YILDIRIM BEYAZIT UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

A WEB-BASED AUDIT TOOL FOR STANDARDIZED MANAGEMENT SYSTEMS

M.Sc. Thesis by

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Department of Computer Engineering

January, 2016

ANKARA

A WEB-BASED AUDIT TOOL FOR STANDARDIZED MANAGEMENT SYSTEMS

A Thesis Submitted to

the Graduate School of Natural and Applied Sciences of Yıldırım Beyazıt University

In Partial Fulfillment of the Requirements for the Degree of Master of Science in Computer Engineering, Department of Computer Engineering

by

Celaleddin BİRKAN

January, 2016

ANKARA

M.Sc. THESIS EXAMINATION RESULT FORM

We have read the thesis entitled **"A WEB-BASED AUDIT TOOL FOR STANDARDIZED MANAGEMENT SYSTEMS"** completed by Celaleddin BİRKAN under supervision of **Asst. Prof. Dr. Lami KAYA** and we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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ETHICAL DECLERATION

I have prepared this dissertation study in accordance with the Rules of Writing Thesis of Yıldırım Beyazıt University of Science and Technology Institute;

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A WEB-BASEDAUDIT TOOL FOR STANDARDIZED MANAGEMENT SYSTEMS

ABSTRACT

In this thesis an automated web based management systems standards audit was implemented. In a traditional auditing process in which each step is performed manually. For example, the planning stages are kept track in excel files and auditing stages are executed without any workflow. All these shortcomings of a traditional audit were taken into consideration while implementing this thesis. First of all, management systems were analyzed, requirements were listed and process flow was designed, finally the web based audit system was implemented by the appropriate coding. Any company, institution or foundation which applies to get a certification of management systems are required to be audited by an accredited institution. Implementation of this audit can be done manually or by a tool with a systematic way. In order to keep the data properly, auditors need a systematic approach while performing the audit.

With the automation tool in the scope of this thesis; collaboration between auditors can be provided and a reporting on the data can be achieved by the use of planning and processing the auditing flow. Besides, searches on standards about audit can be carried out by this audit tool.

The main steps of this audit tool are as following; Planning, Assignment of Duties, Auditing and Reporting. Planning process is the first meeting of supervisor board and supervised part. Assessment process is actualized by using implementation guide, control items and prepared questions associated with standard. Collaboration is provided by having different auditor roles like lead auditor, auditor and provisional auditor. The outcomes of the audit are occurred by reports that show summary of audit processes.

Keywords: Management Systems Standards Audit, Web-based Audit Systems, Audit Tool

STANDARDİZE YÖNETİM SİSTEMLERİ İÇİN WEB TABANLI DENETLEME SİSTEMİ

ÖZET

Yapılan bu tezde yönetim sistemlerinin denetim sürecini iş süreçleriyle otomatik hale getirmek için geliştirme yapılmıştır. Geleneksel denetim sürecinde her aşama herhangi bir araç kullanmadan yapılmaktaydı; örnek olarak planlama aşamasındaki süreçler Excel dosyalarından takip ediliyordu. Denetim süreci de herhangi bir iş akışı olmadan tamamlanmakta idi. Bu tezi oluşturan aracı geliştirirken tüm bu eksiklikler göz önünde bulundurulmuştur. Öncelikle yönetim sistemleri analiz edilmiş, gereksinimler çıkarılıp tasarlanmış ve son olarak da web tabanlı uygulama kodlanarak denetim sistemi ortaya çıkarılmıştır. Yönetim sistemleri için belge almak için başvuran şirketler, enstitüler veya herhangi bir kurum akredite bir kurum tarafından denetlenmelidir. Denetlemenin uygulanması herhangi bir sistem kullanılmadan veya sistematik bir araç ile yapılabilir. Tetkik görevlileri verilerini daha düzenli bir şekilde tutmak için sistematik bir yaklaşıma ihtiyaç duyarlar.

Tez konusu bu araç ile planlama, denetim süreçleri işletilerek tetkik görevlileri arasında ortak çalışma sağlanıp, veriler üzerinde raporlama yapılabilmektedir. Denetleme aracı ile aynı zamanda denetimle ilgili standart üzerinde arama yapılabilir. Denetleme sisteminin ana adımları mevcuttur; Planlama, işlerin atanması, denetleme ve raporlama. Planlama aşaması denetlenecek taraf ile denetçi tarafının ilk temasının yaşandığı aşamadır. Denetim işlemi, uygulama kılavuzunun, kontrol maddelerinin ve standart maddeleriyle ilgili hazırlanmış soruların kullanılmasıyla gerçekleştirilir. İşbirliği farklı tetkikçi rollerine sahip olunmasıyla sağlanmaktadır,bunlar; baş tetkik görevlisi, tetkik görevlisi ve tetkik görevlisi adayıdır. Denetim sonucu denetim sürecinde yapılan işlemlerin raporlarının alınmasıyla ortaya çıkmaktadır.

Anahtar Kelimeler: Yönetim Sistemleri Standartları Denetimi, Web Tabanlı Denetim Sistemi, Denetim Aracı

ACKNOWLEDGMENTS

First of all I want to thank my supervisor Asst. Prof. Lami KAYA for supporting me to achieve my long and arduous way, he has made my way up easy and more efficient.

Finally thanks to my wife and my lovely new-born son for their support, love and patience.

2016, 19 January **Celaleddin BİRKAN**

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ABBREVATION

ER	Entity Relationship Diagram
IT	Information Technology
ISO	International Organization for Standardization
PDCA	Plan-Do-Check-Act
SQL	Structured Query Language
SSMS	SQL Server Management Studio
TSE	Turkish Standards Institution (Türk Standardları Enstitüsü)
TURKAK	Turkish Accreditation Agency

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CHAPTER ONE

INTRODUCTION

1.1. Thesis Outline

There are different management systems on different scopes. Main scopes are quality, safety and security, health and medical, environment and energy, industry, services and information technology. These systems based on international standards like ISO standards. ISO organization state that "Benefits of effective management systems include more efficient use of resources, improved risk management and increased customer satisfaction as services and products consistently deliver what they promise." [1]

There are main management systems standards in different aspects; they can be list as;

- ISO 9001 Customer requirements (products and service)
- ISO 14001 Environmental aspects
- OHSAS 18001 Health & safety aspects
- ISO 22000 Food safety aspects
- ISO 27001 Information security aspects
- ISO 20000 Provision of IT services
- ISO 50001 Energy management aspects

An audit of management system provides clarity about the level of quality and the development options. The independency of auditors and transparency of audit are important elements of certification phase.

Management systems standards have checklist to control auditee situation according to the standard's objectives. Audits are a vital part of the management system approach as they enable the company or organization to check how far their achievements meet their objectives and show conformity to the standard.[1]

There are some needs for an audit of the adequacy and effectiveness of measures taken to achieve the goals described (MILLS, 1993). Mills (1993) declares that the audit is concerned with system performance, area or function being audited. According to Mills (1993) and ISO 9000 (2005), quality auditing is a systematic and independent examination to determine whether the activities of quality and their results are in accordance with what was planned, and if their implementation is efficient and suitable for achieve the goals described [2].To achieve the audit mentioned above, a web based audit tool was developed in an efficient and systematic way. There is a process flow for completing the audit in which each step of this workflow is followed by the next one

1.2. Related Works

At the beginning of this thesis one of the similar web audit tool studied deeply which is named Capability Adviser for Automotive SPICE™ and ISO 15504. This tool is used as Assessment Portal of International Software Consulting Network. This tool has different editions, The Capability Adviser Company Solution is free of charge but other editions Capability Adviser Corporate Solution and Capability Adviser Enterprise Solution are commercially. Functions of this tool is similar to our web – based audit tool but it is different by the software infrastructure, database infrastructure and business processes.

This project has similar point with Capability Adviser Software, both systems supports multi-language. Our system's multi-language feature has difference because any entity on system can be defined in any language. There is no limit to define a new language for web-based audit system. Capability adviser also has pre-defined checklist for some standards but our tool enable to add or remove checklists by admin users.

1.3. Aim of the Work

This thesis focused on to realize automated audit processes on web based practical audit tool. Planners, auditors, researchers and any establishments which are audited by accredited institutions are beneficiaries sides of this tool. Web based tool can use at any place that have internet access. This tool developed for auditor of management systems standards to ensure a systematic way through first step to last. When developing this tool main target is building audit tool and secondary function is full-text searching option on information security standards. Other main idea is making the all entity names used on software is definable. Admin user may define any entity name in any language. This function makes this software extra flexible and responsive. Multi–language support is also other issue that focused to realize.

There are 4 main subjects to be eliminated by using this web-based audit tool, these are;

1.3.1. Inefficient Manual Processes

Many organizations manually perform each process required for an audit. For example, scheduling auditing teams across large organizations typically requires time-consuming phone calls, emails, fax etc. Auditors in the field often use paper forms and manual spreadsheets to keep data which then must be transcribed into an electronic format for the final report; this reduces productivity and can cause errors. Another layer of documentation is added when auditors copy and paste information into primitive tracking systems for future trend analysis. There is no reason to document the same thing multiple times, it may happens for every audit. Web-based audit system has work flow from beginning to end for whole audit process. So this type of difficulties would not be happen.

1.3.2. Lack of Preparation for Audit

Most audits require countless phone calls and emails to schedule coordinate and bring together the members of the auditor and auditee teams. Follow-up also means many uncoordinated phone calls, emails and reminders, plus manual tracking and

tallying of deadlines, status, due dates and delays. This manual, redundant system doesn't guarantee 100 percent success. In large organizations, many audits involving many stakeholders take place at any given time, which increases the chance of oversight failure or even audit failure. Worse yet, ineffective communication can give senior management a false sense of security while potentially serious issues are brewing in their organizations. Web – based audit tool offer to communicate via automatic e-mail to inform organization and auditee team. Auditee team also can follow their duties by log in audit system.

1.3.3. Inconsistent Audit Results

Audit plans can vary widely based on the type of audit and a variety of situational factors, including the auditor's training, skills, and experience. This situation can cause different audit results for same company by different auditors. Web –based audit tool enable to have consistent result for every auditors.

1.3.4. Lack of Oversight

All of the previously mentioned subjects; manual processes, poor communication and documentation, lack of integration, and inconsistent processes lead to an inability to consolidate findings across the global organization and generate actionable reports. The resulting lack of visibility increases the chance that auditors will be unable to see the bigger picture, including trends and high risk areas, which can lead to costly problems or compliance issues. Web – based audit tool enable to consolidation of knowledge with collaboration on audit system between auditors.

1.4. Basis of Audits

The word “audit”, derived from the Latin “audio” word and originated with the old Roman Empire, means to listen or to question [3]. What is “Audit” is described in ISO 19001:2011 Management Systems Auditing standard like “systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled” [4].Type of audit may change based on purpose of audit. Regardless of purpose, audit should be performed professionally. ISO 19001:2011 and ISO/IEC 17021 define fundamentals of good audit by describing guidelines for Auditing Management Systems. In this project we worked on performing certification Audit by web-based tool.

Third-party audits should be performed by organizations that have been audited and accredited by an established accreditation board. For example Turkish Standards Institution (TSE) has been accredited by Turkish Accreditation Agency (TURKAK). Audit types and which standards regulate these audits standard figure out Table 1.1.

Table 1.1 Audit types

Audit Types	**Internal Audit**	**External Audit**	
		Supplier Audit	Certification Audit
Alternative Names	First Party Audit	Second Party Audit, Customer Audit	Third Party Audit
Application of the Standard	ISO 19011		ISO/IEC 17021

There is also integrated approach for auditing management systems but literature about internal and external audits of integrated approach is very rare [5].

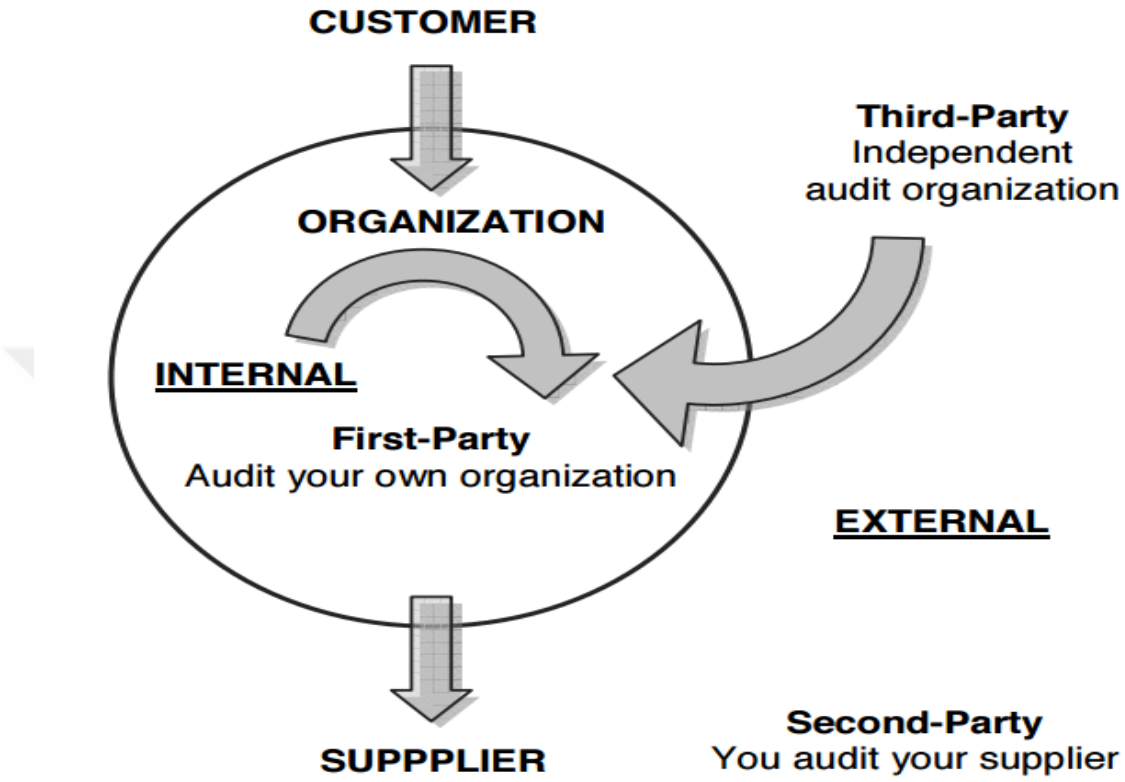


Figure 1.1 Types of Audits [6]

TSE is an independent audit organization which is accredited from national and international accreditation agencies. Third – party audits generally performed for certification of management systems standards. Audits generally perform in 4 phase, preparation (planning), performance (audit process), reporting (audit outcome) and closure (audit result) [7]. This project implemented according to these phases. If certification bodies want to have credible audit, they should have systematic tool to record audit phases. Web based audit tool will assure to have credible audit cycles for certification body and auditee.

CHAPTER TWO

INFORMATION ABOUT MANAGEMENT SYSTEMS

2.1. Audit Life Cycle of Management Systems

An information security management systems consists set of rules that control situation of risks at any information asset we have. So this situation should be observe and report by accredited or non – accredited certification bodies. At our practical example we have used TS ISO/IEC 27001 Information Security Management System Standard. There is a common life cycle of management systems which is called Plan – Do – Check – Act [8].This thesis focused on 'Check' phase of this cycle as audit. At the beginning of check phase it should be triggered by new appeal for certification or periodic supervision of existing certification. This triggering starts the first step of audit which is planning phase. At this stage every basic information of auditee collect, available auditors and date of audit determined. Firstly auditee will be informed for prospective audit dates and scope of audit by planner. If organization confirm that dates planner started to determine auditors of audit. According to the number of employers at organization, duration of audit and number of auditors will be determined. After determination of auditors this stage continues to the next one. Detailed process work flow shows in the appendix A.

Second part is implementation of audit. Lead auditor headed audit with auditor, provisional auditors and if needed with experts. Lead auditor may assign some duties to other auditors. Management Systems Standard's checklist may use during audit. This checklist may be shared among auditors by their subjects.

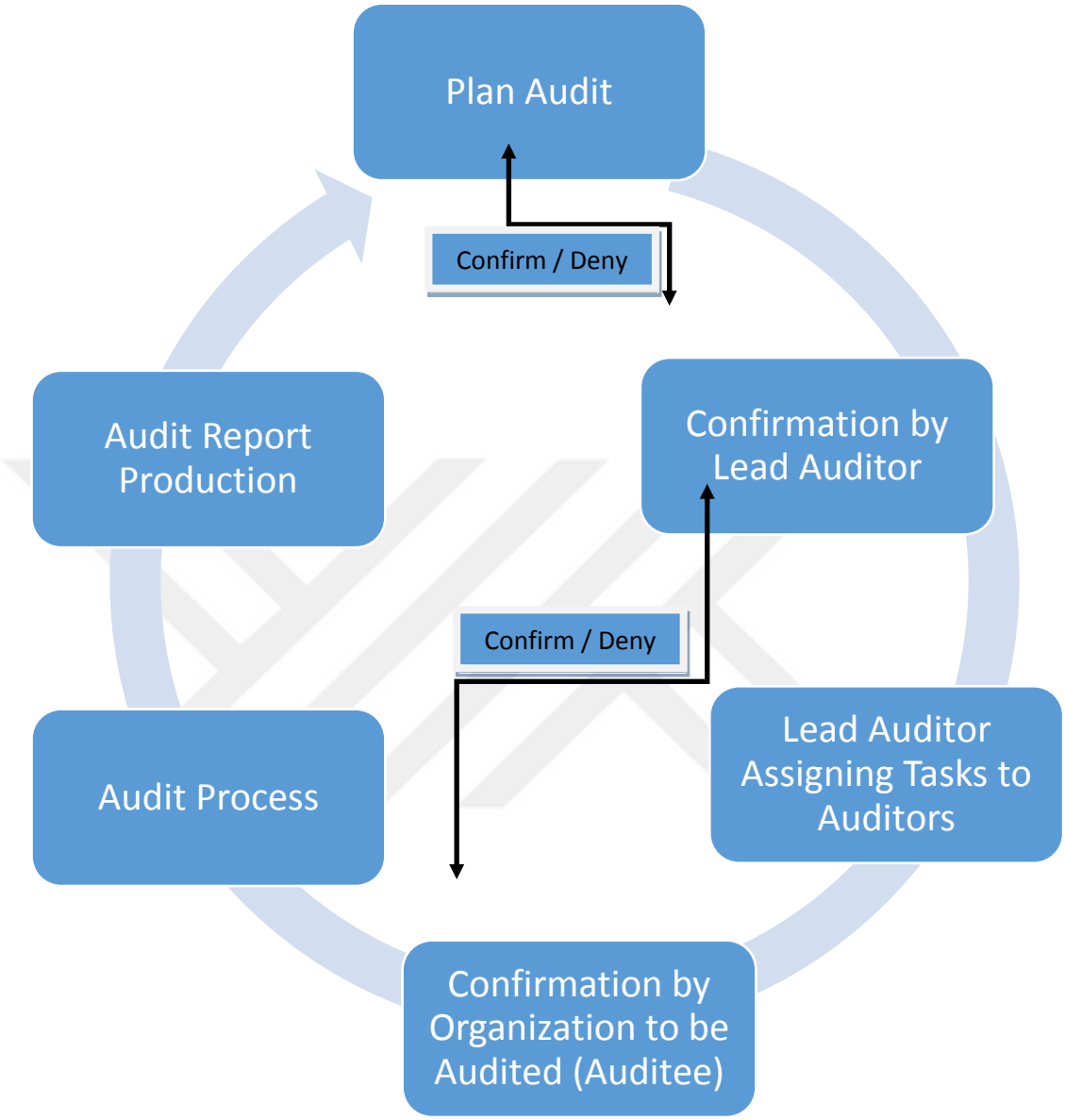


Figure 2.1 General process cycle of Audit System

2.2. Processes of Audit on Web-Based Tool

Every system should be audit by independent auditor. This operation is performed in a certain standard frame. All management systems standards provide guidance during audit. Our web – based audit tool designed to support every management systems standard with its definition modules. Pre-Audit process is planning the audit in order to request of demanding side. Suitable time interval will set to draft plan and auditor will assign to plan according to their work schedule. Demanding side of audit will be informed after first stage of planning. Only auditor whom NACE code is match with organization NACE code can be assigned as auditor. Figure 2.2 shows planning phase of system. Information includes date, auditors, scope of audit for the organization. This tool sends this information to the organization by e-mail. Content of E-mail is all these Second step of briefing the organization is getting confirmation on this information.

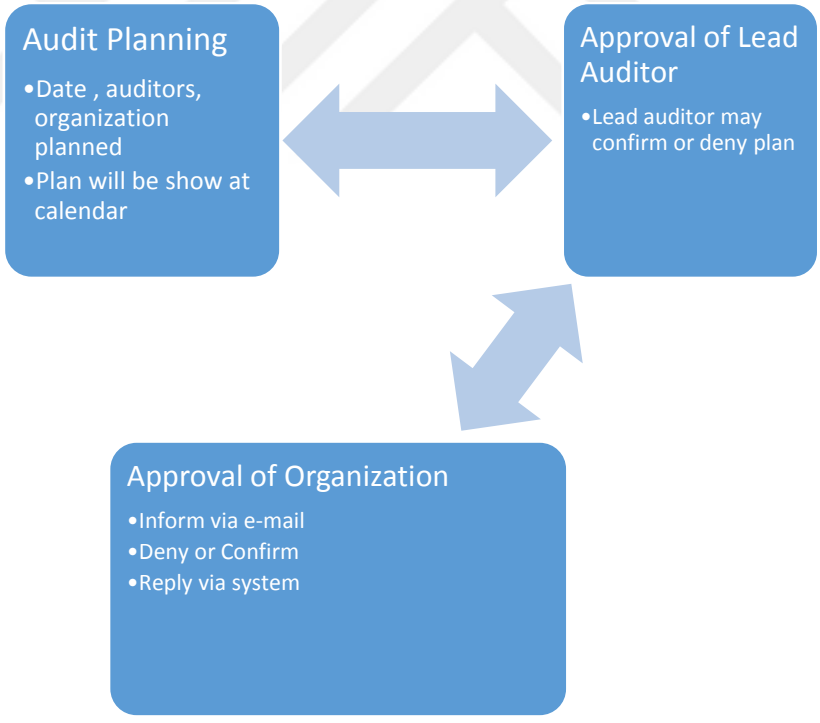


Figure 2.2 Planning processes of Audit System

After confirmation of lead auditor and auditee, lead auditor will assign management system standard's control items to other auditors. Figure 2.3 shows how this processes run. Lead auditor will manage audit according to the audit days and control items. Each auditor may find their duties on "My Audits" web page. They can see organization name, dates and standard information which will use during audit. Each checklist has their own questions and implementation guide about control item. They can use this implementation guidance to accomplish fast and reliable audit.

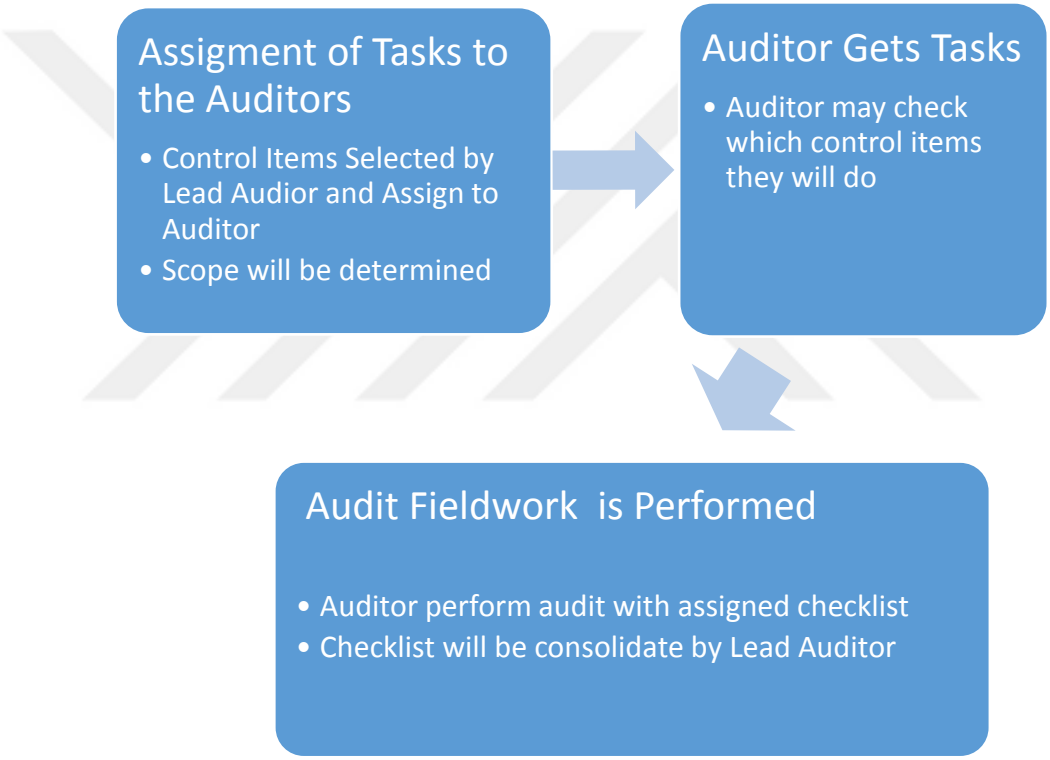


Figure 2.3 Pre-Audit and field work processes of Audit System

On audit day auditors log in the system and find their tasks at “My Audits” menu. They will perform audit according to the schedule which is planned before. Figure 2.4 shows step of field work process of audit. On audit implementation page there is a button which is triggered a pop-up page. This pop-up page comes to screen with whole standard documents with .pdf format. Auditors may search on to standard by using this page. This feature will help auditors during audit because they can find any information about standard on this page.

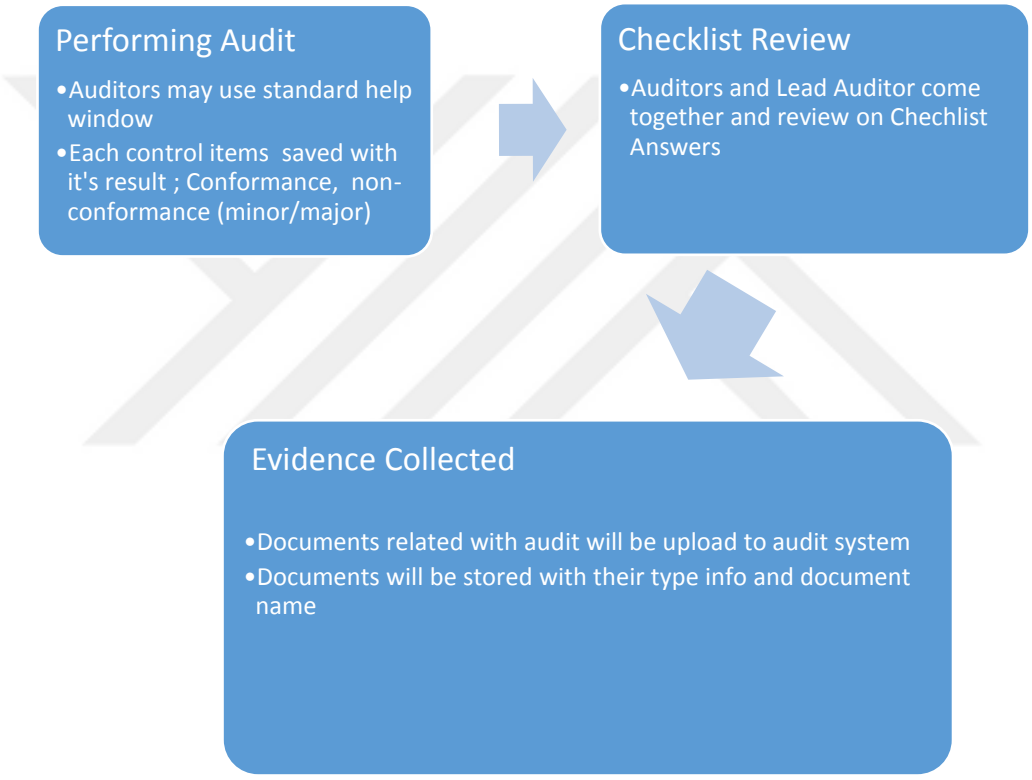


Figure 2.4 Performing audit processes of Audit System

At the end of audit there will be outcome like audit result report. Audit inspection team will take decision about certification of auditee. They will take the decision if organization will get the certification or not. If it is surveillance audit organization may extend validity of certification or invalidate the certification. This processes is figured in Figure 2.5

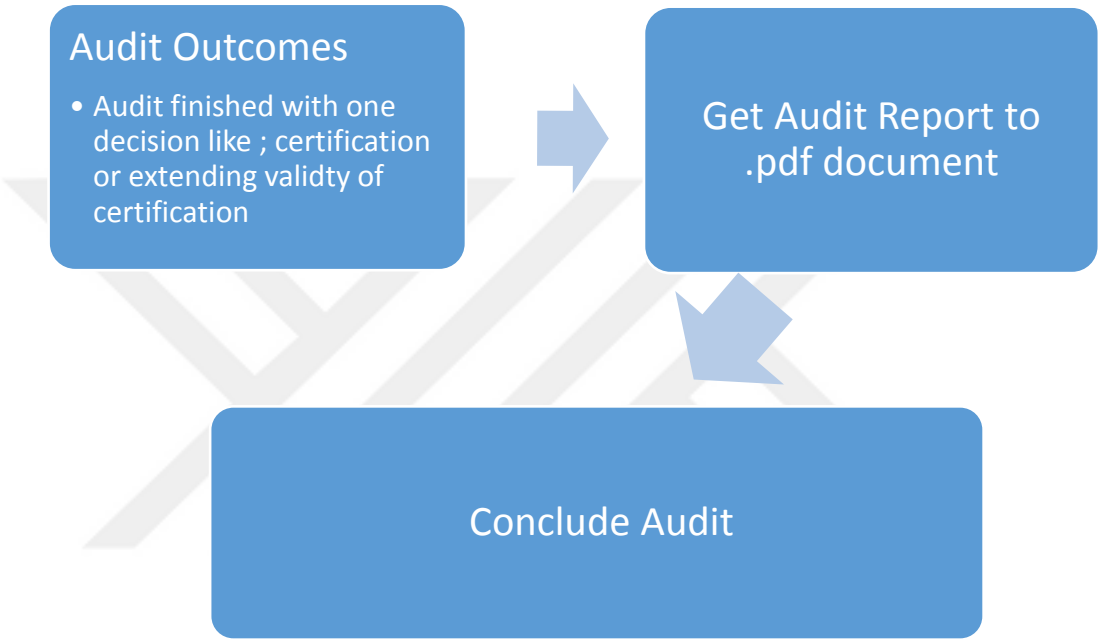


Figure 2.5 Audit outputs and reports

CHAPTER THREE

DATABASE and SOFTWARE TECHNOLOGY

3.1. Database Structure of System

Microsoft SQL Server Management Studio 2012 solution used to design ER diagram of web audit tool. SQL Server Management Studio (SSMS) is an integrated environment for accessing, configuring, managing, administering, and developing all components of SQL Server. SSMS combines a broad group of graphical tools with a number of rich script editors to provide access to SQL Server to developers and administrators of all skill levels.

SSMS combines the features of Enterprise Manager, Query Analyzer, and Analysis Manager, included in previous releases of SQL Server, into a single environment. In addition, SSMS works with all components of SQL Server such as Reporting Services and Integration Services. Developers get a familiar experience, and database administrators get a single comprehensive utility that combines easy-to-use graphical tools with rich scripting capabilities [9].

Every database table that created has relation with some process on web – based audit tool. So every table that has relation with same process has linked by foreign keys. For basic function that will perform on database table's primary key added for all tables. Primary keys types are generally unique identifier. Some of the primary keys identified as integer type. There are 50 database tables created to manage data of this system. Each relation of these tables created at Database Diagram feature of SSMS.

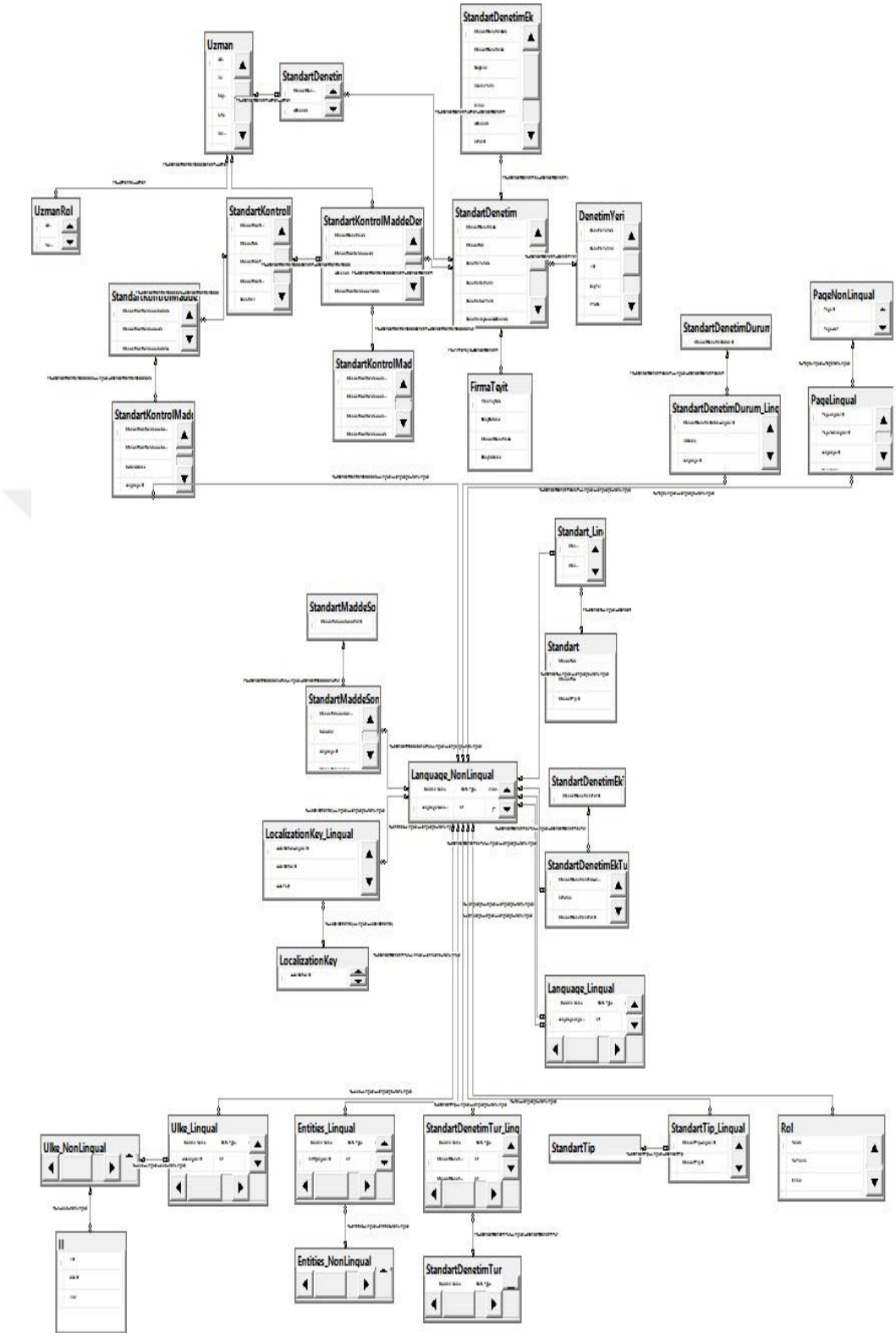


Figure 3.1 General view of data tables relationships form of Audit System

3.1.1. Detailed Description of Database and Data Tables

As mentioned above SSMS used for creating database tables and relationship between of them. Audit process is the core concept of this system's database. There is also one important central table settled as Language_NonLingual table. This table has relation with tables which are capable of multi-language support columns.

Some of the tables are keeping central and vital information, this type of tables makes relational connection with other tables. These tables are "Uzman" (Auditor), "Standart"(Management System Standart), "DenetimYeri" (Auditee), "StandartDenetim" (Audit Info) and Lingual data tables. Data tables which are named with "Lingual" have multi language support definition of original table.

3.1.1.1. "Uzman" (Auditor) Data Table

Auditor's data kept at "Uzman" data table which has relations according to the processes that auditor done at audit system. Entity relations of "Uzman" data table figure out at Figure 3.2 Each auditor have NACE code data which is stored at UzmanNACE data table. The Statistical Classification of Economic Activities in the European Community, commonly referred to as NACE (for the French term "Nomenclature statistique des Activitéséconomiquesdansla Communauté Européenne"), is the industry standard classification system used in the European Union. This code says us in which area auditor has professional study. This code is important because only experts can participate audit that have NACE code about company business area.

Second relational data table with "Uzman" data table is "Rol" which is connected with "UzmanRol" data table to "Uzman". "Rol" data table contains role of auditors. This role may identify as "Lead Auditor", "Auditor" or any role that can take place during audit.

There is another relation with “Uzman” data table which specify Auditor’s duty during audit. “StandartKontrolMaddeDenetim” data table and “StandartDenetimUzmanMadde” data table connected to “Uzman” data table with foreign keys. “StandartKontrolMaddeDenetim” data table contains relations with Auditors and checklist questions. Which auditor will be handled which questions during audit can be determined by getting data from these tables.

Figure 3.2“Uzman” (auditor) data table entity relationship view

3.1.1.2. "Standart" (Management System Standard) Data Table

Management System Standard is the basic data which is essential data to implement Management Systems StandardsAudit System database. System capable to have more than one management system standards. For every standard audit checklist, standard control items and connection between audits can be added to related tables. This relationship show at Figure 3.3 with table illustration.

For our practical example "Standart" data table have data like 'TS ISO/IEC 27001'.

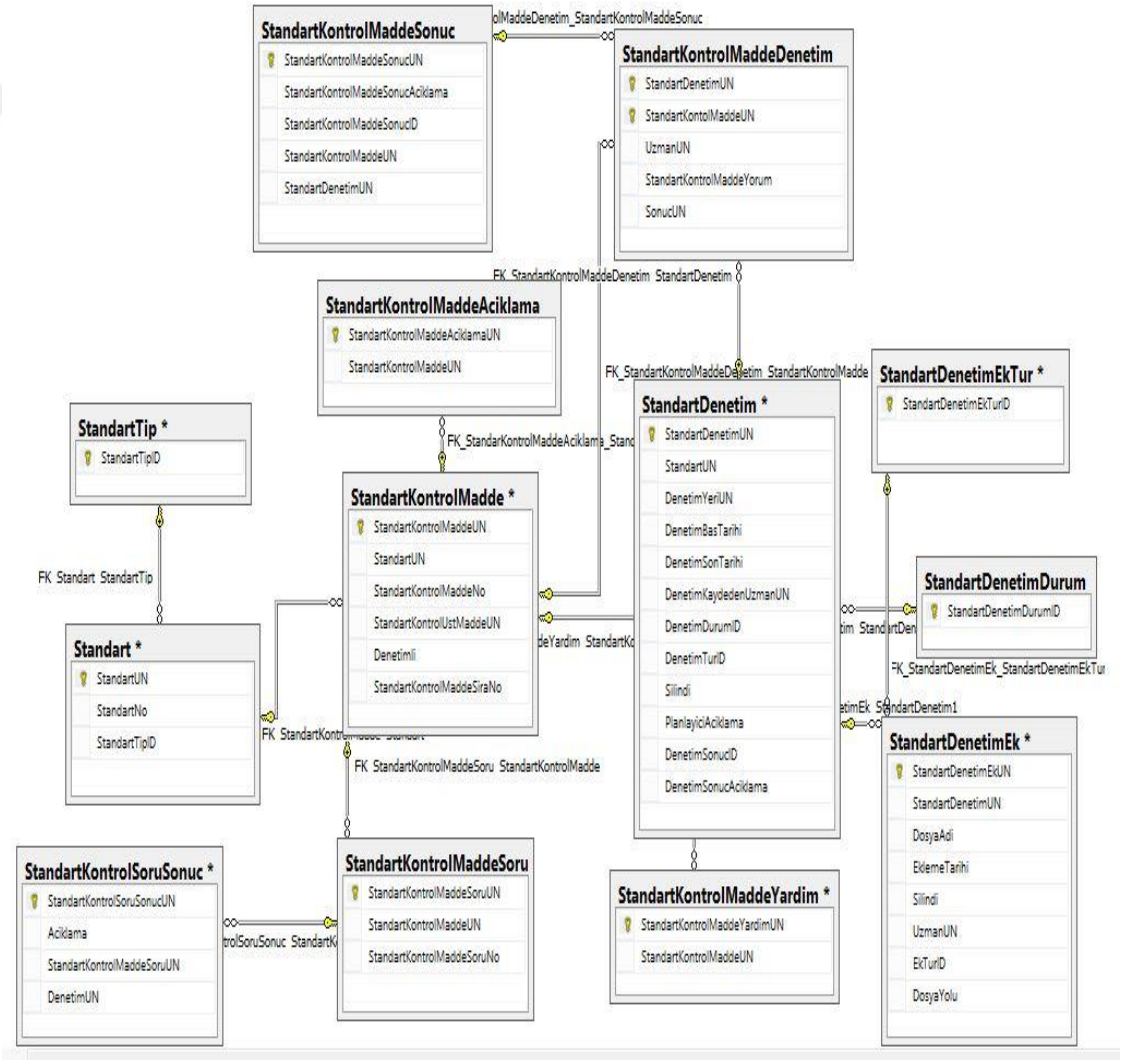


Figure 3.3 "Standart" (management system standard) data table view

“StandartKontrolMadde” (Standard Control Items) has 1-N relation with “Standart” (Standard) data table. Control items will be identified on system related with selected Management System Standard.

“StandartKontrolMaddeSoru” (Standard Control Item’s Checklist) has 1-N relation with “StandartKontrolMadde” (Standard Control Items) data table. Checklist contains questions which are going to use during audit.

“StandartKontrolMaddeSoruSonuç” (Standard Control Item’s Checklist’s Results) has 1-1 relation with each checklist’s question but it’s connected with audit attribute. So for every audit checklist results may change. This data table relationship also filled up during audit by auditors. Every question’s answer that can be asked to organization can be saved with this data table.

“StandartDenetim” (Audit’s Information) has N-N relationship with “StandartKontrolMadde” (Standard Control Items). Audit basic information stored at “StandartDenetim” like audit date, audit’s management standard and auditee.

“StandartKontrolMaddeDenetim” (Management Systems Standard Control Items Audit Results) has N-N relation with “StandartDenetim” (Audit’s Information) and 1-N relation with “StandartKontrolMadde” (Standard Control Items). Each management system standard’s control items have result at the end of audit such as conformance, minor non-conformance or major non-conformance. These result will be stored at “StandartKontrolMaddeDenetim”.

“StandartDenetimEk” (Audit Related Documents) has 1-N relation with “StandartDenetim” (Audit’s Information). Auditors may upload documents to our system which will have relation automatically according to this entity relation diagram. These documents are storing with their document type and document name at “StandartDenetimEkTur” (Audit Related Document Type).

3.1.1.3. "Language_Lingual" Data Table and Relationship between Other Data Tables

One of the most important features of Web-based Audit System for Standardized Management Systems is multi-language support. This feature is provided by Language_Lingual data table. Every data tables has column with name "LanguageID", this id make connection with Language_Lingual data table. For example "Ulke_Lingual" (Country_Lingual) data table stores country names. If country name is "Türkiye" it's language id equal to the id of the language "Turkish". If country name is "Turkey" it's language id equal to the id of the language "English".

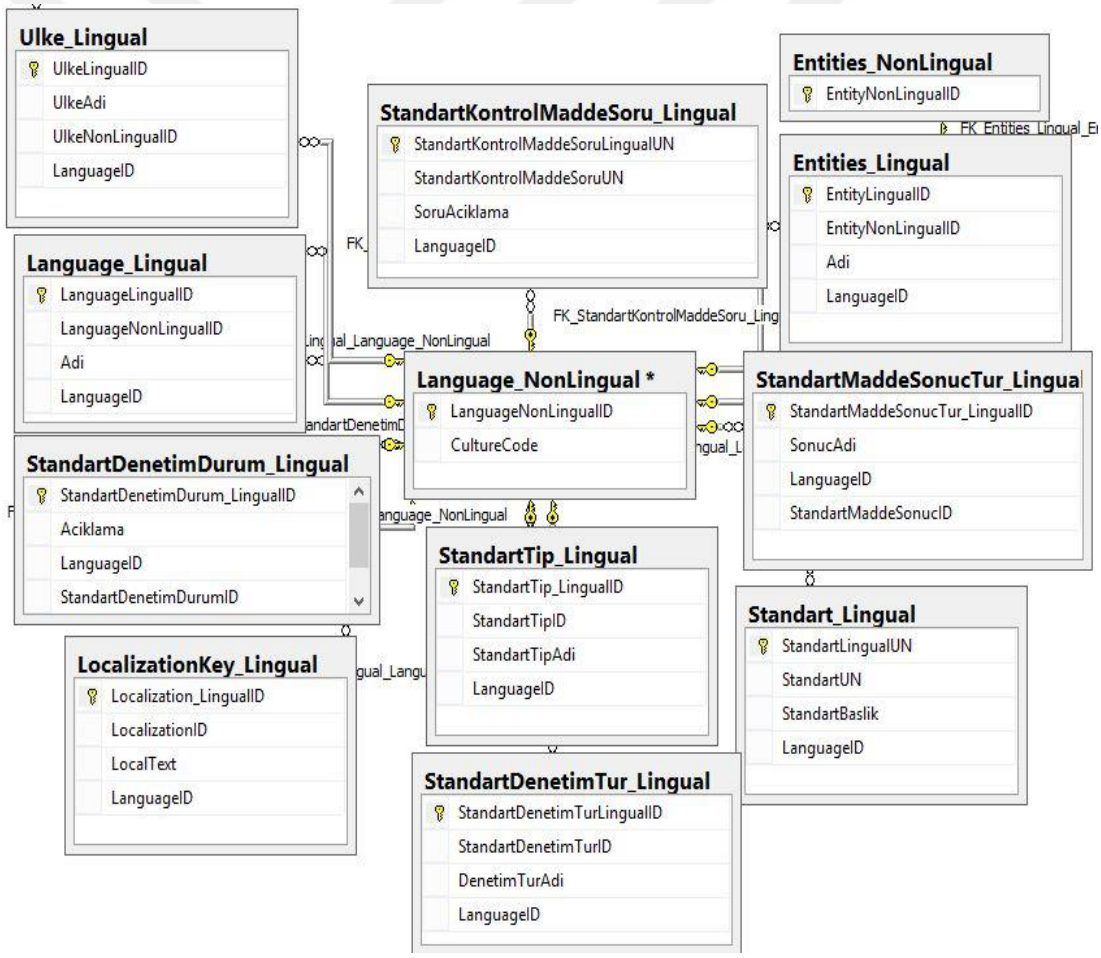


Figure 3.4 Language_Lingual data table and relationship with other data tables

3.2. Essential Information about Web-Based Systems

A Web-based application refers to any program that is accessed over a network connection using HTTP, rather than existing within a device's memory. Web-based applications often run inside a Web browser. However, Web-based applications also may be client-based, where a small part of the program is downloaded to a user's desktop, but processing is done over the Internet on an external server. Web-based applications are also known as Web apps [10]. These tiers and relations between tiers illustrated at Figure 3.5.

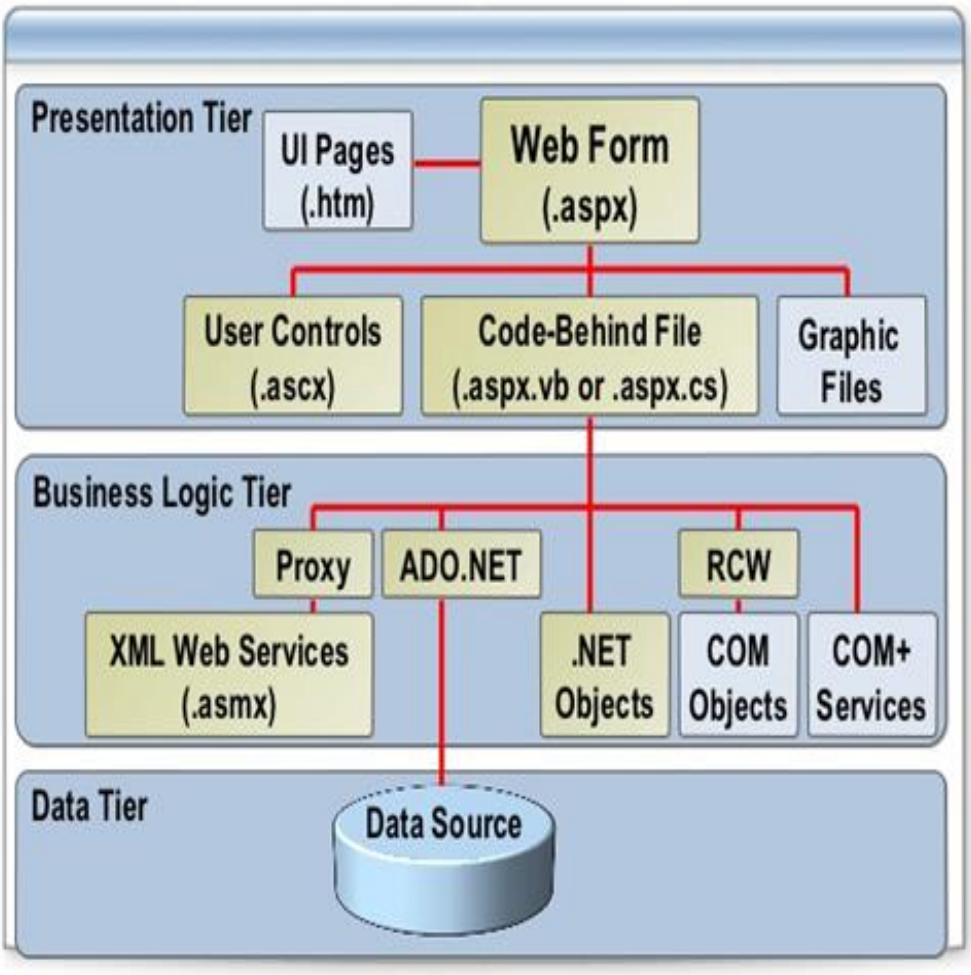


Figure 3.5 Web application architecture [10]

To implement web-based audit tool Microsoft Visual Studio 2013 software is used for coding and debugging. C# is selected as a programming language. ASP.NET Run-Time Services is web application frameworks which enable to create dynamic web pages. ASP.NET working principal illustrated at Figure 3.6.

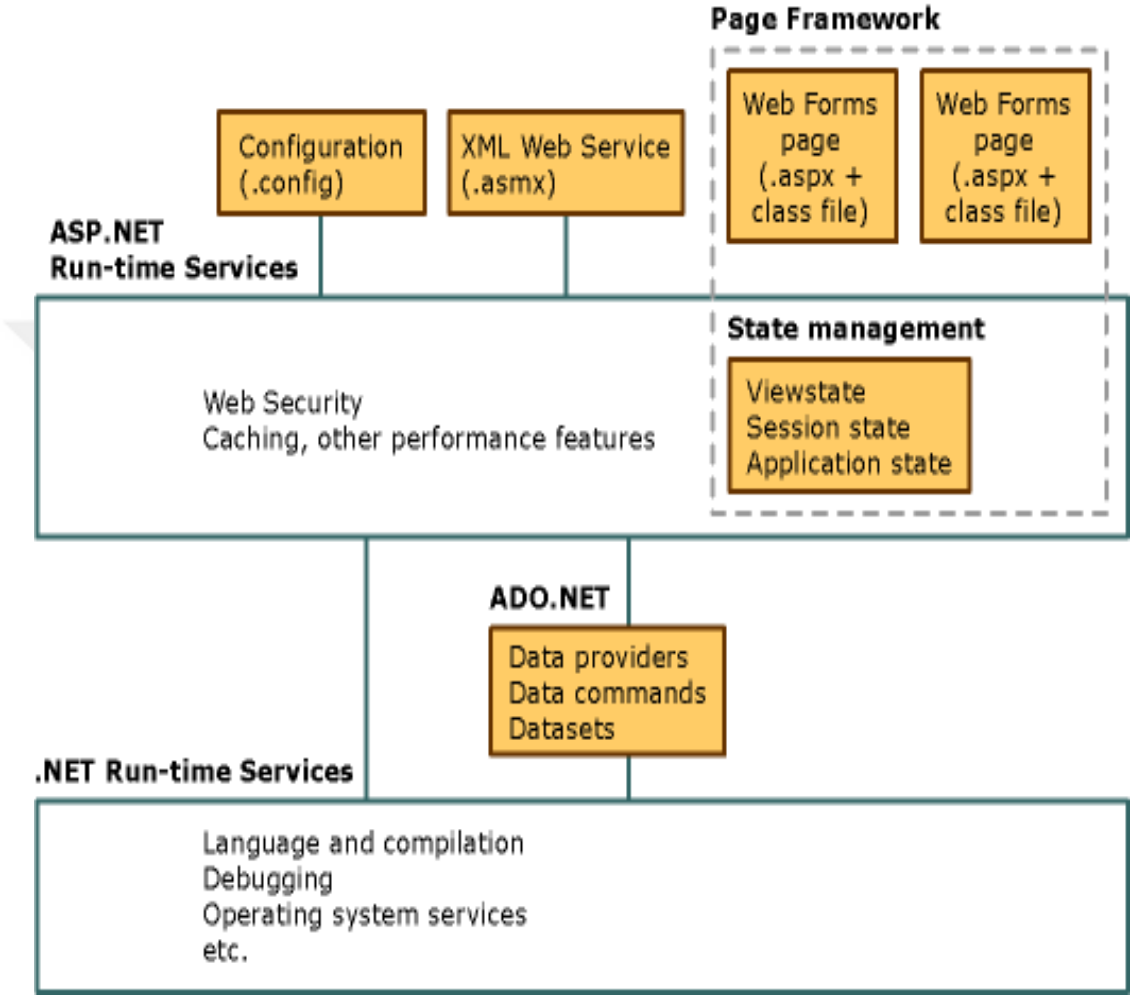


Figure 3.6 .NET framework and web application diagram [11]

3.3. Software Infrastructure of Web-Based Audit System

Main part of this thesis is fully automated web based system which is developed on Microsoft Visual Studio 2013.Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs for Microsoft Windows, as well as web sites, web applications and web services [12].Three-tier software architecture used during coding period which consists of presentation layer, middle layer and data layer which are given in Figure 3.7.

Presentation layer come out with web forms, user controls and user interfaces. User interfaces take shape with Cascading Style Sheet (css) and html. To obtain good and user-friendly view for web pages Metronic Theme free version is used. This makes general view of web design neat, functional and user – friendly. All menu, page frames and main page design created by using this tool.

Middle layer contains business layer which have logic layer and data access layer. Data layer have data tables datasets and xml files. Insert, update, delete functions handle on this layer. This layers run on 'VeriServis' class library which framework is .NET Framework 4. All SQL transactions run over on this class.

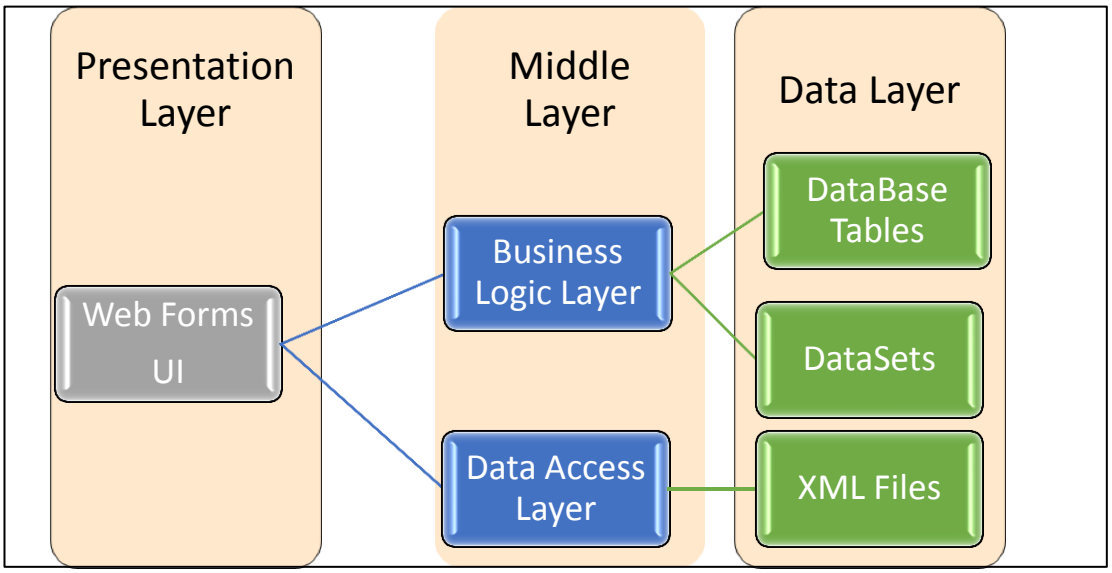


Figure 3.7 Three-Tier software architecture

Tablo 3.1 Illustration of 3-Tier architecture based on management system Audit System

TIER ONE **Presentation Layer**	**TIER TWO** **Business Layer**	**TIER THREE** **Data Layer**

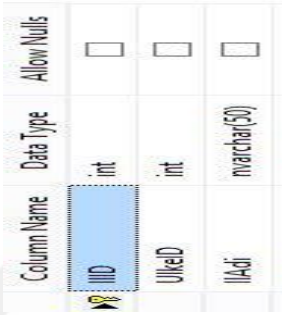
GridView on WebPage
 
 	
	Interface Layer
	[OperationContract]
	FonksiyonSonuc<IlDataSet>GetIlList();
	Logic Layer
	EntitiesAraBirimoEntity = ProxyManager.XProxy<EntitiesAraBirim>();
	FonksiyonSonuc<IlDataSet>fsEntity = null;
	fsEntity = oEntity.GetIlList();EntityList = fsEntity.Sonuc;grdEntity.DataSource = fsEntity.Sonuc;
	grdEntity.DataBind();
		Il Data Table on Database
		 

Table 3.1 illustrated how our web based system run out Three-tier software architecture. At presentation layer city information (İl) listed on Grid View columns which class keeping at System.Web.UI.WebControls library. At business layer GetIlList() method calls SQL query result from business logic layer which has data access via VeriKatmani class.

Our system keeps also data via enumerated type which are generally used as identifiers of constants at system. Some of the category types identified as enumerated data type like shown at Table 3.2.

Tablo 3.2 Examples of enumerated data type

Code Example	Usage Area

Public enumMesajTipiEnum
{
[Description("info")]
Bilgi = 1,
[Description("warning")]
Uyari = 2,
[Description("danger")]
Hata = 3,
[Description("success")]
Basari = 4
}
	This enumeration used to change show dialog window category. If show dialog contains “info” , “Bilgi” enum will call to change show dialog window.

public enum StandartDenetimDurumEnum
{
Firma_Onayi_Bekliyor = 3,
Denetim_Onaylandı = 4,
Denetim_Reddildi = 5,
Denetim_Planlandi = 6,
Denetim_Tamamlandi = 7,
BasTetkikciOnayiBekliyor = 8,
Denetim_Iptal_Edildi = 9,
BasTetkikciOnayladi = 10,
BasTetkikciGeriGonderdi=11,
}
	This enumeration used to show status of audit. Every phase of audit will be monitored by using this enumeration.

CHAPTER FOUR

IMPLEMENTATION

4.1. Main Functions of Web-Based Audit Tool

4.1.1. Login Page and Home Page

4.1.1.1. Login Page

Account holders will be use login page to authenticate for system. Username and password are enough to be log in. See Figure 4.1 for partial screenshot of login page.

Figure 4.1 Login page

4.1.1.2. Home Page

Web-based Audit tool have functional home page which is show quantity of audit, quantity of auditors and quantity of auditee. Homepage (see Figure 4.2) contain menu names which are aligned left. There is a banner with name of system and account holder name. There is also language changer menu on banner part of page. There is a link name with “Secure Logout” at the right upper corner of home page. At the middle of the page there are four square windows. Each window contains numbers; they are summary view of audit system. First square window shows “My Audits” and ratio of completed and non-completed audits. Second square window is

shortcut of all audits page. Third square window is shortcut to list all auditors on system. The last square window is shortcut to list auditee on system.

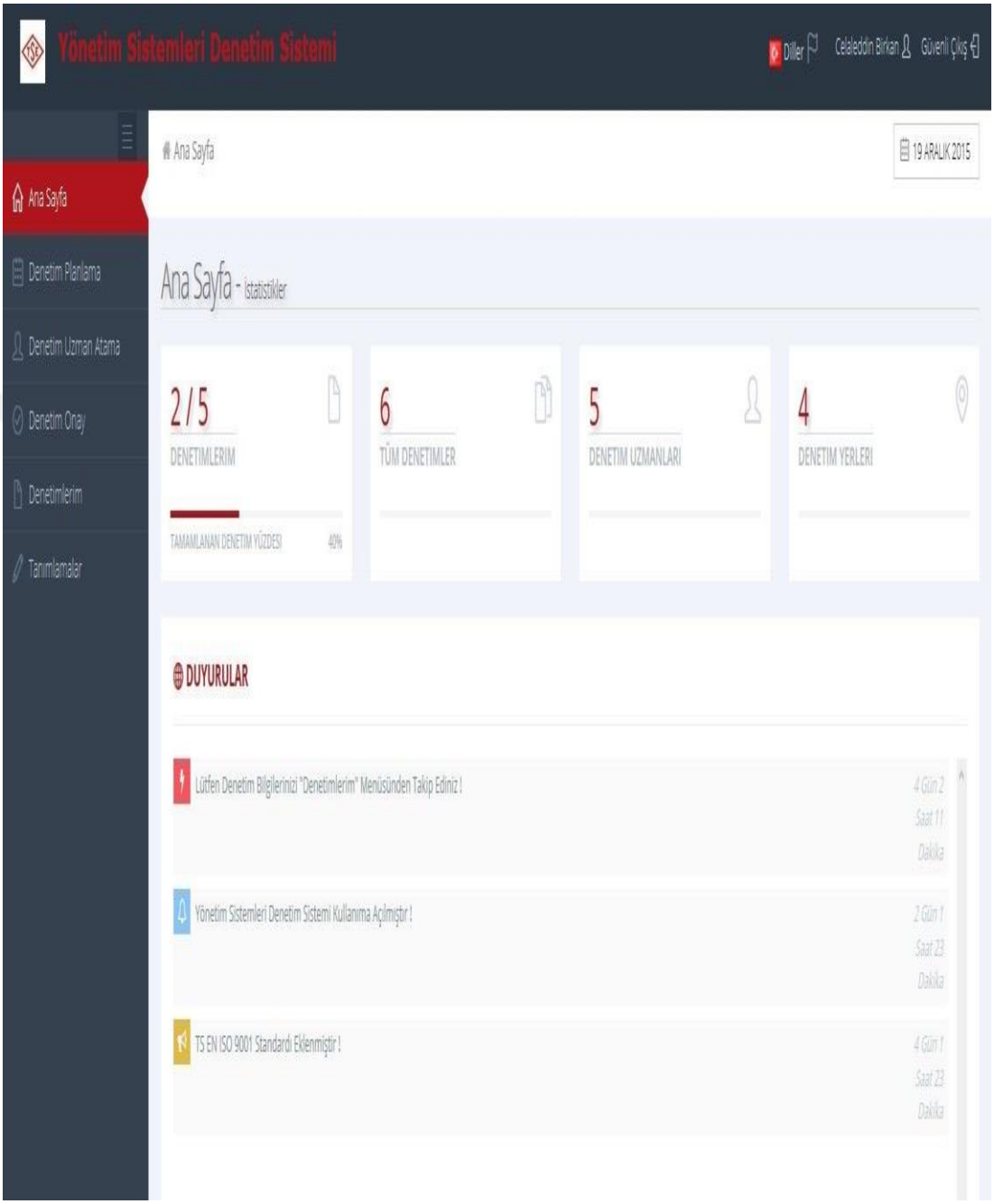


Figure 4.2 Homepage view of Audit System

4.1.2. Entity Definition Modules

Each entity that used at system can be defined by admin user. Every button name, pages titles, grid view column names, labels, textbox texts are can change dynamically. This feature enables to design very dynamic system. Every asset may define in any language which is defined to system before. When you are defining assets system asks in which language you will use.

4.1.2.1. Auditor Definition Module

"Audit Team", defined in the ISO 19011:2002 audit guideline as "one or more auditors conducting an audit supported if needed by technical experts" [8]. Auditor's information can be added or updated by using this module. Auditor's personal information, NACE code of auditor and role of auditor can be added for every auditor. Detailed view show at Figure 4.3.

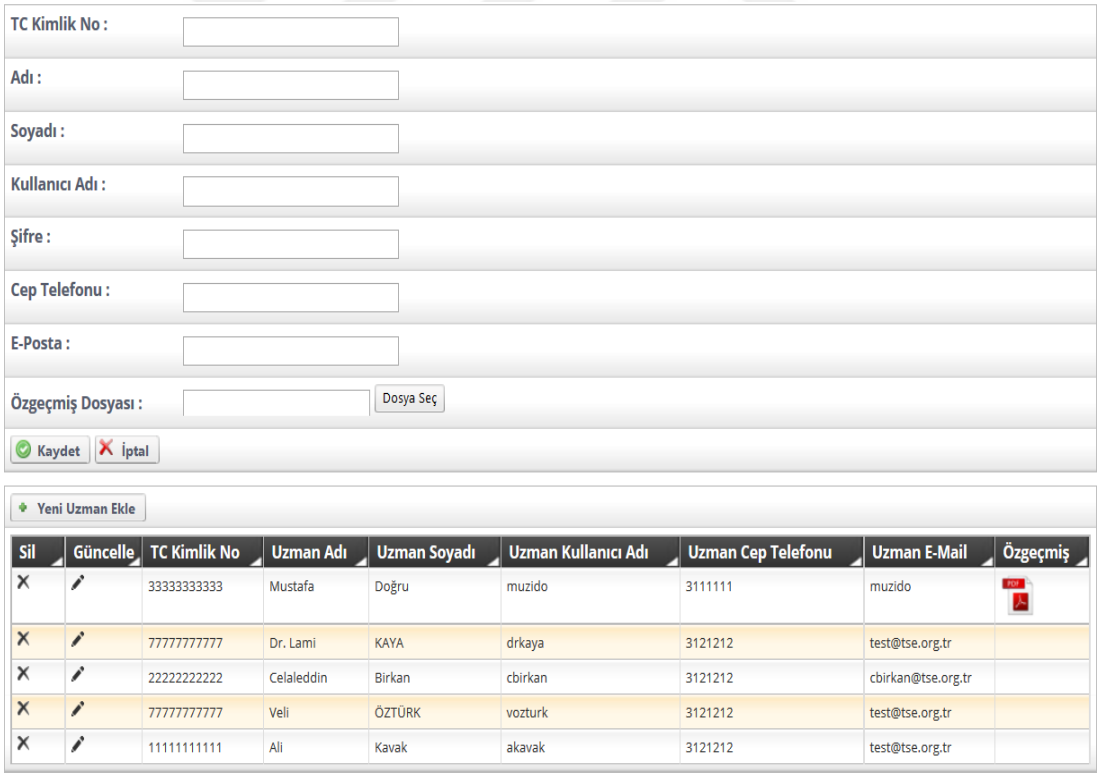


Figure 4.3 Auditor definition module page view

4.1.2.2. Auditee Definition Module

Organization information which is audited on system can be added by this module. NACE code of organization also added by using this module. Detailed view show at Figure 4.4.

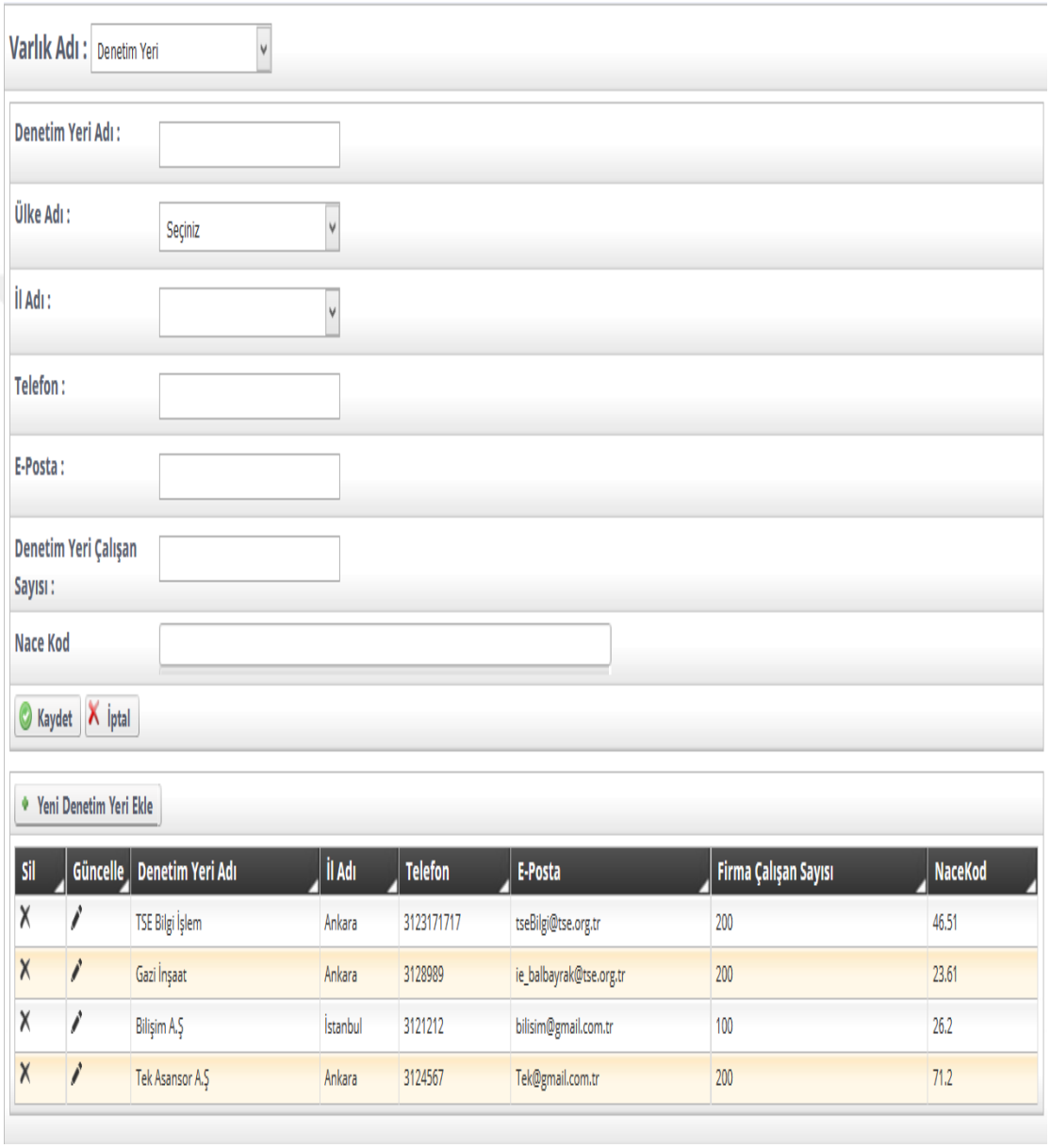


Figure 4.4 Supervised organization definition module view

4.1.2.3. Notification Definition Module

This definition module enables to define notification to publish notifications on home page. Notifications may be in different types like information, warning or caution. Notification will have start and end date. Interval of these dates notification will be published on homepage. Notification language can be selected. Defined notifications are listed in home page in interval of notification start and end date. Notification will be appear in different way at home page based on notification type.

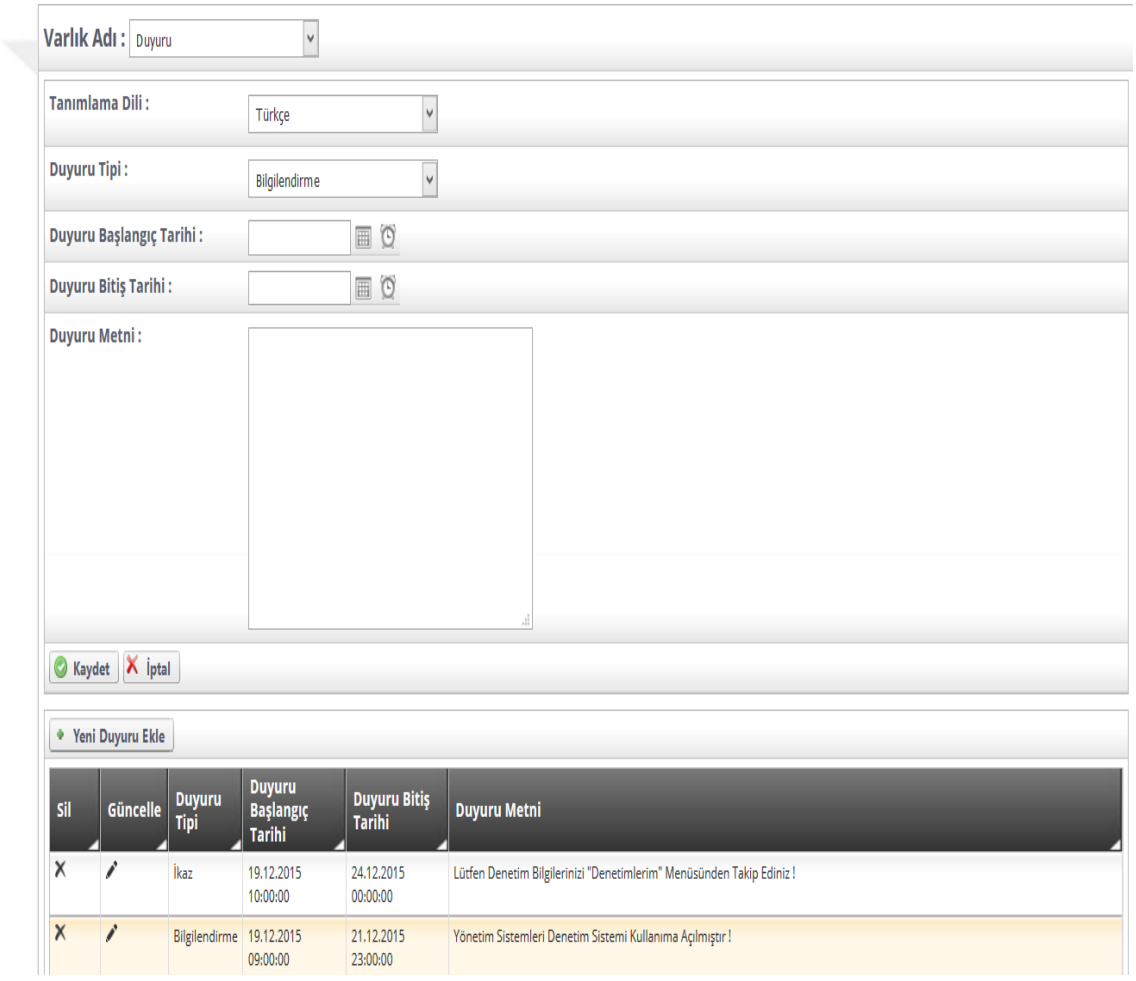


Figure 4.5 Notification definition module

4.1.2.4. Language Definition Module

Audit system definition module consist language definition feature with it. Any language can be defined and other assets may be defined in added language. This feature is the basic requirement for multi-language support. All assets definitions saved with language id on data tables. Detail view show at Figure 4.6.

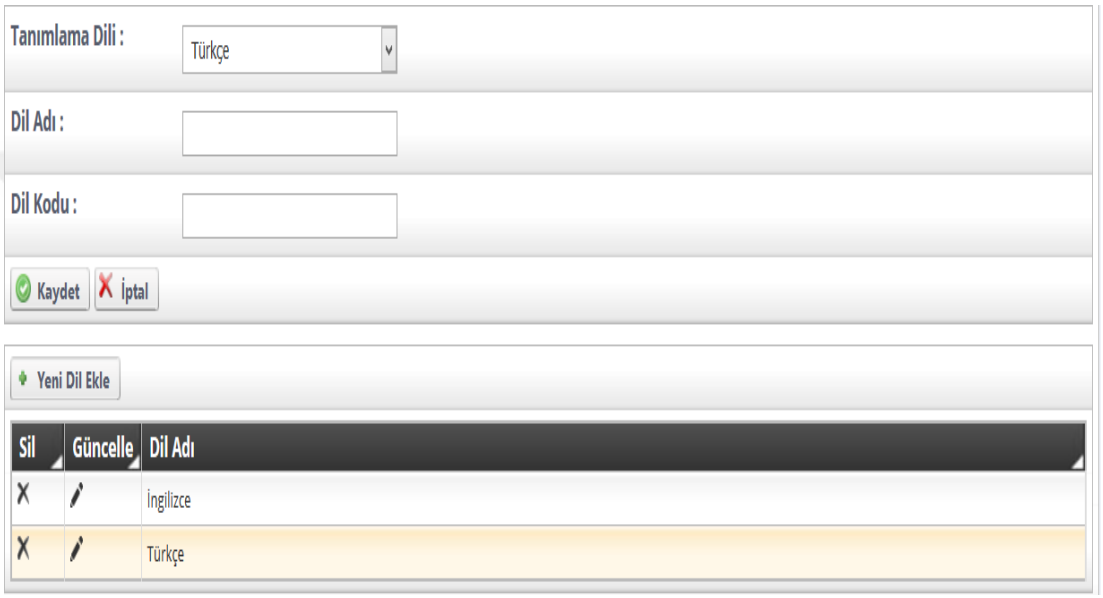


Figure 4.6 Language definition module view

At the right corner of audit system there is language changer menu which is show at Figure 4.7.

4.1.2.5. Selection of Defined Languages

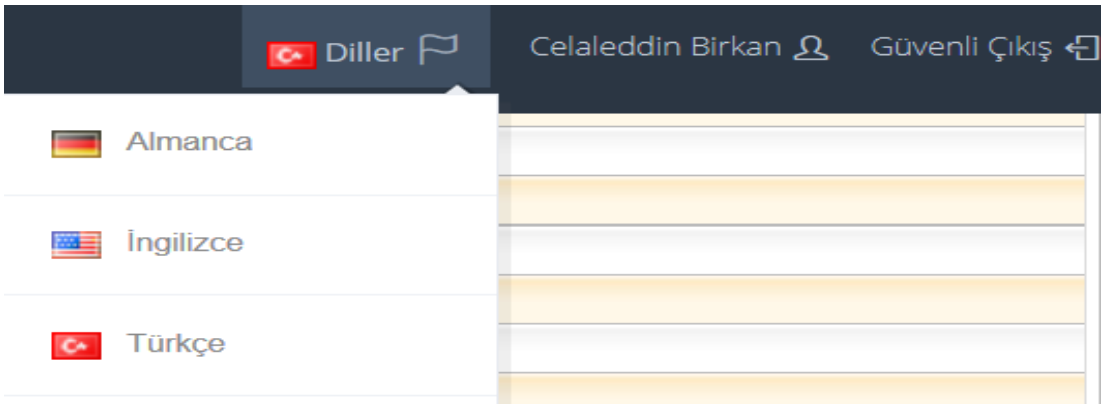


Figure 4.7 Language changer menu

4.1.2.6. Auditor Role Definition Module

Auditor role definition role enable to add, update or delete auditor's role. Auditor's role also can be defined in any language. "System Admin" role capable to make these definitions. "Lead Auditor" role capable to assign tasks to other auditors. One auditor may have more than one role in the system. At planning stage of audit role of auditor can be selected according to the audit. "Lead Auditor" may take "Auditor" role during audit. Account holder with "Admin" role will have administrative authority on audit system. Admin can add, delete and update every assets on web-based audit system. Some defined roles and definition page show at Figure 4.8.

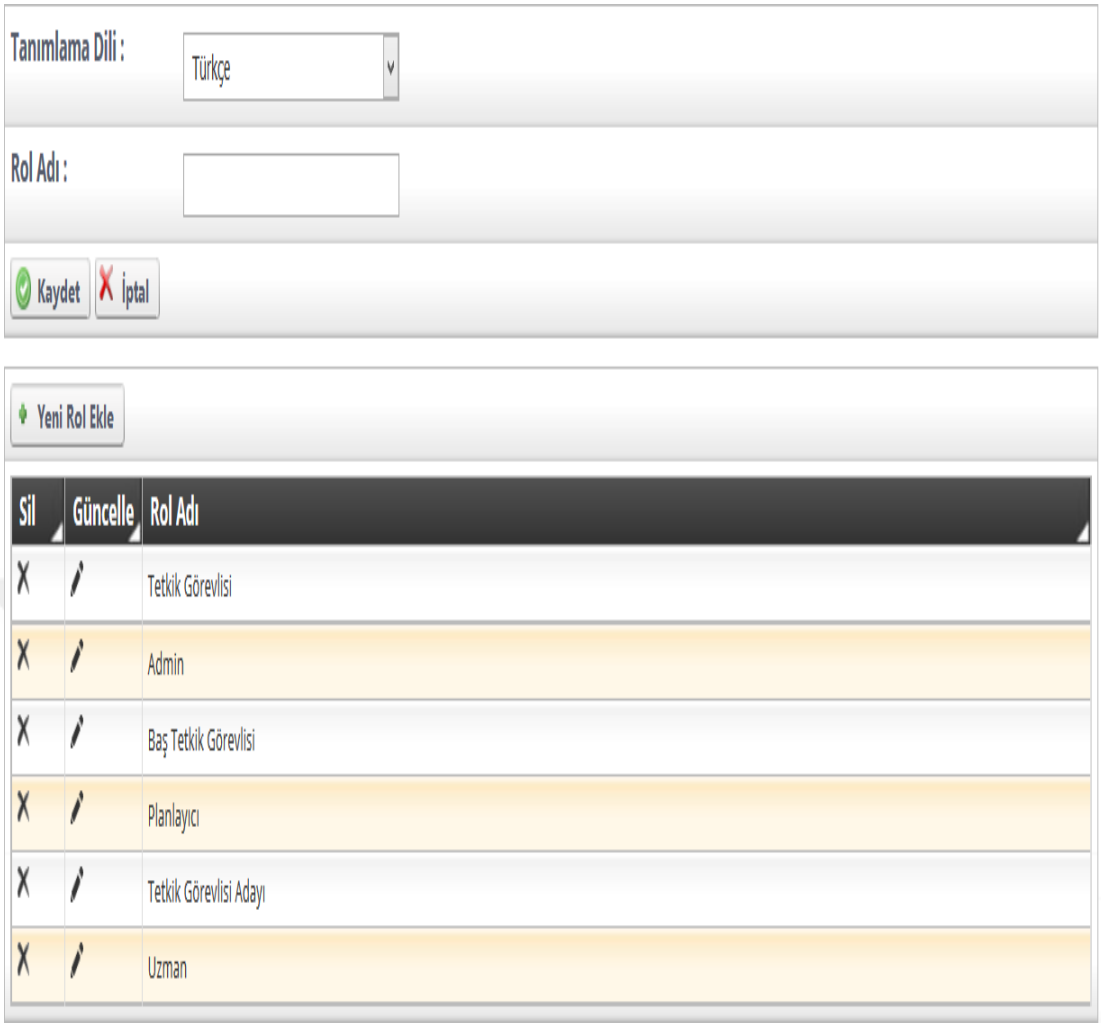


Figure 4.8 Role definition module

4.1.2.7. Management System Standard Definition Module

This definition module is the basic feature to have multi-standard management system standards audit tool. This module enables to define any type of standard with its original file. For example to define a new standard;

Tanımlama Dili (Definition Language): English

Standart No (Standard No): TS EN ISO 9001:2013

StandartBaşlık (Standard Title): Quality Management

Standart Tipi (Standard Type): TS EN ISO

StandartDosyası (Standard's File): Upload original standard .pdf file.

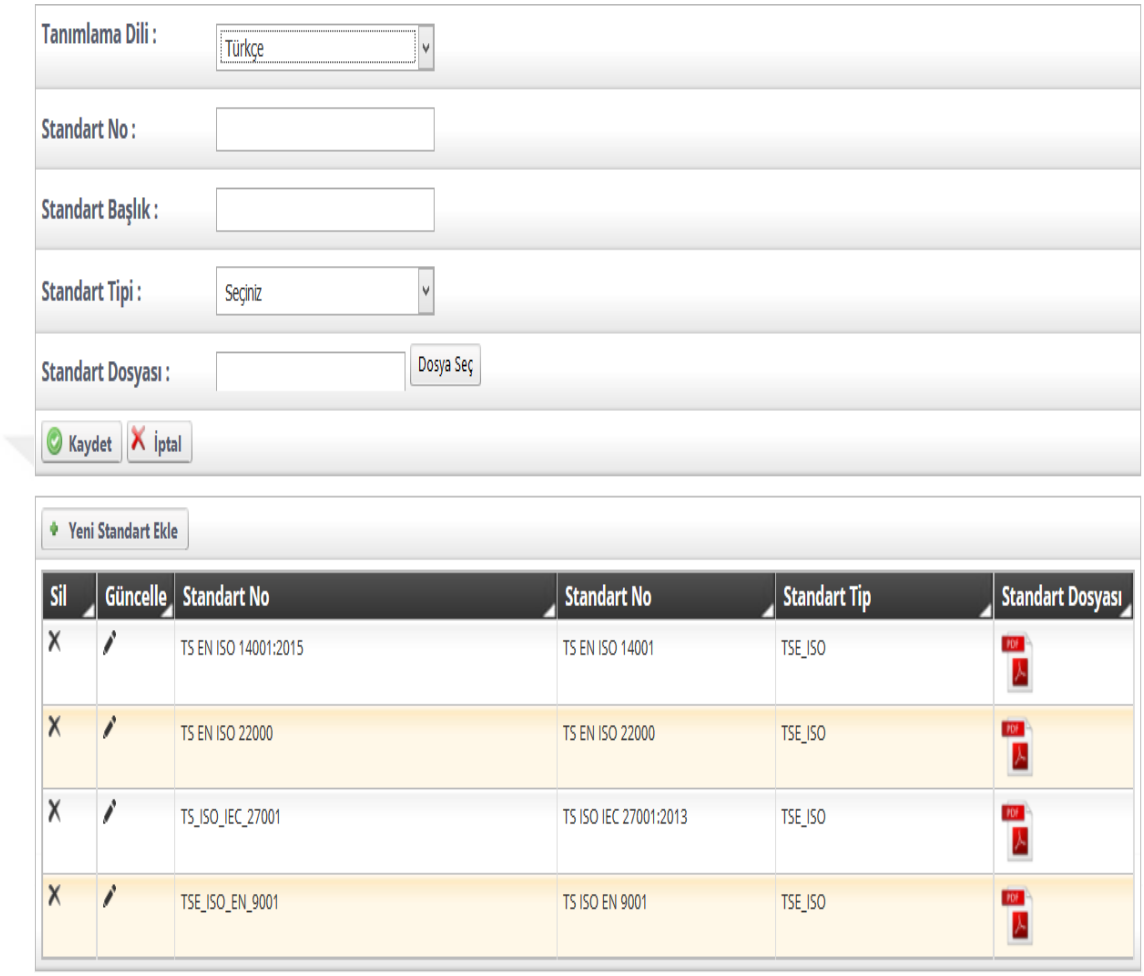


Figure 4.9 Standard definition module

4.1.2.8. Country Definition Module

Country names also can be defined on entity definition module. These defined countries may use to define auditee country. For detail view see Figure 4.10.

Figure 4.10 Country definition module

4.1.2.9. City Definition Module

City names also can be defined on entity definition module. These cities may use to define auditee city. For detail view see Figure 4.11.

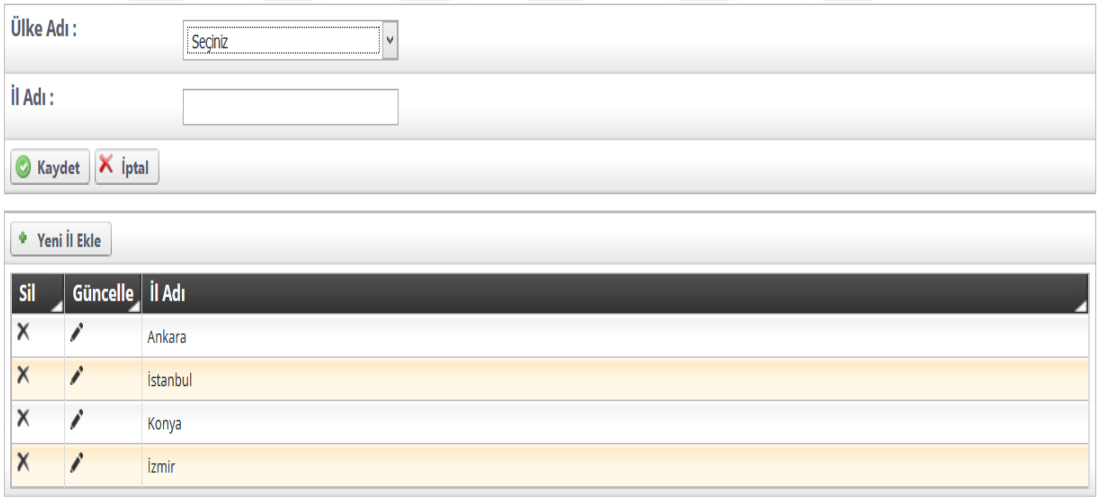


Figure 4.11 City definition module

4.2. Audit Planning Module

This module enables to schedule audit plan. Audit's standard, audit type, auditee, date of audit, auditors and their roles and planners description are parameters of plan.

More than one auditor can be added for one audit. See Figure 4.12 for detailed view. After saving plan for audit, calendar which is at the bottom of page will show dates and short description for planned audit (See Figure 4.13). Documents related with audit plan also can be saved during planning process. More than one document can be saved related with audit plan.

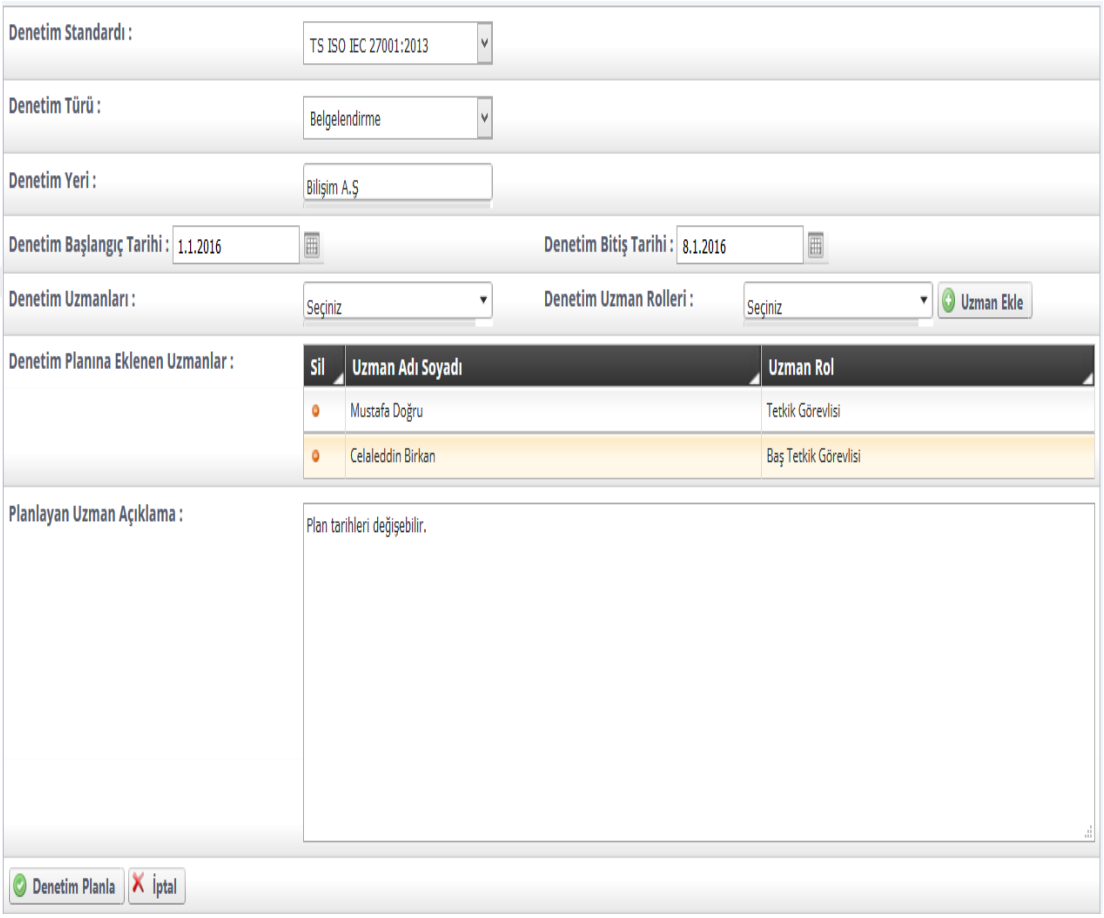


Figure 4.12 Audit planning module

4.2.1. Audit Schedule Calendar

There is a functional calendar to track audit plans. Summary information about audit can be seen on this calendar. Update plan process may perform by right-click on this calendar. Audit plan report can be shown by right-click on audit plans. When mouse cursor wait on this calendar it shows information about auditors.

Detail view show at Figure 4.13.

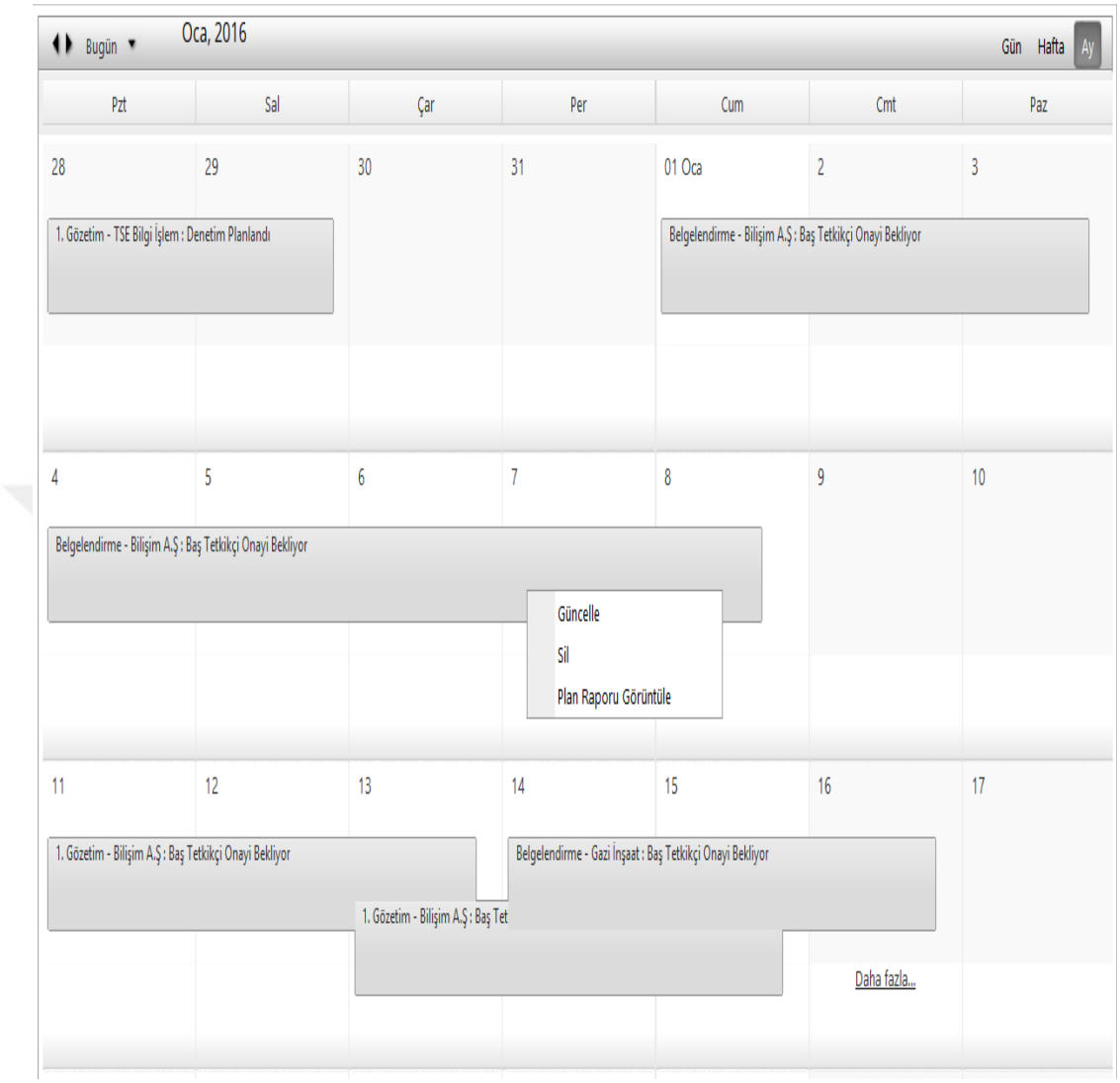
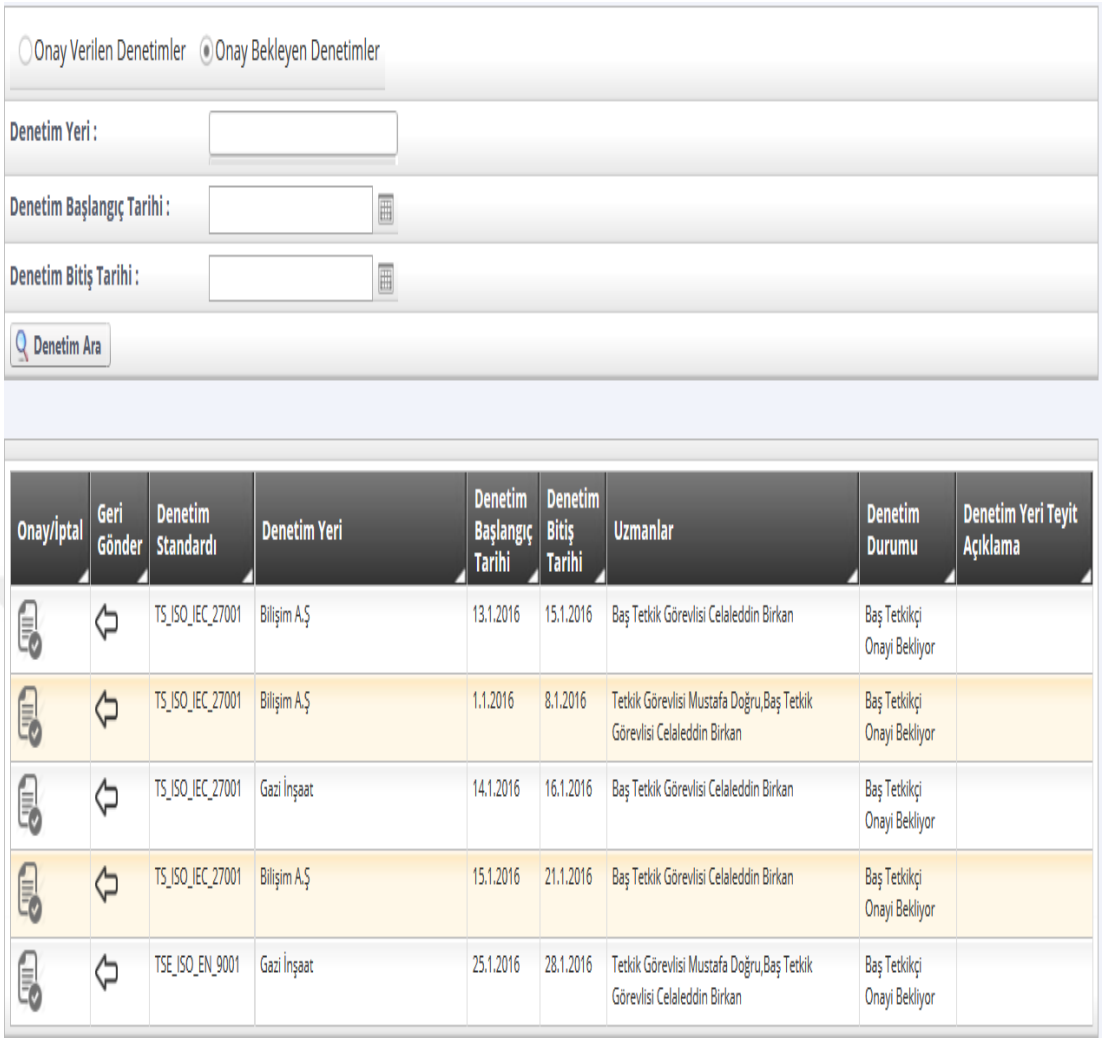


Figure 4.13 Scheduled audits functional calendar

4.3. Audit Management Module

4.3.1. Lead Auditor Audit Plan Confirmation Process

There is a module to confirm or deny audits for lead auditor role. Lead auditor may accept or reject planned audit. If lead auditor not agrees with plan dates or any other issue he can request to update plan from planner. Detail view show at Figure 4.14



Onay/İptal	Geri Gönder	Denetim Standardı	Denetim Yeri	Denetim Başlangıç Tarihi	Denetim Bitiş Tarihi	Uzmanlar	Denetim Durumu	Denetim Yeri Teyit Açıklama
		TS_ISO_IEC_27001	Bilişim A.Ş	13.1.2016	15.1.2016	Baş Tetkik Görevlisi Celaleddin Birkan	Baş Tetkikçi Onayı Bekliyor	
		TS_ISO_IEC_27001	Bilişim A.Ş	1.1.2016	8.1.2016	Tetkik Görevlisi Mustafa Doğru,Baş Tetkik Görevlisi Celaleddin Birkan	Baş Tetkikçi Onayı Bekliyor	
		TS_ISO_IEC_27001	Gazi İnşaat	14.1.2016	16.1.2016	Baş Tetkik Görevlisi Celaleddin Birkan	Baş Tetkikçi Onayı Bekliyor	
		TS_ISO_IEC_27001	Bilişim A.Ş	15.1.2016	21.1.2016	Baş Tetkik Görevlisi Celaleddin Birkan	Baş Tetkikçi Onayı Bekliyor	
		TSE_ISO_EN_9001	Gazi İnşaat	25.1.2016	28.1.2016	Tetkik Görevlisi Mustafa Doğru,Baş Tetkik Görevlisi Celaleddin Birkan	Baş Tetkikçi Onayı Bekliyor	

Figure 4.14 Lead auditor confirmation page

4.3.2. Lead Auditor Audit Tasks Assign Process

Lead auditor should assign tasks to auditors before audit day. For every management systems standards, checklist defined already on audit system by admin. Lead auditor firstly select auditor, then select standard clauses and audit day. Each audit day and standard clauses get relation on this module. This function enable to track which standard clause is going to audit on which audit days. Tasks are Standard's control list shown at Figure 4.15.

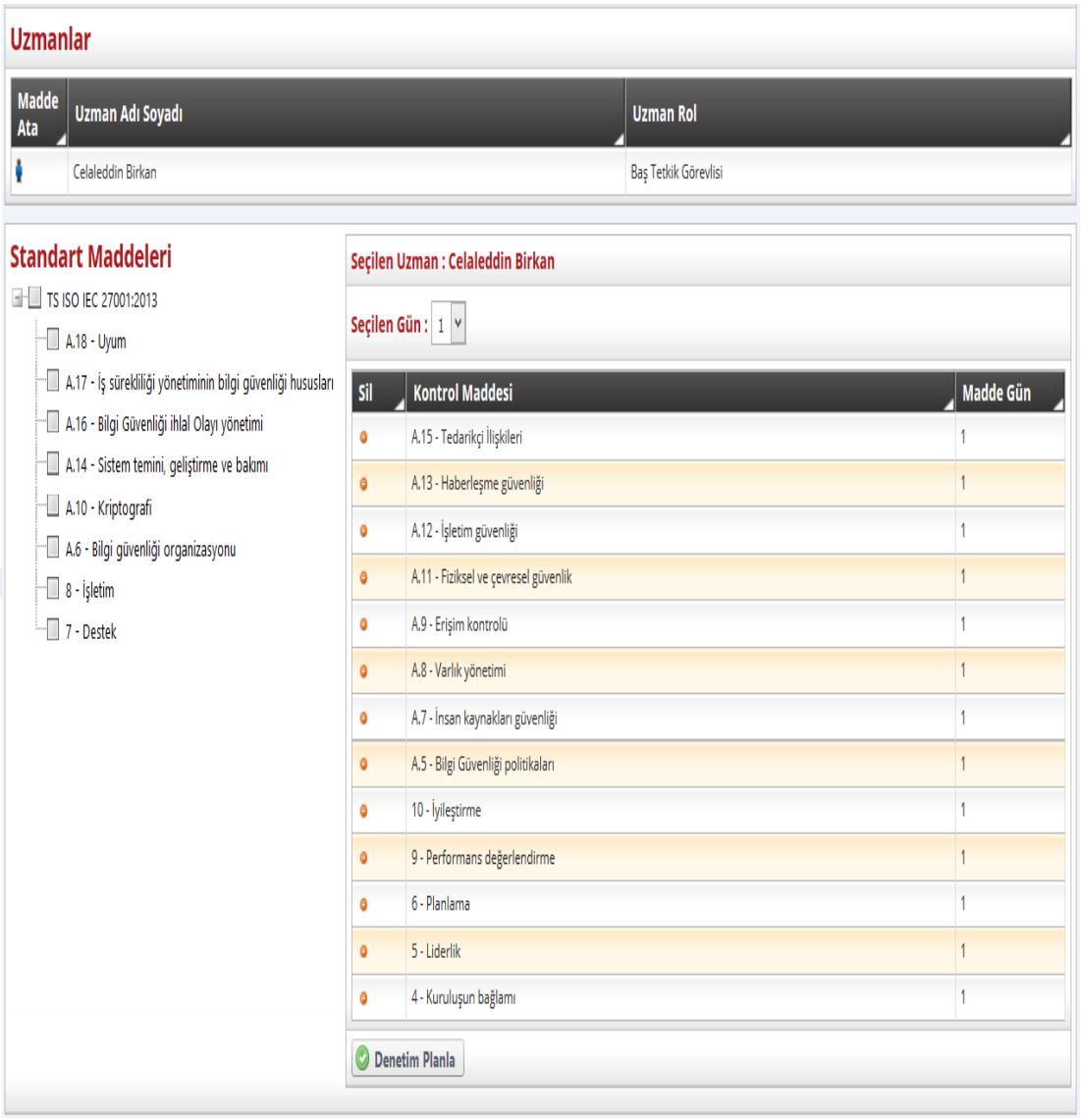


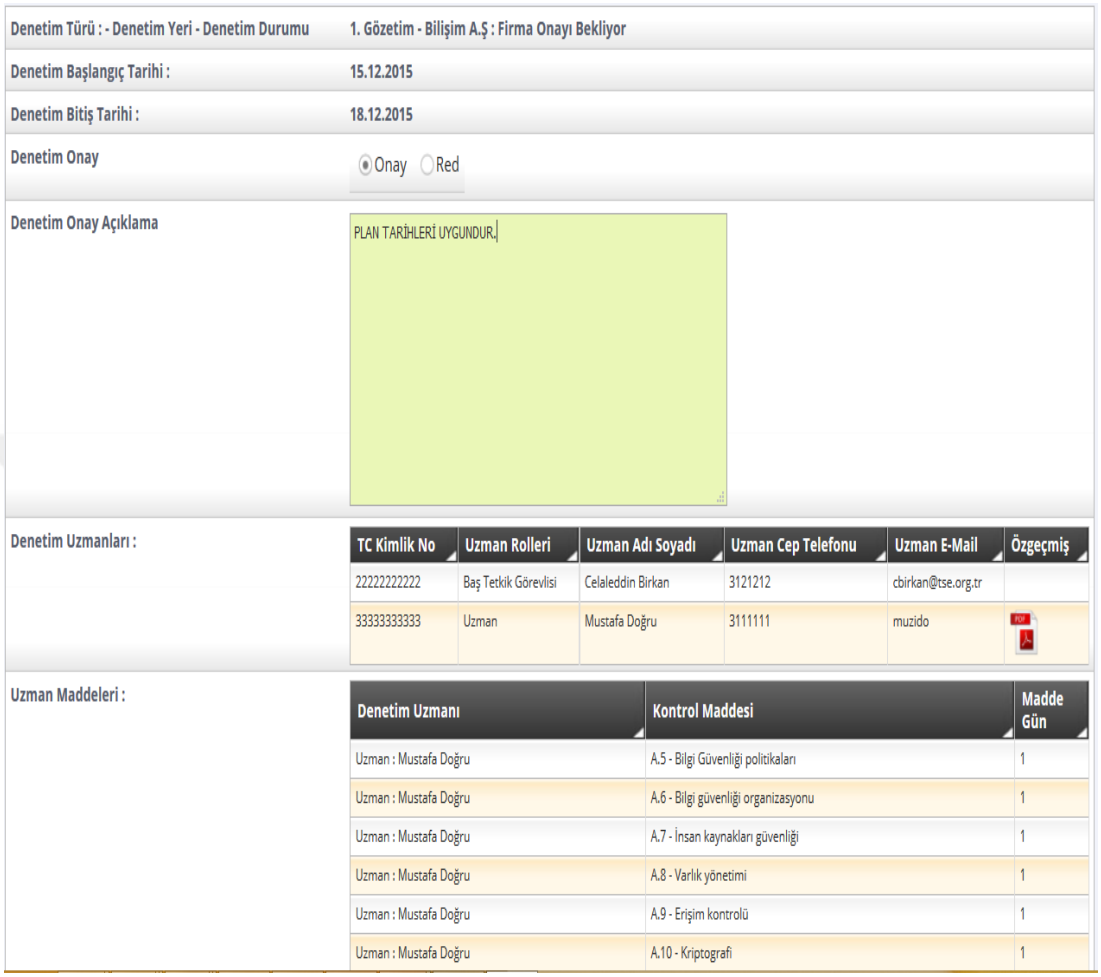
Figure 4.15 Lead auditor assign tasks by selecting control list

4.3.3. Auditee confirmation page

According to ISO 19011, clause 6.3.2, "The audit plan may be reviewed and accepted by the audit client, and should be presented to the auditee. Any objections by the auditee to the audit plan should be resolved between the audit team leader, the auditee and the audit client."[13]

To ensure the ISO 19011 standard, this confirmation page's link send via e-mail to supervised organization when lead auditor finished task assignments to auditors. When organization responsible get this e-mail, after clicking link page which is show at Figure 4.16 will be appear. Organization can see date of audit, auditor's

information and scope of audit. The organization responsible may accept or reject plan by using this page.



Denetim Türü : - Denetim Yeri - Denetim Durumu	1. Gözetim - Bilişim A.Ş : Firma Onayı Bekliyor
Denetim Başlangıç Tarihi :	15.12.2015
Denetim Bitiş Tarihi :	18.12.2015
Denetim Onay	Onay / Red
Denetim Onay Açıklama	PLAN TARİHLERİ UYGUNDUR.

Denetim Uzmanları :

TC Kimlik No	Uzman Rolleri	Uzman Adı Soyadı	Uzman Cep Telefonu	Uzman E-Mail	Özgeçmiş
22222222222	Baş Tetkik Görevlisi	Celaleddin Birkan	3121212	cbirkan@tse.org.tr	
33333333333	Uzman	Mustafa Doğru	3111111	muzido	

Uzman Maddeleri :

Denetim Uzmanı	Kontrol Maddesi	Madde Gün
Uzman : Mustafa Doğru	A.5 - Bilgi Güvenliği politikaları	1
Uzman : Mustafa Doğru	A.6 - Bilgi güvenliği organizasyonu	1
Uzman : Mustafa Doğru	A.7 - İnsan kaynakları güvenliği	1
Uzman : Mustafa Doğru	A.8 - Varlık yönetimi	1
Uzman : Mustafa Doğru	A.9 - Erişim kontrolü	1
Uzman : Mustafa Doğru	A.10 - Kriptografi	1

Figure 4.16 Supervised organization get this confirm page link via e-mail

4.4. Audit Perform Module

On audit day, auditors work on “My Audits” page. On this page they can see checklist which is assigned by lead auditor before. Auditors will see checklist tree view on left side of page, when checklist item clicked there will be helper page on right side. Implementation guidance and questions for checklist can be seen on right side. These questionnaires and guidance clauses pre-defined on Audit System. For every checklist item auditor may enter their comments about supervised organization. There are also checklist item results like conformance or non-conformance. They can save with related result. Detail view show at Figure 4.17.

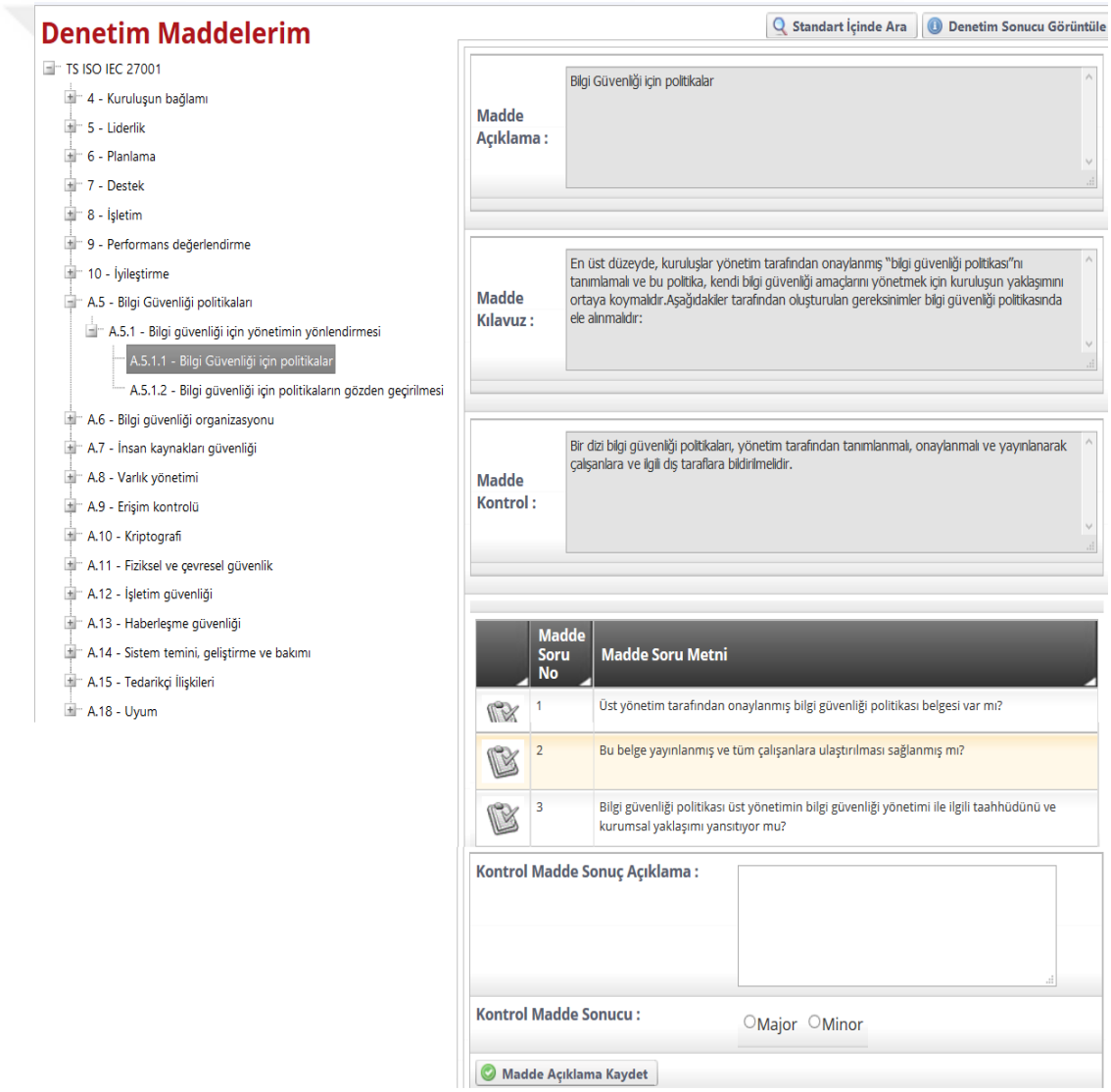
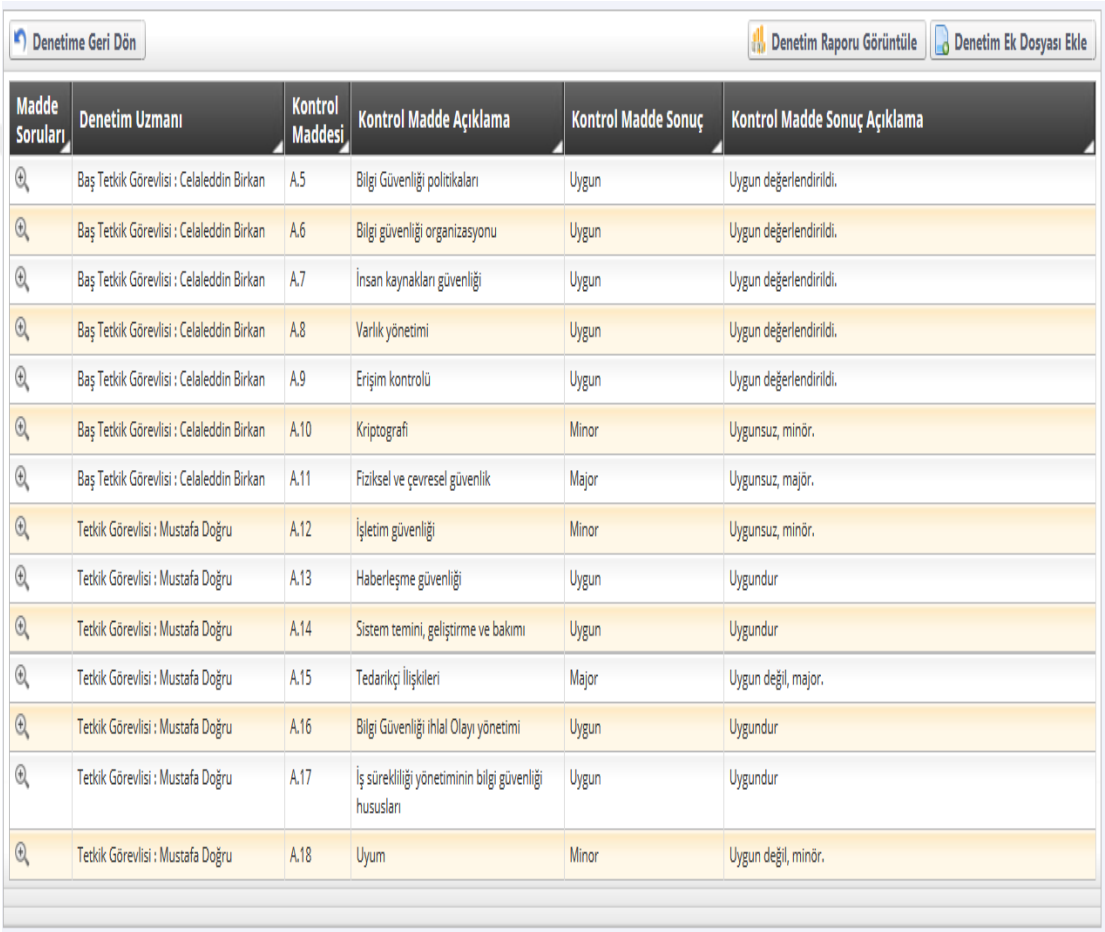


Figure 4.17 Audit performs on checklist and questionnaire page

4.4.1. Audit Consolidation Process

When auditors performs audit they can review result of checklist. Auditors can see other auditor's works about ongoing audit. Every standard clause results and comments can be track on this page during audit. Each standard clause have questionnaire to perform audit. By clicking zoom image on left side, questions about selected standard clause will appear on page. Figure 4.18 shows checklist clauses and results for each clause.



Madde Soruları	Denetim Uzmanı	Kontrol Maddesi	Kontrol Madde Açıklama	Kontrol Madde Sonuç	Kontrol Madde Sonuç Açıklama
	Baş Tetkik Görevlisi : Celaleddin Birkan	A.5	Bilgi Güvenliği politikaları	Uygun	Uygun değerlendirildi.
	Baş Tetkik Görevlisi : Celaleddin Birkan	A.6	Bilgi güvenliği organizasyonu	Uygun	Uygun değerlendirildi.
	Baş Tetkik Görevlisi : Celaleddin Birkan	A.7	İnsan kaynakları güvenliği	Uygun	Uygun değerlendirildi.
	Baş Tetkik Görevlisi : Celaleddin Birkan	A.8	Varlık yönetimi	Uygun	Uygun değerlendirildi.
	Baş Tetkik Görevlisi : Celaleddin Birkan	A.9	Erişim kontrolü	Uygun	Uygun değerlendirildi.
	Baş Tetkik Görevlisi : Celaleddin Birkan	A.10	Kriptografi	Minor	Uygunsuz, minör.
	Baş Tetkik Görevlisi : Celaleddin Birkan	A.11	Fiziksel ve çevresel güvenlik	Major	Uygunsuz, majör.
	Tetkik Görevlisi : Mustafa Doğru	A.12	İşletim güvenliği	Minor	Uygunsuz, minör.
	Tetkik Görevlisi : Mustafa Doğru	A.13	Haberleşme güvenliği	Uygun	Uygundur
	Tetkik Görevlisi : Mustafa Doğru	A.14	Sistem temini, geliştirme ve bakımı	Uygun	Uygundur
	Tetkik Görevlisi : Mustafa Doğru	A.15	Tedarikçi İlişkileri	Major	Uygun değil, major.
	Tetkik Görevlisi : Mustafa Doğru	A.16	Bilgi Güvenliği ihlal Olayı yönetimi	Uygun	Uygundur
	Tetkik Görevlisi : Mustafa Doğru	A.17	İş sürekliliği yönetiminin bilgi güvenliği hususları	Uygun	Uygundur
	Tetkik Görevlisi : Mustafa Doğru	A.18	Uyum	Minor	Uygun değil, minör.

Figure 4.18 Auditors consolidate checklist answers on this page

.

4.5. Audit Completion Module

At the end of audit lead auditor will be complete audit by selecting result of audit. Result comments, scope of audit also filled up by lead auditor. It is significantly clear to remark that, according to ISO 17021, audit team: may identify opportunities for improvement but shall not recommend specific solutions. [14]

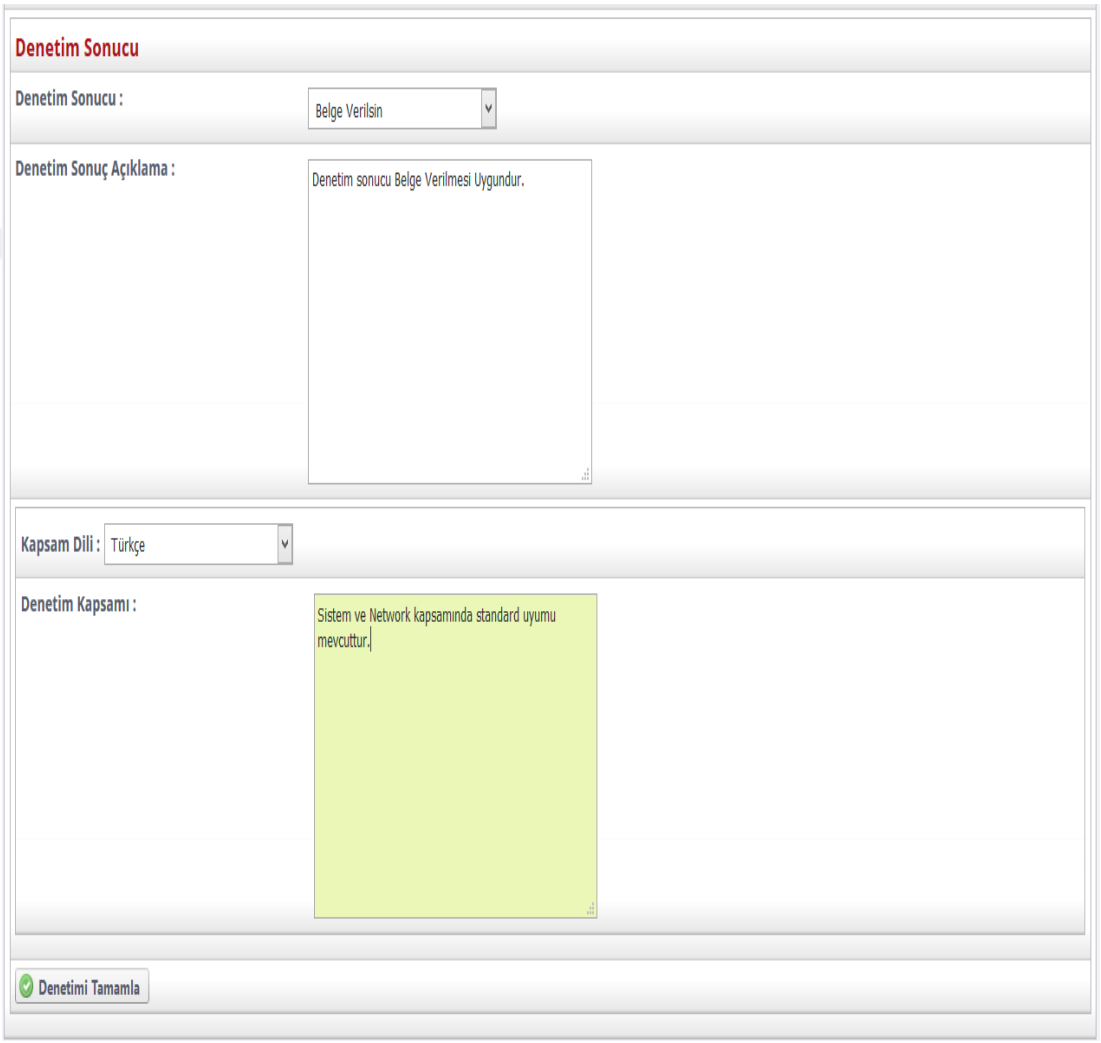


Figure 4.19 Audit Completion Module

4.5.1. Audit Report

Conclude part of audit, audit tool have button with “Show Audit Report” text. After clicking this button audit report will appear on screen with audit result report. Attach file to audit also can be done on same page.

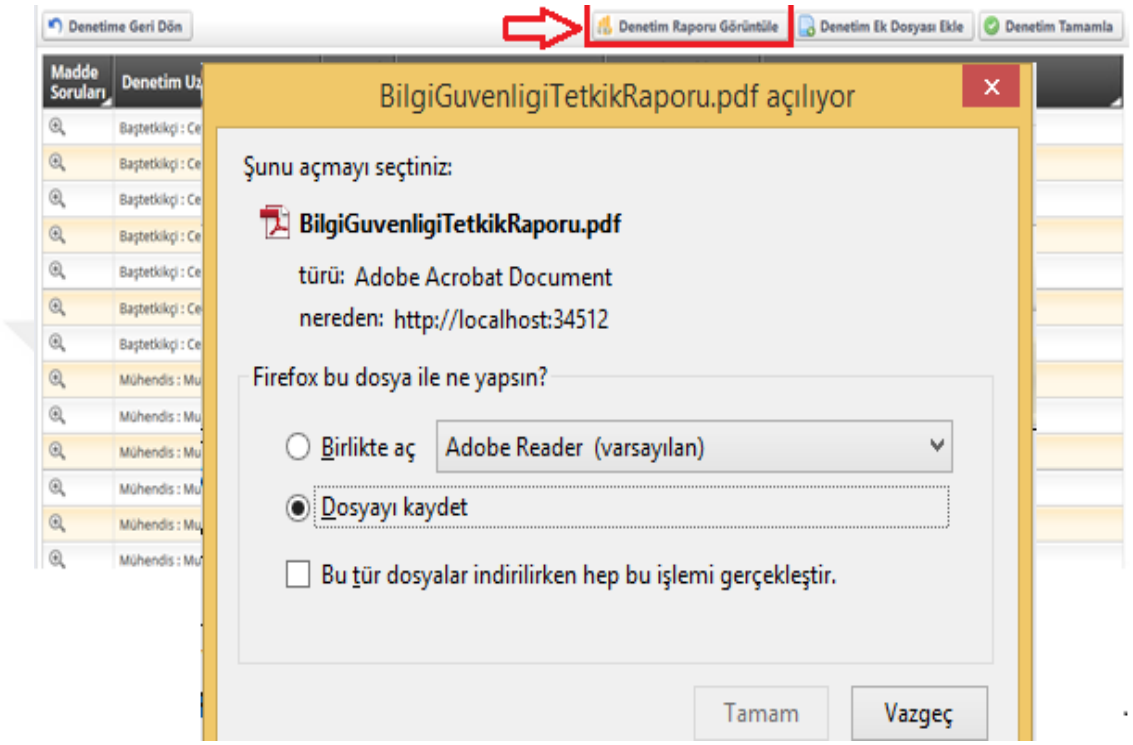


Figure 4.20 Audit report show/save dialog window

CHAPTER FIVE

FUTURE WORK AND CONCLUSION

Management system standards audit tool is capable of containing all management systems standards. Control items of these standards can be added to this tool in order to get a fully automated system. This web based tool will be very useful to track audits of management systems standards.

Future works

- E-learning feature may be added to system. Training about management systems standards will be beneficial for both sides: supervisors and supervised.
- Integrated management system audit feature may be added to audit tool to accomplish two or more management systems' audit at the same time.
- Applicants may get online assistance from supervised organizations. Organizations can apply to get any management system standard.
- A web based system compatible to mobile devices may be implemented, so users can easily access the system anywhere.
- A mobile application of this tool for Android and IOS platform can be implemented. Mobile applications are becoming widespread nowadays.

Finally representative of Turkey in ISO, Turkish Standard Institute (TSE) is going to support usage of Web-based Audit Tool for Standardized Management Systems. TSE is accredited by TURKAK for many management systems standards, so many experienced auditors of TSE may support to improve web-based audit tool.

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APPENDIX A

Audit tool process work flow designed by using IBM Blueworks online tool to illustrate how processes flow through starting point to end point.

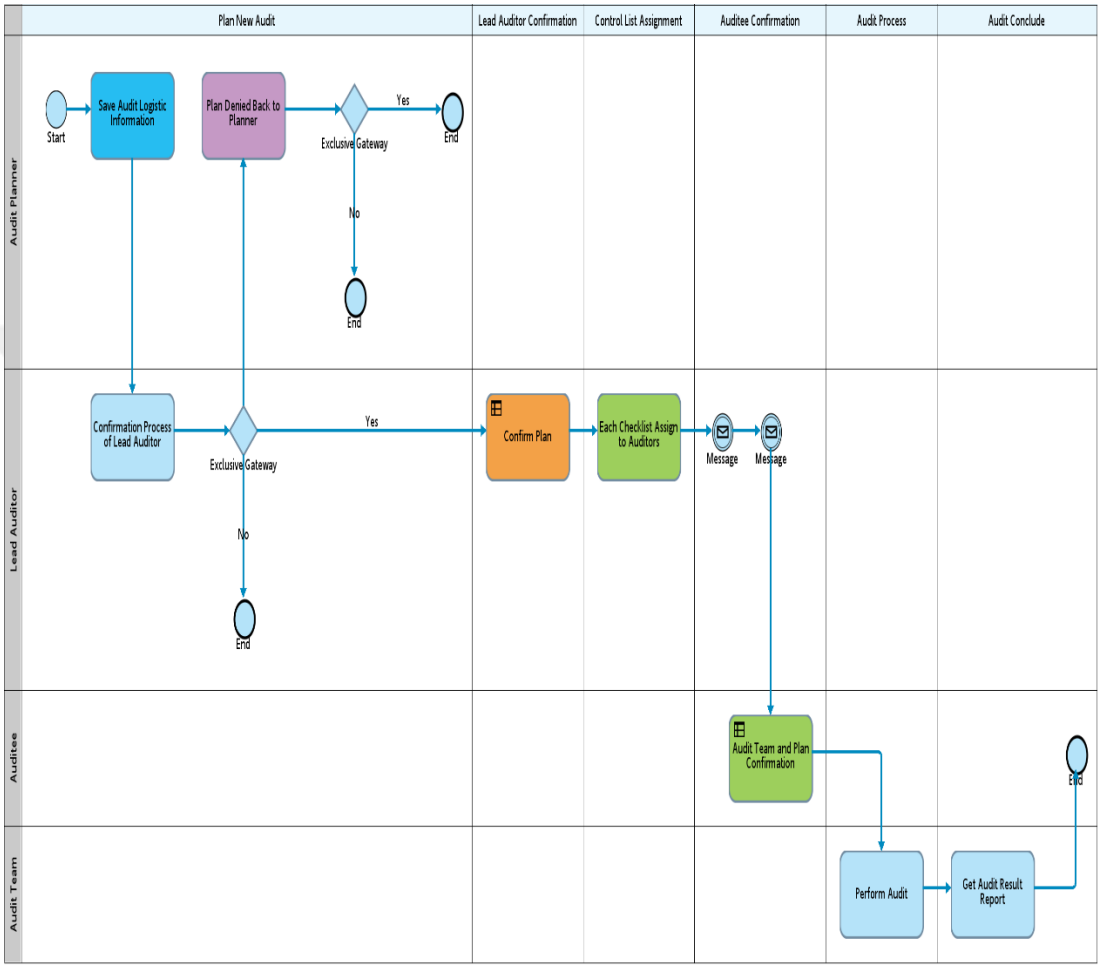

Figure A.1 Process Workflow of Audit Tool

RESUME

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