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BAHÇEŞEHİR UNIVERSITY

A WEB-BASED AUDIT PLATFORM FOR INTERNAL AUDIT DEPARTMENTS OF BANKS

M.S. Thesis

BETÜL DOĞAN

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Supervisor: Asst. Prof. Dr. SELÇUK BAKTIR

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ABSTRACT

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Doğan, Betül

Computer Engineering Master Program

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The emergence of modern technology resulted in the broad usage of information systems in many business areas because of its advantages. The usage of web-based applications in almost every business area has increased with the availability of practical and quick solutions offered by information systems and the widespread use of the Internet. In this way, it became possible provide services to anybody at any time of a day in a costless and effortless way.

In conjunction with these developments, the auditing profession is constantly improving by renewing itself. Besides, using the advantages of information systems promote a broad range of value-added internal auditing. However, when we look at the previous researches, we see that information systems in auditing are used generally to facilitate and assist the audit activity in specific areas.

The purpose of this thesis is to develop a web-based audit platform (W-BAP) which can be used by auditors to perform control activities periodically. With our software, an auditor can generate an annual work plan, can save audit evidences as an attachment to working papers and share their findings with related departments. Thus the auditor will be able to operate a complete audit from beginning to end with this software. Using this software, it is possible for audit department of a bank to be compatible with the International Internal Audit Standards which is issued by The Institute of Internal Auditors (IIA). In the end, we test W-BAP using according to Technology Acceptance Model (TAM) for ease of use and usability.

Keywords: Internal Audit, Web-Based Audit, Information Systems Used in Audit, Risk Control Matrices, Internal Audit in Bank

ÖZET

BANKALARIN İÇ DENETİM BİRİMLERİ İÇİN WEB TABANLI DENETİM PLATFORMU

Doğan, Betül

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Modern teknolojinin ortaya çıkması, bilgi sistemlerinin, avantajları nedeniyle, birçok iş alanında geniş kullanımıyla sonuçlanmıştır. Bilgi sistemleri ve internet kullanımının yaygınlaşmasıyla birlikte sunulan pratik ve hızlı çözümler hemen hemen her iş alanında, web-tabanlı uygulamaların kullanımını arttırmıştır. Bu şekilde, günün her anında herhangi birine zahmetsiz ve masrafsız bir şekilde hizmet sunmak mümkün hale gelmiştir.

Bu gelişmeler ile birlikte, denetim mesleği de sürekli kendini yenileyerek gelişmektedir. Ayrıca bilgi sistemlerinin avantajını kullanmakta geniş bir alanda katma-değerli iç denetimi teşvik etmektedir. Ancak daha önceki araştırmalara baktığımızda, bilgi sistemlerinin denetim alanında genellikle belirli alanlardaki denetim faaliyetlerini kolaylaştırmak ya da denetim faaliyetlerine yardımcı olmak için kullanıldığını görüyoruz.

Bu yüksek lisans tezinin amacı Web Tabanlı Denetim Platformu (W - TDP) olarak isimlendirilen ve denetim birimlerince icra edilen periyodik kontrollerin sistem üzerinden gerçekleştirilmesini sağlayan bir yazılım geliştirmektir. Uygulama, bir denetçinin yıllık planını sistem üzerinden yapmasına olanak sağlayarak, çalışma kâğıtlarını sistem üzerinde oluşturması, denetim kanıtlarını ilgili çalışma kâğıtlarına ekleyerek, bulgularını ilgili birimlerle paylaşmasına imkân verir. Böylelikle, bir denetçi bu yazılım aracılığıyla baştan sona bir denetim faaliyetini icra etmiş olur. Bu uygulama, ayrıca Uluslararası İç Denetçiler Enstitüsü (IIA) tarafından yayınlanan Uluslararası İç Denetim Standartlarına uygun bir yapıyı da sağlama imkânı verir. Sonuç olarak, W - TDP yazılımının kullanılabilirliği ve yararlılığı, Teknoloji Tasdik Modeli (TTM) ile test edilecektir.

Anahtar Kelimeler: İç Denetim, Web Tabanlı Denetim, Denetimde Bilgi Sistemleri Kullanımı, Risk Kontrol Matrisleri, Bankada İç Denetim

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LIST OF ABBREVIATIONS

ACL	:	Audit Command Language
ASP	:	Active Server Pages
CA	:	Continuous Auditing
CAAT	:	Computer Assisted Auditing Tools
CAc	:	Control Activity
CAE	:	Chief Audit Executive
CM	:	Continuous Monitoring
DSS	:	Decision Support Systems
EDP	:	Electronic Data Processing
ES	:	Expert Systems
IDEA	:	Interactive Data Extraction and Analysis
IIA	:	The Institute of Internal Auditors
IS	:	Information Systems
RCM	:	Risk Control Matrix
SDLC	:	System Development Life Cycle
SQL	:	Structured Query Language
TAM	:	Technology Acceptance Model
W-BAP	:	Web-Based Audit Platform
WP	:	Working Plan

1. INTRODUCTION

Globalization has brought many advantages in many business areas. Nonetheless, new risks issues raised as a result of this rapid change. The experiences revealed that if this adaptation process could not be managed effectively, these risks could cause bad impacts especially for enterprises. Therefore, controlling, evaluating and also monitoring control environment, governance process, risk management, compliance and information technologies of an enterprise was became more important when it compared with the past.

Internal audit profession was became a proficiency which was continuously developing, changing especially within 20-30 years, simultaneously globalization of the world to support the board of directors and senior management while performing their duties (Özbek 2012, p. 20). Advantages of the information systems have helped internal auditors to develop new tools and techniques. These advancements have supported internal auditors to perform their engagements in professional ways. In addition to that minimization of the risks which came from the proficiency itself.

Usage and the scope of computers, especially internet, are increasing day by day, so this increase brings so many innovative ways and a chance to enlarge their operations for companies such as banking, education, manufacturing by giving easy access the information from anywhere (Ginige & Murugeson 2001, pp. 14-18). In this way, web-based applications were chosen by the enterprises because of their advantages to give a chance to connect and revamp the systems and processes with a more reducible cost (Lazaakidou 2010, p. 154).

This contribution is about a web-based application which can be used by internal auditors by performing their routine internal audit activities, especially in a bank. Information systems increasingly have taken a big place in auditing areas because of their usefulness. Traditional methods were replaced with more modern, technological and paperless methods to make audit duty more contemporary. The standardization of performing audit profession in a systematic way was aimed to combine information

systems advantages and the audit profession. The importance of this research is came from its objective which is made a compliance with Institute of Internal Auditors (IIA) standards by giving a chance to provide Continuous Auditing (CA) and Continuous Monitoring (CM) to auditors, senior managements and also the board of directors.

The main goal of this contribution is to develop a web-based audit platform called "WEB-BASED AUDIT PLATFORM (W-BAP)" with an emphasis on the ease of use and usability. By this platform it will be possible to meet the auditors' needs while doing their engagements. They can make an annual engagement plan. After planning, during the performance of the engagement, working papers can be created and audit evidences can be uploaded as an attachment. The findings can be shared with the departments which are related to the process. With the follow – up screens, monitoring the results of findings will be possible. Besides, there is a chance to make suitable change on the plan with the revision screens. At the same time, all these processes can be overviewed by supervisors and review comments can be shared between auditors and the supervisors.

When reviewed the previous literature, unfortunately, there is no research or experience related to the performance of audit on an application. Thus, this thesis will be the first research on performing auditing and evaluating this software with Technology Acceptance Model (TAM).

The remainder of this thesis begins with a brief background internal audit and the information systems which were used for auditing. The third section gives information about previous researches which tools and techniques were used. The next section talks about the development process and the W-BAP software, deeply. The fifth section discusses the results of the software which was tested with 28 auditors in a survey. Finally, the conclusion part shares the suggestions for future works.

2. BACKGROUND

The purpose of this chapter is to give some useful information which makes the project more understandable. Two main topics were conducted. The first one was about internal audit, it's meaning and also some related keywords about auditing. The latter one's aim was to explain some Information Systems (IS) which were used for auditing.

2.1 INTERNAL AUDIT

Auditing can be defined as a systematic approach which is evaluating the current position of an entity, area, process or financial account objectively and independently, comparing them an accepted criterion such as a legal, regulatory standard or internally policies and procedures, and finally communicating or reporting the results to the users and also management (Boecker et al 2008, p. 2).

The definition of the internal auditing is described by IIA is given below (Türkiye İç Denetim Enstitüsü 2010, p. 2):

> *Internal audit is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance process.*

According to this definition, the main objective of audit can be summarized as giving an assurance to the organization by evaluating the company's adherence to operational, financial and compliance policies, guidelines and regulations (Boecker et al 2008, p. 3). Audits can serve as a control system which is combining detective and preventive control mechanisms. Hence at the end of audit process, the company gets a chance to improve existing conditions according to predetermined or accepted criteria with the overall opinion of auditing (Boecker et al 2008, p. 3).

Internal auditing is a process and also a supportive power for the board of directors and senior managements in the achievement of the organizations' objectives by doing routine controls on the risky areas. So this responsibility brings the importance of the CA and CM concepts parallel to their responsibilities.

CA is explained in Deloitte LLP (2010, p. 2), "… enables internal audit to continually gather from processes data that supports auditing activities". CM is defined in Deloitte LLP (2010, p. 2), "… enables management to continually review business process for adherence to and deviations from their intended levels of performance and effectiveness". More timely and more useful information are gotten by CA which makes possible to report all deficiencies, irregularities in the control environment on time. (ISACA 2002, p. 43)

These two terms are connected to each other, although CA is the responsibility of audit departments while CM is the responsibility of the management. CA/CM helps organizations to achieve their goals by helping them to supervise the irregularities timely, reduce the errors, compliance the regularity procedures (KPMG International 2012, p. 4).

To sum up, by using CA/CM, audit departments evaluate the organizations' control environment and risk management in a shorter time in a moment which is the primary duty of the audit departments (Özbek 2012, p. 1078). Hence, the importance of the IS is raised with CA/CM terms.

2.2 INFORMATION SYSTEMS USED FOR AUDITING

Recently, with the increase in usage of computers, many software programs started to use everywhere for many reasons. IS provides organizations to operate more efficiently, timely and costless. With the constantly changing world conditions, audit profession is also get a progress in this timeline (Özbek 2012, p. 20). Because of these developments in these two areas brought accordingly, the usage of IS in auditing itself to make audit profession more effective and efficient while performing their engagements. Software programs, which was especially developed for audit, was started to get a big role in auditing.

The sufficient and also competent audit evidence has a more important role for the auditor while performing and getting an objective opinion on the subject to audit

(Boecker et al 2008, p. 3). These types of audit procedures, the Computer Assisted Auditing Tools (CAATs) software programs such as Audit Common Language (ACL) and Interactive Data Extraction and Analysis (IDEA), which gives opportunity to write inquiries on a described scenario, are used for control, monitoring, analyzing and evaluating activities (Özbek 2012, p. 1028).

For evaluating internal control environment, training invoices and other types of audit procedures, Expert Systems (ES) and Decision Support Systems (DSS) which is a decision making systems with the expertise, are used as IS (Chou et al 2007, Sung & You 2006, Changchit 2003, Delisio et al 1994, Hensen & Messier 1992, McKee 1992, Murphy & Brown 1992).

In conclusion, it is possible to see that IS tools which were used in auditing area, gives an opportunity to conduct the engagement in a more modern, timeless way as compared with the traditional way. It uses the advantage of IS to process whole data in a short time and the advantage of seeing the big picture or with using the experts experiments to make more efficient evaluation mechanisms to vanish the differences changing auditor to auditor.

3. LITERATURE REVIEW

In this chapter, IS are being used in auditing will be mentioned. The reviewed literature showed; unfortunately there is no application or experience which the auditors can perform their engagements. The developed systems' objective in the reviewed researches was to assist them while auditing with using IS such as ES, DSS and CAATs.

O'Leary & Watkins (1989) is describing the audit environment with the words "unique" and "complex" which means the audit problems have many solutions to be solved well but not perfect and are solved by the experiences of the auditors. The auditor has an important knowledge which has been gathered from their profession and the operations which was reviewed by the auditors such as bad debt and loan loss estimation (Yang & Vasarheyli 1998, pp. 29-43).

The uniqueness of the audit environment brings an inconsistency and many different errors which are special for the engagement (O'Leary & Watkins 1989, pp.3-22). Besides, as Yang & Vasarheyli (1998) mentioned, there are significant sights between experienced and inexperienced auditors in performing. These situations have brought an advantage to develop audit tools to minimize the risk of audit profession and eliminate different audit views on the same event. Hence, getting an improvement of the standardization of the audit process has been provided. This progress can be achieved through the use of expert systems (Yang & Vasarheyli 1998, pp. 29-43). In addition, with the development of computer, usage of computers in auditing is increased and ES was used to share knowledge with the auditors (O'Leary & Watkins 1989, pp.3-22).

Due to distribution expertise property of ES is used in auditing which is implied a professional opinion about the assessment of the audit risk, internal control evaluation, control risk assessment, audit planning (Murphy & Brown 1992, pp. 187-193). Murphy & Brown (1992) determined the advantages of ES in audit planning as given below:

       a. *Increased audit efficiency;*
       b. *Consistency among decision makers;*
       c. *Effectively dealing with large amounts of information; and*
      d. *The ability to communicate relationships as well as facts.*

ES will be most common used IS in the future (McKee 1992, pp. 261-273). McKee (1992) claims that ES are chosen by many auditing firms because of their opportunity of automated of making professional decision. According to Yang & Vasarheyli (1998) ES can be seen as a mock human expert especially the auditing field because of the usage of the knowledge of human experts. Audit planning, internal control evaluation, non-expert training and the identification of audit risk are the areas which are used to help accountants to improve the quality (Changchit & Holsapple, 2004, Yang & Vasarheyli 1998). Hensen & Messier (1992) made an evaluation of EDP-XPERT system which was a knowledge-based ES for assisting advanced computer environments. This is a good example of an application of ES in Electronic Data Processing (EDP) environments. Delisio et al (1994) is also mentioned an ES which is used for audit planning and risk assessment.

The innovative way of IS provide new ideas on transferring the experience of expert audits to non-expert audits especially, internal control evaluation. ES is chosen to teach non-expert audits with an internet-based intelligent system which also gives an opportunity to improve their skills in auditing. The advantage of this kind of ES is train new auditors with less investments and a high output and also because of the advantage of web-based system, an interactive learning process is offered which is gained more efficient and effective output (Changchit 2003, pp. 449-460).

With the increase of real-time IS, real-time assurance becomes feasible with CA technologies, which can be given by the auditors for audit environment. This is more cheaper and easier way to exchange the data between the systems for audit trails. Hence it produces a preventive control for intentional and unintentional errors (Flowerday et al 2006, pp. 325-331).

Business transactions are started to produce on a real-time basis with the spread of using IS through web. Hereby, the information is more accessible and can be obtained on-line, which is more flexible way to get data. Thus, this innovation brings an opportunity to reach high-quality data quickly, which can be stored, summarized easily. Hence the performing audit is shifted to paperless system. So CA is automatically increased with

the using of the union of CAAT in auditing (Rezaee et al 2001, O'Donnell & College 2013).

CAATs are the most common tools which are used by auditors especially auditing IS and tax collection and management. Hence, CAATs are useful in this kind of audit because of its complexity which makes difficult to combine whole data without CAATs. ACL and IDEA are the most common tools which are preferred by auditors are performed by focusing the output data so substantive tests are conducted with these tools (Huang et al 2009, Neischwietz et al 2001). By using audit experience and CAATs, many audit firms get a double chance to improve their efficiency in tax auditing and quality of tax collection and management (Liu 2011, pp. 50-54).

DSS is another type of IS which is usually used in auditing as decision aids for audit planning, internal control evaluation or the implementation of CA (Chou et al 2007, pp. 2274-2292). Many benefits can be gained by the automation of the auditing process such as less audit risk, more reliable results and more time with high-speed functions. Hence, statistical sampling method and analytical procedures are used as types of DSS for auditing (Chou et al 2007, pp. 2274-2292).

Wu & Offutt (2002) said that internet, especially web-based applications are became essential in the business world wherefore its dynamic properties and answering quickly to rapid changes. Web applications, which give a flexible and an agile integration environment to developers, are chosen by the enterprises to give real-time information and quick answer to customers and partners and also fight the demand of them (Ghani & Sidek 2008, Lee & Shirani 2002). Sung & You (2006) offered an internet based design audit tool which since shifting from traditional method to paperless, electronic and on-line method in auditing the design of the audit is changeable according to enterprise unlike previous studies are especially related with the assistance of IS in auditing (Liu 2011, Huang et al 2009, Chou et al 2007, Sung & You 2006, Changchit 2003, Neischwietz et al 2001, Delisio et al 1994, Hensen & Messier 1992, McKee 1992, Murphy & Brown 1992).

Facilitation of continuous control, monitoring possibilities, multi-layer reporting, and early warning of problems are the advantages which are coming with continuous process of auditing. The audit profession's way changes from a traditional model to automated and continuous model which gives a considerable change the cost/benefit of an audit (Omoteso et al 2008, Kogan et al 1996). Merging the audit techniques and IS, ease and effectiveness can be gained from auditing profession (Omoteso et al 2008, pp. 23-44).

4. DEVELOPMENT PROCESS

W-BAP development process will be explained and also step by step modules will be described in this chapter. Before starting to explain the process, it will be useful to make a declaration about the development which was developed for the auditors who are working in a bank in Istanbul. Hence, the requirements of this department was considered during the development process and aimed to meet these auditors' needs.

As listed Paul Stanley Software (2013), because of the advantages of the web applications such as no need to installation of software, available from everywhere, easy access for authorized everyone, easy update both client and admin side, less time for updating, direct access to latest version and minimum business cost, web technology was chosen for audit platform. Hence, every auditor in the organization can access easily to the platform via intranet and can perform auditing process on-line. Active Server Pages (ASP) and Microsoft SQL Server were used to develop the web pages and as the database, respectively.

System Development Life Cycle (SDLC) is a fundamental process that is followed to develop IS (Kalıpsız et al 2011, p.41). Every project has almost similar four SDLC phases, which is shown in Figure 4.1, to develop a new system. (Dennis et al 2009, pp. 1-33).

Figure 4.1: Phases of SDLC
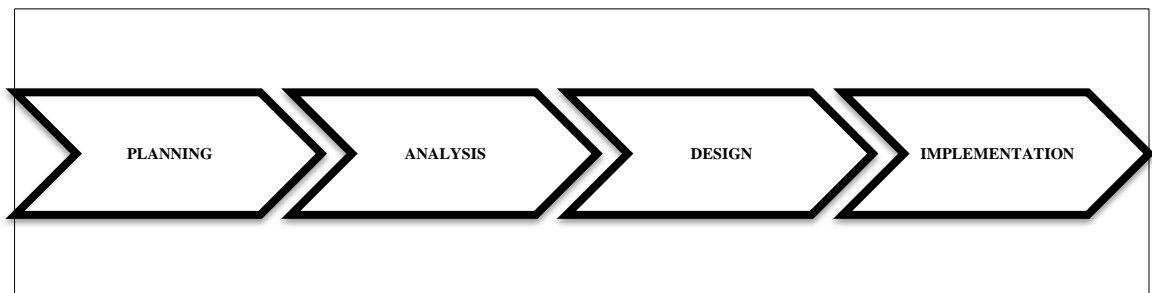
The first step of the development was planning phase; after feasibility analysis, passed through the second phase which an analysis was made for the development by gathering information. Then in design phase, with determination of the strategy, architecture,

interface and database designs were made. Finally, the system was implemented and built. All phases of the development will be elaborated in the next sessions.

Different system development models were generated for SDLC steps' ordering and handling (Kalıpsız et al 2011, p.41). In the planning phase, according to the developed software requirements waterfall development was chosen. The most powerful way of this model is giving a chance to go backward among the steps as seen in Figure 4.2.

Figure 4.2: Waterfall development
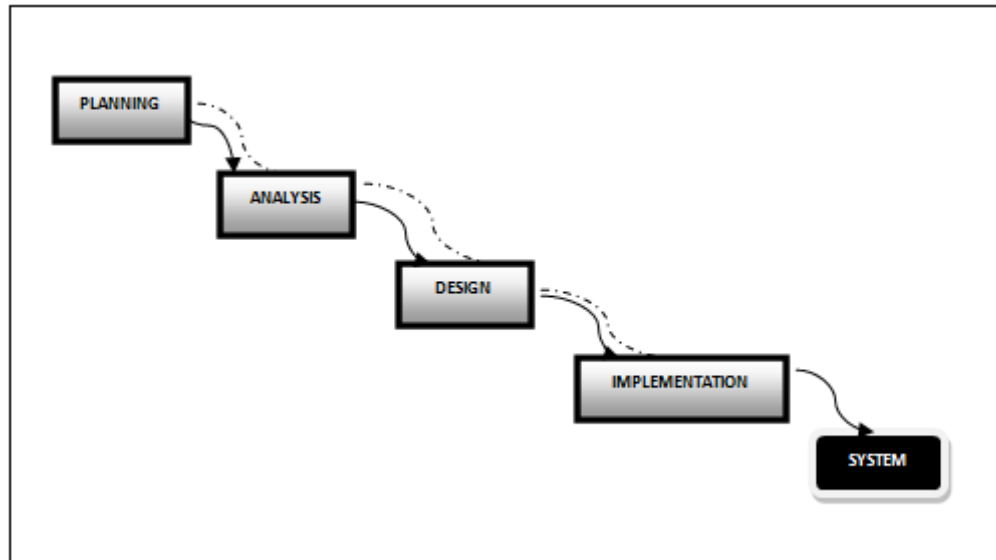
4.1 PHASES OF DEVELOPMENT

Before introducing the newly developed platform step by step screens, the SDLC, which was used for developing W-BAP, will be detailed in this section.

4.1.1 Planning the W-BAP

The planning phase was the most important part of the W-BAP development since the two outcomes of this step had the significant importance to decide for developing the software.

4.1.1.1 Identification and initiation

The main objective of a new system has to create an extra business value and assist the organization's goals. Hence determination of a business need, which can be satisfied through the use of IS has a great value in the process (Dennis et al 2009, pp. 1-33).

When the W-BAP was suggested to develop it must have a positive value to the auditing when it compared to oldest and traditional method. Thus, how we can perform our auditing activities in a more interactive, technological and modern environment while the world is shifting through paperless and on-line process to create a positive business value with spending less cost and time was the inspiration of the W - BAP. An overview and continuity of the auditing also will be provided with this newly developed system.

After initiation, a system request has to be formed to identify the project's sponsor, the business need, business requirements, and business values along with any other issues or constraints as seen in the Figure 4.3 (Dennis et al 2009, pp. 1-33).

Figure 4.3: System request
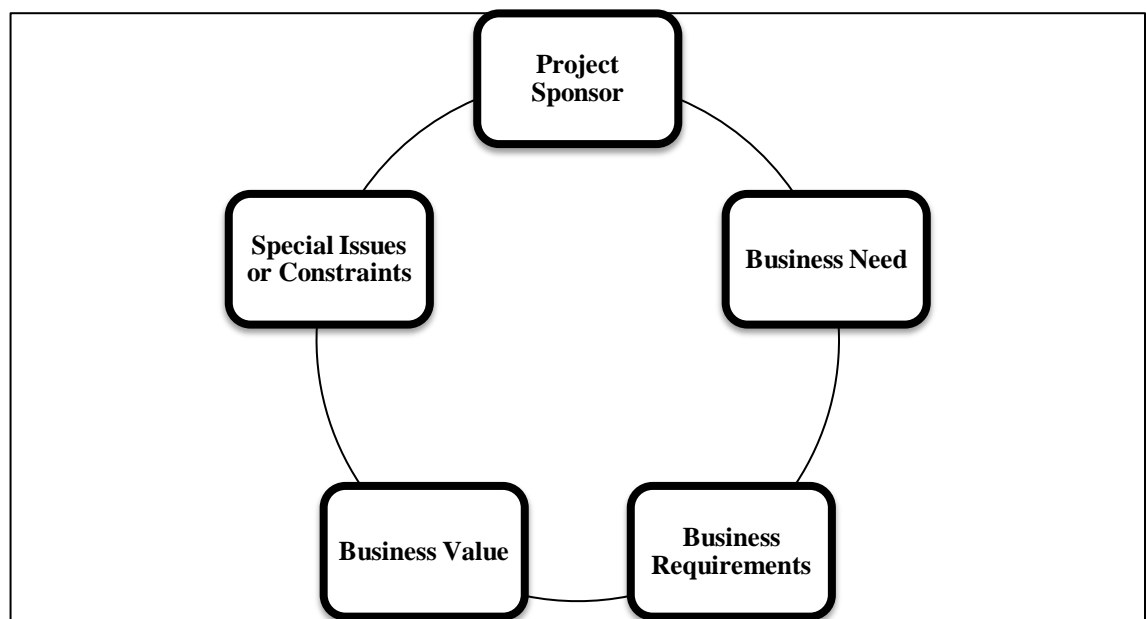
For W-BAP development business need, business requirements and business values were determined as seen in the Figure 4.4. This software is a system that will be used in audit department so there is no need to specify a sponsor. Besides, due to the organizational position of the audit department there is not any a special issue or constraint for developing W-BAP.

Figure 4.4: Summary of W-BAP request

W-BAP Need
- Performing audit on a web - based platform
- Sharing the audit outcomes with the departments

W-BAP Requirements
- Creating WorkPlan
- Creating Working Papers
- Overwieving Working Papers
- Following Up the Findings
- Sharing and Getting Answer for the Findings
- Approving & Updating the Work ing Plans
- Reporting Performance

W-BAP Values
- Resource Savings
- To Prevent Data Loss
- To Ensure the Data Log
- To Ensure the Standardization
- To Establish a Traceable Structure
- To Perform Resource Planning

While defining the business need, the advantage of using IS was the main point. In the literature, IS was not used to perform an audit, it was only used to assist the auditing (Liu 2011, Huang et al 2009, Chou et al 2007, Sung & You 2006, Changchit 2003, Neischwietz et al 2001, Delisio et al 1994, Hensen & Messier 1992, McKee 1992, Murphy & Brown 1992). With the advantage of the web-based applications, auditing will be more modern and technological according to traditional method when this software is completed. Sharing the audit outcomes with the audited side after completing the engagement was the fundamental need of the software.

According to W-BAP needs, requirements were identified which contained the answers of the need. The requirements were actually the requirements which are the necessary to conform the IIA Standards.

An audit planning and performing can be expressed roughly; after annual working plan approval every engagement has to be planned individually by creating the engagement plan with preparing the Risk Control Matrices (RCMs). Audit tests have to be completed and recorded with the audit evidence. After evaluation the findings and evidences, suggestions have to be shared with the audited to want an action plan for the finding (Özbek 2012, pp. 805 - 1037).

Finally, the resource savings were expected with the use of W-BAP because the process will be on – line, every auditor and also Chief Audit Executive (CAE) can see all engagements, their completed time on the web. Hence there will be a more effective resource planning and also efficient usage of resources. When compared to traditional way, the possible data loss can be prevented with the paperless, on-line method with the usage of Microsoft SQL Server. Data integrity, confidentiality and availability will be provided which are vital in information security with the authorization. Standardization will be expected with the automation of the periodic audits with W-BAP.

4.1.1.2 Feasibility analysis

The main purpose of a feasibility analysis is to make a possibility research about the newly developed system in economic, technical and organizational perspective (Kalıpsız et al 2011, pp. 49 - 56). A feasibility analysis has to be answering the questions which are shown in the Figure 4.5 below.

Figure 4.5: Feasibility analysis assessment factors

Technical Feasibility: Can We Build It?
* Familiarity with application: Less familiarity generates more risk.
* Familiarity with technology: Less familiarity generates more risk.
* Project size: Large projects have more risk.
* Compatibility: The harder it is to integrate the system with the company's existing technology, the higher the risk will be.

Economic Feasibility: Should We Build It?
* Development costs
* Annual operating costs
* Annual benefits (cost savings and revenues)
* Intangible costs and benefits

Organizational Feasibility: If We Build It, Will They Come?
* Project champions(s)
* Senior management
* Users
* Other stakeholders
* Is the project strategically aligned with the business?

Source: Dennis et al 2011, p. 21

When technically looked to development of the W-BAP application was feasible since it used the organization's sources for the database and software server. An internet infrastructure was already in place the organization so all user had a knowledge and familiarity with the web - based applications. It did not affect the audit department's daily performance; any business interruption was not lived due to the difference between the newly developed software and the traditional method.

Development of the W-BAP software was economically feasible when the tangible and intangible costs and benefits looked. The W-BAP is web - based software and every user has an internet connection and a computer which means any extra hardware or software was not required for downloading or using the software. Besides, user satisfaction can be improved with this development due to its business value.

From an organizational perspective, this development is feasible. The users of the W-BAP software were expected to complete their all engagements through the web. The CAE was approved and also overviewed the engagements via the W - BAP.

4.1.1.3 Development methodology selection

The most challenging point is to select the most suitable methodology for the development (Dennis et al 2009, pp. 42 -82). As mentioned before, for the W-BAP development, waterfall was chosen as development methodology. The possibility of going backward through the phases gave a chance to identify the requirements before programming. Hence this advantage of the method was one of the reasons why it was selected. This going backward sometimes brought time elapses but it was not a critic effect on the development of the W-BAP since there is not any business interruption during the development. Simplicity and the widely usage of this methodology was also other effective role that the methodology was to be chosen.

4.1.2 Analysis of the W-BAP

Analysis phase of the development was the second part of the W-BAP development which answered the questions that who will use the system, what the system will do, and where and when it will be used. The deliverables of this phase was an important output for designing phase of the W-BAP.

4.1.2.1 Requirement determination

With the understanding the traditional system (as-is system), identifying the improvements then developing requirements for the W-BAP (to - be system) was the three steps in the process of analyzing the W-BAP development. Waterfall development was chosen which meant that a significant time was allotted to understanding the as-is system and indentify improvement before requirement determination for the W-BAP.

Requirement determination was written from the perspective of the auditors. We focused on the auditor needs and especially, what the W-BAP has to do or what characteristic it needs to have.

It was important to understand the current traditional method to development W - BAP. Accordingly, interview and observation were used for the requirements - gathering techniques.

Firstly, for the interview technique a senior auditor, auditor, assistant auditor, CAE and also three persons from different departments were chosen as interviewee to get a better understand auditing cycle. Open ended, neutral and a bit general questions were asked them to take information about the as-is system and learn whether they had any suggestions for the newly developed W - BAP. A part of the questions were listed below:

a. What are your expectations from new system?
b. What are the disadvantages & disadvantages of the traditional system?
c. Would you rather use web applications or desktop applications?
d. Do you use web applications in your daily life?
e. Do you think IS that can improve your business skill?
f. What are the obstacles while you are auditing with this traditional method?

Secondly, observation was very efficient to gather information about the as-is system. It gave a chance to perform and watch the auditor and also the auditee at the same time. Hence a clear opinion was gained for the requirements from the both side.

As a result of this process functional and nonfunctional requirements were defined as detailed in the Figure 4.6 and Figure 4.7.

Figure 4.6: Functional requirements

Functional Requirements

- The W-BAP will allow auditors to plan their annual working engagement by defined RCM.
- The W-BAP will allow auditors to perform by uploading the audit evidences.
- The W-BAP will allow auditors to sent each working paper to senior auditor for overwieving.
- The W-BAP will allow senior auditors / CAE to approve the working plans.
- The W-BAP will allow senior auditors / CAE to overview the working papers.
- The W-BAP will allow auditors to share the findings with the auditee.
- The W-BAP will allow auditee to watch and answer the findings.
- The W-BAP will allow auditors / senior auditors / CAE to watch performance reports.
- The W-BAP will allow auditors to update their engagement by the approval of the senior auditor.

Figure 4.7: Nonfunctional requirements

Nonfunctional Requirements

- The W-BAP will run any web browser.
- Every update will be user related.
- User based working papers wil be secured.
- Every activity on the W-BAP is based on the principle of seperation duties.
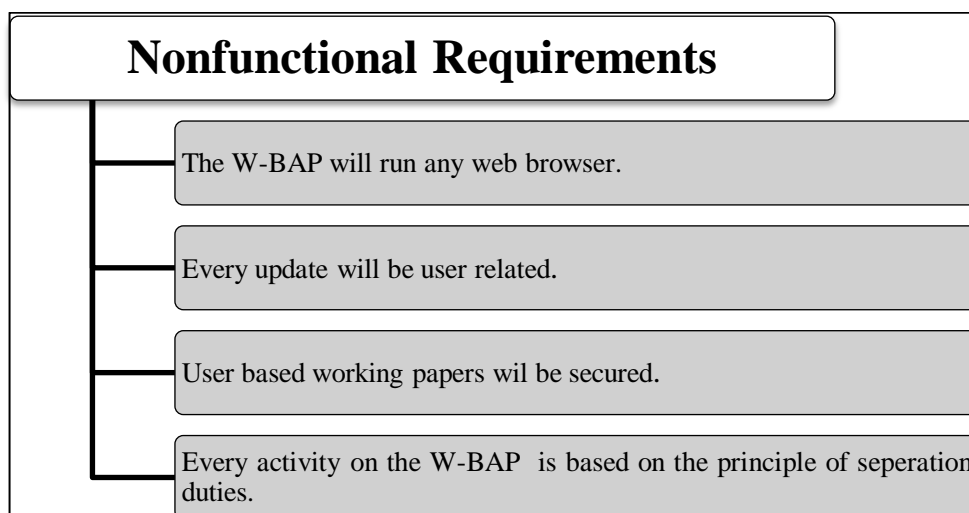
4.1.3 Design of the W-BAP

Designing phase of the development was the next part of the W-BAP development after analyzing which was decided how the W-BAP will operate in terms of software and hardware, and the user interface, forms, and reports that will be used; and finally the database and files that will be needed. This time the requirements were written from the developer's perspective. The deliverables of the analyzing phase of the development became more technical at the end of designing phase.

4.1.3.1 Transition requirements to design

Custom development (building a new system from scratch) was chosen to create the W-BAP which was assumed the best way to develop a system. It gave a flexible and creative way to solve the business problems. Besides, it was unique software which was included the auditing needs. The existence of every needed technical and functional experience was also more effective to choose the custom development. No time extension was another cause.

4.1.3.2 Architectural design

The determination of the hardware and software parts of the W-BAP was the objective of the architecture design. Application architectures provide the software components can be placed in hardware components. Client - server architecture was chosen for the W-BAP development which attempt to balance the processing between the client and the server. As shown in the Figure 4.8, presentation logic is provided in the client side, whereas data access and storage logic is provided in the server side.

Figure 4.8: Client-based architecture
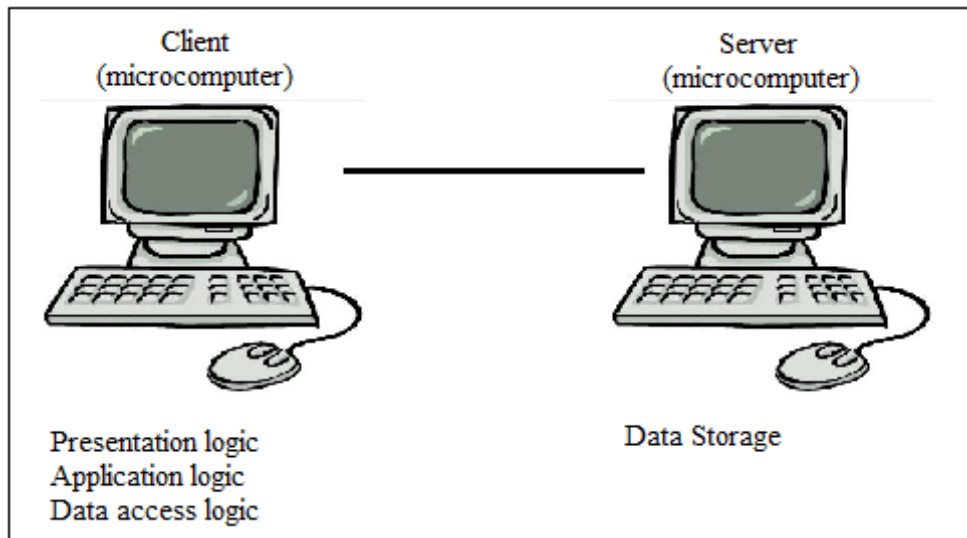
Source: Dennis et al 2009, p. 272

Selecting and acquiring the hardware and software was needed for the W-BAP was the next step in architecture design. Firstly, the operating system was selected as Windows which was used by the organization, since every computer which was belonging to auditor had a Windows operating system.

The requirements for hardware; the W-BAP will be hosted on the audit department's Windows server and connecting to one of the organization's Microsoft SQL server. Microsoft SQL server was chosen for data storage. The client side's hardware requirements were selected a web browser; such as Internet Explorer, Mozilla, etc, and internet access.

Software requirements for the development of the W-BAP were identified as ASP and HTML for the web technology. IIS was used for the web server.

4.1.3.3 User Interface design

Design of user interface of the W-BAP software's aim was to make an appearance pleasing to the eye and simple to use, while minimizing the auditors effort to accomplish their work. Storyboard approach was chosen for interface design prototype.

Due to the uniqueness of the W-BAP, a prototype for each screen and function in the system was depicted on a paper to show the users what would be displayed on each part of the screens. The advantage of using storyboard was to make an interactive meeting with the users of the W-BAP. According to their performing, some controls and some warning notes were decided to use to inform or direct users to complete the action. Thus, the W-BAP interface standards table was created with the auditors. Filter area was added almost all screen which all users can filter the information according to some criteria such as audit year, auditor, etc. Automatic mailing system was designed to inform the overviewed auditor, department which had a finding. Uploading property was designed for the files the audited section as an audit trail.

4.1.3.4 Data storage design

Final phase of designing the W-BAP software was data storage function which how data was stored and handled by the programs. From the two main types of data storage formats, database was chosen. Collection of groupings of information property and the advantage of the creation and manipulation of the data of the database properties was also a very strong indicator to be selected instead of file format. SQL server could manage and store huge amount of data which was important to store all RCMs and the working papers of the engagement yearly. Thus, the filter and report properties can be activated and last year's workings of the engagement was become possible to see on line every time.

The relational database was the most suitable approach for the W-BAP development, since the bulk of the data would be text or number formats. The auditors must have had a possibility to access and change the data over the web. Besides, tables can be related to each other with the foreign key which had high importance to data integrity. Structured Query Language (SQL) was query language which gave a chance for accessing whole data on the table and possibility to make changes on the data at a time. For reporting and filtering properties we had to study on many tables to sum up all information that needed. Therefore, joining property of SQL was very helpful to get a summary of the whole data from different tables.

Management of the storage space had an importance role in the usage of relational database effectively. Redundant data and null values would be caused the space was being wasted, so higher storage hardware costs was arisen. The likelihood of getting errors also would be the side effect of not using data storage agreeably. To minimize the data integrity risk, removing redundancy and null values were decided from data storage design.

4.1.4 Implementation of the W-BAP

The final stage of the W-BAP development was the implementation phase. Firstly, the W-BAP was actually built and then tested. The testing part was the most critical one to decide it performed as designed. More time was separated on testing than on writing. The installation part came after this part to turn off the old system to make a transition to the new one. Finally, post - implementation part was conducted informally to identify minor and major changes.

4.1.4.1 Developing the W-BAP

With this step, building the W-BAP actually started. Programming part was the critic phase of the development which required time and effort. In a normal case, while coding the development, analysts will be designing the testing case which will be tested in the new system. But in W-BAP development there would not be needed to continue this phase in that way. Testing part was became immediately after the ending of the coding the W- BAP.

Programming of the W-BAP started with the writing the creating a work plan which was chosen from the RCM via tables related the process and sending them to approval by the supervisor. After completing this part, creating working plan which was assigned to engagement came to develop. On the screen, every user can edit explanations and also upload the audit trail which had to be saved on the system for controlling during the overview session. In addition, an edit part also coded for the findings which had a possibility to make relation with the related department. Then follow – up screens were

coded which gave an opportunity to both users (auditors, auditees) to see findings. Finally revision and performing screens were completed according to authorization level.

In coding part, the authorization property is the most considerable section because of the importance of the confidentiality of the engagements and information which was gathered during the performing the engagement.

4.1.4.2 Testing the W-BAP

After programming part was finalized, testing part was started which had a significant importance before releasing the W-BAP. Testing phase of the W-BAP development was essential which gave a possibility to test the development with several tests from many aspects such as unit, integration, system and finally acceptance tests.

Unit test was the first step of testing which the W-BAP tested module by module. To aim of unit testing to ensure the tested module performed as defined. Actually, black - box type was chosen to test directly the program specifications. Integration tests were done to assess how well several modules work together. Integration tests gave a chance to modules, which passed their individual tests, were working in a harmony with each other. After finishing the unit and integration test, system tests were conducted to test whole system included modules and programs work together without problem. It can be thinking as an integration test to apply to the W - BAP. The objective of the system test was to ensure the W-BAP modules work in a harmony without any error as excepted and met all business requirements. To finish testing phase, acceptance test was conducted. The aim of acceptance test was to ensure that the W-BAP was complete and met the business needs. These tests were done by users in two parts: alpha testing which was conducted with the made - up data and beta testing which was made with real data to monitor the W-BAP for errors.

4.1.4.3 Transition to the W-BAP

The final step was transition to newly developed W-BAP system. Installation the W-BAP was not a complicated process because there was not an as-is system in the audit department. The system provided to audit department to make a transition from the traditional method to web - based environment. It was the time to introduce persons to a new system which was not accustomed before. A resistance to the W-BAP was expected because the auditors could to think that system can limit their activities, although the total gain was thought while deciding to develop a new system instead of using traditional method.

The transition, which was done by the old system, was turned off and the new one is turned on, could be made abruptly or gradually. Actually, in the development of the W-BAP, the old system was a traditional method hence; there was no risk to make direct conversion. CAE wanted to use the newly developed system as quick as possible to monitor the effects of using more modern methods. Hereby, to be the fastest way to transition was the other reason why direct conversion was selected for transition to the W-BAP.

No extra installments were needed such as software, hardware and convert data to preparing the technical requirements. Every user had personal computers which had internet connection and browser to reach the W-BAP.

Training was the most important part of conversion to teach the users how to use the W-BAP. In this development, classroom training was chosen because the W-BAP was unique software which was developed for the audit department for meeting auditors need. Almost every phase of the development, auditors' opinion was taken and the W-BAP was designed according to auditors' demands. Hence, the training part did not take so many times.

System maintenance was provided after installation to ensure the W-BAP continued to meet business needs. Fixing bugs and improve the system were aimed in the system maintenance.

4.2 NEWLY DEVELOPED SOFTWARE: W-BAP

In this section, the newly developed software will be introduced step by step. Each module will be explained and information will be given how an audit can be performed through W-BAP.

As mentioned before, there were some limitations for this development. The W-BAP has been delimited to auditors in a bank in Istanbul.

The W-BAP has 7 main menus with submenus as seen Figure 4.9. In the following, all menus details and the functions of the W-BAP will be told. By this way, an audit engagement will be completed from beginning to end.

Figure 4.9: Menus of W-BAP

```
┌─────────────────────────────────────────────────────┐
│  WORKING PLAN (WP)                                    │
├─────────────────────────────────────────────────────┤
│  • Create WP                                          │
│  • Monitor WP                                         │
│  • Approve WP                                         │
│  • WP Demand                                          │
│  CONTROL ACTIVITY (CAc)                               │
├─────────────────────────────────────────────────────┤
│  • View CAc                                           │
│  • CAc History                                        │
│  OVERVIEW (OV)                                        │
├─────────────────────────────────────────────────────┤
│  • General OV                                         │
│  • Individual OV                                      │
│  • Send OV                                            │
│  FOLLOW - UP (F-U)                                    │
├─────────────────────────────────────────────────────┤
│  • Findings                                           │
│  • Summary of F-U                                     │
│  • Enter Finding                                      │
│  • Answer Finding                                     │
│  ADD CAc                                              │
├─────────────────────────────────────────────────────┤
│  • Enter New CAc                                      │
│  • General Look                                       │
│  REVISION ON RCM                                      │
├─────────────────────────────────────────────────────┤
│  • Make Demand                                        │
│  • Update Demand                                      │
│  • Remove Demand                                      │
│  PERFORMANCE REPORTS                                  │
├─────────────────────────────────────────────────────┤
│  • Annual Plan                                        │
│  • Compliance to Annual Plan                          │
│  • Realization of Annual Plan                         │
│  • Auditor Base Look                                  │
│  • Process Base Look                                  │
│  • Follow-Up Performance                              │
└─────────────────────────────────────────────────────┘
```

Access to the W-BAP is provided via intranet. Bank's authentication information is used to make a connection to the W-BAP. Hence, there is no need any login screen to enter the system.

4.2.1 The First Menu: Working Plan (WP)

After entering the system, the first step is to make an annual plan to perform the engagements periodically. Realizing this part; "Working Plan" menu is used. General information is given about the W-BAP on the front page. As shown in the Figure 4.10, it has 4 submenus which are named as Create WP, Monitor WP, Approve WP, and WP Demand respectively.

Figure 4.10: Entrance to W-BAP

With the "Create WP" submenu, an auditor can see the RCMs and he/she can select the control activity which has in his/her annual plan and control periodically. After choosing the control points from RCMs, the auditor has to decide how frequently audit this control activity. Completing this part, every auditor has to send their plan to CAE for approving. With the e-mailing property, when the auditor saves the plan on the W-BAP, the system sends an automatic e-mail to inform the CAE about the completeness of the annual plan.

There is a link in the e-mail which can directly orient to the page that CAE can use for approval. CAE can see all working plans that are waiting for approval. This screen can be seen "Approve WP" submenu. This submenu has a control that only authorized person such as CAE or the system admin can overview and approve the working plans.

With the "Monitor WP" submenu, all created and approved working plans can be seen by all auditors as shown in the Figure 4.11. There is some additional information about the working plans such as who is the owner, how many control activity is included. Filtering property is one of the advantages of this submenu which give a chance also to see previous plans.

Figure 4.11: Submenu-Monitor WP

Sometimes there will be quick changes according to demand of audit committee. In these times the auditor has to make change on their annual plan or his/her engagement. To provide this flexibility, a demand link is generated which an audit can demand a request such as removing the control activity or updating the control activities' frequent, etc. In addition, automatic e-mail sending property is used in here to inform the CAE about the request.
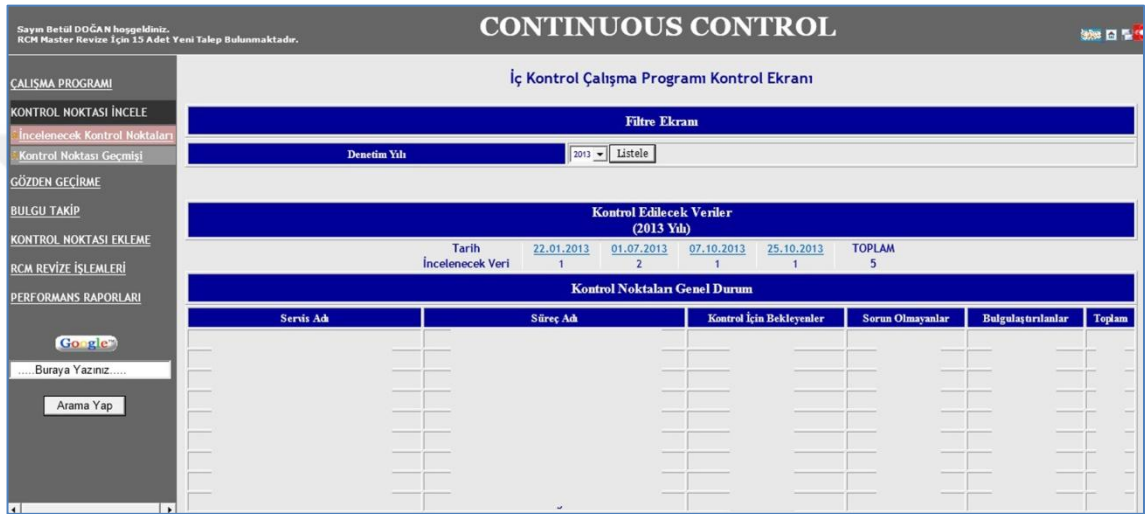
There is a need to monitor the removing or updating control activities both the auditors and CAE. The submenu which is called "WP Demand" provides to see all requests on the bases of the demand owner. The links direct to the details of the request which CAE can approve or deny the request with writing an explanation. The auditors also can see the process of their remands. By approving the requests the related control activity will be removed from or will be added to working plan.

4.2.2 The Second Menu: Control Activity (CAc)

After finalizing the planning phase, the second step is performing the audit. For realizing the audit engagement the second menu is used. This menu is named as "Control Activity" which is shown in the Figure 4.12.

Figure 4.12: Control Activity (CAc)

This menu has two submenus which is named "View CAc" that an auditor can monitor the related to CA and "CAc History" that all previous audit information can be seen by the auditors.

Firstly, on the main page of "View CAc" all control activities are listed according to their status included the responsibility which means who is the owner of the related engagement. According to their frequent, each control activity is checked according to its definition and any audit trail has to be uploaded to the system.

There is an explanation field under the CAc information table that auditor can write his/her own opinion about the control activity. Then the status of the viewed control activity has to be changed to "No Problem" or "Finding" as seen in the Figure 4.13.

Figure 4.13: Submenu-View CAc

When saved the explanation with the chosen status, audit trail has to be attached by using the upload button as seen above in the Figure 4.14.

Figure 4.14: Viewed CAc

If the status of the CAc is "Finding", it has to be sent to the related department to take an action plan. But before sending the finding, an overview of CAE has to be ensured. So firstly, the viewed control activity will be sent via system to CAE for over viewing. The detail of the overview will be told in the next section. After completing the

overview part the finding will send to department over the system. An automatic e-mail will reach the department which has information about the finding and a link that can be used by them to answer the finding.

The second submenu is named as "CAc History". It is used for how the same control activity was viewed before, which audit trails were attached as examples. There is another benefit of this submenu which is very useful to invoice auditor. He/she can get an overall view about the control activity and how perform the viewing process.

4.2.3 The Third Menu: Overview (OV)

After completing to view control activity, it has to be overviewed by the superior or CAE. The third menu, which is named "Overview", of the W-BAP was designed for this purpose. It has three submenus as seen in the Figure 4.15.

Figure 4.15: Overview (OV) Menu

The first submenu is "General OV" which is especially done for the superiors or CAE. On this screen, all control activities can be monitoring according to their situations such as "waiting for overview", "waiting for response" or "overviewed". In addition, this screen has also a filter part that CAE or the superior can filter the control activities by choosing the audit year or the auditor. With the links on the related engagements, the

person who is responsible to overview, can close the overview if there is not any problem or can send to the auditor who viewed to control activity with an overview explanation if there is some missing parts about the activity over the system. By this way, an automatic e-mail will be send to the auditor for giving information. With the link in the e-mail, the auditor can direct to the page that is waiting for the response.

"Individual OV" is the second submenu which is designed to monitor all overviewed control activities are waiting for response. But there is a difference between this submenu and the first submenu in terms of authorization. Every auditor can see their overviewed control activities, and through this screen he/she can close their overview by writing response. When they answered the overview, an automated e-mail will sent to supervisor to give information.

Finally, "Send OV" submenu is designed to see how many viewed control activity is still waiting for sending to overview. In the "View CAc" menu actually, there is a button which makes possible to send to overview. In case to forget to sent, every auditor can monitor their situation through this submenu.

4.2.4 The Fourth Menu: Follow-Up (F-U)

The forth menu is designed for follow – up activities the findings that has four submenus. The need of this menu is come from to collect and see the whole findings which were send to departments.

In the first submenu, it becomes possible to see all findings that were done in the current year. With the hyperlink option, every detail of a finding can be seen such as which department is the responsible of taking any action, the status of it, the finding number which was given by the auditor, etc. If there has to be making any correction or any change on the finding, it is possible to use this submenu. In addition, the finding can be closed through here if it is completed or any document which is related to the findings can be uploaded to W-BAP in here with an overall opinion of the auditor.

As shown in the Figure 4.16, in the second submenu which is named "Findings" is possible to see all findings according to their departments divided into their status such as closed or open. The difference between the first and second menu is actually about the way of showing findings. These two submenus commonly have filtering panel which filtering can be possible according to filtering options. When used the link, findings related to the department can be seen in detail.

Figure 4.16: Submenu-Summary of F-U

The third submenu is "Enter Finding" which makes possible to enter any finding which is not related to control activities. Actually, the need of this submenu is a bit suspicious so the department decided to use this submenu for a while to see whether it is useful or not. In maintenance process, it will be removed from the menu according to business need.

To answer the finding is important to departments, so within the meeting of business need the forth menu is created. There is a control in this screen that gives permission to the owner of the finding only. Departments can see their findings and also answer to them. They have to write down the explanation to the finding and make an action plan which contains a date that define the exact time to complete the finding entirely. When they answer the finding an automatic mail comes through the W-BAP.

4.2.5 The Fifth Menu: ADD CAc

In a living environment there is always changes, to adapt the changes with a minimum cost in a short time, the W-BAP has to be as flexible as to answer all these changes. The fifth menu is designed for this purpose. It has two submenus: "Enter New CAc" and "General Look".

The firs submenu will be used when a new control activity has to be added to RCM because of any update. If this control activity also has to be working plan, there is a checkbox at the end of the page which is allowed to add the working plan when it is chosen. The details of a demand form can be seen in the Figure 4.17.

Figure 4.17: Demand form

When saved the demand, an automatic e-mail was send through the system to superior and CAE.

In the second submenu; it is possible to see all demands. Through this screen, every auditor can see the demands but only the superior or CAE can approve them. By approving, not only the RCM is updated but also the WP is updated if the checkbox is ticked.

4.2.6 The Sixth Menu: Revision on RCM

The sixth main menu of the W-BAP is named as "Revision on RCM" as seen Figure 4.18. It has the same process as the previous menu. Creating a demand is also possible with the "Make a Demand" submenu for two options which are to make a demand for update a control activity in the RCM or remove a control activity in the RCM.

It is possible to monitor all demands, which are suggested for update or remove a control activity to RCM, with two different submenus which are called "Update Demand" and "Remove CAc Demand" respectively. The mailing and approval process same as the previous menu as told above.

Figure 4.18: Revision on RCM

4.2.7 The Seventh Menu: Performance Reports

The final menu of the W-BAP is "Performance Reports" is actually used for making a comparison with the annual plan and monitoring daily process. With the filtering panel, it is possible again monitor the information as needed.

With the "Annual Plan" submenu, every auditor can see their annual plan, how many control activities there is in their WP.

This menu's second submenu is "Compliance to Annual Plan" which is a detailed report screen which has information about how many control activities has to be controlled according to current date, and how many of them are controlled. By this way there is a comparison information is included to see the compliance to annual plan. It is actually designed for the supervisor and CAE to making a comparison. They can choose the date form the filter to see the future situation of the annual plan. This provides flexibility and a general idea what has to be done.

The third submenu is "Realization of Annual Plan" which is as same as the second submenu. The only difference it is designed for other auditors except CAE and the superior.

The fourth and the fifth submenus provide to monitor the activities of auditors the daily or in a chosen period. In a process base performance also can be monitored.

At the end, the final submenu has a significant importance due to its property as seen Figure 4.19. It is a kind of summary screen that has information about all performs.

Figure 4.19: Follow-Up performance

The control activities, which were not viewed yet, can be seen as the viewed ones. In the detail screens, the viewed control activities are divided into parts according to their

status. With the hyperlinks, the more detail information such as sampling number, how many audit trails were attached are reachable as shown in the Figure 4.20.

Figure 4.20: Detailed Follow-Up performance screen

One more detailed screen give the overview information with the date information entirely. Because of these properties, this submenu can be thought as another monitoring screen to compliance with the annual plan.

Using W-BAP, compliance to IIA standards is aimed. In addition, an audit engagement can be entirely completed through the system.

5. DISCUSSION AND EXPERIMENTAL RESULTS

The aim of this thesis is to develop software which can be used by auditors to perform their profession. The most important critic is to figure out the benefit of the W-BAP. It is entirely a novel system for auditors since it gives an opportunity to perform the engagement through the intranet. This means to make a jump from the old, traditional system to technological and modern system. At this point, it is important to measure the feedbacks and evaluate expectations of the auditors. Besides, whether the W-BAP system is acceptable in IS is also another question that has to be answered.

5.1 EXPERIMENTAL METHOD

In this situation, we consider TAM to be the most suitable evaluation model. According to Lee et al (2003), TAM is the theory which is used for the users' behaviors. Perceived ease of use and perceived usefulness are two main factors that change and affect user acceptance. The validity of the TAM and its sufficient explanation of end-user application usage are supported by many studies (Wu et al. 2007, pp162-174).

Davis (1989) defined the "perceived ease of use" as "the degree to which a person believes that using a particular system would be free from effort" and "perceived usefulness" as "the degree to which a person believes that using a particular system would enhance his or her job performance." It is obvious that there is a close relationship between these two significant factors, because ease of use affects the usage of technology with the effect of usefulness. A system is thought as usefulness as the usage of the system is easy or vice versa.

The first study was done with 112 participants and used fourteen-item questionnaires for each factor in the TAM. The items in these questionnaires have seven steps from "unlikely" to "likely" and mixed positive and negative tone (Davis 1989, pp.319 - 340). Finally, according to results of the study, Davis eliminated some negative tone items and converted to some items from negative tone to positive tone (Sauro & Lewis 2012,

p.231). The last versions of the Perceived Usefulness and Perceived Ease of Use items were used as seen in Table 5.1.

Table 5.1: Survey items for Perceived Usefulness and Perceived Ease of Use

W-BAP Perceived Ease of Use	
Question No	Questions
1	Learning to operate the W-BAP app would be easy for me.
2	I would find it easy to get the W-BAP app to do what I want it to do.
3	My interaction with the W-BAP app would be clear and understandable.
4	I would find the W-BAP app to be flexible to interact with.
5	It would be easy for me to become skillful at using the W-BAP app.
6	I would find the W-BAP app easy to use.
W-BAP Perceived Usefulness	
Question No	Questions
1	Using W-BAP in my job would enable me to accomplish tasks more quickly.
2	Using the W-BAP app would improve my job performance.
3	Using the W-BAP in my job would increase my productivity.
4	Using the W-BAP app would enhance my effectiveness on the job.
5	Using the W-BAP app would make it easier to do my job.
6	I would find the W-BAP app useful in my job.

The survey to evaluate the W-BAP was conducted subjectively. Table 5.1 was used with the Likert scale in Figure 5.1. As known, the Likert scale was used to evaluate each item in the survey from 1, as "extremely unlikely", up to 7 as "extremely likely", because commonly in the scale a seven-point scale format is proposed. A greater insight into how much an audit that used the W-BAP agrees with the item was gained by the Likert scales (Lowdermilk 2013, p.81). In this survey, the Likert scale responses depicted as shown in Figure 5.1 and the ranking values are between 1 and 7.

Figure 5.1: Likert scale
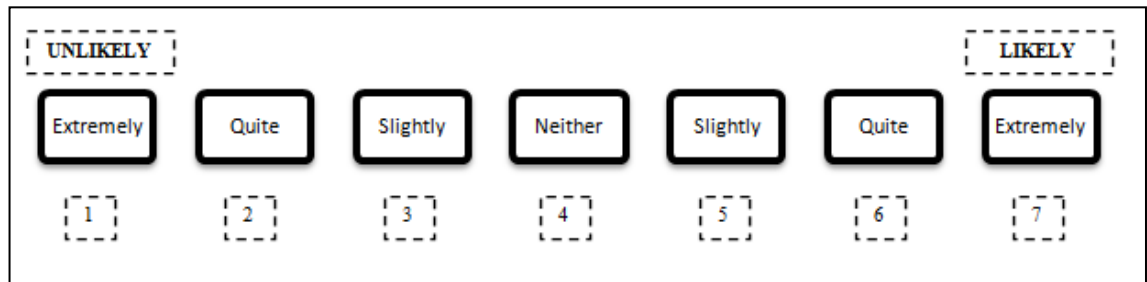
5.2 EXPERIMENTAL RESULTS

The survey was conducted with 28 participants who are auditors for the subjective evaluation of the W - BAP. Actually, the general information was gained from the participants which were the first part of the survey. Secondly, ease of use was evaluated. Finally, usefulness was the third part. Seven-point Likert scale was used to evaluate each item in the survey from 1, as "extremely unlikely", up to 7, as "extremely likely" and calculated each item mean values.

5.2.1 Discussions on the General Information of the Survey

Some demographic information of the survey participants, such as gender, age and audit experiences, was given in this part. This information will establish the data of the survey. As mentioned before, the W-BAP was developed especially for meeting the requirements of a bank; hence the survey's participants were the auditors. An overall opinion about the W-BAP can be obtained from the findings of the survey, when the average experience of the auditors was thought in Turkey, the group's experiences and the ages of them.

As shown in Table 5.2, % 82,1 of the participants is male and %17,9 of them are female.

Table 5.2: The frequency of participants in terms of gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	23	82,1	82,1	82,1
	Female	5	17,9	17,9	100,0
	Total	**28**	**100,0**	**100,0**	

As seen in Table 5.3 and 5.4, they are generally young auditors and % 53,6 of them have audit experience more than 5 years.

Table 5.3: The frequency of participants in terms of age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-25	5	17,9	17,9	17,9
	26-30	9	32,1	32,1	50,0
	31-35	13	46,4	46,4	96,4
	36 +	1	3,6	3,6	100,0
	Total	**28**	**100,0**	**100,0**	

Table 5.4: The frequency of participants in terms of audit experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-2	5	17,9	17,9	17,9
	3-5	8	28,6	28,6	46,4
	6-8	10	35,7	35,7	82,1
	9 +	5	17,9	17,9	100,0
	Total	**28**	**100,0**	**100,0**	

5.2.2 Discussions on Perceived Ease of Use

In this survey, the Likert scale was used where the minimum score was 1.00 and the maximum score was 7.00. The reference table of the survey according to this survey is shown in Table 5.5 below.

Table 5.5: The frequency of Likert scale for the survey

Unlikely Extremely	Unlikely Quite	Unlikely Slightly	Neither	Likely Slightly	Likely Quite	Likely Extremely
1.000-1.857	1.857-2.714	2.714-3.571	3.571-4.428	4.428-5.285	5.285-6.142	6.142-7.000

The mean value of the perceived ease of use questions in the survey is calculated as 5,39 which mean our W-BAP software's ease of use is "Quite Likely" according to Table 5.5. The statistical details of the questions concerning "ease of use" can be seen in Table 5.6.

Table 5.6: The statistical detail of perceived ease of use questions

Perceived Ease of Use Questions	Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely	Mean	Std. Deviation
Learning to operate the W-BAP app would be easy for me.	0	0	1	3	10	9	5	5,5	1,04
I would find it easy to get the W-BAP app to do what I want it to do.	0	1	2	2	10	9	4	5,29	1,24
My interaction with the W-BAP app would be clear and understandable.	0	1	1	2	7	12	5	5,54	1,2
I would find the W-BAP app to be flexible to interact with.	1	0	3	5	6	8	5	5,11	1,5
It would be easy for me to become skillful at using the W-BAP app.	0	2	1	3	9	7	6	5,29	1,41
I would find the W-BAP app easy to use.	1	0	2	1	6	10	8	5,61	1,45

5.2.2.1 Discussions on perceived ease of use in terms of gender

In this thesis, Mann - Whitney test was applied to find out whether there is a difference in terms of gender for testing the perceived ease of use the W - BAP. Table 5.7 showed the ranks of the test.

Table 5.7: Ranks for perceived ease of use in terms of gender

Gender	N	Mean Rank	Sum of Ranks
Male	23	14,72	338,5
Female	5	13,5	67,5
Total	**28**		

To test the difference in terms of gender, the H_0 and H_1 hypotheses were set as given below.

H_0: There is no significant difference between male and female auditors in terms of the ease of use W-BAP.

H_1: There is a significant difference between male and female auditors in terms of the ease of use W-BAP.

Table 5.8 shows the Mann - Whitney test result for the perceived ease of use of W-BAP in terms of gender. The asymptotic significance (2-Tailed) value is 0.763, which is greater than 0.05. So it cannot be considered there is a statistically significant difference for $p < 0.05$ in terms of genders according to ease of use the W-BAP. In this case, H_0 is not rejected. In terms of ease of use criteria, it does not show a significant difference according to the gender variable.

Table 5.8: Mann – Whitney test statistics for perceived ease of use in terms of gender

	Ease of Use
Mann-Whitney U	52,500
Wilcoxon W	67,500
Z	-,301
Asymp. Sig. (2-tailed)	**,763**
Exact Sig. [2*(1-tailed Sig.)]	0,771

5.2.2.2 Discussions on perceived ease of use in terms of age

In this thesis, the Kruskal-Wallis H test was applied to find out whether there is a difference in terms of age group for testing the perceived ease of use of W-BAP. Table 5.9 shows the ranks of the test.

Table 5.9: Ranks for perceived ease of use in terms of age

Age	N	Mean Rank
20-25	5	17,40
26-30	9	11,06
31-35	13	14,73
36 and +	1	28,00
Total	**28**	

To test the difference in terms of age, the H_0 and H_1 hypotheses were set as given below.

H_0: There is no significant difference between auditors, from different age groups, in terms of the ease of use of W-BAP.

H_1: There is a significant difference between auditors, from different age groups, in terms of the ease of use of W-BAP.

Table 5.10 shows the Kruskal-Wallis H test result for the perceived ease of use in terms of age. The asymptotic significance value is 0.176, which is greater than 0.05. So there is statistically no significant difference for $p < 0.05$ in terms of age in the ease of use of W-BAP. In this case, H_0 is not rejected. In terms of the ease of use criteria, it does not show significant difference according to age variable. In addition, there is no relationship between the age and the ease of use.

Table 5.10: Kruskal – Wallis test statistics for perceived ease of use in terms of age

	Ease of Use
Chi-Square	4,940
df	3,000
Asymp. Sig.	**0,176**

5.2.2.3 Discussions on perceived ease of use in terms of audit experience

In this thesis, Kruskal-Wallis H test was applied to find out whether there is a difference in terms of audit experience for testing the perceived ease of use of W-BAP. Table 5.11 shows the ranks of the test.

Table 5.11: Ranks for the perceived ease of use in terms of audit experience

Audit Experience	N	Mean Rank
0-2	5	18,70
3-5	8	10,06
6-8	10	15,15
9 and +	5	16,10
Total	**28**	

To test the difference in terms of audit experience, the H_0 and H_1 hypotheses were set as written below.

H_0: There is no significant difference between auditors, with different experiences, in terms of the ease of use of W-BAP.

H_1: There is a significant difference between auditors, with different experiences, in terms of the ease of use of W-BAP.

Table 5.12 shows the Kruskal-Wallis H test results for perceived ease of use in terms of audit experiences. The asymptotic significance value is 0.271, which is greater than 0.05. There is no statistically significant difference, in terms of audit experience

according to ease of use the W-BAP. In this case, H_0 is not rejected. In terms of the ease of use criteria, it does not show a significant difference according to the audit experience variable. In addition, there is no relationship between the audit experience and the ease of use.

Table 5.12: Kruskal – Wallis test statistics for perceived ease of use in terms of audit experience

	Ease of Use
Chi-Square	3,912
df	3,000
Asymp. Sig.	**0,271**

5.2.3 Discussions on Perceived Usefulness

The mean value of the perceived usefulness questions in the survey is calculated as 5,40 which means the perceived usefulness of the W-BAP software is "Quite Likely" according to the reference table given with Table 5.5. Table 5.13 shows us some information such as frequency, mean value and standard deviation about the questions concerning the "usefulness" part of the survey.

Table 5.13: The statistical details of perceived usefulness questions

Perceived Usefulness Questions	Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely	Mean	Std. Deviation
Using W-BAP in my job would enable me to accomplish tasks more quickly.	1	0	1	4	9	8	5	5,29	1,36
Using the W-BAP app would improve my job performance.	1	0	1	4	6	8	8	5,5	1,45
Using the W-BAP in my job would increase my productivity.	2	2	0	1	8	10	5	5,25	1,6
Using the W-BAP app would enhance my effectiveness on the job.	2	0	1	1	10	7	7	5,36	1,59
Using the W-BAP app would make it easier to do my job.	1	1	0	2	9	10	5	5,39	1,4
I would find the W-BAP app useful in my job.	2	0	0	2	5	11	8	5,61	1,57

5.2.3.1 Discussions on perceived usefulness in terms of gender

In this thesis, Mann - Whitney test was applied to find out whether there is a difference in terms of gender for testing the perceived usefulness of W-BAP. Table 5.14 shows the ranks of the test.

Table 5.14: Ranks for perceived usefulness in terms of gender

Gender	N	Mean Rank	Sum of Ranks
Male	23	14,5652	335
Female	5	14,2	71
Total	**28**		

To test the difference in terms of gender, the H_0 and H_1 hypotheses were set as given below.

H_0: There is no significant difference between male and female auditors in terms of the usefulness of W-BAP.

H_1: There is a significant difference between male and female auditors in terms of the usefulness of W-BAP.

Table 5.15 shows the Mann - Whitney test result for the perceived usefulness in terms of gender. The asymptotic significance (2-Tailed) value is 0.928, which is greater than 0.05. So there is no statistically significant difference for $p < 0.05$ in terms of genders according to usefulness of W-BAP. In this case, H_0 is not rejected. In terms of ease of use criteria, it does not show a significant difference according to the gender variable.

Table 5.15: Mann – Whitney test statistics for usefulness in terms of gender

	Usefulness
Mann-Whitney U	56,000
Wilcoxon W	71,000
Z	-,090
Asymp. Sig. (2-tailed)	**,928**
Exact Sig. [2*(1-tailed Sig.)]	0,954

5.2.3.2 Discussions on perceived usefulness in term of age

In this thesis, we applied the Kruskal-Wallis H test to find out whether there is a difference in terms of age group for testing the perceived usefulness of W-BAP. Table 5.16 shows the ranks of the test.

Table 5.16: Ranks for perceived usefulness in terms of age

Age	N	Mean Rank
20-25	5	16,00
26-30	9	10,83
31-35	13	15,46
36 and +	1	27,50
Total	**28**	

To test the difference in terms of age, the H_0 and H_1 hypotheses were set as given below.

H_0: There is no significant difference between the auditors, from different age groups, in terms of the usefulness of W-BAP.

H_1: There is a significant difference between the auditors, from different age groups, in terms of the usefulness of W-BAP.

Table 5.17 shows the Kruskal-Wallis H test result for the perceived usefulness of W-BAP in terms of age. The asymptotic significance value is 0.199, which is greater than

0.05. There is no statistically significant difference for $p < 0.05$ in terms of ages according to the usefulness criteria of W-BAP. In this case, H_0 is not rejected. In terms of ease of use criteria, it does not show a significant difference according to the age variable. In addition, there is no relationship between the age and usefulness of W-BAP.

Table 5.17: Kruskal – Wallis test statistics for perceived usefulness in terms of age

	Usefulness
Chi-Square	4,654
df	3,000
Asymp. Sig.	**0,199**

5.2.3.3 Discussions on perceived usefulness in terms of audit experience

In this thesis, Kruskal-Wallis H test was applied to find out whether there is a difference in terms of audit experience for testing the perceived usefulness of W-BAP. Table 5.18 shows the ranks of the test.

Table 5.18: Ranks for perceived usefulness in terms of audit experience

Audit Experience	N	Mean Rank
0-2	5	14,80
3-5	8	10,69
6-8	10	17,20
9 and +	5	14,90
Total	**28**	

To test the difference in terms of audit experience, the H_0 and H_1 hypotheses were set as given below.

H_0: There is no significant difference between auditors, with different experiences, in terms of the usefulness of W-BAP.

H_1: There is a significant difference between auditors, with different experiences, in terms of the usefulness of W-BAP.

Table 5.19 shows the Kruskal-Wallis H test result for perceived usefulness in terms of audit experiences. The asymptotic significance value is 0.419, which is greater than 0.05. So there is no statistically significant difference, in terms of audit experience according to usefulness of W-BAP. In this case, H_0 is not rejected. In terms of ease of use criteria, it does not show significant difference according to the audit experience variable. In addition, there is no relationship between the audit experience and the usefulness of W-BAP.

Table 5.19: Kruskal – Wallis test statistics for perceived usefulness in terms of audit experience

	Usefulness
Chi-Square	2,829
df	3,000
Asymp. Sig.	**0,419**

According to the survey results, using the W-BAP software give auditors a modern audit environment. Auditors expressed that the W-BAP software saves their time and gives an opportunity to overview their engagements. To sum up, auditors who have been using the W-BAP software found it easy to use and useful.

6. CONCLUSION & SUGGESTIONS

With the IS improvement, computers started to take a significant role in the personal and professional lives of people and organizations. The widespread use of the Internet also facilitates a wider use of web-based software. Banking, education and manufacturing are some of the industries which use computers commonly to enlarge their operations. Another area which is using IS for achieving their objective is the audit profession. Previous studies show that IS such as ES, DSS and CAATs are used for adding value to audit profession by educating non-expert auditors, audit designing, providing CA/CM, and facilitating internal control evaluations.

The common property of the earlier systems studied using IS for assisting the auditor while performing auditing. In this study, a different perspective of IS was used to add a value to the audit profession. This research is an initial investigation of the use of a web-based system to perform an audit process from beginning to end. Our software named W-BAP, was developed for auditors and can be used in a complete audit. So the aim of this thesis is to develop a web-based audit platform which meets an auditor's needs and builds a systematic structure for routine controls compatible with the IIA standards.

In this thesis, firstly, we developed W-BAP with the waterfall design process. To meet the auditors' needs and determine the requirements perfectly, we conducted interviews. After testing the W-BAP, we carried out the implementation of novel software. Then, 28 auditors participated in a survey of the W - BAP. The survey was designed including twelve items by considering the Technology Acceptance Model in the Human-Computer Interaction research field. These questions were related to W-BAP's ease of use and usefulness. Besides, the demographic information such as gender, age and audit experiences of the participants was gathered. The Mann - Whitney and Kruskal Wallis H tests showed that there is no significant difference between participants in terms of demographic properties aspects of the ease of use and usefulness criteria of W-BAP. It is useful software that is easy to use.

W-BAP has some limitations in several aspects. Firstly, our research concentrates only on the audit process in a bank. Secondly, it investigates the auditor's needs commonly found in Istanbul, TURKIYE. Thus, a system's need may be country - specific or sector - specific. These limitations can be extended by future investigations.

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