	66	47	56	0
metu online	82	120	82	0	108	167	104	158	115	168	110
proficiency	0	0	0	0	0	0	0	0	0	114	471
yatay geçiş	0	0	0	0	0	0	0	0	0	0	21

The weekly search trend graph was created with Excel for the keywords which have higher search volume and are about important events in the academic calendar. Similar keywords like “add-drop” and “add drop” are grouped and their search statistics were combined. Weekly search trend graph of Add Drop related queries can be seen in Figure 9.

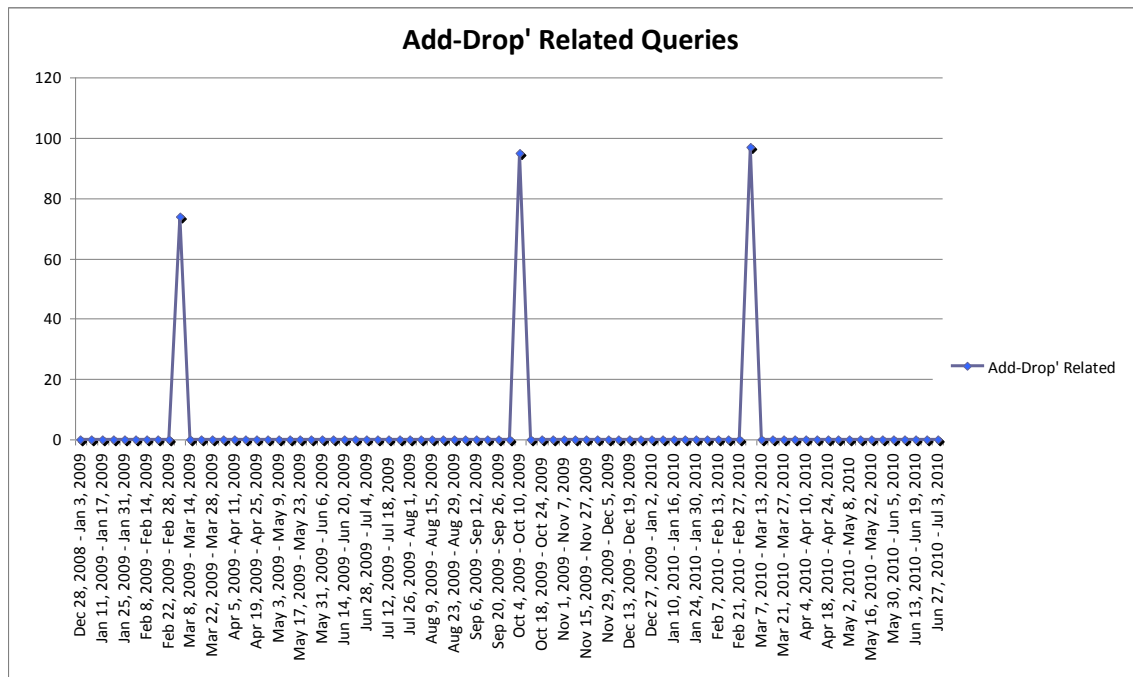


Figure 9 - Weekly Search Trend Graph Of Add-Drop Related Queries

The keywords obtained from the search graph and academic calendar were compared in order to find the number of days between the days of activity begins and the day people start searching about that activity.

4.3.3. Time Period Selection For Search Statistics

For search statistics, Google Custom Search reports for the period between **01.01.09** and **30.06.10** have been taken which includes three semesters. Google Custom Search has been started to used as the default search engine at 13 November 2008 in METU Website.

CHAPTER V

DATA ANALYSIS

5.1. GOOGLE ANALYTICS

In this section we will describe the analysis of Google Analytics reports. The abbreviations which we use for Google Analytics metrics and dimensions are given in the Table 1.

We start this section by introducing our university web site using Google Analytics statistics. Secondly, we will apply landing page optimization method to problematic keywords that we select from Google Analytics reports. Thirdly, we will use Lostness Factor method to evaluate users' paths while they are searching for information in our case study web site.

5.1.1. *General Web-Site Statistics*

To gather information about new design, Google Analytics is the first tool we have used to reach our aim in this study. Our case study is an information-driven university web site.

Above, we identified users of website as information seekers. METU website has several user groups which needs access to different information. METU website provides information about university, university history, campus life, graduate and undergraduate programs, research facilities and staff roster.

Above, we also mentioned METU website's problems which are identified by IG. IG has started to a project for the new web design for the METU Website. This study aims to gather information to help this design process.

During the time period between 01.01.09 and 30.06.10, a total of 4,360,309 visits, 8,213,174 page views, 1.88 pages/visit, 61.84% bounce rate, 01:55 Average Time on Site, 33.09% New Visits has been realized. Top ten web-pages during this time period are the main page, information on Faculties, Institutes & Schools page, graduate programs page, contact page, undergraduate programs page, and web page of METU Photos, Accommodation page, Sport Facility Page and Food & Drink page. Nearly 39% The most popular keyword is "odtü". As can be seen from Table 16, most of keywords are a variant of the word "odtü".

Table 16 - Top 10 Keywords Received From Google From 01.01.09 to 30.06.10

	Keyword	Frequency
1.	odtü	1072392
2.	odtu	193142
3.	odtü üniversitesi	85346
4.	orta doğu teknik üniversitesi	15137
5.	ortadoğu teknik üniversitesi	12259
6.	odtu.edu.tr	10149
7.	www.odtu.edu.tr	7919
8.	ödtü	6134
9.	odtü yüksek lisans	5801
10.	piyata odtü	3797

Search engine traffic includes 49,916 different keywords have a lower tailed shape frequency graph. **606** of the keywords among 49.916 are used more than 100 times. As can be seen from the Figure 10. 49.916 keywords have a lower tailed shape frequency graph. The horizontal axis shows the visit count bins and vertical axis

shows the frequency of these visit counts.

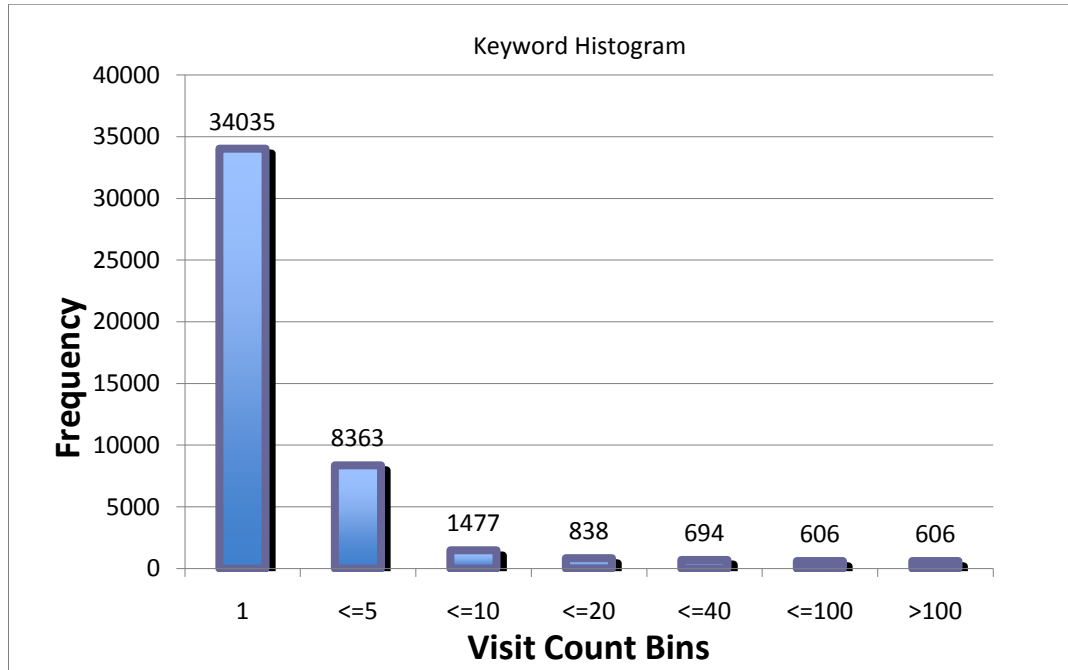


Figure 10 - Selected Period Keyword Histogram

The most popular web-page is the home page: "<http://www.odtu.edu.tr/>".

Table 17 gives the top 30 landing pages and their Entrances, Bounces and Bounce Rate (BR) values from 01.01.09 to 30.06.10.

Table 17 - Selected Period Top 30 Landing Pages; Their Entrances, Bounces and Bounce Rate

	Landing Page	E	B	BR
1	/	4045002	2516706	62,22%
2	/academic/units.php	66806	35936	53,79%
3	/academic/grad.php	36670	20274	55,29%
4	/about/contact.php	21331	15015	70,39%
5	/academic/undergrad.php	17182	9372	54,55%
6	/metupics/	16928	9014	53,25%
7	/clife/accomodate.php	10176	7162	70,38%
8	/clife/sports.php	9538	7136	74,82%
9	/clife/fooddrink.php	9233	7494	81,17%
10	/academic/class.php	8516	7040	82,67%
11	/alumni/	7800	3232	41,44%
12	/clife/studgroups.php	7258	4821	66,42%
13	/clife/transport.php	6673	4306	64,53%
14	/tov/	6367	3135	49,24%
15	/academic/online.php	6114	2917	47,71%
16	/about/misguide.php	5634	2987	53,02%
17	/about/admins.php	5616	3598	64,07%
18	/about/orglist.php	5503	3336	60,62%
19	/metusite/help.php	5433	2961	54,50%
20	/clife/bankpost.php	5232	4603	87,98%
21	/about/locationmap.php	4620	2463	53,31%
22	/research/tubitak.php	4385	3537	80,66%
23	/clife/shopping.php	4009	3013	75,16%
24	/about/admunits.php	3878	2035	52,48%
25	/services/compethics.php	3878	2751	70,94%
26	/metusite/404.php	3791	1729	45,61%
27	/metusite/sitemap.php	3581	987	27,56%
28	/tov/academic/grad.php	2847	1502	52,76%
29	/metusite/desktop.php	1808	1013	56,03%
30	/tov/academic/undergrad.php	1642	978	59,56%

The Google Analytics reports help to identify the visitors' hardware, network properties and software preferences so that it is possible to couple them with the requirements of the website. We considered the following statistical information about the visitors from 01.01.2009 to 31.12.2009: Operating System Statistics, Browser Statistics, Screen Resolution Statistics and Service Provider Statistics.

5.1.1.1. Operating System Statistics

98.22% of users have Windows operating system on their computers. Table 18 gives the operating system statistics.

Table 18 - METU Website Users' Operating System Statistics From 01.01.09 To 30.06.10

	Operating System	Entrance	Percentage
1.	Windows	4,282,802	98.22%
2.	Linux	33,590	0.77%
3.	Macintosh	30,625	0.70%
4.	SymbianOS	3,994	0.09%
5.	iPhone	3,786	0.09%
6.	(not set)	2,254	0.05%
7.	iPod	1,762	0.04%
8.	Samsung	729	0.02%
9.	FreeBSD	224	0.01%
10.	BlackBerry	167	> 0.00%

5.1.1.2. Browser Statistics

63.56% of users browse METU website with Internet Explorer, while 28.00% use Firefox and 6.15% use Chrome. Table 19 shows browser statistics of METU users.

Table 19 - METU Website Users' Browser Statistics From 01.01.09 To
30.06.10

	Browser	Entrance	Percentage
1.	Internet Explorer	793,777	62,83%
2.	Firefox	383,439	30,35%
3.	Chrome	71,748	5,68%
4.	Opera	10,218	0,81%
5.	Safari	3077	0,24%
6.	Mozilla	707	0,06%
7.	Mozilla Compatible Agent	139	0,01%
8.	SAMSUNG-GT-S5233W	98	0,01%
9.	Konqueror	32	0,00%
10.	SAMSUNG-S8003	32	0,00%

5.1.1.3. Screen Resolution Statistics

1280x800 is most popular screen resolution with 33.58%. 66% of users use screen resolution type which is suitable for widescreen monitors. Table 20 shows screen resolution statistics of METU users.

Table 20 - METU Website Users' Screen Resolution Statistics From
01.01.09 To 30.06.10

	Screen Resolution	Entrance	Percentage
1.	1280x800	1,464,024	33.58%
2.	1024x768	1,413,622	32.42%
3.	1280x1024	542,986	12.45%
4.	1440x900	192,408	4.41%
5.	1366x768	167,28	3.84%
6.	1152x864	156,252	3.58%
7.	1680x1050	69,911	1.60%
8.	1280x960	59,971	1.38%
9.	1280x768	54,695	1.25%
10.	1024x600	37,537	0.86%

5.1.1.4. Service Provider Statistics

“middle east technical university(metu)” is default service provider of university. Every computer’s default homepage is METU website in university labs. This increase bounce rate ratio of METU Website.

Table 21 - METU Website Users’ Service Provide Statistics From
01.01.09 To 30.06.10

	Service Provider	Entrance	Bounce Rate
1.	middle east technical university(metu)	948,706	73.23%
2.	tt adsl-alcatel dynamic_ulus	247,769	58.58%
3.	turk telekom adsl-alcatel	185,026	60.76%
4.	tt adsl-ttnet alc dynamic_ulus	136,219	58.87%
5.	tt adsl-nec dynamic_ulus	70,166	59.17%
6.	tt adsl-alcatel_ulu	65,118	62.56%
7.	tt adsl-alcatel dynamic_aci	55,027	49.20%
8.	tt adsl-ttnet nec dynamic_ulus	50,98	59.02%
9.	turksat uydu-net internet	46,343	65.85%
10.	tt adsl-ttnet huwai dynamic_ulus	44,517	60.25%

5.1.2. Landing Page Optimization

In this study, we applied landing page optimization using Google Analytics reports on METU Website. Our case study website has 61.85% Bounce rate for Search Engine Optimization (SEO). Since website has more than %60 bounce rate for all pages, Kumar (2009) suggests that we need to examine information on our landing pages.

Table 22 - Selected keywords to be analyzed

	Keywords (tags)
1	master
2	erasmus
3	havuz
4	harita
5	uzaktan
6	iibf
7	servisler
8	misafirhane
9	yaz okulu
10	bölümler

5.1.3. Problematic Keyword Clusters

There are 10 problematic keywords which landed on METU Website. In this section, we will analyze the clusters that we formed based on these keywords. We will use the abbreviations listed in the beginning of this chapter in Table 1.

5.1.3.1. Problematic Keyword Cluster 1

First problematic keyword cluster includes ‘master’ keyword.

Table 23 - “master” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtü de işletme masterı	0	1	/tov/academic/grad.php	/academic/grad.php	7
odtü master	0	0	/tov/academic/grad.php		6
odtü işletme master	2	4	/tov/academic/grad.php		5
odtü master programları	0	1	/tov/academic/undergrad.php		4
finansal matematik master programları	0	1	/tov/academic/grad.php		3
odtü insan kaynakları master	1	2	/tov/academic/grad.php		3
odtü mühendislik yönetimi master başvurusu	2	2	/tov/academic/grad.php		2
ingiliz edebiyatı odtu master başvurusu	1	1	/tov/academic/grad.php		1
odtu endustri muh master forum	1	1	/tov/academic/grad.php		1
odtu işletme master ı	1	1	/tov/academic/grad.php		1
odtu uluslararası ilişkiler master	1	1	/tov/academic/grad.php		1
odtü biyoloji master programı	0	1	/tov/academic/grad.php		1
odtü iibf harvard master onur	1	1	/tov/academic/grad.php		1
odtü işletme master başvuru	1	1	/tov/academic/grad.php		1
odtü işletme masterı	1	1	/tov/academic/grad.php		1
odtü işletme masterı	0	1	/tov/academic/grad.php		1
odtü kentleşme politikaları master programı	1	1	/tov/academic/grad.php		1
odtü master programları mühendislik yönetimi	0	0	/tov/academic/undergrad.php		1
odtü mühendislik yönetimi master	1	1	/tov/academic/grad.php		1

Discussion: Our first keyword to be analyzed is “master”. Although “master” is abbreviation of “Master of Science”, it is searched with Turkish keywords. This keyword is used in 22 visits during the selected period. The bounce rate for this cluster is 63 %. 95% of users landed text version of target landing page in this cluster.

Text version of graduate page’s url is “/tov/academic/grad.php” and the target landing page is “/academic/grad.php”. *Text version does not include any graphics or image and there is no image sign that this page is related to METU. Therefore, text version must not be reachable from search engines to prevent users to land on the text version of a page.*

5.1.3.2. Problematic Keyword Cluster 2

Second problematic keyword cluster includes ‘erasmus’ keyword.

Table 24 - “erasmus” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtü erasmus	17	38	/tov/metusite/sitemap.php		74
erasmus odtü	5	8	/tov/metusite/sitemap.php		15
odtü erasmus ofisi	3	4	/tov/metusite/sitemap.php		6
erasmus odtu	4	4	/tov/metusite/sitemap.php		4
erasmus orta dogu üniversitesi	0	1	/tov/metusite/sitemap.php		3
erasmus	2	2	/tov/metusite/sitemap.php		2
erasmus odtü aysegul	0	1	/tov/about/orglist.php		2
erasmus ofisi odtü	0	1	/tov/metusite/sitemap.php		2
odtu erasmus	2	2	/tov/metusite/sitemap.php		2
odtu yuksek lisans erasmus	0	0	/tov/metusite/sitemap.php		1
odtü erasmus	0	0	/tov/clife/studgroups.php		1

Discussion: Our second keyword to be analyzed is “Erasmus”, it is used in 61 visits during the selected period. The bounce rate for this cluster is 54 %. Target landing page is sitemap of METU Web page which includes an Erasmus program link. However target landing page is the homepage of Erasmus program named ‘<http://www.ico.metu.edu.tr/node/7>’.

Since search engines cannot access javascript files successfully, Javascript based navigation menu cannot be reached by search engines. *For better, search engine optimization, main navigation menu must be CSS based.*

5.1.3.3. Problematic Keyword Cluster 3

Third problematic keyword cluster includes ‘havuz’ keyword.

Table 25 - “havuz” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtü yüzme havuzu	4	5	/about/misguide.php	/clife/sports.php	6
odtü yüzme havuzu üyelik	0	1	/about/misguide.php		3
ortadoğu teknik üniversitesi yüzme havuzu	0	1	/about/misguide.php		3
iller bankası sosyal tesisleri yüzme havuzu	0	1	/about/misguide.php		2
odtu acik yuzme havuzu	0	1	/about/misguide.php		2
odtü kampüs acik yüzme havuzu	0	1	/clife/accomodate.php		2
odtü kapalı havuz seansları	0	1	/clife/accomodate.php		2

Discussion: Our third keyword to be analyzed is “Havuz”, it is used in 11 visits during the selected period. The bounce rate for this cluster is 36 %. Although bounce rate is lower than general bounce rate ratio, landing page does not include related information about swimming pool. It only includes the name of swimming pool.

For this keyword cluster, users landed on wrong page, because “/about/misguide.php” page include the name of swimming pool. *When a page, include a text related to other page, it must be linked to that page. Swimmig pool text must be linked to “clife/sports.php” page.*

5.1.3.4. Problematic Keyword Cluster 4

Fourth problematic keyword cluster includes ‘harita’ keyword.

Table 26 - “harita” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtü yerleşke haritası	5	33	/tov/metusite/sitemap.php	about/locationmap.php	87
odtü teknokent harita	4	5	/metusite/sitemap.php		5
odtu yerleşke haritası	0	1	/tov/metusite/sitemap.php		4
odtu ankara haritası	0	0	/metusite/sitemap.php		3
odtu ankara kampus harita	0	0	/metusite/sitemap.php		3

Discussion: Our fourth keyword to be analyzed is “harita”, it is used in 39 visits during the selected period. The bounce rate for this cluster is 23 %. For this keyword cluster, although bounce rate is lower than general bounce rate ratio, users landed sitemap of university web page, while they were trying to reach “Location & Campus Map”. Since landing page include ‘map’ in page title, users landed on wrong landing page.

5.1.3.5. Problematic Keyword Cluster 5

Fifth problematic keyword cluster includes ‘uzaktan’ keyword.

Table 27 - “uzaktan” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtu uzaktan eğitim yüksek lisans	2	11	/tov/academic/grad.php		29
uzaktan eğitim odtü	0	0	/tov/academic/grad.php		5
uzaktan eğitim yüksek lisans biyoloji	0	1	/tov/academic/grad.php		4
uzaktan yüksek lisans odtü	0	1	/tov/academic/grad.php		4
sosyoloji uzaktan yüksek lisans eğitimi	0	1	/tov/academic/grad.php		2

Discussion: Our fifth keyword to be analyzed is “uzaktan”, it is used in 14 visits during the selected period. The bounce rate for this cluster is 14 %, however users landed text version of “Graduate Programs” webpage despite of “Online Education Programs” webpage.

5.1.3.6. Problematic Keyword Cluster 6

Sixth problematic keyword cluster includes ‘iibf’ keyword.

Table 28 - “iibf” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtü iibf	12	41	/		126
iibf odtü	0	3	/		10
odtü iibf nerde	0	1	/		7

Discussion: Our sixth keyword to be analyzed is “iibf”, it is used in 45 visits during the selected period. The bounce rate for this cluster is 26%. While users are trying to reach “Faculty of Economic and Administrative Sciences” webpage, they landed home page of the university website.

5.1.3.7. Problematic Keyword Cluster 7

Seventh problematic keyword cluster includes ‘servisler’ keyword.

Table 29 - “servisler” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtü servisler	1	2	/services/compethics.php	/clife/transport.php	4
odtü servisleri	2	3	/services/compethics.php		4
odtu personel servisleri	0	0	/services/compethics.php		2
odtü öğrenci servisleri	0	1	/services/compethics.php		2
odtü personel servisleri	1	1	/services/compethics.php		1

Discussion: Our seventh keyword to be analyzed is “servisler”, it is used in 7 visits during the selected period. The bounce rate for this cluster is 57%. While users are trying to reach “METU District Buses operating between the districts and METU campus in weekdays”, they landed web services web page of METU.

5.1.3.8. Problematic Keyword Cluster 8

Eighth problematic keyword cluster includes ‘misafirhane’ keyword.

Table 30 - “misafirhane” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtü misafirhanesi	6	19	/visitor/		58
odtü misafirhane	2	3	/visitor/		4
odtu misafirhanesi	0	1	/visitor/		3
odtü misafirhanesi adres	0	1	/visitor/		2
odtü misafirhane fiyat	1	1	/visitor/		1

Discussion: Our eighth keyword to be analyzed is “misafirhane”, it is used in 25 visits during the selected period. The bounce rate for this cluster is 36%. Users landed “Information for Visitors” webpage which is prepared for new undergraduate students, however they were searching “guesthouse” of METU.

5.1.3.9. Problematic Keyword Cluster 9

Ninth problematic keyword cluster includes ‘yaz okulu’ keyword.

Table 31 - “yaz okulu” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtü yaz okulu	7	14	/about/misguide.php		32
odtü yaz okulu harç	9	13	/about/misguide.php		17
odtü yaz okulu harçları	3	6	/about/misguide.php		10
odtü yaz okulu harcı	3	5	/about/misguide.php		5
odtü yaz okulu harçları sosyal bilimler ankara	0	1	/about/misguide.php		4
odtu yaz okulu harci	0	1	/about/misguide.php		3
yaz okulu harç	1	2	/about/misguide.php		3
odtu yaz okulu harc	2	2	/about/misguide.php		2
odtü yaz okulu açılan dersler	2	2	/tov/about/misguide.php		2
odtü yaz okulu ücret	0	1	/about/misguide.php		2
yaz okulu harcı	0	1	/about/misguide.php		2
yaz okulu harçlar	0	1	/about/misguide.php		2
2010 yılı odtü yaz okulu harc ücreti	0	0	/about/misguide.php		1
ankara oddü yaz okulu	1	1	/about/misguide.php		1
ankara odtü den kuzey kıbrıs odtüye yaz okulu	1	1	/about/misguide.php		1
harç odtü yaz okulu	1	1	/about/misguide.php		1
odtu mühendislik yaz okulu harç	1	1	/about/misguide.php		1
odtu yaz okulu harcı	1	1	/about/misguide.php		1
odtu yaz okulu harç	1	1	/about/misguide.php		1
odtu yaz okulu harçları	1	1	/about/misguide.php		1
odtu yaz okulu sınav harci	0	0	/about/misguide.php		1
odtu yaz okulu tl	1	1	/about/misguide.php		1
odtü yaz okulu ders alımı harç	1	1	/about/misguide.php		1
odtü yaz okulu ders harcı	1	1	/about/misguide.php		1
odtü yaz okulu etkinlik programı	1	1	/about/misguide.php		1
odtü yaz okulu hakkında bilgiler	1	1	/about/misguide.php		1
odtü yaz okulu harç ücretleri	1	1	/about/misguide.php		1
odtü yaz okulu harçları 2010	1	1	/about/misguide.php		1
odtü yaz okulu ingilizce	1	1	/about/misguide.php		1
odtü yüzme yaz okulu	1	1	/about/misguide.php		1
odtü yüzme yaz okulu 2010	1	1	/about/misguide.php		1
yabancı dil yüksek okulu odtü sınav yaz okulu takvim	1	1	/about/misguide.php		1
yaz okulu harc	1	1	/about/misguide.php		1
yaz okulu harci	1	1	/about/misguide.php		1
yaz okulu harçları odtü	0	1	/about/misguide.php		1
yaz okulu odtü harç	1	1	/about/misguide.php		1
yüksek lisans yaz okulu ankara	1	1	/about/misguide.php		1

Discussion: Our ninth keyword to be analyzed is “yaz okulu”, it is used in 72 visits during the selected period. The bounce rate for this cluster is 68%. Users landed “General Information” web page despite of “Summer School” web page. *In “General Information”, “Summer School” text must be linked to “Summer School” web page*

5.1.3.10. Problematic Keyword Cluster 10

Tenth problematic keyword cluster includes ‘bölümler’ keyword.

Table 32 - “yaz okulu” Problematic Keyword Cluster Report

K	B	E	LP	TLP	PV
odtü bölümleri	39	91	/metusite/help.php		173
odtü bölümler	6	17	/metusite/help.php		145

Discussion: Our tenth keyword to be analyzed is “bölümler”, it is used in 108 visits during the selected period. The bounce rate for this cluster is 31%. Users landed METU Help Page which includes “About this Web Site” information despite of “Undergraduate Programs and Degrees Offered at METU” page.

5.1.4. Lostness Factor

In this study, we applied our proposed procedure introduced in Section 4.1.7 to analyze user paths and lostness of users. There are two lostness factor values to determine user lostness. Calculations of two lostness factor values are mentioned at Section 2.3.2. Smith (1996) found that participants with lostness factor score less than 0.4, did not have any sign of being lost. However, participants with a lostness score greater than 0.5, definitely appears to be lost.

5.1.5. Problematic Keyword Clusters in METU Web-Site

For our case study website, problematic keyword clusters with high pagedepth values are selected. Since METU website has two level navigation, keywords whose

pagedePTH values are greater than 2, are selected to calculate the lostness factors. During the selection process, non-generic keywords like “odtü”, ”odtu.edu.tr”, ”www.odtu.edu.tr”, ”odtü üniversitesi”, “odtu” were eliminated. In Table 33, the list of selected keywords can be seen.

Table 33 - Problematic Keyword Clusters in Metu Website With High PagedePTH Values

Selected Keyword	K	LPP	PD	PV	E
yüksek lisans	odtü yüksek lisans	/academic/grad.php	3	388	139
	odtü yüksek lisans	/academic/grad.php	4	247	64
	odtü yüksek lisans	/academic/grad.php	5	128	26
	odtü yüksek lisans	/academic/grad.php	6	104	22
uzaktan	odtü uzaktan eğitim	/academic/online.php	3	176	62
	odtü uzaktan eğitim	/academic/online.php	5	129	28
	odtü uzaktan eğitim	/academic/online.php	4	120	30
bölüm	odtü bölümleri	/metusite/help.php	3	144	54
	odtü bölümleri	/metusite/help.php	4	84	28
	odtü üniversitesi bölümleri	/	3	76	6
yemek	odtü kafeterya yemek	/	4	107	26
topluluk	odtü öğrenci toplulukları	/clife/studgroups.php	75	95	0
	odtu ogrenci topluluklari	/clife/studgroups.php	20	26	1
	odtü topluluklar	/clife/studgroups.php	19	25	1
adres	odtü adres	/	8	42	5
	odtü adres	/	3	89	28
	odtü adres	/	4	78	16
	odtü adres	/	5	44	8
eğitim	odtü eğitim fakültesi	/academic/units.php	4	88	25
	odtü eğitim fakültesi	/academic/units.php	3	73	26
	odtü eğitim fakültesi	/academic/units.php	5	37	9
	odtü eğitim fakültesi	/academic/units.php	6	52	9
iibf	odtü iibf	/	3	73	25
	odtü iibf	/	4	33	9
	odtü iibf	/	8	21	2
taksi	odtü taksi	/	3	72	24
	odtü taksi	/	4	53	13
	odtü taksi	/	5	33	6
piyata	piyata odtü	/	3	72	24
	odtü piyata	/	3	32	10

Table 34 (continued).

	piyata odtü	/	4	32	8
erasmus	odtü erasmus	/tov/metusite/sitemap.php	3	62	26
	odtu erasmus	/	3	58	18
	odtü erasmus	/	3	33	5
	odtu erasmus	/	4	32	8
	odtu erasmus	/	4	32	8
havuz	odtü açık havuz	/	3	56	12
	odtü yüzme havuzu	/clife/sports.php	3	46	17
	odtü açık havuz	/	4	34	8
	odtü havuz seansları	/	3	34	10
	odtü açık havuz	/	7	28	4
master	odtü master	/academic/grad.php	4	62	18
	odtü master	/academic/grad.php	3	52	18
	odtu master	/academic/grad.php	6	24	4
	odtü master programları	/academic/grad.php	9	24	2

In keyword clusters, when lostness factor 1 value is greater than 0.4, this value is shown in red and italic. Smith (1996) found that participants with lostness factor score less than 0.4, did not have any sign of being lost. However, participants with a lostness score greater than 0.5, definitely appears to be lost. In lostness factor result tables, lostness factor values (LF1) which is greater than 0.4, is shown in red and italic.

5.1.5.1. Selected Keyword Cluster 1

The pages with 'yüksek lisans' keyword are analyzed in this cluster.

Table 35 - Pageview, Entrance, Bounce and Bounce Rate Statistics Including
‘Yüksek Lisans’ Keyword

LPP	PV	E	B	BR
/academic/grad.php	4696	2298	1214	52,83%
/	2266	970	587	60,52%
/tov/academic/grad.php	979	504	256	50,79%
/academic/undergrad.php	445	242	145	59,92%
/academic/online.php	207	69	34	49,28%
/about/orglist.php	204	112	68	60,71%
/tov/academic/undergrad.php	192	97	44	45,36%
/about/misguide.php	127	84	50	59,52%

While there are 2298 entrances in ‘/academic/grad.php’ page, 504 users landed /tov/academic/grad.php page which is the text version of ‘/academic/grad.php’ . Most of the users landed to the target page. 60.52% of users bounce when they landed to the main page. “/about/orglist.php” page has the highest bounce ratio in this cluster.

Table 36 - Lostness Factor Statistics Including ‘Yüksek Lisans’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	42	169	0,369	0,610
/	0	2	78	226	0,209	0,811
/about/misguide.php	1	2	20	56	0,165	0,829
/about/misguide.php	0	2	6	16	0,286	0,889
/about/orglist.php	1	2	19	64	0,276	0,714
/about/orglist.php	0	2	3	11	0,311	0,667
/academic/grad.php	1	1	345	1281	0,650	0,329
/academic/grad.php	0	1	0	0	-	-
/academic/online.php	1	2	10	53	0,520	0,447
/academic/online.php	0	2	2	12	0,400	0,600
/academic/undergrad.php	1	2	53	170	0,251	0,735
/academic/undergrad.php	0	2	14	40	0,428	0,802
/tov/academic/grad.php	1	1	131	433	0,262	0,735
/tov/academic/grad.php	0	1	0	0	-	-
/tov/academic/undergrad.php	1	2	23	71	0,220	0,762
/tov/academic/undergrad.php	0	2	5	12	0,133	0,867

Discussion: In this cluster, “/academic/grad.php” , “/academic/online.php” and “/academic/undergrad.php” pages have lostness factor values greater than 0.4

When we analyzed related sessions we can say that users who searched about ‘yüksek lisans’ and visited ‘academic/grad.php’ in a session, mostly visit “Faculties, Institutes & Schools”, “Undergraduate Programs”, “Graduate Programs” pages. These pages are all about academic programs in METU.

Lostness factor value of users landed on ‘academic/grad.php’ is 0.650. *Keywords about “yüksek lisans” include phrases like “başvuru koşulları (requirements for application)”, “ücretler (tuition)”, “başvuru tarihi (application date)”.* However, we should consider that while users navigate through this pages, they cannot find related information about undergraduate programs. These pages includes list of links about related undergraduate programs.

Users landed to “/academic/undergrad.php” page and missed the target page (/academic/undergrad.php) has lostness value greater than 0.4. *Landing on undergraduate programs page while searching information about graduate programs can confuse users.*

5.1.5.2. Selected Keyword Cluster 2

Second selected keyword cluster includes ‘uzaktan’ keyword.

Table 37 - Pageview, Entrance, Bounce and Bounce Rate Statistics Including ‘Uzaktan’ Keyword

LPP	PV	E	B	BR
/academic/online.php	1570	704	346	49,15%
/	338	97	36	37,11%
/tov/academic/online.php	157	66	24	36,36%
/tov/academic/grad.php	111	54	22	40,74%
/tov/academic/undergrad.php	28	16	12	75,00%

The target page for this keyword cluster is ‘/academic/online.php’ has the highest entrance value with 704. 49.15% of users who landed to the target page, bounced. The main page has 37.11% bounce ratio.

Table 38 Lostness Factor Statistics For Landing Pages Including ‘Uzaktan’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	41	141	0,282	0,717
/	0	2	5	18	0,239	0,737
/academic/online.php	1	1	93	418	0,696	0,289
/academic/online.php	0	1	0	0		
/tov/academic/grad.php	1	2	27	79	0,178	0,813
/tov/academic/grad.php	0	2	3	9	0,278	0,722
/tov/academic/online.php	1	1	15	58	0,347	0,648
/tov/academic/online.php	0	1	0	0	-	-
/tov/academic/undergrad.php	1	2	3	12	0,444	0,556
/tov/academic/undergrad.php	0	2	0	0	-	-

Discussion: In this cluster, “/academic/online.php” , “/tov/academic/undergrad.php” pages have lostness factor values greater than 0.4.

Since “/academic/online.php” page includes 4 links about online education services in METU and does not include any text about that services, users are lost while searching for information about online services.

5.1.5.3. Selected Keyword Cluster 3

Third selected keyword cluster includes ‘yemek’ keyword.

Table 39 - Pageview, Entrance, Bounce and Bounce Rate Statistics Including ‘Yemek’ Keyword

LPP	PV	E	B	BR
/	349	179	105	58,66%
/clife/fooddrink.php	62	48	37	77,08%

Target page for this keyword cluster is /clife/fooddrink.php. However, main page has highest entrance value with 179 while 48 users landed to target page.

Table 40 - Lostness Factor Statistics Including ‘Yemek’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	23	87	0,436	0,563768
/	0	2	3	14	0,258	0,733333
/clife/fooddrink.php	1	1	2	6	0,601	0,333333
/clife/fooddrink.php	0	1	0	0	-	-

Discussion: ‘clife/fooddrink.php’ includes text information about food & drink facilities in METU. *Bounce rate is 77.08% for this cluster. High pagedepth and lostness factor values gathered from the sessions of %22.92 of users.* In this situation, since 77.08% of users bounced on landing page, high lostness factor cannot indicate users’ lostness.

However, user landed on index page has 58.66% bounce rate and lostness value greater than 0.4. Thus, landing on index page cause lost of users while searching information.

5.1.5.4. Selected Keyword Cluster 4

Fourth selected keyword cluster includes ‘topluluk’ keyword.

Table 41 Pageview, Entrance, Bounce and Bounce Rate Statistics Including ‘Topluluk’ Keyword

LPP	PV	E	B	BR
/clife/studgroups.php	736	248	156	62,90%
/	617	370	282	76,22%
/metusite/help.php	26	14	9	64,29%

Target page for this keyword cluster is /clife/studgroups.php which has second highest entrance value with 248. 370 users landed to main page and 76.22% of these users bounced.

Table 42 - Lostness Factor Statistics Including ‘Topluluk’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	2	6	0,333	0,667
/	0	2	14	56	0,244	0,756
/clife/studgroups.php	1	1	4	29	0,643	0,361
/clife/studgroups.php	0	1	0	0	-	-
/metusite/help.php	1	2	3	22	0,521	0,468
/metusite/help.php	0	2	1	3	-	-

Discussion: Users landed to “/metusite/help.php” page and missed the target page (/academic/undergrad.php) has lostness value greater than 0.4. *Landing on help page while searching information about student groups can confuse users.*

5.1.5.5. Selected Keyword Cluster 5

Fifth selected keyword cluster includes ‘eğitim fakültesi’ keyword.

Table 43 Pageview, Entrance, Bounce and Bounce Rate Statistics Including ‘Eğitim Fakültesi’ Keyword

LPP	PV	E	B	BR
/academic/units.php	856	334	112	33,53%
/	764	390	297	76,15%
/about/contact.php	135	54	29	53,70%
/academic/undergrad.php	58	20	14	70,00%
/about/admins.php	41	16	6	37,50%

Target page for this keyword cluster is /academic/units.php which has second highest entrance value with 334. Target page has low bounce rate with 33.53%. 390 users landed to main page and 76.15% of these users bounced.

Table 44 - Lostness Factor Statistics Including ‘Eğitim Fakültesi’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	3	13	0,159	0,833
/	0	2	9	49	0,311	0,675
/about/admins.php	1	2	1	8	0,707	0,250
/about/admins.php	0	2	2	10	0,249	0,738
/about/admunits.php	1	2	1	6	0,333	0,667
/about/admunits.php	0	2	1	3	0,333	0,667
/about/contact.php	1	2	7	37	0,454	0,535
/about/contact.php	0	2	3	15	0,361	0,639
/academic/undergrad.php	1	2	2	7	0,278	0,722
/academic/undergrad.php	0	2	2	10	0,550	0,417
/academic/units.php	1	1	40	215	0,715	0,272
/academic/units.php	0	1	0	0		
/about/admins.php	1	2	1	8	0,707	0,250
/about/admins.php	0	2	2	10	0,249	0,738

Discussion: Lostness factor values for /about/admins.php and /about/admins.php page are gathered from one sessions. These values cannot represent users’ lostness because of low frequency.

On the contrary, users who landed “/about/contact.php” page in 7 sessions, has lostness value greater than 0.4. When we analyze session info, we determined that users who searched contact information of “Faculty of Education” landed at contact page which includes contact information of all departments and academic units.

5.1.5.6. Selected Keyword Cluster 6

Sixth selected keyword cluster includes ‘bölüm’ keyword.

Table 45 - Pageview, Entrance, Bounce and Bounce Rate Statistics Including
‘Bölüm’ Keyword

LPP	PV	E	B	BR
/	2619	903	638	70,65%
/metusite/help.php	1615	781	366	46,86%
/academic/units.php	1539	753	386	51,26%
/academic/undergrad.php	495	263	143	54,37%
/about/orglist.php	472	243	125	51,44%
/about/contact.php	89	56	40	71,43%
/about/locationmap.php	88	44	16	36,36%
/academic/grad.php	85	26	9	34,62%
/academic/class.php	61	30	20	66,67%

Target page for this keyword cluster is “/academic/units.php” which has third highest entrance value with 753. Main page has highest entrance value with 903.

Table 46 - Lostness Factor Statistics Including ‘Bölüm Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	52	225	0,291	0,704
/	0	2	23	127	0,245	0,772
/metusite/help.php	1	2	96	420	0,211	0,784
/metusite/help.php	0	2	32	137	0,234	0,757
/academic/units.php	1	1	57	300	0,679	0,307
/academic/units.php	0	1	0	0	-	-
/academic/undergrad.php	1	2	12	52	0,334	0,652
/academic/undergrad.php	0	2	13	47	0,292	0,733
/about/orglist.php	1	2	22	93	0,304	0,683
/about/orglist.php	0	2	5	17	0,351	0,846
/about/contact.php	1	2	0	0	0,000	1,000
/about/contact.php	0	2	1	4	0,167	0,833
/about/locationmap.php	1	2	4	15	0,353	0,647
/about/locationmap.php	0	2	4	15	0,185	0,796
/academic/grad.php	1	2	2	14	0,634	0,311
/academic/grad.php	0	2	2	6	0,333	0,667
/academic/class.php	1	2	1	3	0,333	0,667
/academic/class.php	0	2	5	20	0,276	0,704

Discussion: In this cluster, “/academic/grad.php”, “/academic/units.php” pages have lostness factor values greater than 0.4. These two pages include related information about faculty of education. When session information is analyzed, users tried to find different information like ‘contact information’, ‘faculty magazine’, ‘dean of faculty’. METU Website must have information about departments and faculties and these pages must include basic information about departments and faculties like contact, e-mail, dean, address and secretary.

5.1.5.7. Selected Keyword Cluster 7

Seventh selected keyword cluster includes ‘iibf’ keyword.

Table 47 Pageview, Entrance, Bounce and Bounce Rate Statistics Including ‘iibf’ Keyword

LPP	PV	E	B	BR
/	393	147	41	27,89%

Although target page of this cluster is “/academic/units.php”, this page did not have enough search volume. Target page of that keyword is “/academic/units.php”, although, this page does not include the abbreviation “iibf”. So, the main page has the highest entrance value with 147.

Table 48 - Lostness Factor Statistics Including ‘iibf’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	41	128	0,215	0,783
/	0	2	23	93	0,360	0,682

Discussion: Lostness factor value of users landed main page and not visited target page is lower than users visited target page. “iibf” keyword is abbreviation of “İktisadi İdari Bilimler Fakültesi (Faculty of Economic and Administrative Sciences)”.

5.1.5.8. Selected Keyword Cluster 8

Eighth selected keyword cluster includes ‘taksi’ keyword.

Table 49 Pageview, Entrance, Bounce and Bounce Rate Statistics Including ‘taksi’ Keyword

LPP	PV	E	B	BR
/	687	417	279	66,91%
/clife/transport.php	182	148	129	87,16%

Target page of this cluster is “/clife/transport.php”. Main page has highest entrance value with 417.

Table 50 - Lostness Factor Statistics Including ‘taksi’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	1	4	0,500	0,500
/	0	2	26	71	0,169	0,826
/clife/transport.php	1	1	6	18	0,590	0,403
/clife/transport.php	0	1	0	0		

Discussion: Users who landed main page, visited target page only in 1 session. In 26 sessions users did not visit target page “/clife/transport.php” after main page. Lostness factor value of users landed main page and visited target page is lower than users visited target page. When we analyze session info, we determine that users searched telephone number of taxi service and landed on main page. After they could not find related information at main page, they navigated to other pages like “Contact”, “Academic Units” pages.

5.1.5.9. Selected Keyword Cluster 9

Ninth selected keyword cluster includes ‘piyata’ keyword.

Table 51 Pageview, Entrance, Bounce and Bounce Rate Statistics Including ‘piyata’
Keyword

LPP	PV	E	B	BR
/	1014	673	475	70,58%
/clife/fooddrink.php	236	219	202	92,24%

Target page of this cluster is “/clife/fooddrink.php”. 202 of 219 user bounced on that page. That means this page has 92,24% ratio. Main page has highest entrance value with 219.

Table 52 - Lostness Factor Statistics Including ‘piyata’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	2	2	0,260	0,700
/	0	2	44	52	0,195	0,801
/clife/fooddrink.php	1	1	5	6	0,570	0,417
/clife/fooddrink.php	0	1	0	0	-	-

Discussion: ‘clife/fooddrink.php’ includes text information “piyata” which is a restaurant in the campus. Bounce rate is 92.24% for this cluster. *High pagedepth and lostness factor values gathered from the sessions of 7.76% of users.* In this situation, high lostness factor cannot indicate users’ lostness.

5.1.5.10. Selected Keyword Cluster 10

Tenth selected keyword cluster includes ‘erasmus’ keyword.

Table 53 - Pageview, Entrance, Bounce and Bounce Rate Statistics Including
‘erasmus’ Keyword

LPP	PV	E	B	BR
/	1995	1433	1183	82,55%
/tov/metusite/sitemap.php	550	329	192	58,36%

In landing page optimization method, we concluded that Erasmus keyword must have a different landing page. Since “/tov/metusite/sitemap.php” page has ‘Erasmus’ link, we can define this page as a target page. 192 of 329 user bounced on that page. That means this page has 58,36% ratio. Main page has highest entrance value with 1433. Bounce rate is 82.55 % at main page.

Table 54 - Lostness Factor Statistics Including ‘piyata’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	1	9	0,748	0,222
/	0	2	52	165	0,247	0,744
/tov/metusite/sitemap.php	1	1	42	143	0,634	0,345
/tov/metusite/sitemap.php	0	1	0	0		

Discussion: Sitemap page includes lots of links which can confuse user about Erasmus programme. Since link of Erasmus Programme is in javascript based navigation menu, users mostly landed on index page and sitemap page.

5.1.5.11. Selected Keyword Cluster 11

Eleventh selected keyword cluster includes ‘havuz keyword.

Table 55 - Pageview, Entrance, Bounce and Bounce Rate Statistics Including ‘havuz’ Keyword

LPP	PV	E	B	BR
/	2267	1465	1105	75,43%
/clife/sports.php	2058	1537	1242	80,81%
/about/misguide.php	120	70	40	57,14%

Target page of this cluster is “/clife/sports.php” which has highest entrance value with 1537. This page has high bounce rate ratio with 80,81%. 70 users landed to “/about/misguide.php” page which includes “General Information” page include

“olympic-size indoor swimming pool, and an outdoor swimming pool are available on METU campus” phrase. 1465 users landed to main page with 75,43% bounce rate.

Table 56 - Lostness Factor Statistics Including ‘havuz’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/	1	2	19	49	0,149	0,851
/	0	2	72	210	0,197	0,799
/clife/sports.php	1	1	154	438	0,584	0,400
/clife/sports.php	0	1	0	0		
/about/misguide.php	1	2	25	66	0,183	0,807
/about/misguide.php	0	2	3	8	0,539	0,833

Discussion: In this cluster, “/clife/sports.php”, “/about/misguide.php” pages have lostness factor values greater than 0.4.

Since “/clife/sports.php” and “/about/misguide.php” page does not include information about ‘swimming pool schedule’ users get lost while searching information about swimming pool.

5.1.5.12. Selected Keyword Cluster 12

Twelveth selected keyword cluster includes ‘master’ keyword.

Table 57 - Pageview, Entrance, Bounce and Bounce Rate Statistics Including ‘master’ Keyword

LPP	PV	E	B	BR
/academic/grad.php	990	485	248	51,13%
/	746	483	369	76,40%
/tov/academic/grad.php	78	38	22	57,89%
/academic/undergrad.php	28	16	9	56,25%

Target pages of this cluster is “/academic/grad.php” and text version of this page “/tov/academic/grad.php”. These pages have 51,13% and 57,89% bounce ratios respectively.

Table 58 - Lostness Factor Statistics Including ‘master’ Keyword

LPP	TVP	O	S	PV	LF1	LF2
/academic/grad.php	1	1	75	260	0,632	0,343
/academic/grad.php	0	1	0	0		
/	1	2	19	62	0,250	0,741
/	0	2	28	66	0,113	0,887
/tov/academic/grad.php	1	1	7	25	0,312	0,660
/tov/academic/grad.php	0	1	0	0		
/academic/undergrad.php	1	2	4	12	0,250	0,750
/academic/undergrad.php	0	2	0	0		

Discussion: Most users who searched “master” keyword, landed target page “/academic/grad.php” of that keyword. When we compare ‘academic/grad.php’ and text version of same page ‘/academic/online.php’, we can see that users which landed to graphical version has lower lostness values than user landed to text version.

5.1.6. Error Page Optimization

For our case study website, pages which include broken links were analyzed. For getting these statistics, custom Google Analytics report were created as mentioned in Section 4.1.8. All page data can be found in Table 59.

Table 59 - Data of Pages Sent Users to Error Page

PP	PPP	PV	B	E
/metusite/404.php	/	278	0	0
/metusite/404.php	/academic/units.php	40	0	0
/metusite/404.php	/academic/grad.php	19	0	0
/metusite/404.php	/about/locationmap.php	15	0	0
/metusite/404.php	/metusite/sitemap.php	15	0	0
/metusite/404.php	/academic/class.php	11	0	0
/metusite/404.php	/academic/online.php	10	0	0
/metusite/404.php	/academic/undergrad.php	9	0	0
/metusite/404.php	/tov/metusite/desktop.php	7	0	0
/metusite/404.php	/about/contact.php	6	0	0
/metusite/404.php	/metusite/feedback.php	6	0	0
/metusite/404.php	/about/admunits.php	5	0	0
/metusite/404.php	/clife/transport.php	5	0	0
/metusite/404.php	/metusite/azlist.php	5	0	0
/metusite/404.php	/tov/academic/grad.php	3	0	0
/metusite/404.php	/about/misguide.php	2	0	0
/metusite/404.php	/clife/accomodate.php	2	0	0
/metusite/404.php	/clife/studgroups.php	2	0	0
/metusite/404.php	/tov/about/locationmap.php	2	0	0
/metusite/404.php	/tov/metusite/sitemap.php	2	0	0
/metusite/404.php	/about/emblem.php	1	0	0
/metusite/404.php	/about/history.php	1	0	0
/metusite/404.php	/alumni/	1	0	0
/metusite/404.php	/clife/shopping.php	1	0	0
/metusite/404.php	/research/tubitak.php	1	0	0
/metusite/404.php	/tov/about/misguide.php	1	0	0
/metusite/404.php	/tov/about/org.php	1	0	0
/metusite/404.php	/tov/academic/online.php	1	0	0
/metusite/404.php	/tov/academic/undergrad.php	1	0	0
/metusite/404.php	/tov/clife/bankpost.php	1	0	0
/metusite/404.php	/tov/clife/fooddrink.php	1	0	0

278 users tried to reach moved or deleted page from main page. Dynamic events and activities part in main page mostly causes this broken links. Events and Activities refreshed in five minutes and in this period if creator of activity or event deletes this

item, there will be a broken link on main page until other refresh in five minutes.

/academic/units.php page which includes links to Faculties, Institutes & Schools, is in the second position on table. Users clicked a broken link 40 times on that page. In other words, when users tried to reach a faculty, institute or a school, in 40 sessions they reach an error page instead of related link.

5.1.7. Mobile Page Optimization

For our case study website, users' preferences were analyzed when they are redirected to text version. For getting these statistics, custom Google Analytics report were created as mentioned in Section 4.1.9.

Since users entered to www.odtu.edu.tr with their mobile phones, they were redirected to text version of main page which is '/tov/'. Custom Google Analytics report was created for the users redirected to '/tov/' page. All user data can be found in Table 60.

Table 60 - Data of Users' Entered With Mobile Device

PP	NPP	PPP	PV	B	E	EX
/tov/	/tov/	(entrance)	3119	1908	3119	1908
/tov/	/tov/	/tov/	605	0	0	343
/?mobile=off	/?mobile=off	/tov/	456	0	0	303
/tov/academic/units.php	/tov/academic/units.php	/tov/	197	0	0	129
/?mobile=off	/?mobile=off	/?mobile=off	116	0	0	58
/tov/academic/units.php	/tov/academic/units.php	/tov/academic/units.php	52	0	0	25
/tov/	/tov/	/?mobile=off	47	0	0	13
/tov/academic/grad.php	/tov/academic/grad.php	/tov/	41	0	0	13
/tov/	/tov/	/tov/academic/units.php	37	0	0	10
/tov/academic/undergrad.php	/tov/academic/undergrad.php	/tov/	34	0	0	17
/tov/about/misguide.php	/tov/about/misguide.php	/tov/	32	0	0	10
/tov/about/contact.php	/tov/about/contact.php	/tov/	31	0	0	28
/tov/about/locationmap.php	/tov/about/locationmap.php	/tov/	28	0	0	10
/tov/academic/class.php	/tov/academic/class.php	/tov/	20	0	0	14
/tov/about/admunits.php	/tov/about/admunits.php	/tov/	19	0	0	7
/tov/clife/accomodate.php	/tov/clife/accomodate.php	/tov/	19	0	0	13

3119 users redirected to web page and 1908 users bounced on that page. 61.17% of users ended his session when they redirected to mobile friendly web page. Bounce rate is similar with main page's bounce ratio which is 61.84% as mentioned in Section 5.1.1.

Table 61 - Statistics of Users Redirected to Text Version

PP	NPP	PPP	PV	B	E	EX
/tov/	/tov/	(entrance)	3119	1908	3119	1908

456 users return to graphical version of website and 303 users ended their session on that page. 15% users choice graphical interface instead of text version. After that choice,

Table 62 - Statistics of Users Redirected to Text Version

PP	NPP	PPP	PV	B	E	EX
/tov/	/tov/	(entrance)	3119	1908	3119	1908

755 of 3119 users navigate through text version of web page. That is to say, 24% of users continued at text version. Figure shows users preferences on mobile friendly text-version page.

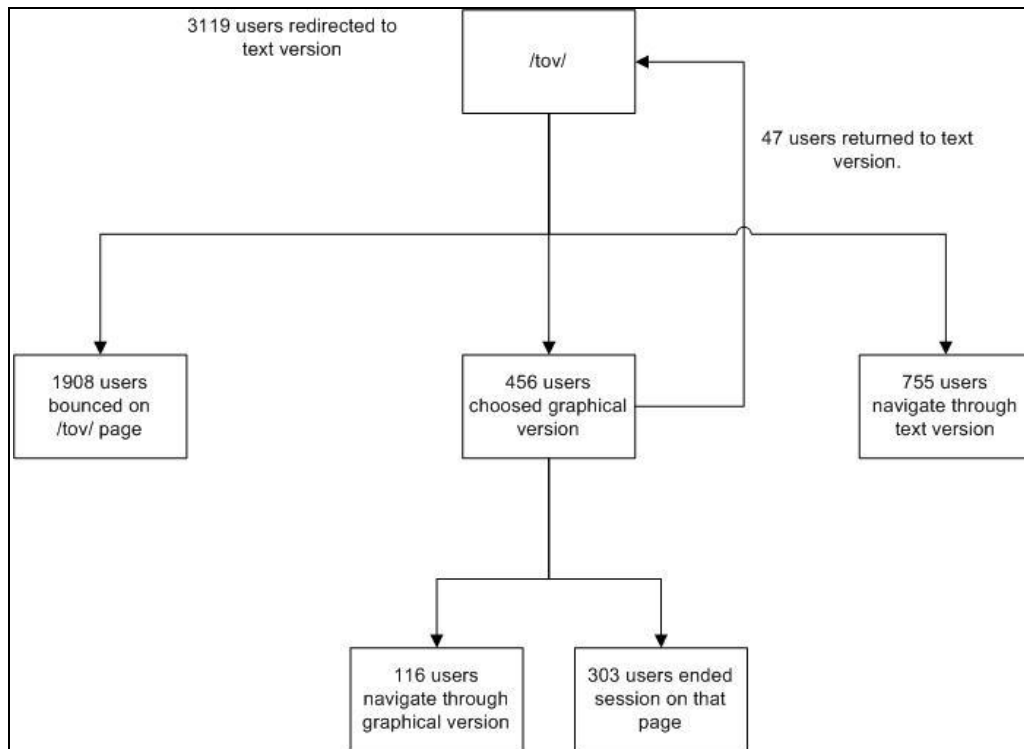


Figure 11 - Users' Path Graphic When They Landed On Mobile Friendly Index Page

5.1.8. Summary of Google Analytics Results

Landing page optimization, lostness factor, mobile page optimization and error page optimization methods helped us to provide recommendations about information architecture, information availability and efficiency of case study website. *General statistics* shows us:

- Users searched keywords like 'odtü', 'odtu.edu.tr', 'metu', 'otdü' and 'oddü' to reach main page of METU website. 9 of top 10 keywords include "odtu" keyword which shows users Google usage as a browser url bar.
- METU Website has 61.85% bounce rate for Search Engine Optimization and according to Kumar (2009) suggests that we need to examine information on our landing pages. However, as in Arendt & Wagner (2010)'s study, every computer in university lab opened METU website homepage by default which increase bounce rate ratio. In the same way, METU website has

73.23% bounce rate ratio when users' internet service provider is "middle east technical university(metu)".

- 1280x800 and 1024x768 are most popular screen resolution types. This must be considered during the new design process.

Landing page optimization with problematic keyword clusters include master, erasmus, havuz, harita, uzaktan, iibf, servisler, misafirhane, yaz okulu, bölümler.

Landing page optimization method shows us:

- Text version must not be reachable from search engines to prevent users to land a text version of a page.
- Since search engines cannot access javascript files successfully, Javascript based navigation menu cannot be reached by search engines. *For better, search engine optimization, main navigation menu must be CSS based.*
- When a page, include a text related to other page, it must be linked to that page. For example swimming pool text in "about/misguide.php" must be linked to "clife/sports.php" page.

Lostness factor method with problematic keyword clusters include master, Erasmus, havuz, harita, uzaktan, iibf, servisler, misafirhane, yaz okulu, bölümler. Landing page optimization method shows us:

- Most of pages do not include information which users need. For example, "/clife/sports.php" and "/about/misguide.php" page does not include information about 'swimming pool schedule' and users get lost while searching information about swimming pool schedule. When users landed on target landing page, in every keyword cluster, these users have lostness factor value greater than 0.4
- METU Website must have information about departments and faculties and these pages must include basic information about departments and faculties like contact, e-mail, dean, address and secretary. For example, users tried to find requirements for application, tuition and application date information

about graduate programs however they cannot find related information on related pages.

Mobile page optimization shows us that only 24% of users continued at text version after redirection which means users' do not prefer text version page on mobile access.

Error page optimization shows us:

- Broken links are found mostly on index page of METU Website. Dynamic events and announcement part is refreshed in every 5 minutes and if someone deletes an event which is recently added, this event link turns into a broken link. So, this part must be refreshed on every database action.
- /academic/units.php page which includes links to Faculties, Institutes & Schools, is in the second position on table. Users clicked a broken link 40 times on that page. In other words, when users tried to reach a faculty, institute or a school, in 40 sessions they reach an error page instead of related link. So, METU Website must have department and faculty pages.

5.2. SEARCH STATISTICS

In this section we will describe the analysis of search statistics. We start this section by introducing selected keyword groups for analyzing search trends. Secondly we will analyze search trend graph of each keyword group. Thirdly, we will compare academic calendar and search start date of important events on academic calendar. Finally we will summarize the results that gathered from analysis in this section.

5.2.1. Selected Keyword Groups

These keywords selected to find the number of days between the day of activity begins and the day people start to search about that activity.

Table 63 - Selected Keywords To Be Analyzed

	Keywords (tags)
1	akademik takvim
2	add drop
3	bahar şenliği
4	çift anadal
5	erasmus
6	final tarihleri
7	harç
8	is100
9	notlar
10	proficiency
11	withdraw
12	yandal
13	yatay geçiş
14	yaz okulu
15	yurt
16	yüksek lisans

5.2.1.1. Query Group 1

‘akademik takvim’ (academic calendar) is first search query group to analyze.

Related keywords in this group are:

- akademik takvim
- academic calendar
- academic calender

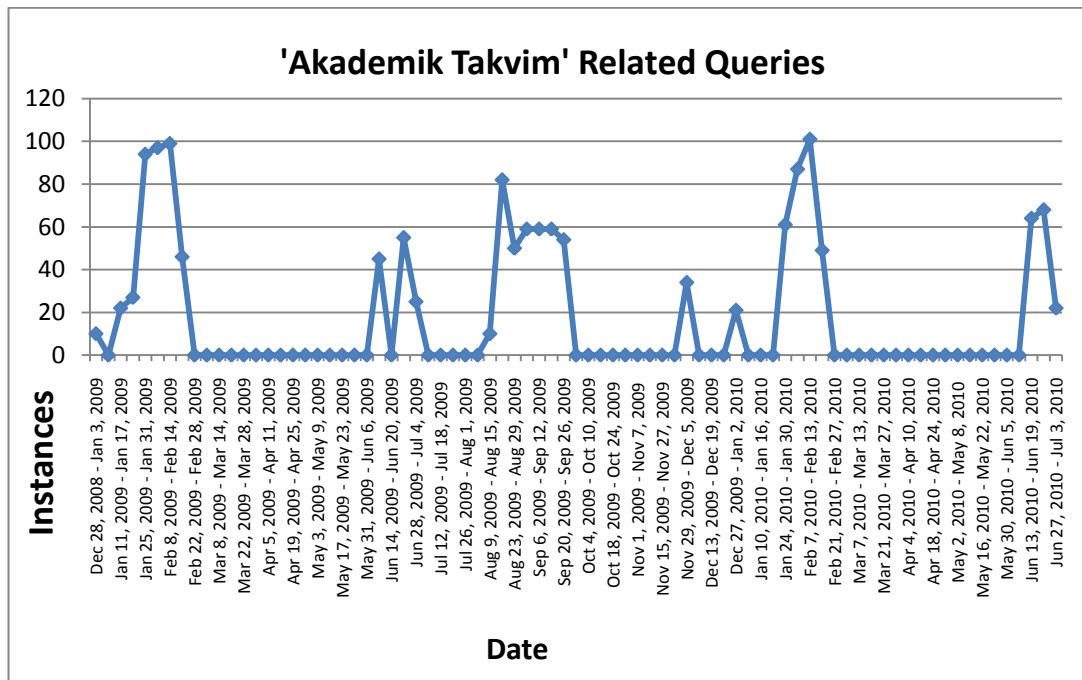


Figure 12- Search Trend Of ‘Akademik Takvim’ Query Group

Discussion: Users can reach to academic calendar from the “Academic Calendar” link on header of METU website. Instead of using this link, users tried to use in-site search to reach academic calendar. In three semesters, users started to search “academic calendar” a month before “Registration and Advisor Approvals” and finished to search after classes began.

5.2.1.2. Query Group 2

‘add-drop’ is second search query to analyze. Related keywords in this group are:

- add drop
- add-drop

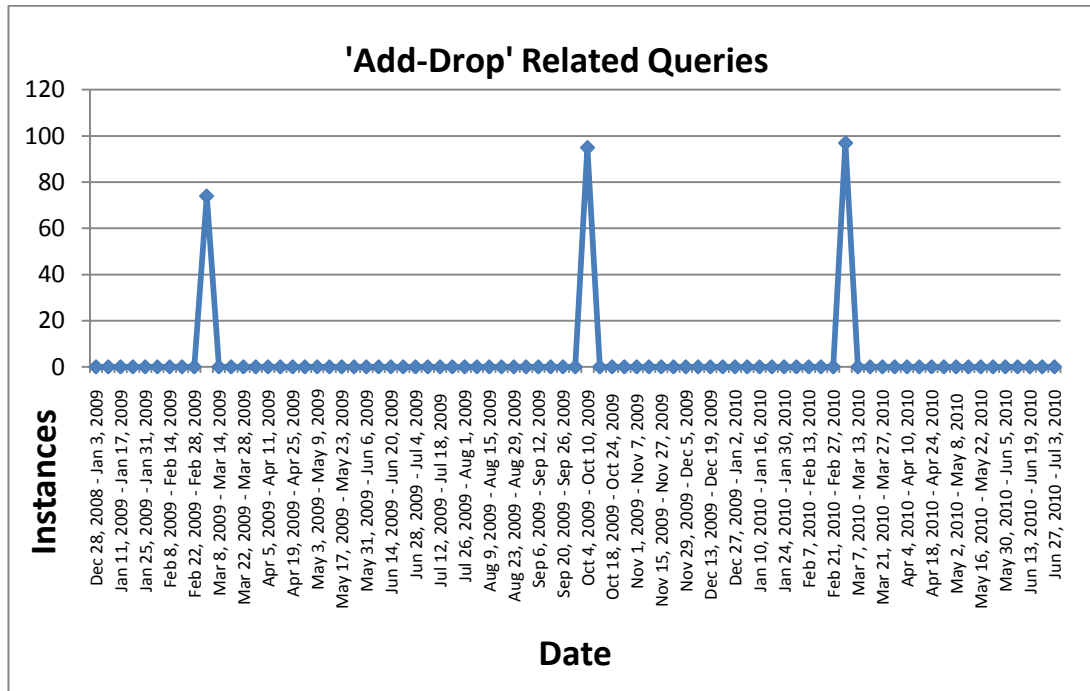


Figure 13 - Search Trend Of 'Add-Drop' Query Group

Discussion: Dates of add drop session weeks in three semesters were 2-6 March 2009, 5-9 October 2009 and **1-5 March 2010**. In three semesters, users started to search information about “add-drop” with the start of add-drop week.

5.2.1.3. Query Group 3

‘bahar şenliği’ (spring festival) is first search query to analyze. Related keywords in this group are:

- 2009 bahar şenliği
- 2010 bahar şenliği
- bahar
- bahar senligi
- bahar şenliği
- bahar şenliği 2009
- bahar şenliği 2010
- bahar şenlikleri

- senlik
- spring fest
- spring festival
- şenlik
- şenlik 2009
- şenlik 2010
- şenlik programı
- şenlikler

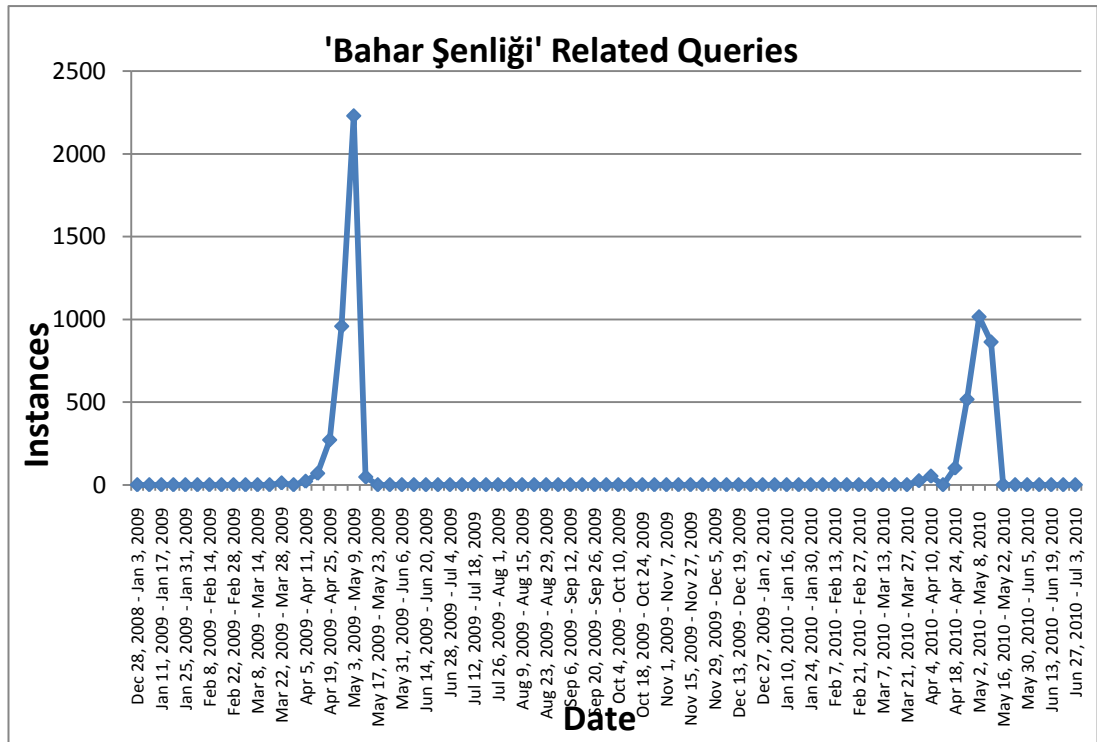


Figure 14 - Search Trend Of 'Bahar Şenliği' Query Group

Discussion: Spring festival was organized at 7-10 May 2009 and 12-15 May 2010. In 2009, users start to search spring festival related queries at 5 April 2009 and in 2010, users start to search at 4 April 2010. Thus, users started to search about spring festival one month before the festival.

5.2.1.4. Query Group 4

'dbe' is fourth search query to analyze. This group includes only one keyword which is 'dbe'.

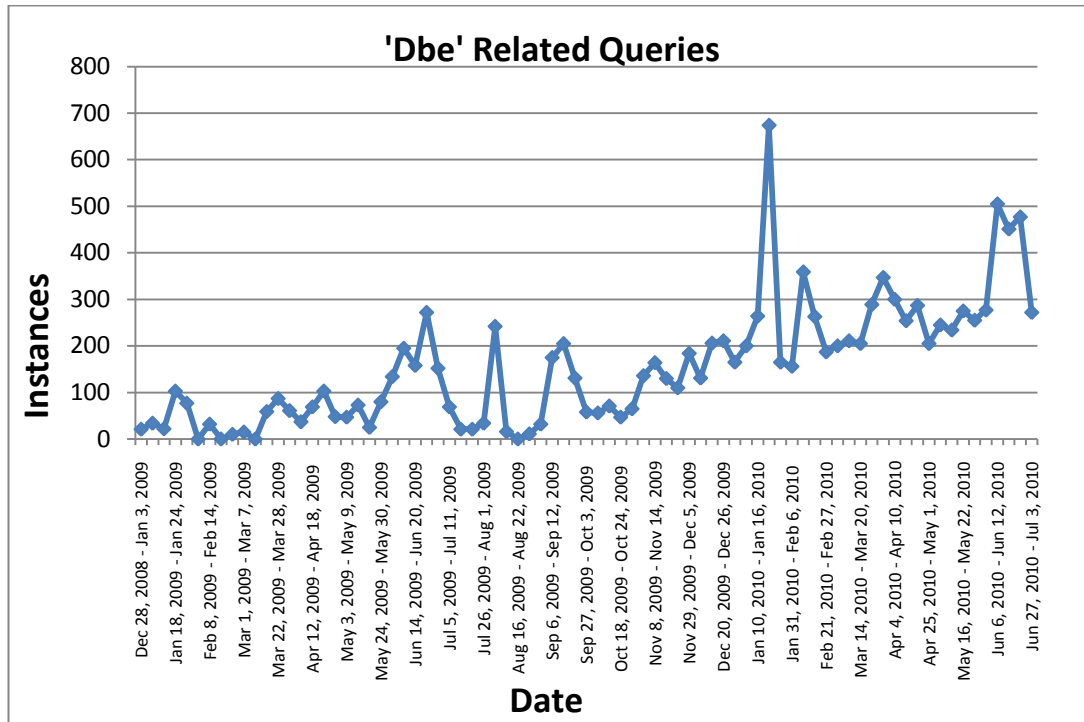


Figure 15 - Search Trend Of 'DBE' Query Group

Discussion: Spring festival was organized at 7-10 May 2009 and 12-15 May 2010. In 2009, users start to search spring festival related queries at 5 April 2009 and in 2010, users start to search at 4 April 2010. Thus, users started to search about spring festival one month before the festival.

5.2.1.5. Query Group 5

'final' is fifth search query to analyze. Related keywords in this group are:

- final dates
- final tarihleri
- view final dates

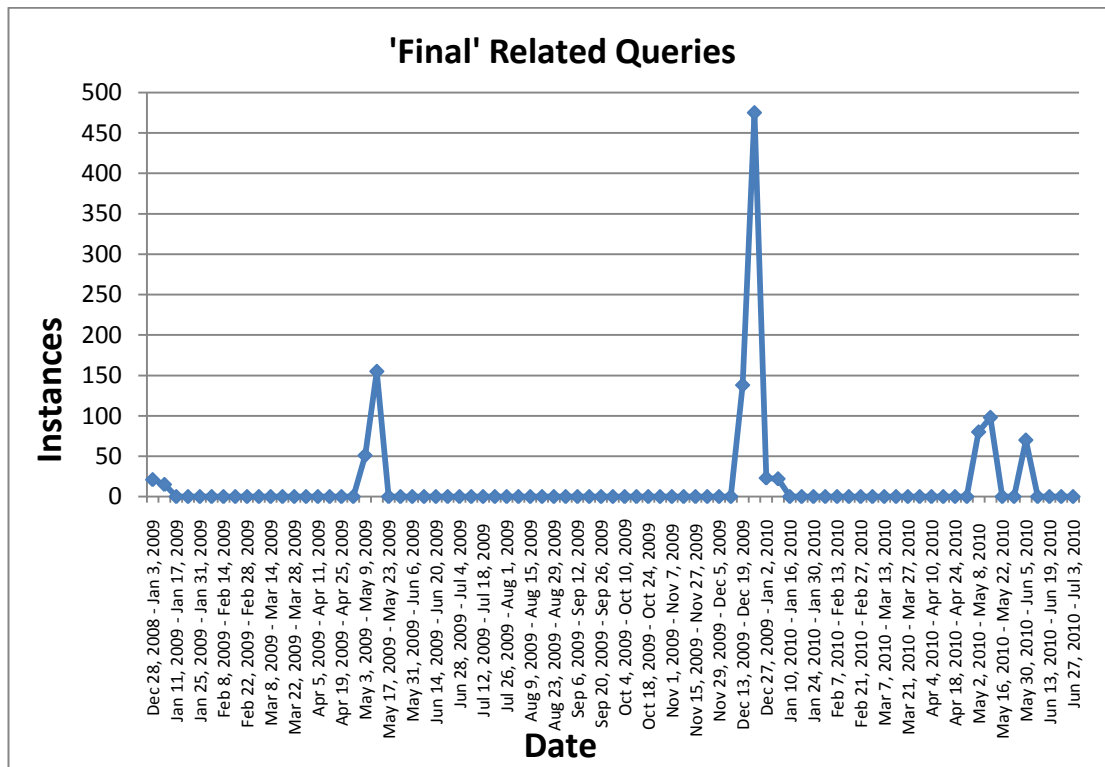


Figure 16 Search Trend Of ‘Final’ Query Group

Discussion: Final weeks in three semesters were 1-13 June 2009 and 11-23 January 2010, May 31-June 12, 2010. In three semesters, users search final dates one month before final weeks.

5.2.1.6. Query Group 6

‘harç’ (tuition) is sixth search query to analyze. Related keywords in this group are:

- harc
- harç
- harçlar

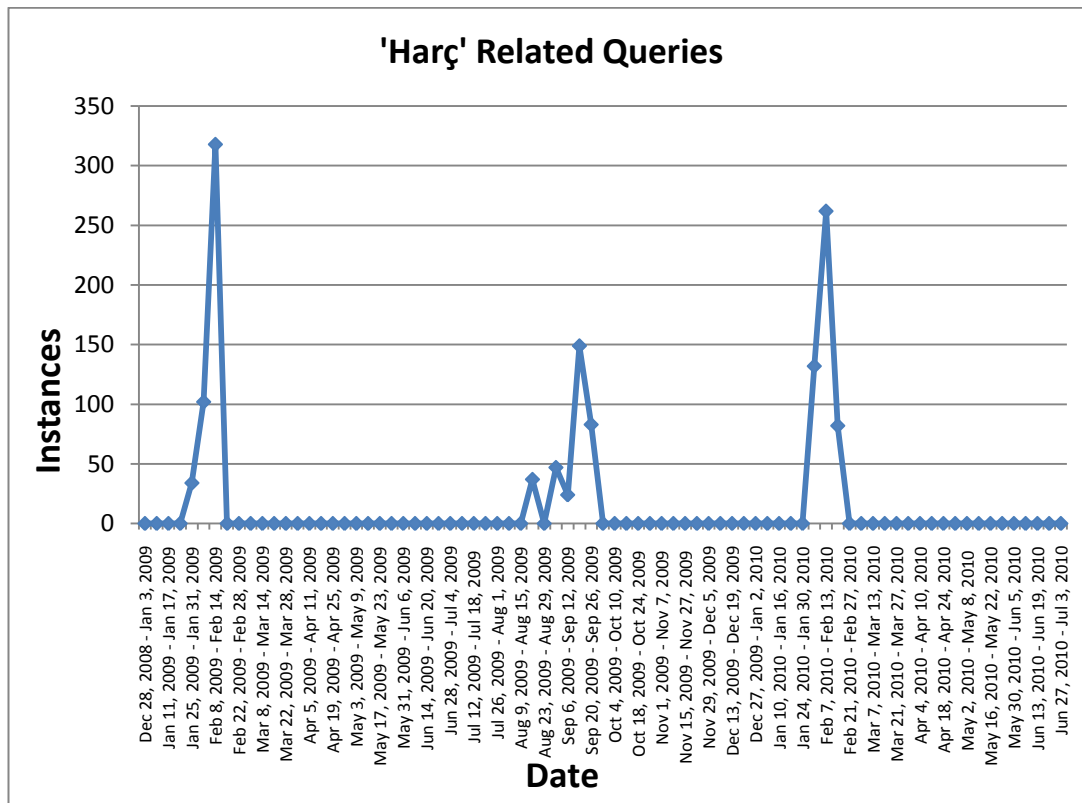


Figure 17 - Search Trend Of ‘Harç’ Query Group

Discussion: 13 February 2009 was the last day to pay tuition fees, users started to search after 25 January 2009. In second semester, September 25, 2009 was the last day to pay tuition fees and users tried to find information at Aug 16, 2009. In third semester, users started to search 17 days before the last day of tuition payment. Thus, users started to search 15-30 days before the last day of tuition fees.

5.2.1.7. Query Group 7

‘is 100’ is seventh search query to analyze. Related keywords in this group are:

- is 100
- is100
- is 100
- is100

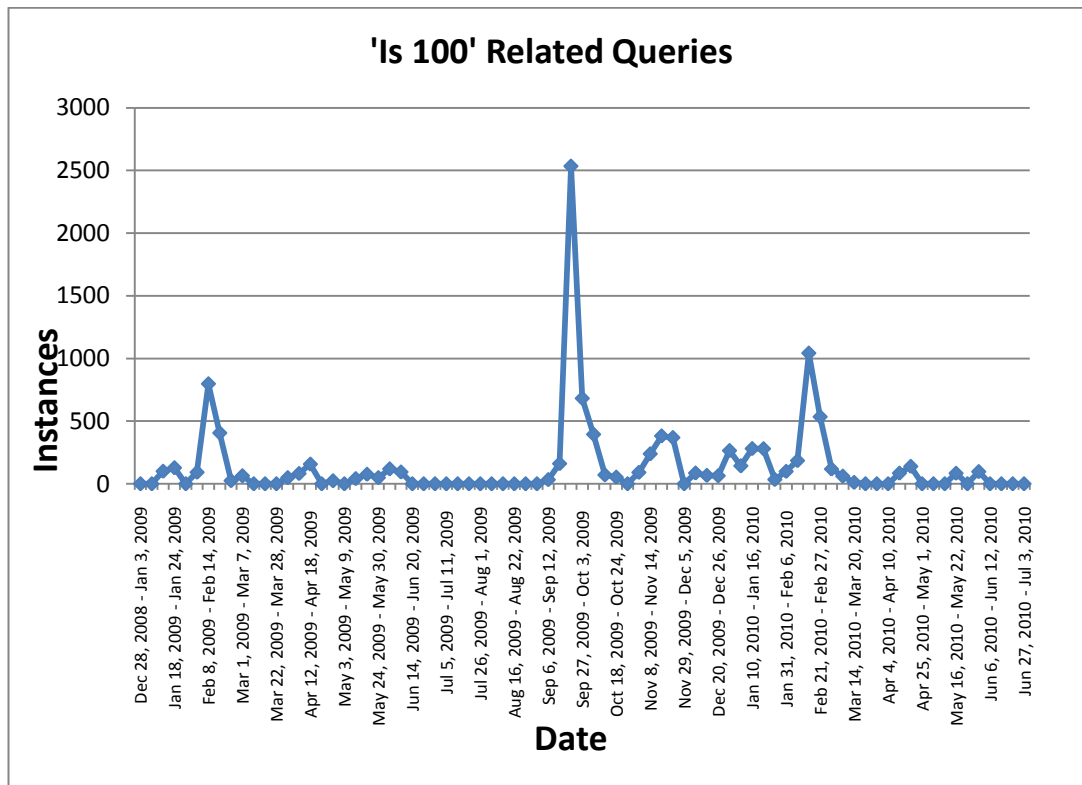


Figure 18 - Search Trend Of ‘is100’ Query Group

Discussion: “is 100” search for “Introduction to Information Technologies and Applications (IS100)” is one of most searched keyword in METU Website. Although “is 100” page is under Informatics Institute page, user searched this page from METU Website.

5.2.1.8. Query Group 8

‘metu online’ is eighth search query to analyze. Related keywords in this group are:

- metu online
- metuonline
- online
- online metu
- onlinemetu

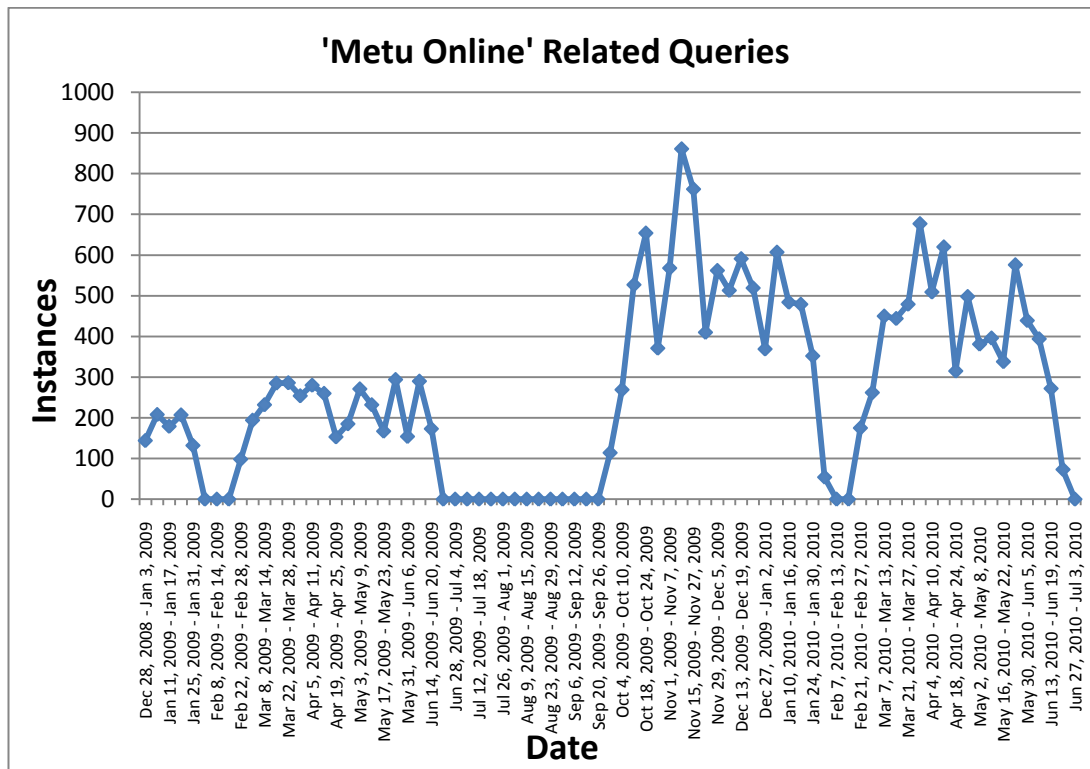


Figure 19 - Search Trend Of ‘METU Online’ Query Group

Discussion: As it can be seen from Figure “metu online” keyword always in top 20 keywords list except holidays. In semesters, trend of search has similarities because of homework and mid-term dates.

5.2.1.9. Query Group 9

‘not’ is ninth search query to analyze. Related keywords in this group are:

- grades
- not sistemi
- notlar
- yaz okulu notları

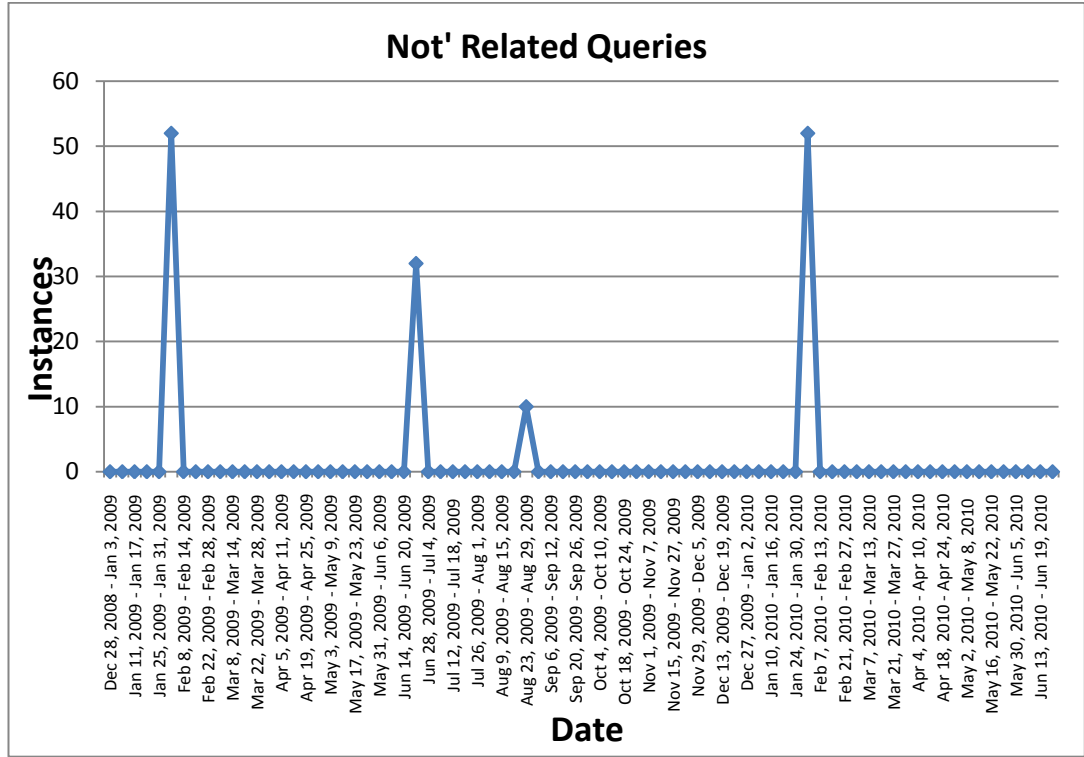


Figure 20 - Search Trend Of 'Not' Query Group

Discussion: “grades” search is in top 20 searched keywords four times in a year. This search started at announcement day of final grades.

5.2.1.10. Query Group 10

Proficiency’ is tenth search query to analyze. Related keywords in this group are:

- proficiency exam
- proficiency
- prof
- ingilizce yeterlik
- ingilizce yeterlilik
- ingilizce yeterlilik sınavı

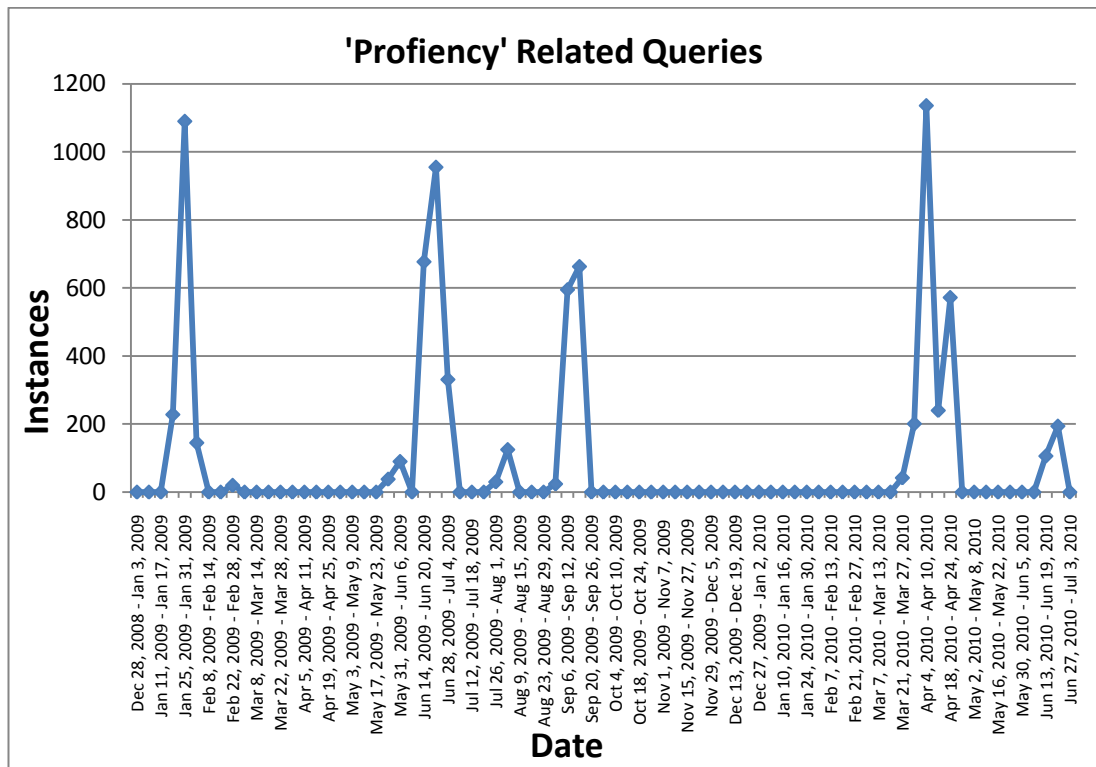


Figure 21 - Search Trend Of ‘Proficiency’ Query Group

Discussion: Proficiency exam was organized at 26-28 January 2009 , 16-18 June 2009, 3-5 August 2009, 4-10 September 2009 and 8-10 April 2010 and 17-22 June 2010 . In 2009 and 2010, Average search start days which users start to search before the exam were 9.5.

5.2.1.11. Query Group 11

‘withdraw’ is eleventh search query to analyze. This group includes only one keyword which is ‘withdraw’.

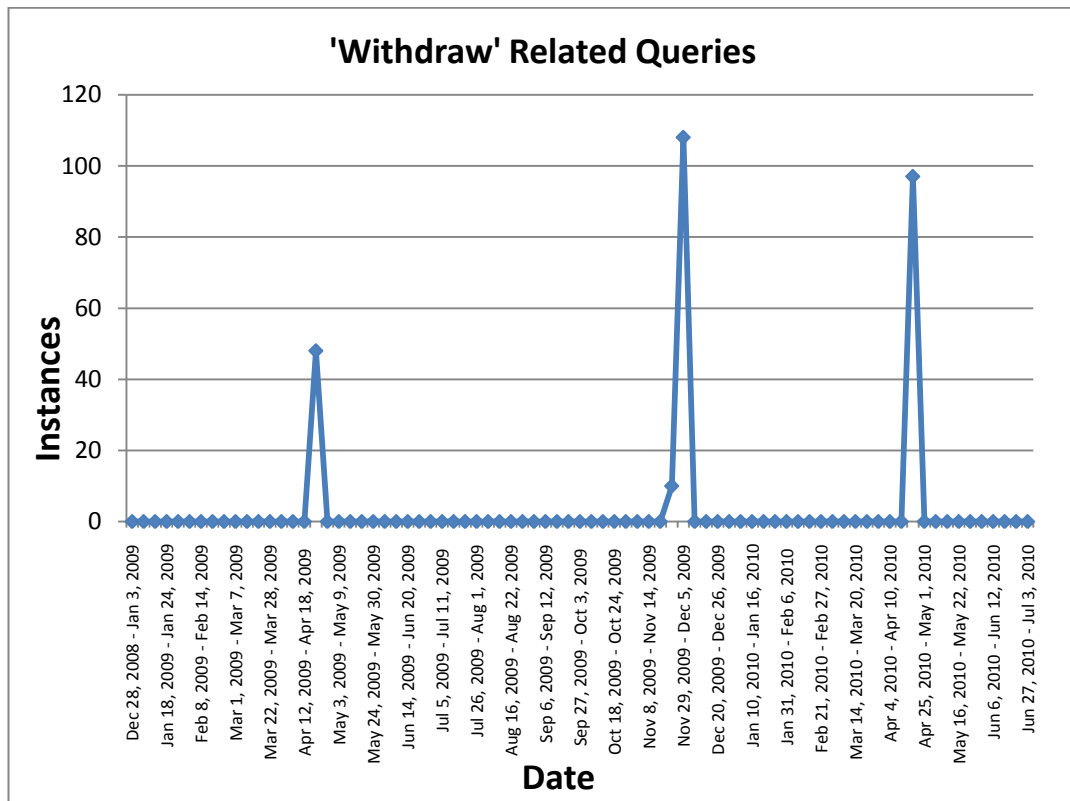


Figure 22 - Search Trend Of 'Withdraw' Query Group

Discussion: “withdraw” keyword is in top 20 searched keywords three times in a year. “withdraw” search started at last day for withdrawal from courses.

5.2.1.12. Query Group 12

‘yandal’ is twelfth search query to analyze. Related keywords in this group are:

- yan dal
- yandal

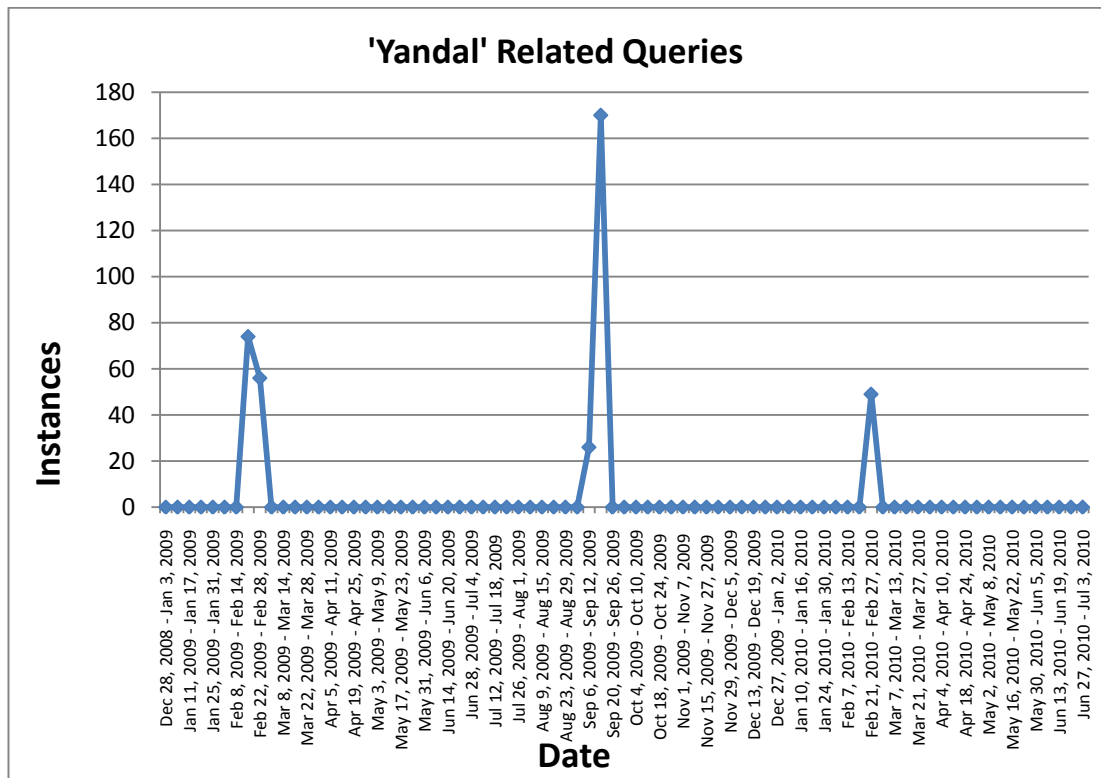


Figure 23 - Search Trend Of 'Yandal' Query Group

Discussion: “yandal (double minor)” search is in top 20 searched keywords three times in a year. “yan dal” search started at 10 days before the day that evaluations of double minor programs submitted to Registrar's Office.

5.2.1.13. Query Group 13

‘yatay geçiş’ is thirteenth search query to analyze. Related keywords in this group are:

- yatay gecis
- yatay geçiş

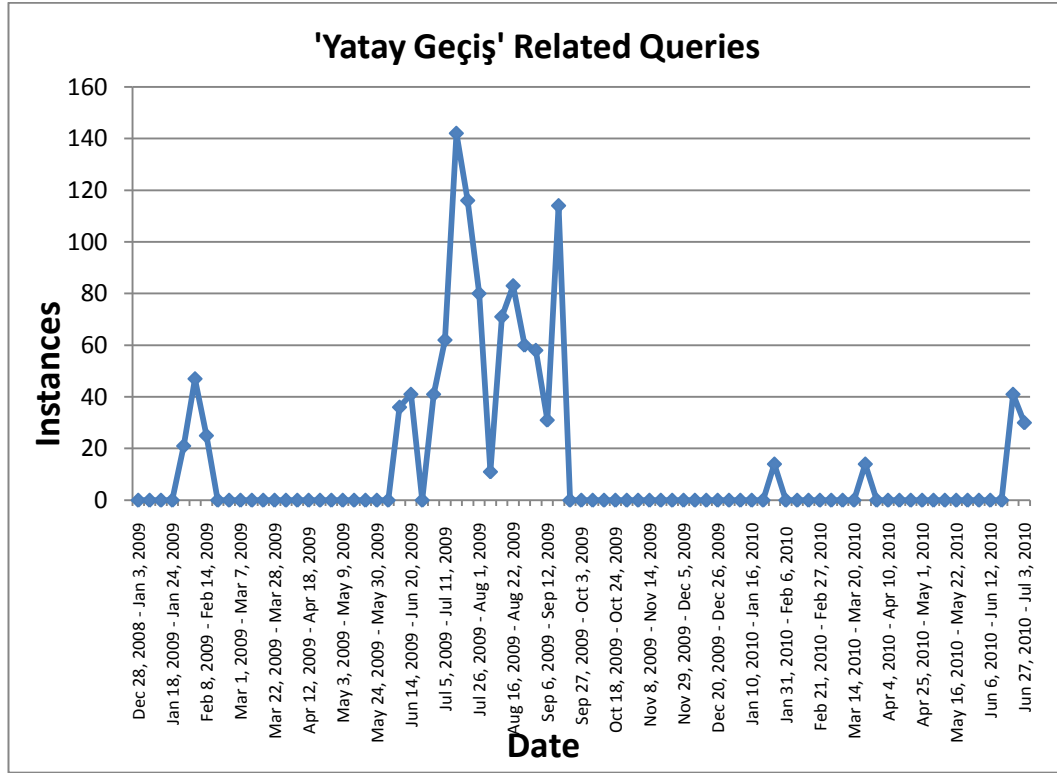


Figure 24 - Search Trend Of 'Yatay Geçiş' Query Group

Discussion: Applications for transfer from all other universities for undergraduate programs ended at 17 July 2009. Search about yatay geçiş (transfer) started at one and a half month before deadline.

5.2.1.14. Query Group 14

'yaz okulu' (summer school) is fourteenth search query to analyze. Related keywords in this group are:

- yaz okulu
- summer school

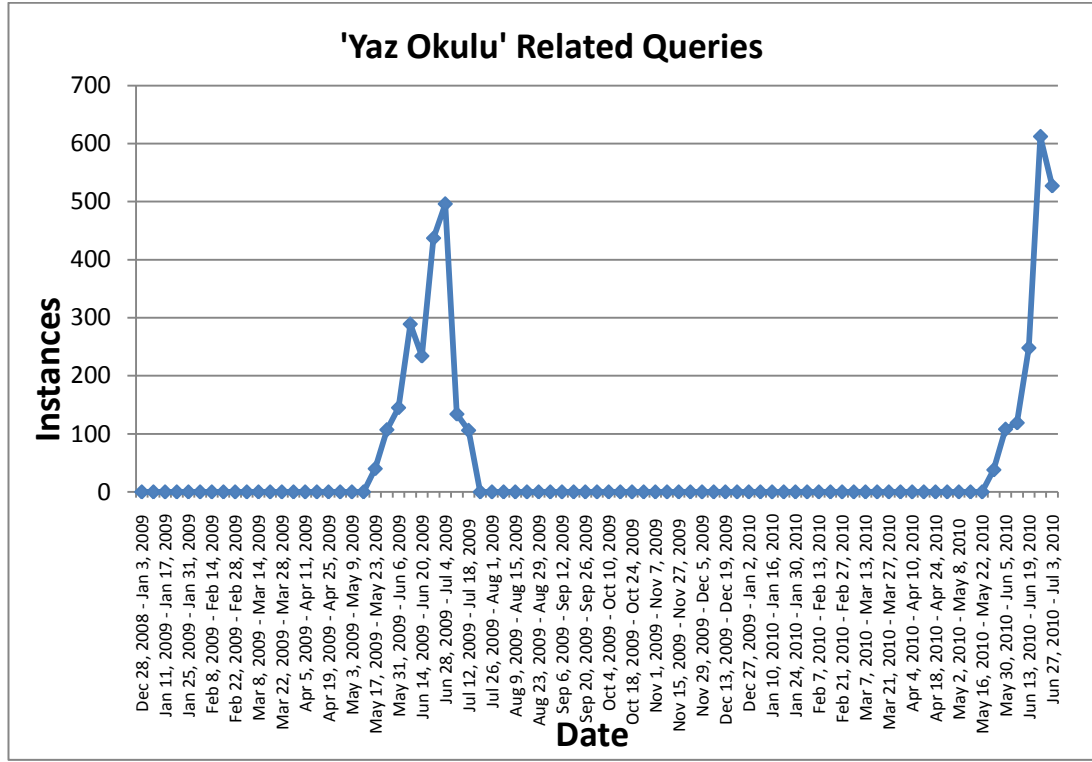


Figure 25 - Search Trend Of 'Yaz Okulu' Query Group

Discussion: Summer school started at 29 June 2009 and 28 June 2010. In 2009, users start to search summer school related queries at 17 May 2009 and in 2010, users start to search at 23 May 2010. Thus, users started to search about summer school one and a half month before summer school.

5.2.1.15. Query Group 15

'yurt' is fifteenth search query to analyze. Related keywords in this group are:

- yurt
- yurt sonuçları
- yurtlar
- yurtlar müdürlüğü

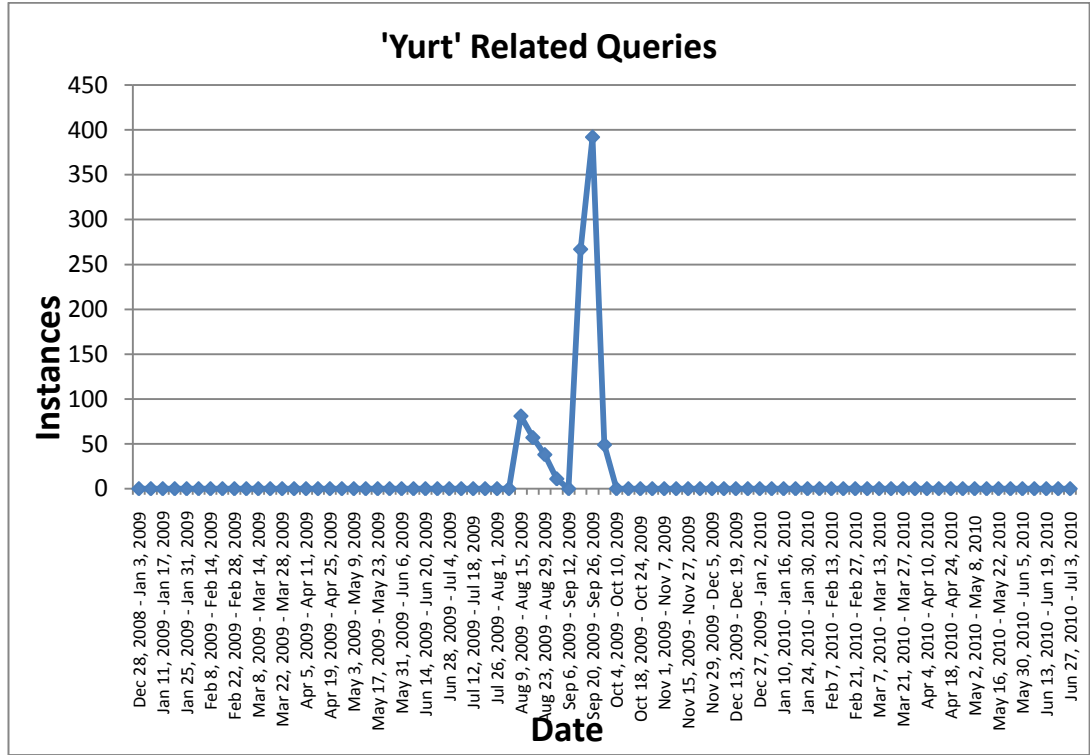


Figure 26 Search Trend Of ‘Yurt’ Query Group

Discussion: Yurt (Dormitory) related queries started before fall semester. That means, new students started to search about dormitory facilities before the semester.

5.2.1.16. Query Group 16

‘yüksek lisans’ is sixteenth search query to analyze. Related keywords in this group are:

- yüksek lisans
- yüksek lisans başvuru
- yüksek lisans

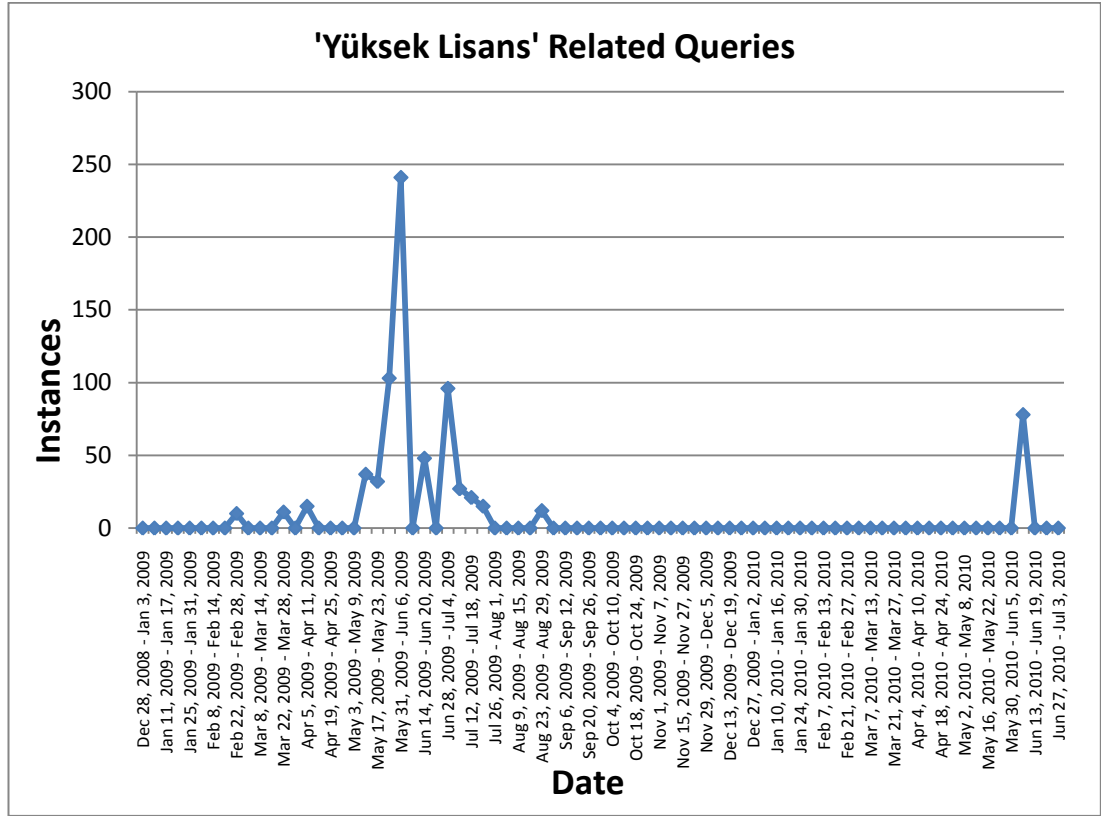


Figure 27 Search Trend Of 'Yüksek Lisans' Query Group

Discussion: “is 100” search for “Introduction to Information Technologies and Applications (IS100)” is one of most searched keyword in METU Website. Although “is 100” page is under Informatics Institute page, user searched this page from METU Website.

5.2.2. Summary Of The Search Statistics Results

Search statistics helped us to determine search trends of users about academic calendar related events. Selected keyword groups are keyword clusters include akademik takvim,add drop,bahar şenliği,çift anadal, erasmus,final tarihleri, harç, is100, notlar, proficiency, withdraw, yandal,yatay geçiş,yaz okulu,yurt and yüksek lisans. Landing page optimization method shows us:

- Keywords like “metu online” and “dbe” are mostly in top 20 keywords. These pages have information which students always need to reach.
- Keywords like “withdraw” and “grades” started to search in event day.
- Most keywords like “spring festival”, “summer school” and “final weeks”, started to be searched 15-30 days before the academic calendar related event.

5.3. CARD SORTING

User groups related with METU Web page, identified with the help of Informatics Group. Since METU website is information driven, users are named as ‘Information Seekers’. All user groups are selected with the help of the Informatics Group.

Table 64 User Groups of METU Web-Site

User Groups	
METU Members	
Student	METU undergraduate, M.S and Ph.D students
Alumni	People graduated from METU
Administrative Staff	People working in administrative units in METU
Academic Staff	People working in academic units in METU
Non-METU Members	
Research Group	Research groups looking for research groups in METU working in same field.
Companies	Companies looking for METU Graduate workers, researcher for their projects and information about METU Technopolis
Prospective Students	Students looking information for their programme choice

5.3.1. Card Sorting Sessions

In this study open card sort planned for two user groups. Cards were prepared with free listing method as in Sinha & Boutelle (2004)’s study. Free-listing method helped to generate full list information need that users searched on METU Website. Cards can be seen in APPENDIX A.

Think aloud procedure is used for both card sorting sessions held with 21 users in

“staff” group and 21 users in “alumni” group. OptimalSort which is online software is used for card sort sessions.

5.3.2. *Alumni User Group*

21 users from “Alumni” group sorted 37 cards which can be seen in APPENDIX A. They sorted and grouped the cards and gave a name to group.

5.3.2.1. *Dendogram*

Dendagram shows visual relationship of cards sorted in card sorting sessions.

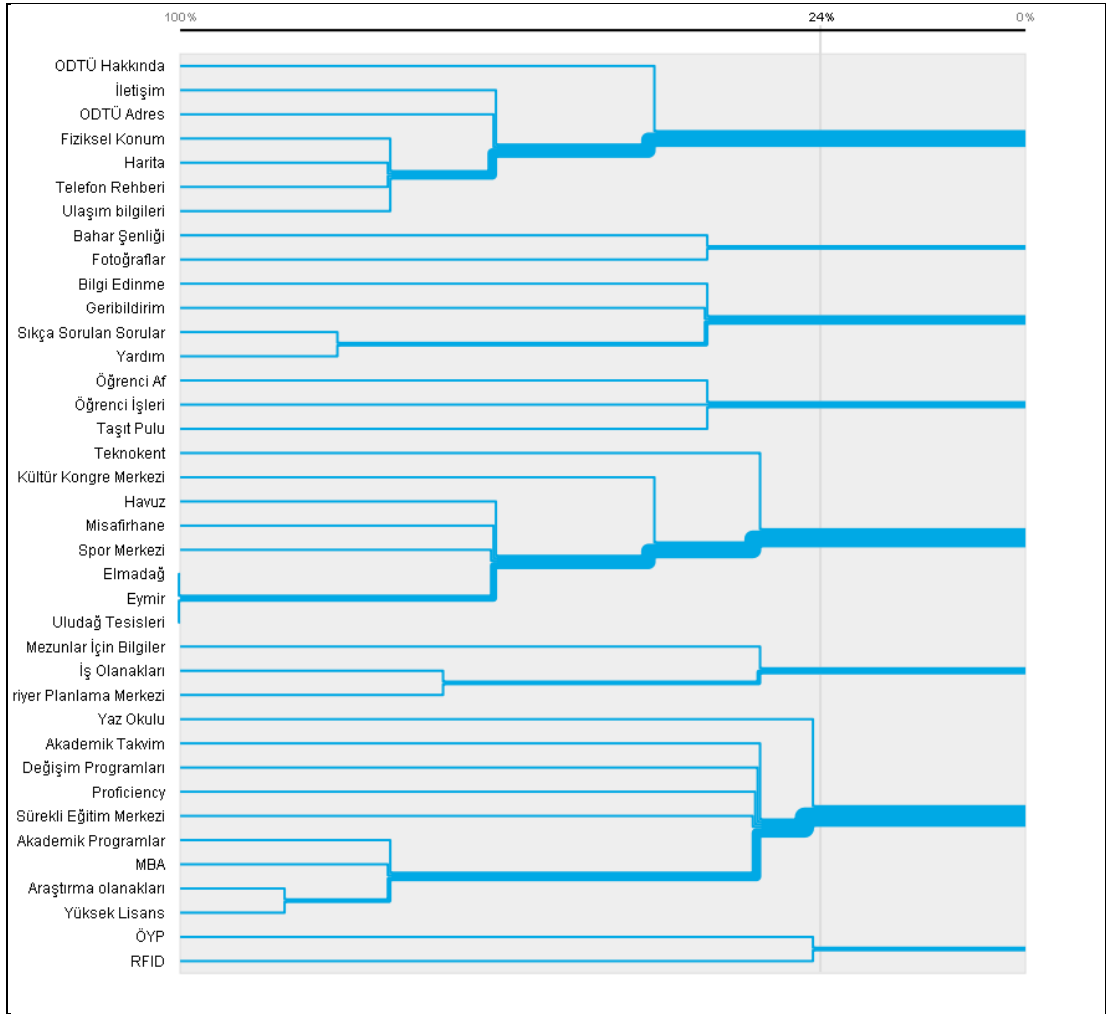


Figure 28 - Dendrogram of Card Sorting Session With 21 Users From METU Alumni

5.3.2.2. Cluster Analysis

Cluster analysis showed the users' categorization of given cards. When cluster number is three, "ODTÜ", "Akademik" (Academic) and "Tesisler" (Facilities) headlines can be highlighted.

Table 65 Cluster Analysis With 3 Clusters

3 Clusters			
Suggested names	ODTÜ (100,0%) ODTU hakkında (95,7%) mezun (genel) (91,7%)	Neden Buradayım? (82,8%) AKADEMİK (80,0%) AKADEMİK (78,6%)	Tesisler ve etkinlikler (100,0%) Nereye gitsek? (94,1%) SOSYAL TESİSLER (94,1%)
Match within cluster	34%	13%	42%
Contains cards	(10) Geribildirim (4) Bilgi Edinme (35) Yardım (27) Sıkça Sorulan Sorular (20) ODTÜ Adres (13) İletişim (33) Ulaşım bilgileri (11) Harita (8) Fiziksel Konum (32) Telefon Rehberi (21) ODTÜ Hakkında (9) Fotoğraflar	(37) Yüksek Lisans (2) Araştırma olanakları (17) MBA (0) Akademik Programlar (29) Sürekli Eğitim Merkezi (36) Yaz Okulu (5) Değişim Programları (25) Proficiency (1) Akademik Takvim (24) ÖYP (23) Öğrenci İşleri (22) Öğrenci Af (30) Taşıt Pulu (26) RFID (15) Kariyer Planlama Merkezi (14) İş Olanakları (18) Mezunlar İçin Bilgiler	(28) Spor Merkezi (12) Havuz (19) Misafirhane (16) Kültür Kongre Merkezi (7) Eymir (6) Elmadağ (34) Uludağ Tesisleri (31) Teknokent (3) Bahar Şenliği

When cluster number is four, “ODTÜ”, “Akademik” (Academic), “Tesisler” (Facilities) and “Mezun” (Alumni) headlines can be highlighted.

Table 66 - Cluster Analysis With 4 Clusters

4 Clusters				
Suggested names	ODTÜ (100,0%) ODTU hakkında (95,7%) mezun (genel) (91,7%)	Tesisler ve etkinlikler (100,0%) Nereye gitsek? (94,1%) SOSYAL TESİSLER (94,1%)	AKADEMİK (88,9%) Akademik Konular (88,0%) AKADEMİK (88,0%)	ODTÜ SONRASI (100,0%) MEZUNLAR (100,0%) Mezunlar (80,0%)
Match within cluster	34%	42%	19%	44%
Contains cards	(10) Geribildirim (4) Bilgi Edinme (35) Yardım (27) Sıkça Sorulan Sorular (20) ODTÜ Adres (13) İletişim (33) Ulaşım bilgileri (11) Harita (8) Fiziksel Konum (32) Telefon Rehberi (21) ODTÜ Hakkında (9) Fotoğraflar	(28) Spor Merkezi (12) Havuz (19) Misafirhane (16) Kültür Kongre Merkezi (7) Eymir (6) Elmadağ (34) Uludağ Tesisleri (31) Teknokent (3) Bahar Şenliği	(37) Yüksek Lisans (2) Araştırma olanakları (17) MBA (0) Akademik Programlar (29) Sürekli Eğitim Merkezi (36) Yaz Okulu (5) Değişim Programları (25) Proficiency (1) Akademik Takvim (24) ÖYP (23) Öğrenci İşleri (22) Öğrenci Af (30) Taşıt Pulu (26) RFID	(15) Kariyer Planlama Merkezi (14) İş Olanakları (18) Mezunlar İçin Bilgiler

5.3.3. Staff User Group

21 users from “Staff” group sorted 84 cards which can be seen in APPENDIX A. 12 of 21 users were academic staff and other 9 users were administrator staff. They sorted and grouped the cards and gave a name to group.

5.3.3.1. Dendogram

Dendagram shows visual relationship of cards sorted in card sorting sessions.

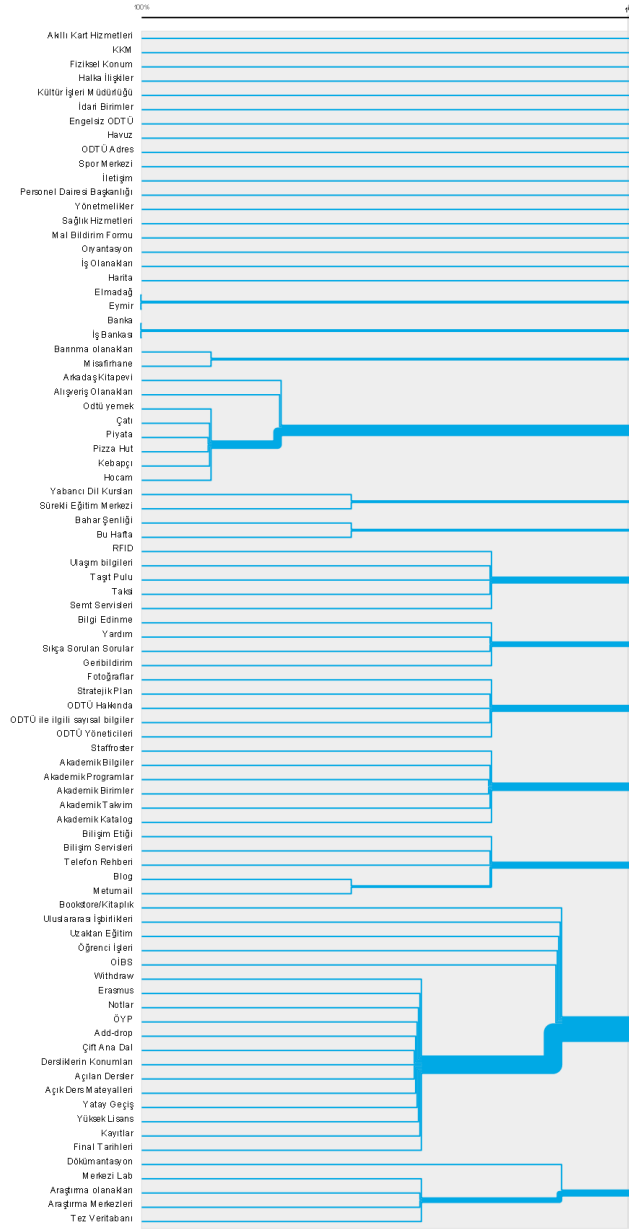


Figure 29 - Dendrogram of Card Sorting Session With 21 Users From METU Staff

5.3.3.2. Cluster Analysis

Cluster analysis showed the users' categorization of given cards. When cluster number is three, "Öğrenci" (Student), "ODTÜ Hakkında" (About METU) and "Sosyal Yaşam" (Social Life) headlines can be highlighted.

Table 67 - Cluster Analysis With 3 Clusters

3 Clusters			
Suggested names	Öğrenciler İçin Gerekli Bilgiler (83,7%) A Grubu (78,0%) Öğrenci İşleri (69,8%)	Odtü Hakkında (58,2%) Genel (49,1%) Ulaşım ve İletişim Bilgileri (46,2%)	Odtü'de Yaşam ve Sosyal Olanaklar (97,4%) Universitede Yaşam (90,9%) ODTÜ'de Sosyal Yaşam ve Olanaklar (72,7%)
Match within cluster	18%	9%	29%
Contains cards	(53) Araştırma Merkezleri (10) Merkezi Lab (49) Araştırma olanakları (79) Tez Veritabanı (52) Akademik Takvim (38) Akademik Bilgiler (41) Akademik Programlar (76) Akademik Katalog (51) Akademik Birimler (19) Staffroster (45) Yatay Geçiş (30) Add-drop (24) Withdraw (35) Çift Ana Dal (71) Final Tarihleri (44) Açık Ders Mateyalleri (40) Açılan Dersler (36) Dersliklerin Konumları (68) Yüksek Lisans (26) Erasmus (69) Kayıtlar (27) Notlar (80) OİBS (74) Öğrenci İşleri (28) ÖYP	(82) METUmail (78) Telefon Rehberi (75) Bilişim Servisleri (32) Bilişim Etiği (77) Blog (2) RFID (1) Akıllı Kart Hizmetleri (62) Sıkça Sorulan Sorular (56) Yardım (81) Geribildirim (3) Bilgi Edinme (22) Engelsiz ODTÜ (73) Semt Servisleri (60) Taksi (54) Taşıt Pulu (50) İletişim (12) Fiziksel Konum (37) ODTÜ Adres (29) Ulaşım bilgileri (83) Harita (70) Oryantasyon (42) ODTÜ ile ilgili sayısal bilgiler (13) ODTÜ Hakkında (6) Fotoğraflar (55) Uluslararası İşbirlikleri (8) Stratejik Plan (65) ODTÜ Yöneticileri (15) Kültür İşleri Müdürlüğü (14) Halka İlişkiler (7) KKM (16) İdari Birimler (9) Dökümantasyon (64) Mal Bildirim Formu (61) Yönetmelikler (58) Personel Dairesi Başkanlığı (72) İş Olanakları (11) Sürekli Eğitim Merkezi (0) Yabancı Dil Kursları (59) Uzaktan Eğitim	(34) Alışveriş Olanakları (5) Arkadaş Kitapevi (31) Piyata (17) Çatı (66) Kebapçı (33) Pizza Hut (67) Hocam (4) Odtü yemek (57) İş Bankası (21) Banka (63) Sağlık Hizmetleri (20) Bookstore/Kitaplık (46) Eymir (18) Elmadağ (23) Havuz (43) Spor Merkezi (48) Misafirhane (39) Barınma olanakları (47) Bu Hafta (25) Bahar Şenliği

When cluster number is four, “Öğrenci” (Student), ”ODTÜ Hakkında” (About METU) , “Sosyal Yaşam” (Social Life) and “İdari” (Administrator) headlines can be highlighted.

Table 68 - Cluster Analysis With 4 Clusters

4 Clusters				
Suggested names	Öğrenciler İçin Gerekli Bilgiler (83,7%) A Grubu (78,0%) Öğrenci İşleri (69,8%)	Odtü'de Yaşam ve Sosyal Olanaklar (97,4%) Universitede Yasam (90,9%) ODTÜ'de Sosyal Yaşam ve Olanaklar (72,7%)	Ulaşım ve İletişim Bilgileri (60,0%) Odtü Hakkında (55,8%) Genel Hatlarıyla ODTÜ (54,1%)	İdari Bilgiler (72,7%) PDB (58,8%) Birimler (57,1%)
Match within cluster	18%	29%	11%	13%
Contains cards	(53) Araştırma Merkezleri (10) Merkezi Lab (49) Araştırma olanakları (79) Tez Veritabanı (52) Akademik Takvim (38) Akademik Bilgiler (41) Akademik Programlar (76) Akademik Katalog (51) Akademik Birimler (19) Staffroster (45) Yatay Geçiş (30) Add-drop (24) Withdraw (35) Çift Ana Dal (71) Final Tarihleri (44) Açık Ders Mateyalleri (40) Açılan Dersler (36) Dersliklerin Konumları (68) Yüksek Lisans (26) Erasmus (69) Kayıtlar (27) Notlar (80) OİBS (74) Öğrenci İşleri (28) ÖYP	(34) Alışveriş Olanakları (5) Arkadaş Kitapevi (31) Piyata (17) Çatı (66) Kebapçı (33) Pizza Hut (67) Hocam (4) Odtü yemek (57) İş Bankası (21) Banka (63) Sağlık Hizmetleri (20) Bookstore/Kitaplık (46) Eymir (18) Elmadağ (23) Havuz (43) Spor Merkezi (48) Misafirhane (39) Barınma olanakları (47) Bu Hafta (25) Bahar Şenliği	(82) METUmail (78) Telefon Rehberi (75) Bilişim Servisleri (32) Bilişim Etiği (77) Blog (2) RFID (1) Akıllı Kart Hizmetleri (62) Sıkça Sorulan Sorular (56) Yardım (81) Geribildirim (3) Bilgi Edinme (22) Engelsiz ODTÜ (73) Semt Servisleri (60) Taksi (54) Taşıt Pulu (50) İletişim (12) Fiziksel Konum (37) ODTÜ Adres (29) Ulaşım bilgileri (83) Harita (70) Oryantasyon (42) ODTÜ ile ilgili sayısal bilgiler (13) ODTÜ Hakkında (6) Fotoğraflar (55) Uluslararası İşbirlikleri (8) Stratejik Plan (65) ODTÜ Yöneticileri	(15) Kültür İşleri Müdürlüğü (14) Halka İlişkiler (7) KKM (16) İdari Birimler (9) Dökümantasyon (64) Mal Bildirim Formu (61) Yönetmelikler (58) Personel Dairesi Başkanlığı (72) İş Olanakları (11) Sürekli Eğitim Merkezi (0) Yabancı Dil Kursları (59) Uzaktan Eğitim

5.3.4. *Summary of Card Sorting Results*

Card sorting study helped us to determine information architecture of users from different user groups. 21 users from METU Alumni and METU staff sorted cards that were prepared by free listing technique. Card sorting method showed us:

- Free listing method showed that METU website has different content for different user groups.
- Users from different user groups can differently group items.
- Think aloud technique showed that users from different groups have different expectations from website.

CHAPTER VI

CONCLUSION

In this thesis study, METU website's current design problems like static index page, one landing page for all user groups, limited distribution channels, content frequency update and mobile access have been discovered. Aims of the study have been defined in the light of current design problems. Aims of the study are to improve the information architecture of website, to gather general statistics about user preferences, to analyze mobile website's efficiency, to learn users' search behaviours and to gather information about user groups and content.

In order to increase information architecture and information availability of website, Google Analytics is chosen as the web analytics tool to get detailed custom reports about users' preferences, landing page optimization and lostness factor analysis. As a contribution, users' sessions gathered from Google Analytics are analyzed to determine users' lostness while searching information on website. New methodology is formed to define problematic keyword clusters and analyze session information. Mobile page effectiveness is analyzed to determine users' preferences when they are redirected to text-version of website. Error page statistics are analyzed to find pages including broken links. Search statistics are used to determine users' information search trends. These methods are used to get insights about new website design process.

This study indicated important findings about users' preferences and mental models.

Users try to reach METU website by searching keywords 'odtü', 'odtu.edu.tr', 'metu', 'otdü' and 'oddü' from Google. Instead of typing "www.odtu.edu.tr" to address bar in browser, they select to search from Google and click the first result on search results page. Top screen resolution statistics showed us that 66% of users reach to the website with 1280x800 and 1024x768 screen resolutions which mostly used by laptops. As in as in Arendt & Wagner (2010)'s study, every computer in university labs opened METU website homepage by default which caused high bounce rate. 73.23% of users from METU bounced while 58.58% of users using "tt adsl-alcatel dynamic_ulus" service provider bounced on index page.

Information architecture and availability of current website are analyzed with landing page optimization and lostness factor methodologies. These methods indicate that users landed on wrong pages instead of target page of related keyword. Text version of the website also causes wrong landing page and keyword pairs. Moreover, when users landed on target page of related keyword, lostness factor analysis shows that users cannot find related information about keyword and get lost while searching information. Swimming pool schedule, tuition of graduate programs and contact info of departments are examples of information searched on METU website.

Mobile page analysis showed that 24% of users continue to navigate when they are redirected to text version website. This showed that redirection to text version is not efficient. Error page optimization indicated that index page includes broken links more than other pages.

Card sorting method indicated that different user groups have different information needs. Free listing method showed us that every user group which are Student, Alumni, Staff, Research Groups, Companies, Prospective Students need to have different landing page in order to different information needs. Information structure of each landing page can be determined by using open card sort. In this study two user groups' information structured were gathered and analyzed.

Search statistics were used to analyze users' search trend for content frequency

update problem. The results showed that, a user starts searching for an academic calendar related event 15-30 days before it; however information on a web page is updated twice a year, leading to misinformation to arise on the side of the user.

According to the results of methods used, recommendations for new website design process are formed. Recommendations are:

- METU Website needs to be updated more frequently and search trends need to be considered for content update. In-site search statistics must be tracked.
- Every user group in METU must have different landing page. Index page is not useful for all user groups.
- Mobile interface needs to be designed for users considering mobile devices and browsers.
- METU Website must have information about departments and faculties and these pages must include basic information about departments and faculties like contact, e-mail, dean, address and secretary.
- When a page includes a text related to another page, it must be linked to that page. For example swimming pool text in “about/misguide.php” must be linked to “clife/sports.php” page. This improvement helps users to land on target page of the keyword.
- Text version must not be reachable from search engines to prevent users to land a text version of a page.
- For better, search engine optimization, main navigation menu must be CSS based.
- Broken links are found mostly on index page of METU Website. Dynamic events and announcement part is refreshed in every 5 minutes and if someone deletes an event which is recently added, this event link turns into a broken link. So, this part must be refreshed on every database action.
- Error page must be tracked in order to find broken links.
- 1280x800 and 1024x768 are most popular screen resolution types. This must be considered during the new design process.

Prototype of the new website can be seen in Figure 30.



Figure 30 – Prototype of the new METU website

Further studies can be done with think-aloud study to verify new design. Also eye-tracking can be used for verifying new design by comparing Google Analytics metrics with eye tracking metrics. Moreover, for card sort study, closed card sort can be used to verify new information structure.

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APPENDICES

APPENDIX-A –CARDS FOR USER GROUPS

Staff	Alumni
Yabancı Dil Kursları	Akademik Programlar
Akıllı Kart Hizmetleri	Akademik Takvim
RFID	Araştırma olanakları
Bilgi Edinme	Bahar Şenliği
Odtü yemek	Bilgi Edinme
Arkadaş Kitapevi	Değişim Programları
Fotoğraflar	Elmadağ
KKM	Eymir
Stratejik Plan	Fiziksel Konum
Dökümantasyon	Fotoğraflar
Merkezi Lab	Geribildirim
Sürekli Eğitim Merkezi	Harita
Fiziksel Konum	Havuz
ODTÜ Hakkında	İletişim
Halka İlişkiler	İş Olanakları
Kültür İşleri Müdürlüğü	Kariyer Planlama Merkezi
İdari Birimler	KKM
Çatı	MBA
Elmadağ	Mezunlar İçin Bilgiler
Staffroster	Misafirhane
Bookstore/Kitaplık	ODTÜ Adres
Banka	ODTÜ Hakkında
Engelsiz ODTÜ	Öğrenci Af
Havuz	Öğrenci İşleri
Withdraw	ÖYP
Bahar Şenliği	Proficiency
Erasmus	RFID
Notlar	
ÖYP	Spor Merkezi
Ulaşım bilgileri	
Add-drop	Taşıt Pulu
Piyata	Teknokent
Bilişim Etiği	Telefon Rehberi

Pizza Hut	Ulaşım bilgileri
Alışveriş Olanakları	Uludağ Tesisleri
Çift Ana Dal	Yardım
Dersliklerin Konumları	Yaz Okulu
ODTÜ Adres	Yüksek Lisans
Akademik Bilgiler	
Barınma olanakları	
Açılan Dersler	
Akademik Programlar	
ODTÜ ile ilgili sayısal bilgiler	
Spor Merkezi	
Açık Ders Mateyalleri	
Yatay Geçiş	
Eymir	
Bu Hafta	
Misafirhane	
Araştırma olanakları	
İletişim	
Akademik Birimler	
Akademik Takvim	
Araştırma Merkezleri	
Taşıt Pulu	
Uluslararası İşbirlikleri	
Yardım	
İş Bankası	
Personel Dairesi Başkanlığı	
Uzaktan Eğitim	
Taksi	
Yönetmelikler	
Sıkça Sorulan Sorular	
Sağlık Hizmetleri	
Mal Bildirim Formu	
ODTÜ Yöneticileri	
Kebapçı	
Hocam	
Yüksek Lisans	
Kayıtlar	
Oryantasyon	
Final Tarihleri	
İş Olanakları	
Semt Servisleri	
Öğrenci İşleri	
Bilişim Servisleri	
Akademik Katalog	
Blog	
Telefon Rehberi	

Tez Veritabanı	
OİBS	
Geribildirim	
METUmail	
Harita	