AN AUTOMATED TOOL FOR QUALITY MANUAL GENERATION FROM BUSINESS PROCESS MODELS

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Approval of the Graduate School of Informatics

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ABSTRACT

AN AUTOMATED TOOL FOR QUALITY MANUAL GENERATION FROM BUSINESS PROCESS MODELS

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The majority of organizations make their business processes explicit to improve them. Defining business processes manually and modeling them are two alternatives utilized for this purpose. Meanwhile, organizations have quality management systems which are frequently shaped by frameworks. The most commonly used process improvement frameworks in the IT sector are ITIL, Cobit, CMMI and ISO 9001. These frameworks indicate the necessity of process documentation and ISO 9001 addresses the name "Quality Manual" for this purpose.

In this thesis, an automated tool is developed for quality manual generation from predetermined business process models. In addition, a case study is performed by means of a systematic approach and its results were discussed with the findings of structured interviews. The aim of the study is to reduce the effort and time required

for quality manual preparation and merge quality management activities with process modeling by means of process documentation.

Keywords: Business Process Modeling, Quality Manual, eEPC, Automated Document Generation, ARIS

ÖZ

İŞ SÜRECİ MODELLERİNDEN KALİTE EL KİTABI ÜRETMEK İÇİN BİR OTOMASYON ARACI

AYDIN, Elif

Yüksek Lisans, Bilişim Sistemleri Bölümü

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Eylül 2010, 78 sayfa

Bir çok organizasyon, iş süreçlerini yeniden yapılandırmak için onları açık ve net bir şekilde belirtmektedir. Bu amaçla modelleme ve tanımlama alternatiflerini kullanmaktadırlar. Aynı zamanda, organizayonların çoğunlukla kalite çerçeveleri tarafından şekillendirilen bir kalite yönetim sistemleri mevcuttur. Bilgi teknolojileri sektöründe en yaygın olarak kullanılan kalite çerçeveleri ITIL, Cobit, CMMI ve ISO 9001'dir. Tüm bu çerçeveler, süreç tanımlamanın gerekliliğinden bahsetmekte ve ISO 9001 tarafından bu amaçla kalite el kitabı adıyla ele alınmaktadır.

Bu tez kapsamında, öntanımlı iş süreci modellerinden otomatik olarak kalite el kitabı üreten bir otomasyon aracı geliştirilmiştir. Buna ek olarak, sistematik bir yaklaşım ile bir vaka çalışması yapılmış ve sonuçlar yapılan röportajlardaki bulgular ile birlikte ele alınmıştır. Bu araştırmanın amacı, kalite el kitabı hazırlamak için harcanan efor

ve zamanı azaltmak ve süreç dokümantasyonu için yapılan kalite yönetimi işleri ile süreç modelleme işlerini birleştirmektir.

Anahtar Kelimeler: İş Süreci Modelleme, Kalite El Kitabı, eEPC, Otomatik Doküman Üretme, ARIS

To my family and newborn nephew Emir

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LIST OF ABBREVIATIONS

BPM – Business Process Modeling

BPMN – Business Process Modeling Notation

UML – Unified Modeling Language

EPC – Event Driven Process Chain

eEPC – Extended Event Driven Process Chain

CobiT- Control Objectives for Information and Related Technology

ITIL – Information Technology Infrastructure Library

CMMI – Capability Maturity Model Integration

ISO – International Standards Organization

IT – Information Technology

ARIS - Architecture of Integrated Information Systems

METU – Middle East Technical University

FP – Function Point

FAD – Function Allocation Diagram

TOC – Table of Contents

CHAPTER 1

INTRODUCTION

Making business processes explicit became a significant target for a majority of organizations. Having explicit process models, organizations build up the infrastructure of their quality management system, and based on this infrastructure they improve their processes. Process models either reveal existing processes of organizations or define recommended processes for reengineering purposes. Business process reengineering is described as "*The role that process management can play in creating sustainable advantage.*" and also identified as a necessity for producing radical improvement of organizational performance [1].

Another usage of explicit business processes is about establishing quality management systems. Quality management systems are frequently shaped by the frameworks applied. Most commonly used process improvement frameworks in the information technology sector are IT Infrastructure Library (ITIL), Control objectives for information and related technology (CobiT), Capability Maturity Model Integration (CMMI), and ISO 9001. In order to satisfy the requirements of these frameworks, organizations need to form, define and shape their business processes. These processes should then also be documented so as to make the processes available to all parties and keep them stable until an improvement for the process is necessary. That is, a new version of the process is published. The necessity of documentation in a quality management system is defined in all process improvement frameworks. The combination of documents defining processes of the

organization with all details in an understandable manner is called as “Quality Manual” as stated in ISO 9001: 2008 [2].

A quality manual, in quality management systems, includes the set of policies, processes and rules related to the implementation of the quality standard which the organizations choose to obey. Meanwhile, this manual is used for internal and external auditing purposes. It is used internally to stabilize the unique execution of the processes and it also enables better understanding of the process improvement opportunities. On the other hand, in external cases, the auditors review the quality manual and all referenced documents to verify that the quality system satisfies the framework utilized. Another motivational issue about quality documents is making employees familiar with all relevant processes, especially new employees. That is; having defined processes in an organization wide document helps new employees to get used to work easily and quickly.

1.1. Statement of Problem

Business processes are frequently defined with natural language or by utilizing graphical notations. The usage of graphical notations is usually supported by software tools for business process modeling. Contemporary tools serve a variety of notations to perform modeling. Many organizations define their processes by using these tools, utilizing different business processes modeling notations. In other words, modeling is a language dependent description method. Contemporary tools enable modeling of processes with different perspectives and different features. For example; processes can be described by means of the necessary actions in a sequential manner with their prerequisites, inputs, outputs, rules; needed for performing this action, roles; responsible for this action and organizational units etc. By using these tools, the time required to create a company’s information system and the time required to track operations will decrease [3]. However, the sole use of models in organizational processes is not a frequent practice. According to a case study by Siegers & Grasl [4], most of the models are process and workflow oriented;

whereas, day-to-day work needs roles and artifacts. Moreover, they can only be used by experienced users, and navigating between models without any guidance is hard. The last drawback is the hidden textual notations which cannot be seen directly via models. Therefore; in addition to the process models, organizations frequently document business processes in an understandable manner. They either choose to document business processes directly, without having process models, or they create documentation from process models.

Another significant issue is that, organizations who model their processes need to perform quality manual documentation separately. There are details for each process and transforming all information is vital to convey them all over the organization. Having separate tasks for creating a quality manual and modeling business processes will cause redundant effort. That is; there exists a gap between modeling and creating quality manuals although both contain the same information.

It is inevitable that organizational change occurs; as the business processes of the organization change, so do their definitions. In order to satisfy the change needs, process models and related documents should be updated continuously. While updating the documents, process models should also be kept consistent with the defined process. In fact, process models and the quality manual should be compatible in both ways. That is, if process models are updated, the quality manual should also be updated. Making quality manuals up to date and consistent with business process models are hard and time consuming if done manually. These activities are also error prone; consistency checking should be done meanwhile and afterwards. Managing the change also consumes significant non-value added time and effort.

1.2. Approach

The aim of this thesis is to reduce the time and effort required for quality manual preparation and business process change management, as well as eliminating inconsistencies between process models and the quality manuals. By accomplishing

the purpose, separate efforts for process modeling and quality manual documentation will be decreased and these activities will be merged.

Business Process Modeling was used as an approach for automatic "Quality Manual" preparation. In order to automate this action, an automated tool was developed in ARIS script language. This tool transforms process models drawn in predetermined modeling notations to a document in natural language which obeys the definition of the quality manual mentioned in process improvement frameworks such as ITIL, Cobit, CMMI, and ISO 9001:2008.

The approach is actualized by means of case study performed on the T.R. Prime Ministry State Planning Organization. In the case study, business processes of certain divisions are modeled using eEPC's, function trees and function allocation diagrams. Having designed process models for this study, the first activity was creating a template for the quality manual to construct its content. Then the content of the document was reorganized with subject matter experts. After having a final template, a sample quality manual was documented from small pieces of process models. The next activity was coding the automation tool for quality manual generation from predetermined process models. The information in the models was enough for generating the approved quality document template. The full set of models have not been used, as they are additional representations intended for automatic requirements generation purposes [5]. While the tool was created, quality manuals were generated for each module. Lastly, they were reviewed by the subject matter experts and end users via interviews for validation purposes and to be used in the improvement of laws, regulations, and organization's manuals for development agencies.

1.3. Validation of Approach

In order to validate this approach, two methods were carried out. One of these methods is sampling. Small pieces of business processes are randomly selected for generating the manual both automatically and manually. The aim of the validation is to evaluate the efficiency of the automation tool. The time and effort required to

generate the documents manually from these processes are calculated and the results are compared with the numbers recorded in the automatic generation process. In addition to these, the generated manuals are reviewed by the process engineers and subject matter experts about their consistency with process models.

The second method utilized was to perform interviews with end users and subject matter experts. Interviews were performed by means of a structured open ended questionnaire. During the interviews quality manuals of two modules corresponding 96 pages were reviewed by the attendees. The aim of the interview was to reveal the usability of quality manuals by means of the questions available in Appendix F.

1.4. Thesis Outline

This thesis is organized in five chapters. The first chapter is the introduction and consists of the overview of the study. Chapter 2 describes related work beginning from process modeling to quality management systems and similar studies. After that, Chapter 3 gives details about the automation tool and the content of the quality manual generated from business process models. Then, in Chapter 4, the case study is described. Lastly, Chapter 5 provides a conclusion and includes directions for future works.

CHAPTER 2

RELATED STUDY

In the related study chapter, the literature about generating quality manuals from business process models is explored. Therefore; the concept of business process modeling is explained by giving advantages and limitations. Moreover, the aim of using business process modeling and modeling techniques is listed. Then, the content and necessity of having a quality manual are justified by giving information about process documentation and quality management in the view of the four most commonly used process improvement frameworks: ITIL, CMMI, COBIT and ISO 9001. Lastly, two similar studies that aim to generate process documentation automatically are investigated and compared in different dimensions. In addition to these two studies, it is explained that business process models can also be used for requirements generation purposes. In order to give some examples in literature, two related studies are summarized briefly as well.

2.1. Business Process Modeling

Information Technology experts and Business Engineering experts have the same opinion: "*successful systems start with an understanding of the business processes of an organization*" [6]. So as to define business processes there are two alternative ways; defining and modeling.

Process model is an abstract description of an actual or proposed process. The aim of process modeling is to decrease the complexity of phenomenon or understanding it by eliminating unnecessary details so that the model can only reflects the process by means of its creator's belief about what is important [7].

Business Process Modeling is not only used for assuring consciousness about business processes within the organizations, but also it is used for deconstructing organizational complexity [8]. In addition, process modeling is considered a key element in a study for analysis and design of process [9]. Indulska et al. claims that business process modeling is a fundamental pre-requisite for organizations if they want to take part in business process improvement or business process management initiatives [10]. In order to actualize the purpose, models should at least include the activities, events/states, and control flow logic to constitute a business process. Moreover, they can be described with information regarding the involved data, organizational and IT resources, risk and performance metrics [11]. Rosemann et al. summarizes the purposes of process modeling in two groups [12]. First, intuitive process models are used for scoping project, capturing and discussing business requirements, and process improvement initiatives with subject matter experts. Second, it is used for process automation.

There are different techniques and languages for process modeling representation. It is insisted that before modeling, it is important to identify the aim of construction in order to choose the right technique [13]. However, when integrating an enterprise, the modeling technique and tool used for applying this technique cannot provide a complete solution alone, these are just aids for business analysts to design and manage the process [13]. In order to select the right technique, there are studies investigating the integration of different modeling languages and methods. One of these studies claims that: "*there is no method or technique available to evaluate the fit between business process requirements*" [14]. In view of this information, a study is performed to evaluate conceptual modeling languages by Wand and Weber and results in the creating of the Bunge-Wand-Weber ontology which is a benchmark for the evaluation of representational capabilities of a modeling technique in the

Information System domain [15]. Söderström et al. propose a meta-model of business process concepts that can be used to evaluate business process modeling languages [16]. In all studies, the idea is that one can perform the evaluation of conceptual modeling languages based on a set of reference concepts [17].

In large organizations, business process modeling can be time consuming and costly, so convincing executive managers is troublesome. Understanding the actual benefits of process modeling in academia and practice is limited. To visualize this gap, a study is held and reported through a global Delphi study [10]. While performing this study, three different stakeholder groups are involved. This study concludes that three top benefits are perceived. These are "*Process Improvement*", "*Understanding*", and "*Communication*". In addition to these three top benefits, some practitioners mentioned that process modeling has benefits like "*Requirement Specification*" and "*Knowledge Management*". Another study, held by Kesari M, Chang S. and Seddon P.B., lists some advantages and disadvantages of process modeling in view of some interviews [18]. Advantages are grouped under three categories; "*Documentation Benefits*", "*Design Benefits*", and "*Use Benefits*" as are the disadvantages "*Possibility of Over-Analysis*", "*Possibility of Misinterpretations*", and "*Possibility of Developer Bias (es)*". Rosemann also investigates potential pitfalls of process modeling in one of his studies [19]. He states that "*Being aware about main challenges is often better secret of success than blindly following recommendations why we should do it*". There are 22 pitfalls listed in this study [19] [20]. These are; lack of strategic connections, lack of governance, lack of synergies, lack of qualified modelers, lack of qualified business representatives, lack of use buy-in, lack of realism, the chicken and egg problem, lack of details, lost in translation, lost in drawing tool, lack of complementary methodologies, l'art pour l'art (when artists in process modeling dominate), lost in syntactical correctness, focus on models and not on modeling, lost in detail, lack of imagination, lost in best practice, design to-be models solely centered on new IT, modeling success is not process success, lost in model maintenance, lack of measuring modeling performance.

2.2. Documentation Needs in Process Improvement Frameworks

"*In the current marketplace, there are maturity models; standards, methodologies, and guidelines that can help an organization improve the way it does business*" [21]. The most commonly used standards (process improvement frameworks) are IT Infrastructure Library (ITIL), Control objectives for information and related technology (CobiT), Capability Maturity Model Integration (CMMI), and ISO 9001 [22].

2.2.1. ISO 9001

ISO 9001 is an international standard "*promotes the adoption of a process approach when developing, implementing and improving the effectiveness of a quality management system, to enhance customer satisfaction by meeting customer requirements.*" [2].

ISO 9001 is one of the most popular standards used for quality management purposes. It is declared in a study that nearly 900,000 organizations in 170 countries have ISO 9001 quality management system standard certification [23]. Having quality management certification is very beneficial for organizations especially where information search cost is high [24].

In ISO 9001:2008 [2], in section 4.1, the general requirements for satisfying standard are mentioned. The ones which are related with process definition and documentation are listed below;

- *"Determine the process needed for the quality management and maintain their application throughout the organization"*
- *"Determine the sequence and interaction of these processes"*
- *"Implement actions necessary to achieve planned results and continual improvement of these processes"*

In section 4.2, it is declared that "*Quality Manual*" is a must for a quality management system. In the following sections, the content of the quality manual is described in some detail. In view of that information; a quality manual should include;

- *"The scope of the quality management system,"*
- *"The documented procedures established for quality management system"*
- *"The description of processes in details and the interaction between processes."*

2.2.2. CMMI

"*The purpose of CMMI for Development is to help organizations improve their development and maintenance processes for both products and services. CMMI for Development is a collection of best practices that is generated from the CMMI Framework*." [21]

In order to satisfy the need for CMMI 3rd maturity level, an organization should define its processes. "*A defined process is a managed process that is tailored from the organization's set of standard processes according to the organization's tailoring guidelines; has a maintained process description; and contributes work products, measures, and other process improvement information to the organizational process assets*." The main distinction between 2nd and 3rd maturity levels are the scope of standards, process descriptions, and procedures.

According to the description of defined process, in CMMI for Development [21], it should include the information about "*Purpose, Inputs, Entry criteria, Activities, Roles, Measures, Verification Steps, Outputs, and Exit Criteria*".

In CMMI for Development, the organization's set of standard processes are described as "*A collection of definitions of the processes that guide activities in an organization.*" It is also mentioned that "*A standard process enables consistent development and maintenance activities across the organization and is essential for long-term stability and improvement.*"

2.2.3. ITIL

After organizations are aware of the Information Technology, they understand the importance of IT service management. One of the most popular frameworks in the field of IT is ITIL (IT Infrastructure Library). By the help of this framework, IT service management processes can be documented, controlled and developed by managers [25].

According to the ITIL Service Operations guideline, in section 3.7, all of the teams (IT Operations Management, Technical and Application Management) are involved in documentation operations. One of their duties about process documentation is mentioned in ITIL [26] as;

> "*Participation in the definition and maintenance of process manuals for all processes they are involved in. These will include processes in other phases of the IT Service Management Lifecycle as well as for all processes included in Service Operation phase*."

Another important issue about process documentation is given in the Process Documentation Templates section of the ITIL Service Design book [27]. In this section, it is declared that process specification, produced while designing new or revised process for the Service Management Process, should be kept at a high level with some detail about scope and interfaces. Deeper understanding of the process with additional details will also be necessary to satisfy the consistency of the process and its application. Typical content of process framework and specification are given in Table 1 below.

Table 1 - Typical Content of Process Framework and Specifications

Typical Content of Process Framework and Specifications	
Process name, description and administration	
Vision and mission statement	
Objectives	
Scope and terms of reference	
Process overview;	Inputs Procedures Activities Outputs Triggers Tools and other deliverables Communication
Roles and responsibilities;	Operational responsibilities Process owner Process members Process users Other roles
Associated documentation and references	
Interfaces and dependencies to;	Other SM processes Other IT processes Business Processes
Process measurement metrics: reviews, assessments, and audits	
Deliverables and reports produced by process:	Frequency Content Distribution
Glossary, acronyms and references.	

2.2.4. CObiT

Cobit is a framework which explains the need for management and controlling of information and related information technology. "*The impact on IT resource is mentioned in this framework with business requirements for effectiveness, efficiency, confidentiality, integrity, availability, compliance, and reliability of information that need to be satisfied."* [28]

In Cobit framework it is mentioned that process documentation is necessary. Moreover, the problems with documentation are given so as to be eliminated. These are [29];

- "*Documentation is occasionally produced and is inconsistently distributed to limited groups*."
- "*Much of the documentation and many of the procedures are out of date."*

There are maturity levels given in "*Maturity Attribute Table*" in Cobit framework on page 21. These levels have different dimensions and one of them is "Policies, Plans and Procedures". In each maturity level different process documentation needs and appearances are available [29]. These are;

- Level 3: "*The process, policies and procedures are defined and documented for all key activities*."
- Level 4: "*All aspects of the process are documented and repeatable. Policies have been approved and signed off on by management. Standards for developing and maintaining the process and procedures are adopted and followed.*"
- Level 5: "*Process documentation is evolved to automated workflows. Processes, policies and procedures are standardized and integrated to enable end-to-end management and improvement*. "

2.3. Automated Process Definition

Business process models are used for different purposes in literature. Some of the studies use modeling for automating documentation, whereas some studies use these notations for requirements generation. In all of these studies different modeling notations are used and different products are generated. “Model Driven Business Transformation” [4] and “Another Motivation for Usage Models: Generation of User Documentation” [30] are studies held for assisting documentation. Besides the studies held for documentation purposes, business process models can also be used for requirements generation purposes. For example, a study is performed by Coşkunçay (2010) [5] simultaneously with this thesis by using the same modeling notation, eEPC and Function Allocation diagrams, with some additional parts so as to create natural language requirements.

Table 2 - Comparison of Previous Studies

	STUDY 1	STUDY 2
Level of Abstraction	Detailed Design	Detailed Design
Supports	Day-to-day work with user friendly process documentation	System Design & Test Planning
Products	Web site (process portal) for process documentation (process, role and artifact based access)	User Documentation via web site & Test Cases
Quality of Products (validation)	Not validated	Validated by a single case study

Table 2 (cont.)

	STUDY 1	STUDY 2
Modeling Notations	UML & BPMN and & XML (for portal generation)	Extended - Use Cases (extended usage models)
Advantages	Consistent and easy communication of workflows and responsibilities across the company	Reliability Estimation Early feedback to system design Support for test planning and test preparation
Disadvantages	Not mentioned	Reference and index section of the usage documents will be added to documents Drag and drop features and drawing capabilities can be added to extended usage models.
Tools Used	Enterprise Architect	toolset_Certify & Clean Test

The detailed comparison of the two studies related with this thesis is given in Table 2 in detail and summaries of the studies are given below in parts 2.3.1 and 2.3.2. Both have similar purposes in general; generating documentation automatically from business process models in order to increase efficiency by means of time and effort and increase consistency between documentation and models. However, they have different purposes in details. The structures of models in both cases are complex and they model processes in the design level of an information system life cycle. For example, in study 2, test case generation and their validation can also be performed.

2.3.1. Model Driven Business Transformation (STUDY - 1) [4]

"*This case study reports from a business transformation project **gematik**, a German public-private partnership that is responsible for specification and implementation of German health insurance chip card due to be introduced in 2008*."

BPMN, using Enterprise Architect tool, is chosen for modeling. However, the modeling team has encountered some limitations while modeling which are listed below;

- Organizational responsibilities within the workflows and complex artifact structure supported by business processes
- By means of documentation; easy, role based navigation and cross reference between roles, processes and artifacts are not directly utilizable
- Organizing large scale modeling effort

In order to overcome the limitations of the notation, BPMN was extended with the language constructs based on UML. The organizational structure, the artifact landscape, and the high-level process structure is modeled using UML concepts.

The reason for documenting processes rather than using BPMN in order to support day-to-day work is because;

- *"BPMN models are centered around processes and workflows , not roles and artifacts"*
- *"Modeling tools can only be used by experienced users"*
- *"Comprehending and navigating complex models is difficult without guidance"*

- *"Useful textual annotations are hidden in the notes of the model and not directly visible"*

The approach of creating process documentation in this study begins with creating a mock-up and choosing an initial set of processes to be documented. Then they refine the meta-model aligned with the initial process. After that, portal generator is implemented and prototype for process portal is evaluated. Lastly, process portal is generated.

2.3.2. Another Motivation for Usage Model: Generation of User Documentation (STUDY - 2) [30]

The aim of this study is to investigate the possibility of generating user documents from usage models in addition to the reliability prediction and test planning. It is realized that usage models contain a lot of relevant information for user documentation. The effort for defining usage models in the level of abstraction which enables the reliability testing is quite high since the usage models are complex. Therefore; until this study was performed, application of reliability testing was limited with safety critical applications.

There are additional benefits gained from formally specifying system usage. These are: early feedback to system design and support for test planning & preparation. In this study, usage models are represented with state machine formalism. The simplest form is shown in Figure 1 below. Usage models can be used in both usage and black-box testing techniques. With the help of software tools, it is possible to generate test cases, as random sequences of stimuli, which then translated into test scripts that become input to a test automation tool.

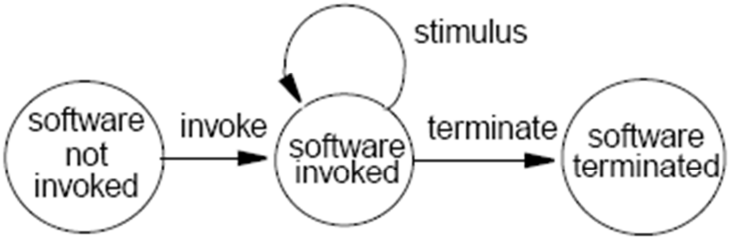


Figure 1 – A simple state machine representation

User documentation typically includes;

- A tutorial section,
- A reference section,
- Introduction, conventions used, a table of contents, and an index.

However, usage models are insufficient while modeling semantics and not all possible interactions need to be included in the tutorial section. Therefore; usage models need to be extended so as to include necessary information about what the user manual consists of. Extended usage models are composed of three sub-models:

- Scenario model: defines semantics of usage models in terms of goals, tasks, and solutions.
- Action model: defines possible sequence of user inputs and covers the information captured by conventional usage models
- User interface model: defines user interface and its elements

The automated tool first parses the description file of extended usage models, then builds a runtime representation of the models and lastly generates a user manual in html format. In Figure 2 an overview is given.

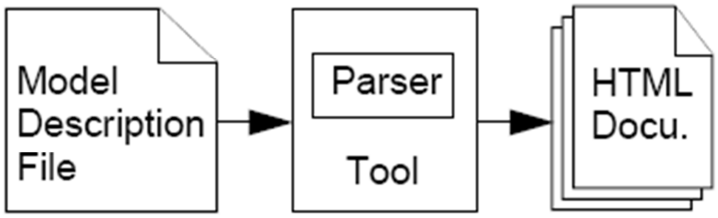


Figure 2 - Overview of Prototype Implementation

The final product of this automation tool is a process documentation portal in html format. In this portal there is one page for each goal, sub-goal and sub-task defined in the scenario model. All pages basically include the following;

- A navigation bar with icons at the bottom and top
- Header
- Content (description of goals, tasks or solutions)
- Links to pages

In this study, the quality of the documentation is evaluated in five dimensions. These are: modularity, structure, navigation, readability, and consistency. It total, quality validated by a single case study is adequate, but readability can be improved by allowing text components to be inserted at any location within the assembled text flow.

2.3.3. Previous Studies Held for Requirements Generation

There are studies performed for requirements generation purposes automatically from different modeling notations.

One of these studies is performed by Su (2004) in a master thesis [31]. In this study, requirements are generated in natural language from business process models in eEPC notation by using ARIS platform. The name of the automated tool is KAOS. KAOS tool was tested within a large military project. It generated 26930 FP requirements in 30 minutes. In a similar project generation of 10092 FP requirements document took 2 persons/month when done manually.

Another study held simultaneously with this thesis is performed by Coşkunçay (2010) [5]. In this study, requirements are generated from eEPC and FAD (Function Allocation Diagram) in ARIS platform. In the case study, applied in government organizations, 946 process models with 791 FADs are created. 3000 man hours were spent for generating 11000 FP system requirements in 1002 pages when done manually. Besides increasing the efficiency of requirements analysis in terms of total effort, many other benefits were observed. The possibility of skipping and duplicating any part of the information systems requirements is eliminated.

CHAPTER 3

APPROACH: GENERATING QUALITY MANUAL

This chapter describes the approach developed in this study and consists of four parts. The first part gives details about modeling notation and ARIS platform in order to clarify the notation and libraries used for process modeling. The second part, explains the activities required to be executed to generate quality manuals from process models. The third part describes the algorithm design. The last part, defines parts of the quality manual generated by relating them with the modeling notation and the modeling platform.

3.1. Modeling Notations & ARIS Platform

In this study, process models are expressed in eEPC notation and used as the core input. In addition to eEPC, function trees are used for defining sub-functions of a process. The modeling notation EPC consists of functions, events and logical connectors. eEPC extends EPC by enabling definition of variety of process elements including resources, data, time and probabilities, organizational units and roles, inputs and outputs. We have used a restricted version of the eEPC and ARIS for process modeling. This restriction comes from another case study held by Coşkunçay [5].

The restricted set of elements of eEPC including events, functions, logical operators, input & outputs (information carrier), organizational units, process interface are the main building blocks in this business process modeling study. There is a hierarchical relationship between EPC-EPC and EPC-Function Tree. They are named as superior and subordinate models. Process interfaces and sub-processes are used for satisfying hierarchy. The details for eEPC elements (objects) utilized in the approach are given in Table 3 below;

Table 3 - Modeling Notation Elements

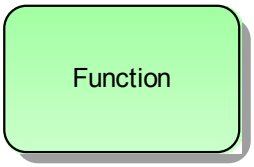
Element	Symbol	Description
Function		Functions are used to describe the activity of task [32]. Function needs at least one event to trigger it.
Event		Events are used to express what triggers the process of tasks inside a process. The process can also be explained by events [32].

Table 3 (cont.)

Element	Symbol	Description
Logical Operators	 OR, AND, XOR	There are 3 logical operators. These are "AND","OR", and "XOR (Exclusive OR)". **OR:** At least one event needed to occur in order to trigger the function OR function(s) will cause at least one of the following events to occur **AND:** All events must occur in order to trigger the function OR function(s) will cause all events to occur **XOR:** used when only one cases can occur at a time in order to satisfy the need

Table 3 (cont.)

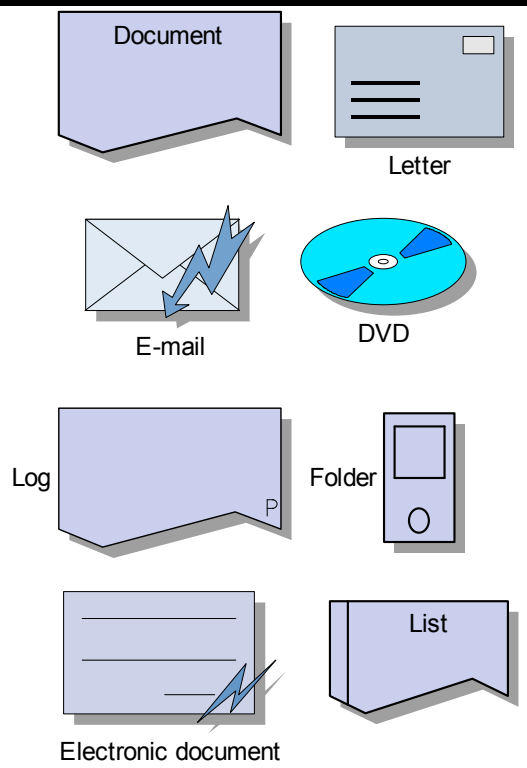
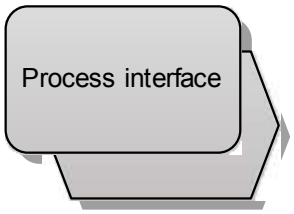
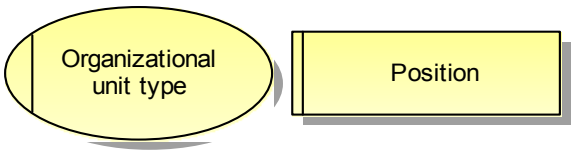
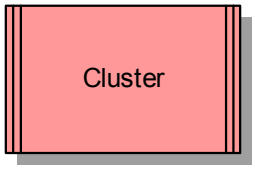
Element	Symbol	Description
Information Carrier		Information Carriers can be used as an input or ouput to the functions. There are different symbols avaibale in ARIS platform for describing inputs & outputs. These are shown in the left hand side. Different symbols represent different physically stored data.
Business Rule		Business rules include prerequisites for functions to act which cannot be reprenseted by activity flow. These rules are coming from laws, regulations, and organization's manuals.

Table 3 (cont.)

Element	Symbol	Description
Process Interface		Process interface is a link between process models. It can be used inside an EPC. It indicates that from the point process interface is used another process begins and until it ends the flow won't contunue.
Position & Organizational Unit		Positions and organizational units are used for indication of the responsible people, position of group for actions to occur. They can either be places at the top of the column or they can be conncted to a function directly by using arcs.
Cluster		In this sudy cluster type business objects are used to represent database type objects.

In the eEPC models, column display format is used. A simple example is given in Figure 3 and Figure 4 below. In this example there is an Organizational Unit "**YDO**" which indicates that the action in that column are performed by "Yatırım Destek Ofisi (YDO)" personnel. In an eEPC there can be more than one organizational unit/position. In the example below, there is one starting and one ending event. Information carriers are used as inputs and outputs. For example, "Basılı Materyal Çoğaltım ve Dağıtım Planı" is a document used both as input and output to different functions. There are also two process interfaces and a cluster in the model. The events coming after "Yazılı ve Görsel Tanıtım Materyallerinin Hazırlanması" process interface is divided into two paths with the help of XOR logical operator which indicates that only one of these paths will be followed.

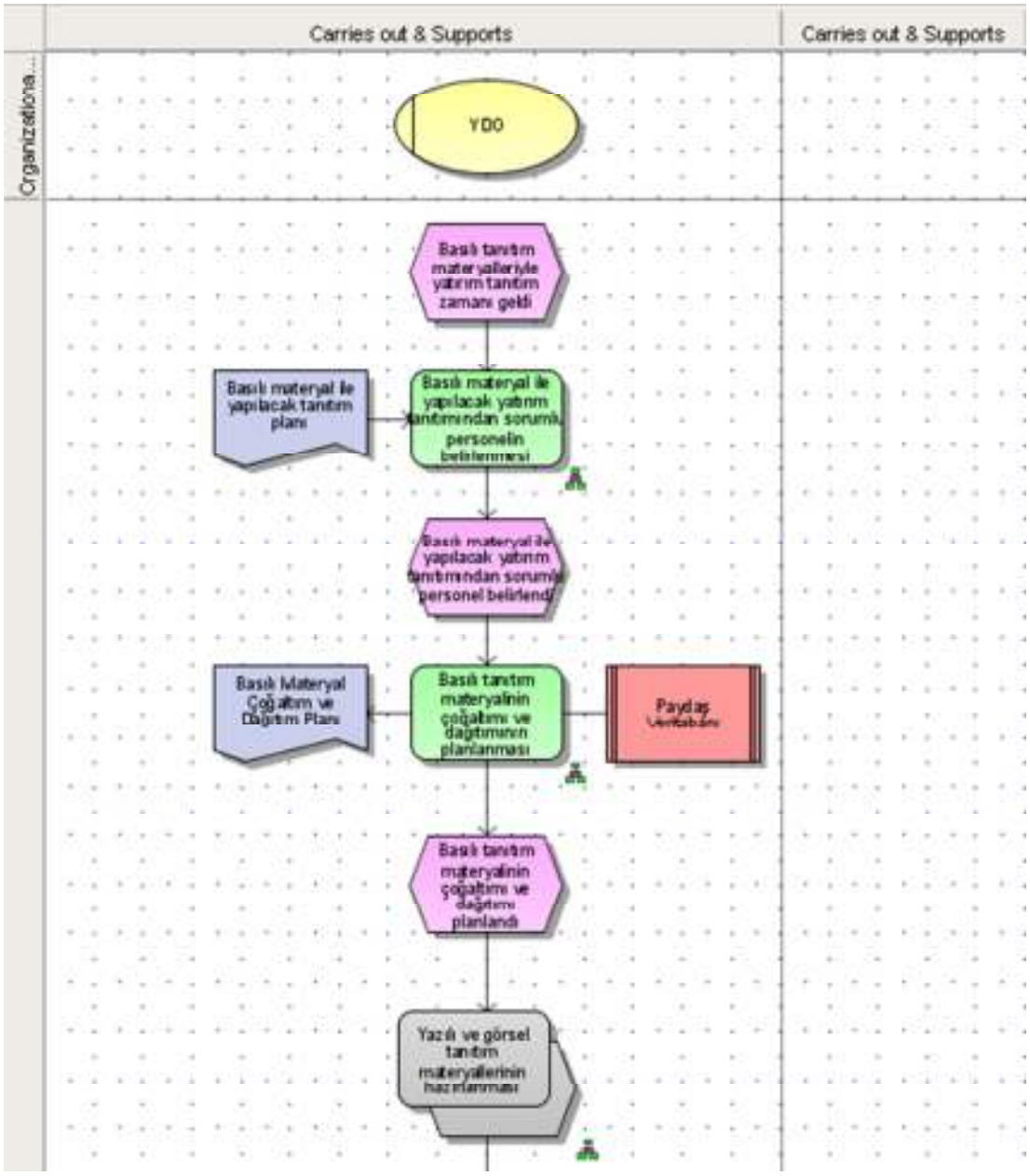


Figure 3 – Example EPC Part 1

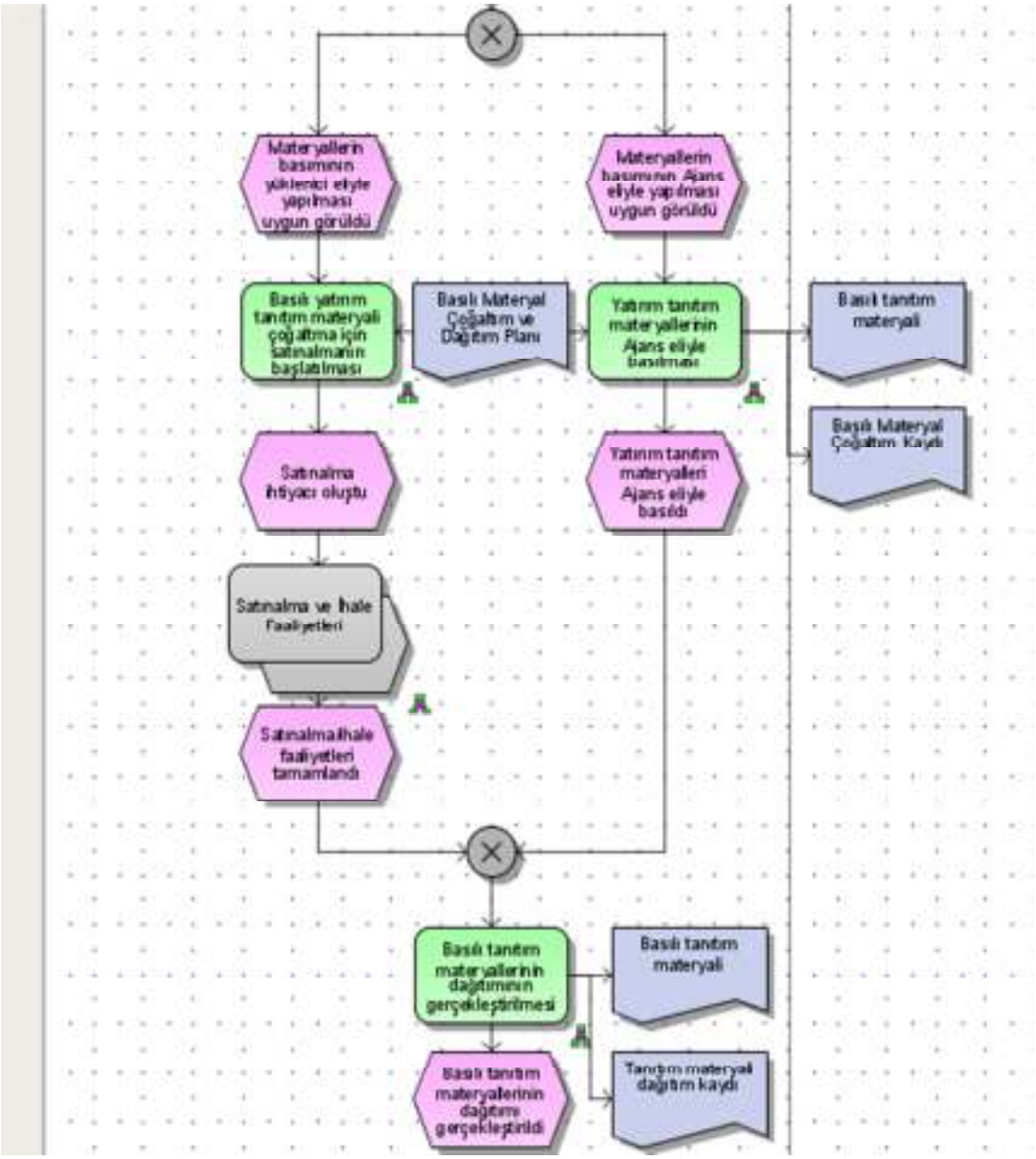


Figure 4 – Example EPC Part 2

3.2. Quality Manual Generation Approach

The quality manual generation approach utilizes an automated tool. This tool takes business process models as inputs and gives quality manuals as output. Moreover, it is created in ARIS platform with script language. The context diagram for this tool is given in Figure 5.

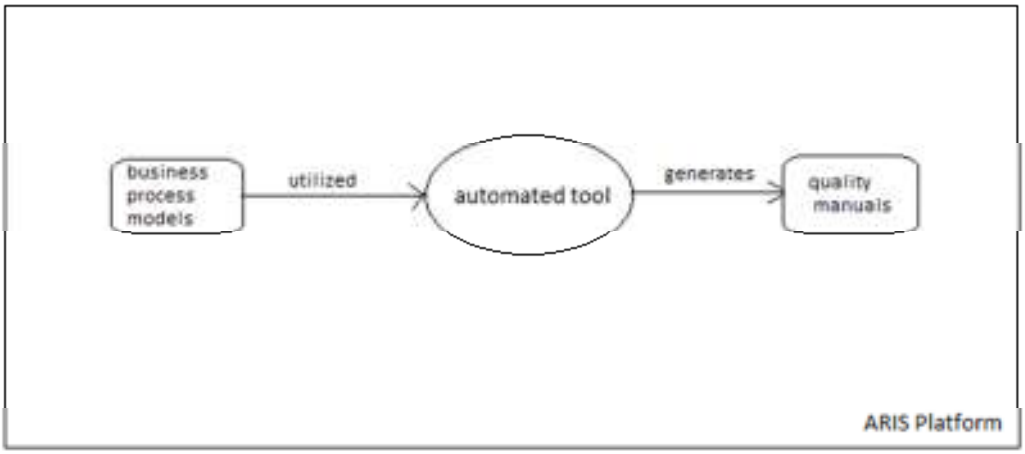


Figure 5 – Context Diagram of the Approach

In order to generate a manual, the business processes should be defined in specific detail. The level of detail and necessary activities are described below and displayed graphically in Figure 6.

3.2.1. Identify the context:

Defining context is the first activity of process modeling. In this activity, aim and scope of the study is determined. In the high level, business processes are examined and then they are separated to different clusters depending on the context. Before completing this activity, a work plan with all resources, deliverables, and stakeholders is prepared. The scheduling for each task in the plan should also be determined.

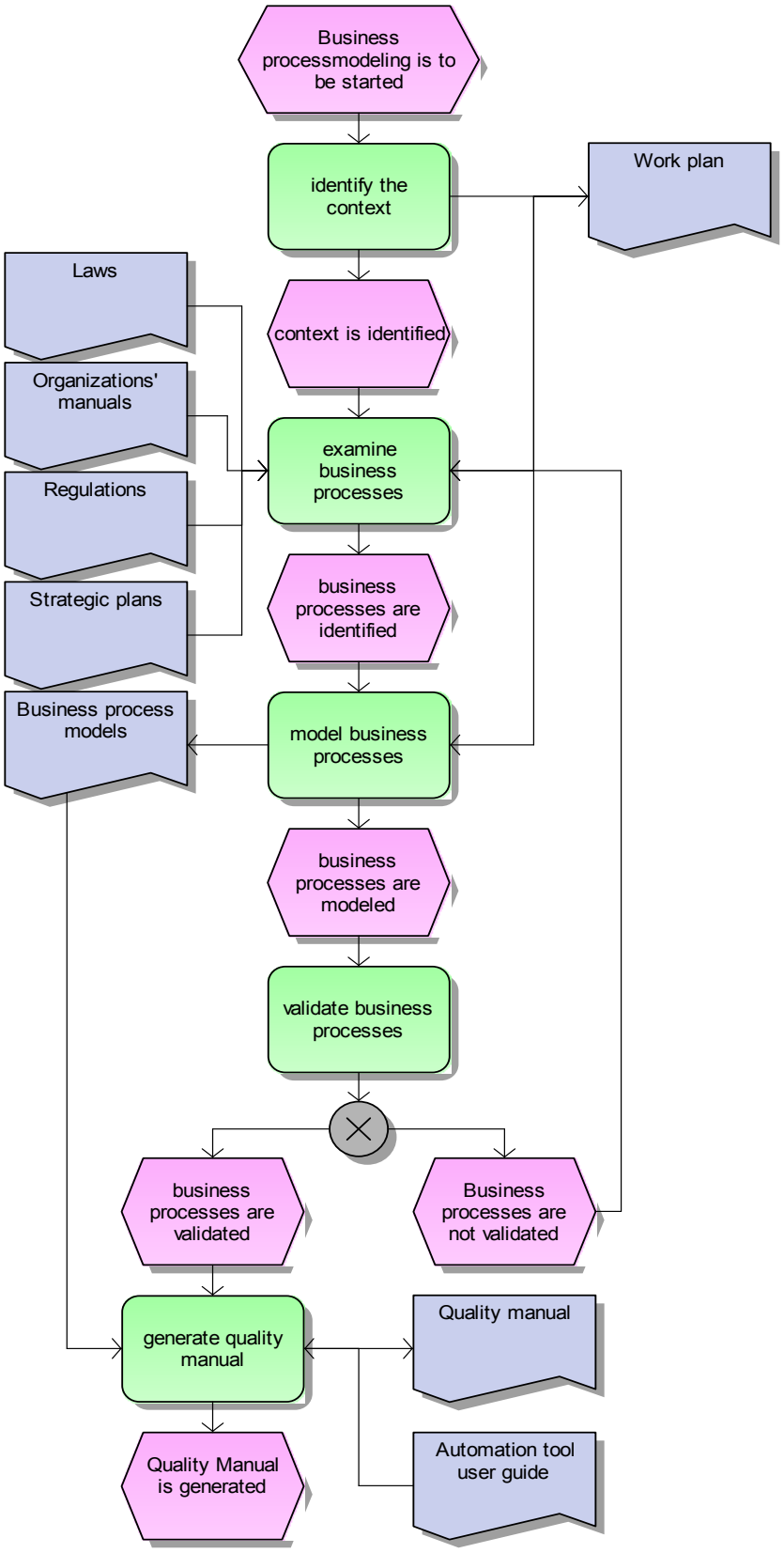


Figure 6 - Approach

3.2.2. Examine Business Processes:

From top to down business processes are examined following the order described in the work plan. In this activity, laws, regulations, organization's manuals and other strategic plans are used for identifying the boundaries of the processes. These documents are guidelines and they are negotiated with subject matter experts who are experts of different topics related with selected modules. These negotiations are held by carrying out workshops to eliminate inconsistencies between documents and determine the processes by considering the best and worst cases. Analyzing the business processes is an important activity since it affects whole processes. Errors or misunderstandings in this phase are side effects in the validation process.

3.2.3. Model Business Processes:

In this activity, modeling is performed using eEPC notation. The elements are basically events, functions, logical operators, process interfaces, inputs, outputs, roles, business rules and clusters. These are drawn in the flow of executing processes and each model at least includes the role, a function and an event. If there is a hierarchical relationship between models, function trees are used to depict hierarchical links between modules.

3.2.4. Validate Process Models

While validating business process models, they are reviewed in detail with subject matter experts and process engineers. If there is a revision necessary, it will be reflected to all models by considering potential conflicts and inconsistencies. If models are not validated, the flow is returned to the examine business processes phase again.

3.2.5. Generate Quality Manual

As the business process models are completed, the quality manual will be generated from them using the automated tool. (Appendix A includes the user guide of the tool).

3.3. Automation Tool Scenario

The scenario of the automation is given in Appendix B and Appendix C generally. The details of the functions are also available in Figures 7, 8, 9, and 10. After the quality manual generation is initiated, a group which represents a module in this study is needed to be selected. Meanwhile, output file format is chosen. After selecting the group, "getSelectedGroups" function takes all available information about a group in ARIS platform so that other details can be reached for reporting. First of all, information about the header and footer of the document is retrieved. Then, the body, the most important part of the document, is prepared. Lastly, by using the prepared information in the body part, the table of contents is printed at the beginning of the document in order to guide users.

After completing all parts of the document, it is printed in the selected format. If any of the information necessary for different parts is not available a warning appears saying "There is no such information" in the related part of the document. This does not imply missing information, this indicates that this process for example does not have any input, output or rule.

In ARIS platform, there is an object created as output object so as to be used in printing. This object is created with the method "createOutputObject" having parameters: selected format and selected file.

3.3.1. writeHeader

The function "**writeHeader**" takes 2 arguments. One of these arguments is output object and the other one is module name which is also the name of the selected group. The header is written between two methods; "**BeginHeader**" and "**EndHeader**". Anything written between these two methods is printed in the header of the document. In quality manual, the name of the organization and name of the module is printed in there. The scenario of the header is shown in Figure 7 below.

3.3.2. writeFooter

The function "**writeFooter**" takes one argument; output object. The footer is written between two methods; "**BeginFooter**" and "**EndFooter**". Anything written between these two methods is printed in the footer of the document. In quality manual, the document version number and pager numbers are printed in this section. The scenario of the footer is shown in the Figure 8 below.

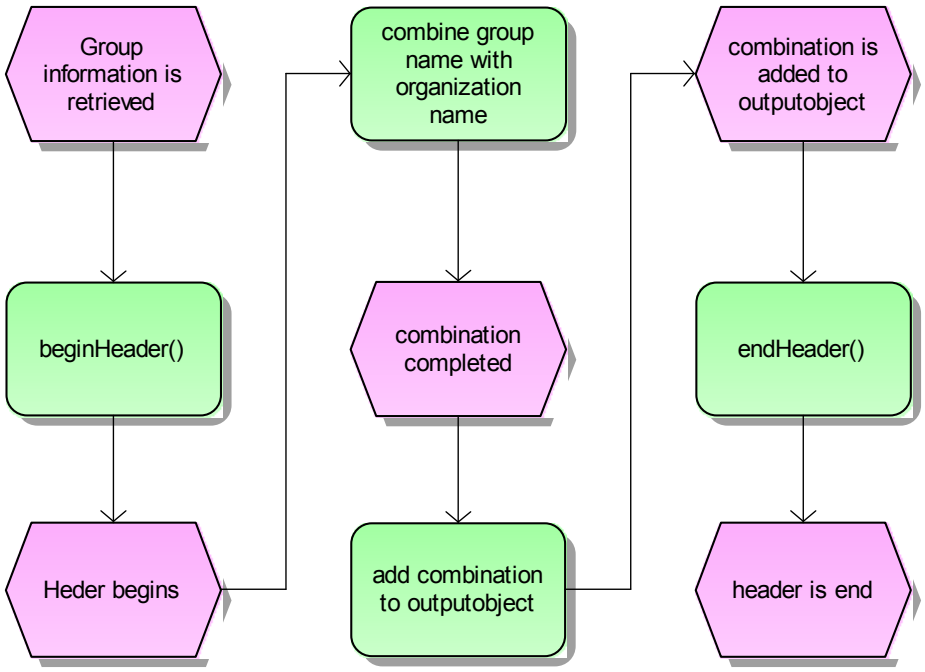


Figure 7 – Header Scenario

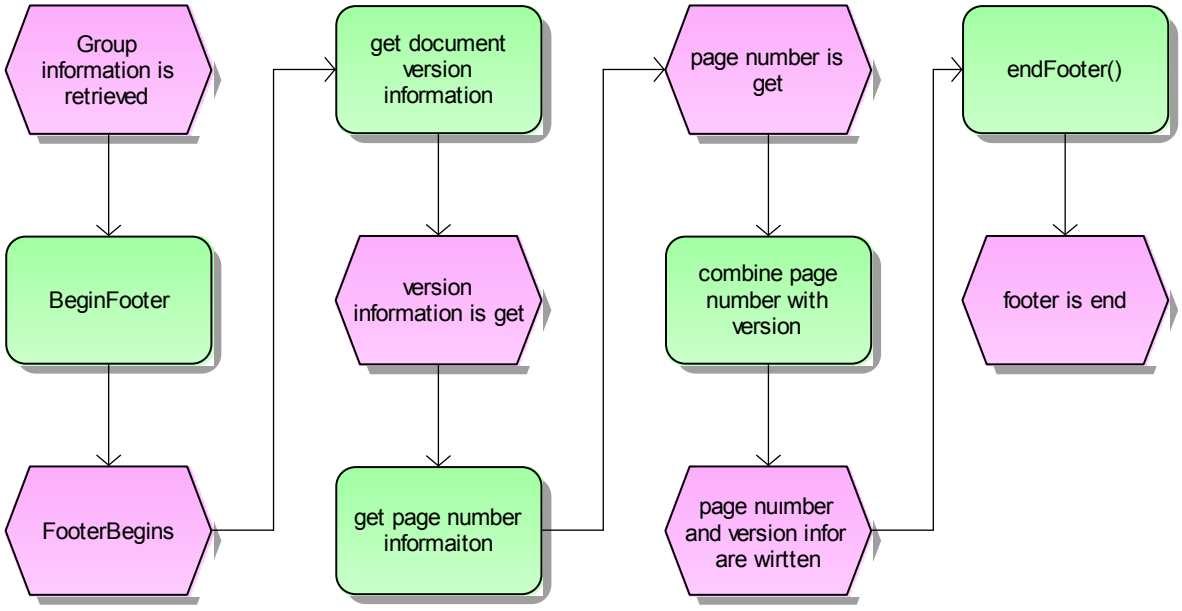


Figure 8 – Footer Scenario

3.3.3. writeTableofContents

Table of contents in ARIS platform can be generated automatically by arranging the leveling, style and place of printing. It should be coded between "**BeginSection**" and "**EndSection**" methods. Then, if numbering needs to be done "**autonumbering**" method of output object can be used with Boolean parameters. After that, all levels are set with "**SetTOCFormat**" method and numbers are assigned for each level. If anything needs to be printed such as heading, it can also be printed inside this section. Before ending the section, "**OutfutField**" of output object is used with "**FIELD_TOC**" constant in order to print Table of Contents (TOC).

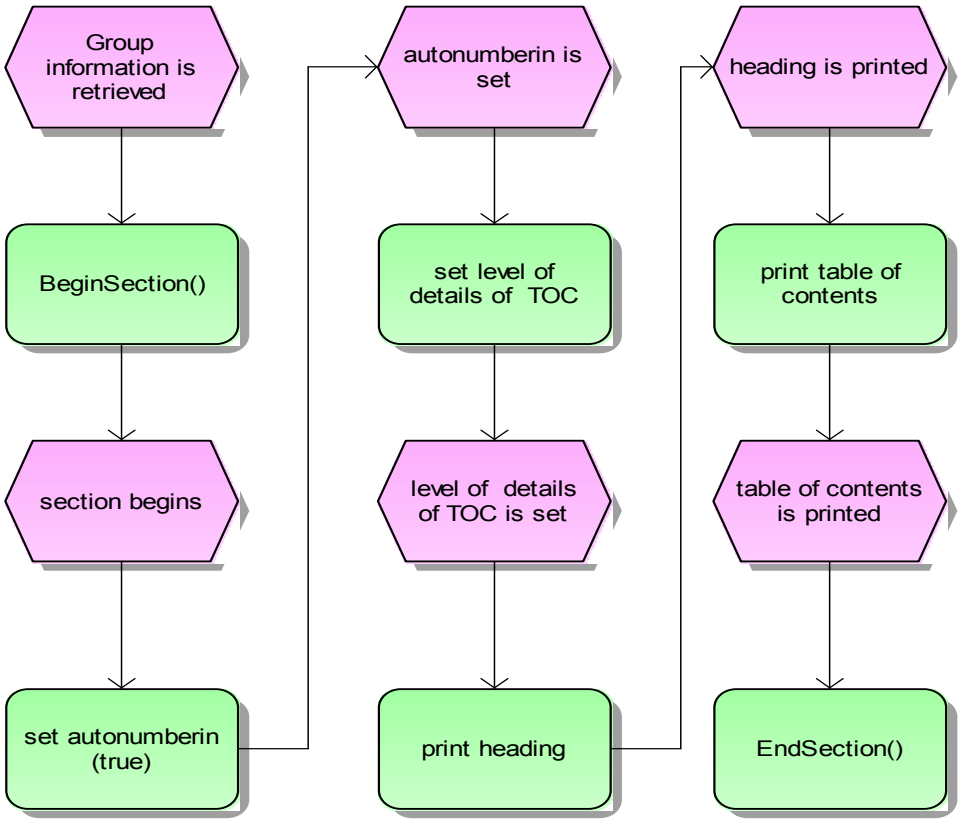


Figure 9 – TOC Scenario

In order to print whatever is necessary to TOC, "**FMT_TOCENTRY0**", or "**FMT_TOCENTRY1**", or "**FMT_TOCENTRY2**", or "**FMT_TOCENTRY3**" constant should be added to "**OutputLn**" or "**OutputLnF**" methods. These constants are referring to different levels with the numbers at the end of their names (0, 1, 2, and 3). This usage can only be used to write directly to document not in a table cell. The scenario of TOC is also given in Figure 9 in EPC representation.

3.3.4. writeBody

Since there is a hierarchical relationship between groups, and process modeling is performed by separating the system into different modules, "writeBody" function is run recursive to the end of the module list, until no leaf node is left. The body of the quality manual consists of eEPC and function trees sorted from up to down and from outside to inside. The scenario of the body part is given in Figure 10 below in graphical representation.

At the beginning of the body part the model list of the group is retrieved by using "**ModelList**" method of group object. Then the process is divided into two parts for "**EPC**" and "**Function Tree**" models. They have different output styles and own different information. In order to filter them "**TypeNum()**" method is used and the returning integer value is compared with the constants of model types "**Constants.MT_EEPC_COLUMN** " or "**Constants.MT_FUNC_TREE**" to understand whether these models are the ones which will be added to quality manual.

After having function tree list, they are documented in a different format than EPC column display models. They include sub-process of the module, and only are used when there is a hierarchical relationship between modules and no action flow is available. This page of quality manual includes header, footer, purpose statement and sub-process list. An example function tree page is available in Appendix D.

The remaining part of the quality manual consists of the documentation of EPC models. In order to get necessary information from models, different methods are used. After having retrieved the EPC model list, their first degree "Childs" are listed. Then inside a loop, inputs, outputs, roles, events, functions, organizational units, business rules, starting and ending events, process interface and occurrences are filtered and assigned to different array objects. This filtering is performed by using "**ObjOccListFilter**" method for each model and having different constants as parameters. The detailed information and the list of the used constants are given in Table 4 below. After filtering the model list's object occurrences, connection list of each object is examined by using "**CxnOccList**" method. In addition to connection list method, "**AssignedModels**" of "**ObjDef**" methods are used for finding the relationships of models to which they are assigned and to find their features hidden in their object definitions. Connection list of the object have "**SourceObjOcc**" and "**TargetObjOcc**" methods. These methods can be used to identify the input and outputs of an object using the direction of the arcs in each connection. However, these methods return all objects regardless of their type. Therefore; results can be filtered using the output and input object constant given in Table 4. After having listed input and output object which are named "Information Carrier" in ARIS Platform, their type (electronic document, folder, e-mail etc.) can be found out with "**SymbolName**" method of the objects. This method is also used to identify the processes used within another. That is, when the symbol name of a function is "**process interface**". One last important method is used for identifying the occurrences of the model inside another model, the opposite of using a process interface inside a model. This method is "**SuperiorObjDefs**". After finding superior objects of a function, their occurrences and object definitions can be reached.

In the body part of the quality document, all of the information for tables and bulleted lists are collected in different arrays which contain objects including necessary attributes. However, these arrays include repeated functions, events, inputs etc. because any object can be used more than once inside a model. Therefore; all

arrays are made unique using a dynamic function. Then, these arrays are printed in the related place of the quality document.

Table 4 - Constants in ARIS Script Language

Constant		Related Object	
Constants.OT_BUSINESS_RULE		Business Rule	
Constants.OT_ORG_UNIT, Constants.CT_EXEC_1		Roles	
Constants.OT_EVT		Events	No "**dependon**" and No "**iscreatedby**" relationship refers that this event is a starting event No "**evaluatedby**" and No "**activates**" relationship refers that this event is an ending event
Constants.CT_CRT_OUT_TO		Output Object	
Constants.CT_PROV_INP_FOR		Input Object	
Constants.OT_FUNC		Functions	
Text style constants	Constants.C_BLACK Constants.C_TRANSPAREN Constants.FMT_BOLD Constants.FMT_CENTER	Black Color Colorless Bold Center	
Constants.SORT_GEOMETRIC Constants.SORT_GROUPPATH		Sorting geometrically Sorting by group path	
Constants.FIELD_NEWPAGE		Adds page break	

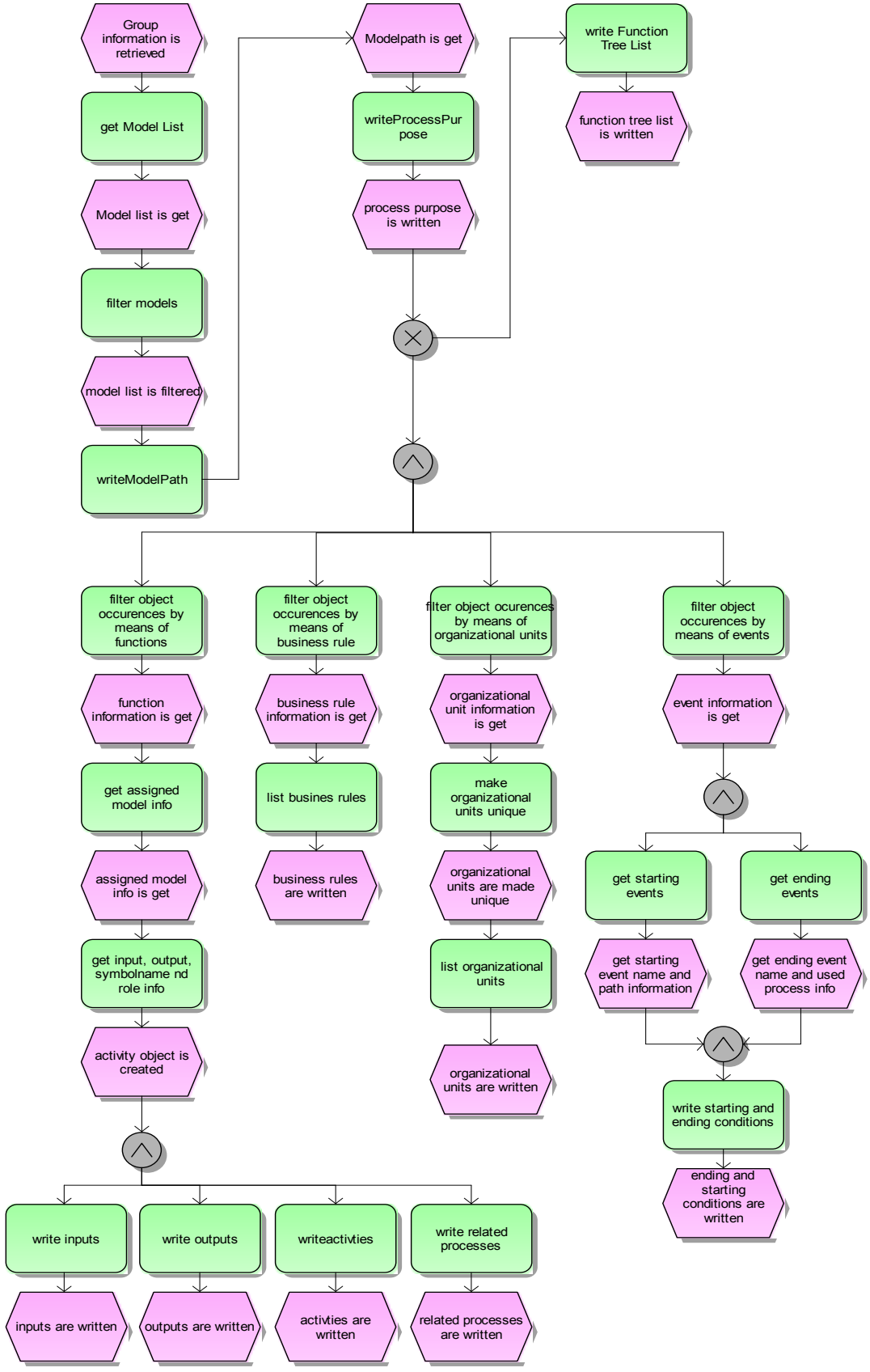


Figure 10 – Body Scenario

3.4. Content of The Quality Manual

The content of the quality manual is determined in the view of process improvement frameworks. Then the content is negotiated with subject matter experts during the workshops. The template of the quality manual is available in Figure 11 and Figure 12. An example quality manual for a simple process (EPC) shown in Figure 3 and Figure 4 is available in Appendix E.

KALKINMA AJANSLARI SÜREÇ KILAVUZU
(İlgili Modülün İsmi)

(Sürecin Bulunduğu Grup)

1 Sürecin amacı

Sürecin amacı belirtilmektedir.

2 İlgili Roller

Süreçteki roller belirtilmektedir.

3 Girdiler

Süreçte girdi olarak kullanılan nesneler aşağıdaki tablodaki biçime göre listelenmektedir.

İsim	Tipi	Kaynak
Girdinin Adı	Girdinin Tipi (Doküman, belge, e-posta vs.)	Girdi eğer dış kaynaktan geliyorsa; bu kaynağın adı belirtilmektedir.

4 Çıktılar

Süreçte çıktı olarak kullanılan nesneler aşağıdaki tablodaki biçime göre listelenmektedir.

İsim	Tipi	Hedef
Çıktının Adı	Çıktının Tipi (Doküman, belge, e-posta vs.)	Çıktı eğer dış kaynağa gidiyorsa; bu hedefin adı belirtilmektedir.

5 Başlama Koşulları

Sürecin başlaması için gerekli olan olayları aşağıdaki tablodaki biçime göre listelenmektedir.

Durum	İlgili Süreç
Olayın Adı	Olayın geçtiği sürecin klasör yolu (path)

6 Bitiş Koşulları

Sürecin bitmesi için gerekli olan olayları aşağıdaki tablodaki biçime göre listelenmektedir.

Durum	Kullanıldığı süreçler
Olayın Adı	Olayın kullanıldığı süreçlerin klasör yolu (path)

Figure 11 - Quality Manual Template Part 1

KALKINMA AJANSLARI SÜREÇ KILAVUZU
(İlgili Modülün İsmi)

7 Aktiviteler ve Sorumlular

Süreç içerisinde geçen aktiviteler aşağıdaki tablodaki biçime göre listelenmektedir.

No	Aktivite	Sorumlu	Girdi	Çıktı	Süre
Sıra numarası	Aktivitenin Adı	Aktiviteden sorumlu olan kişi. Eğer aktivite "Dış Süreç" ise burada belirtilmektedir.	Bu aktiviteye girdi olan nesnelerin adları.	Bu aktivite sonucunda üretilen, değiştirilen vs. çıktıların adları	Bu aktivite için atanmış süre.

8 İlgili İş Kuralları

Süreç bulunan iş kuralları listelenmektedir.

9 Sürecin Kullanıldığı Yerler

Sürecin kullanıldığı diğer süreçler listelenmektedir.

10 Kullandığı Dış Süreçler

Süreç içerisinde kullanılan diğer süreçler listelenmektedir.

Figure 12 – Quality Manual Template Part 2

3.4.1. Table of Contents

The table of content appears at the beginning of the quality manual. It consists of process path and the corresponding page numbers.

3.4.2. Header & Footer

Each page has a header and footer. The header includes the name of the organization and the name of the selected group. The footer includes the document version and page numbers.

3.4.3. Process Path

The process path appears at the beginning of each process part as a heading. It reflects the hierarchy of the process, where it belongs, and what the upper processes are.

3.4.4. Process Scope

The process scope is a sentence consisting of the algorithm given below;

> *"upper process name" + döneminde + "current process name" + için gerçekleştirilen faaliyetleri anlatır.*

3.4.5. Related Roles

The roles declared inside the process as organizational units or position types are declared in the related roles part. Although one role is mentioned in a single process more than once, it is listed under this heading just once.

3.4.6. Inputs

Inputs are documented inside a table. This table consists of the heading; Input name, Input type, and Source. The source is given if the input is coming from outside of the organization. Otherwise, this cell of the row is left empty. Inputs are from the object type "Information Carrier". In this object type, in order to be declared as input, the direction of the arc should be from the information carrier to the function. There are also subtypes of this object and they will be mentioned under the input type heading. These are given in Table 3 in detail.

3.4.7. Outputs

The documentation of outputs is just like the inputs table format. This table includes Output name, Output type and Destination. The destination is opposite of the source mentioned in the input part. The direction of the arc is also the opposite; from the function to the information carrier. Outputs have the same subtypes which are listed in Table 3 under the information carrier part.

3.4.8. Starting Conditions

In this study, all process models (EPC) start with a triggering event. These events are counted as starting condition in quality manual. There can be one or more starting conditions. These conditions are documented inside a table with the heading; The state (name of the event) and Related process (the process where event first arise).

3.4.9. Ending Conditions

Ending conditions are also event type objects. Like starting conditions, all models are ending with at least one event. These are counted as ending conditions in the quality manual and documented in table format. The table consists of state (name of the event) and paths of the processes where this is used.

3.4.10. Activities & Responsibilities

The activities in a process are equal to the functions in that process. In the quality manual, this part is given in table format. This table has the headings: activity name, activity responsible, inputs, outputs and time. The activity name comes from function

name. The roles in the process are also the responsible units of the functions. However, there can be more than one role in a process. So, using the column information activity, specific roles can be found. The inputs and outputs of the functions are discovered like it is mentioned in sections 3.4.6 and 3.4.7. This time, their target and source function are also considered so as to find activity specific objects. An information carrier can be input and output of different activities at the same time. The last column of the table is time. Nevertheless, the scope of the study does not include time information for functions to be carried out. This column is added in the view of the demands of project stakeholders and considered as future study.

3.4.11. Related Business Rule

Business rules mentioned inside a process are given in bulleted list format in the quality manual.

3.4.12. The places where the process is used

The places where the process is used as “Process Interface” are mentioned under this heading in the quality manual in bulleted list format. This item is important to evaluate the dependencies of other processes to the current process.

3.4.13. The processes which are used in the flow

This part of the quality manual lists “Process Interface” objects which correspond to the process used inside the current process. This item is important to evaluate the dependencies of the current process to other processes.

CHAPTER 4

CASE STUDY

This chapter explains the details of case study. Before describing the case study design, the aim of the study, its description, and the research questions are explained. The design includes the case study plan. Then the implementation of the plan is described. The result of the study is given via a descriptive table. Lastly, the validation studies carried out and limitations of the study are defined.

4.1. Case Study Questions

The aim of the case study is to develop the automation tool, analyze the outputs of the tool applied on a selected set of business processes and validate the benefits. In order to reach this aim, research questions are defined and a case study is designed to answer these questions.

Question 1

Does generating quality manual automatically from business process models decrease the time and effort required to create a quality manual?

By making documentation of the process automatic, we intend to measure the time and effort required and compare the data with the manual documentation.

Question 2

Does generating quality manual automatically from business process models eliminate the inconsistencies between process models and quality manual?

Since both quality manual and process models define the business process, they should be consistent from all perspectives. Controlling their consistency needs additional effort when it is done manually and human factor leads to errors.

Question 3

Does generating quality manual automatically from business process models decrease the effort and time required for change management?

By generating quality manual automatically, it is aimed to control the changes occurring in the process models and reflect the changes to the quality manual accordingly.

Question 4

Is using quality manual for organizational process execution effective by means of usability?

The aim of this question is to investigate if using quality manual instead of previously used documents such as laws, regulations and organization's manuals make a difference. Are the defined quality manuals more efficient? Usability of generated quality manual is evaluated by means of the interview questions available in Appendix F.

4.2. Case Study Description

The case study is a small part of a process improvement project held in a government organization. The whole project life cycle is 12 months. The aim of the project is to define and improve business processes of the organization.

The experimental study is carried out inside this process improvement project because;

- Organization requires business process models,
- Management of the organization support process improvement activities,
- Process documentation so thus quality manual is need to be generated,

In order to actualize the project, six subject matter experts from three different government organizations, three modeling experts and a coordinator were involved. By means of workshops, business processes are analyzed, created and revised. The mechanism of the business processes are explained by subject matter experts and their correspondence with process models is decided by modeling experts. In addition to subject matter experts' suggestions, laws, regulations, and organization's manuals are also investigated so as to complete the models and add business rules required to perform processes. If supplied documents (laws, regulations and organization's manuals) and suggestions are not enough for completing process or there is a failing part of it, any additional comment can be done either by subject matter experts or modeling experts. This case can be declared as process improvement state of the project and they are documented as improvement reports. These reports are one of the deliverables of the project. There are also other outputs: process models, software requirements specification document, quality manual, data dictionary, and workshop records. These outputs are designed to be used by 26 units with 962 personnel. Process models are one of the most important outputs since they

are also the source of the quality manual and software requirements. The resulting process models in the project consist of eEPC, function tree, FAD and an organizational chart. However, the quality manual experimental study part only considers eEPC and function trees which include sufficient information in order to create a quality manual.

4.3. Case Study Plan & Implementation

Before conducting the case study, a detailed plan is prepared. The activities of this plan are;

1. Analyze quality management frameworks and define the requirements of the quality manual
2. Prepare the quality manual template
3. Create the quality manual for a single process (manually)
4. Perform workshops with subject matter experts to review sample manual
5. Determine the revision needs of modeling notation and its adequacy for automatic generation of the quality manual
6. Create automation tool
7. Generate quality manuals automatically
8. Send quality manuals to software process and subject matter experts for validation
9. Take feedbacks from validation group and make necessary changes
10. Generate new versions of the quality manual
11. Carry out interviews with subject matter experts and end users for validating the quality manual

After making case study plan, the implementation of the experiments begins with the analyzing of quality management frameworks and defining requirements of the manual. In order to decide the content of the manual, three modeling experts examine CMMI, Cobit, ITIL and ISO 9001. The minimum requirement set of a quality

manual is decided at the end of the negotiations. This small set includes, process scope, process name, flow of actions, rules, details of the activities, and inputs & outputs. Then a template is prepared and a small set of processes is documented by using this template. This sample is presented to subject matter experts to understand their opinion about the template and its usability. Four workshops were performed so as to have the final version of the quality manual.

The first version; the first version of the quality manual has a process path at the beginning and the name of the process, with the name of the organization, in the header part. Then the purpose of the process and related roles are listed. After that, the activities held inside the process are given in table format with their responsible person/unit and related product. Then inputs, outputs, starting conditions and ending conditions are also given in table format. Lastly, business rules, the places where process is used, and process interfaces used inside the process are listed.

The second version; in the second version, the place where activities listed is changed after the recommendation of subject matter experts. They are given after ending conditions and in the natural language format. The reason for giving the activities in natural language format is to ease the understanding by end users.

The third version; unlike the second version, the third version again lists activities in table format. This is because of the recommendations of some of the domain experts in the case study. They argued that giving them in table format with numbering at the beginning and separating the inputs and outputs from each other increases the readability rather than giving them in natural language format. As a result, all subject matter experts agreed after examining the sample quality manual. In addition to inputs and outputs columns, the time column is added to the activities part although there is no such information in the process models of the study. This does not however mean that notation or platform does not support adding time attribute for

future use. The experts assumed that only by applying these business process models, the reasonable time can be assigned for them. Furthermore, the time column is made ready for future studies.

The fourth version; in the fourth version only the source column of the inputs and outputs tables are changed. They are named source again for inputs and destination for outputs. However, they have different meanings when they were thought in the previous versions. They now indicate the sender if the input comes from outside the organization; whereas the receiver if the output goes to the outside of the organization. These columns previously represented the source place when the input or output is created regardless of the outside options. However, the subject matter expert group states that their origin is most commonly the same place as where they are listed; so it is redundant to indicate this place. The condition of and outsource is more important to be mentioned.

In the scope of this thesis study, the modeling language is examined by means of its adequacy of information to fill the quality manual template from process models. Moreover, the limitations of ARIS Business Architect's script editor which is the platform used for the creation of automation tool is negotiated and some sample reports are examined. The result was positive; the platform and modeling language needs no revision to create the quality manual. Then the automation tool is created. Using this tool, a large number of business processes is documented and the final quality manuals are created. Then these products are again reviewed by the subject matter experts and business process engineers for consistency checking and for finding out the missing parts of the manual. After these reviews, they suggest that at the beginning of the manual there should be table of contents so that the readability of the document will increase. They also suggest changing the order of the processes given. These change requests are examined and implemented with the automation tool. That is; after this review, automation tool was revised. Therefore, new versions of the quality manual were created.

Besides validating consistency and missing parts of the manual with a small group, interviews were held with subject matter experts and end users selected randomly in order to evaluate usability. The interview questions are available in Appendix F. According to the result of the interviews and after the quality manual usage process, its effectiveness by means of time, effort, consistency and change management is evaluated. Since the quality manual has just reached its latest version and hasn't been started to be used in the organization yet, the effectiveness cannot be evaluated by observing their actual usage. The reason for performing these interviews is to get the understanding, and attitude of the end users and their satisfaction about generated manuals. Before asking interview questions, a 30 minute walkthrough was carried out with the participants to help them recognize and understand the parts and content of the manual. The results of the interviews are described in section 4.5, discussion part.

4.4. Case Study Results

In the case study, business process models created to improve organizations' process are used and analyzed. Then they are used to create quality manuals automatically for 7 different modules. The number of pages and total number of models used in this study are summarized in Table 5 below. The total time to generate these manuals takes approximately 5 minutes when they are created automatically. 5 minutes not just includes the total execution time of the tool, but it includes total interaction time of the user who generates manuals. On the other hand, manual preparation for a function tree takes 10 minutes. For total number of function tress it takes "10 times (x) 22 = 220 minutes". In addition, effort for manual preparation of eEPC models is calculated by adding up the number of functions in all eEPC models having varying complexities. The number of functions is related with the complexity of the models and there are 1758 functions in total. In order to approximate total effort, 7 different eEPCs are selected from all modules. The number of functions in selected models and the effort in minutes are given in Table 6 below. By making an approximation, and applying direct proportion (1758 x 143/ 69), total effort for eEPC documentation

takes 61 man hours. To sum up, total effort for quality manual preparation takes 65 man hours when it is done manually.

Table 5 - Process Models Summary

Module Short Name	Number of Pages of Quality Manual	Number of EPC Models	Number of Function Tree Models	Number of Functions in eEPCs
PFDY	261	87	4	762
ÇPBMY	230	61	7	508
İKY	67	21	4	214
PaydaşVY	30	12	3	84
ABY	29	11	1	52
YDO	49	17	3	118
PerfY	13	6	0	20
TOTAL:	**666**	**215**	**22**	**1758**

Table 6 - Total Effort in eEPCs

Module Short Name	Number of Functions in selected eEPC	Total Time to Generate Manual in Minutes
PFDY	11 functions	21 minutes
ÇPBMY	11 functions	24 minutes
İKY	16 functions	32 minutes
PaydaşVY	10 functions	19 minutes
ABY	7 functions	14 minutes
YDO	6 functions	15 minutes
PerfY	8 functions	18 minutes
TOTAL:	**69 functions**	**143 minutes**

4.5. Discussion

To answer the first research question, the quality manual was generated manually and the time and effort information was kept to be compared. Then the total numbers of functions were counted so that the total time and effort for the whole process could be calculated. After that, the creation of the quality manual process was repeated by using the tool. The results were compared in order to answer the first research question. That means, time and effort required to create the quality manual was significantly decreased by using the automation tool.

The second issue is related with the validity of the quality manual. For this purpose we review the manual with the subject matter experts and the business process engineers. Two business process engineers and two subject matter experts reviewed the manual. They first read different parts of the quality manual in detail and identified any inconsistencies between models and their documentation. Then they reviewed the whole manual. None of the experts identified any inconsistencies between generated quality manual and modeled processes.

The third research question is about the change management procedures. This issue is examined by sampling a single process, generating the quality manual, changing the process and regenerating the quality manual. After these activities, two versions of the manual are compared so as to find out whether the change made in the processes reflected to the quality manual or not. We observed that the changes are automatically reflected to the documentation part and the versioning can easily be done. In addition to the sampling method for change management, throughout the case study, business process models are changed approximately 45 times which can be calculated from the version of the databases.

To answer the fourth question we performed structured interviews. Interviews were held with end users and subject matter experts. There were in total five attendees from the government organization where case study took place. Two of these attendees are from the subject matter expert group, one of them is from the administrative staff, and two of these is from end users. Selecting this group with different background knowledge by means of modeling, content of the project, and familiarity to the quality manual concepts enables objectiveness and variety of ideas.

The interview was performed with questions available in Appendix F. Before asking questions, sample quality manuals are examined by the attendees. These samples are products of IKY (İnsan Kaynakları Yönetimi) and ABY (Arşiv Belge Yönetimi) modules with 96 pages totally. This corresponds to %14 of the total manuals.

The first question of the interview aims to identify the usage of the quality manual instead of other documents such as laws, regulations and organization's manuals. One of the attendees, explained this issue by explaining their scope and goals. "*The laws are more general rules; whereas regulations (legislations) are details of these rules. But, both of them do not explain the actualization process of these rules. The processes should be identified with such kinds of manuals".* All of the attendees explained that the usage of the quality manual will be beneficial and effective. The administrative staff expresses the importance of the quality manual in three parts; the first one is filling the gaps between practice and laws; the second one is eliminating inconsistent application of rules because of different interpretations, and the last one is assisting monitoring and controlling of procedures. He also mentioned that, the input and output list can be used as a checklist for the completion of the processes. By considering all answers, it is concluded that, the quality manual is a very beneficial and effective way of monitoring and controlling processes besides giving guidelines for actualizing it.

The second question tries to find out whether quality manuals are preferred or not instead of using business process models. The reason for asking this question is to validate the importance of generating a manual from process models. One of the attendees said that, "*Process models form the basis of the architecture, whereas the quality manual gives the details*." He also added that, "*Process models are not appropriate for daily usage.", "ARIS platform is suitable for designers, but documents are suitable for end users.", "Using process models may lead to errors and some parts may be missed while implementing the process*.", "*The Quality Manual is more useful*." One of the subject matter experts states that "*Process models are suitable for visualization, foreseeing the whole and following the flow*." The other subject matter expert states the usefulness of the quality manual from another point of view. She said that ARIS cannot be installed on whole users' computers. That is, the quality manual can be carried to any place where it is needed without any dependence or pre-installation needs when comparing with software tools.

The third question has the purpose of discussing the sufficiency of the content. The question reveals the missing and misleading parts of the manual. Attendees are asked to find missing parts generally and then some leading questions are converted. All attendees agreed on the readability and traceability of the manual. One of the attendees thought that the quality manual is so simple that it eases the finding of anything within the document. However, they noticed some missing and problematic parts which lead to revisions. These issues are listed below;

- The conditions and the order of the activities in the activities and responsibilities part.
- The list of abbreviations part
- The template of the manual or definitions of usage or a guideline for usability of the document
- Sorting of inputs and outputs in the order of execution

- The source and target of the input and outputs in the activities and responsible part

The fourth question aims to identify the effects of table format when compared to natural language. All of the attendees agree that the table format is a better way of expressing information. They added that, representing information in table format increases readability, traceability, comparability. One of the attendees emphasizes that "*It is so easy to identify inputs and outputs for each activity by using table format*."

4.6. Case Study Limitations

First of all, the quality manual is generated from a restricted set of eEPC modeling notation. Therefore; this is the basic limitation. In addition to this, the modeling notation does not allow directly accessing the order of the activities which stand for functions in EPCs. Therefore; the activities part of the quality manual is sorted geometrically not in the order of their execution. Geometric sort results in a most likely sequence of activities by ordering them by means of the distance from the place of their existence to the left upper corner of the model. Moreover, the conditions such as "OR", "AND", and "XOR" cannot be shown between the activities in the manual, so the control flow are hard to recognize without using the actual models.

Another limitation of the study is that laws, regulations and organization's manuals shape the business rules and some other details, but they are not reflected in the quality manual. This is related with the insufficiency of the information carrier objects; they do not include a references property. Therefore; in the quality manual the source or destination of inputs, outputs and business rules are not defined.

The last limitation of the study is the restricted use of natural language in the quality manual. In the majority of the manual, table format is chosen to represent inputs, outputs and activities. The reason for this is not just because of the difficulties, which took roots from the linguistic of the modeling language, when converting business process models to natural language, but also due to the preference of subject matter experts in the case study.

Effort estimation and interview also have some limitations. Interviews were performed with five attendees. These are selected randomly from the government organization personnel. However, the majority of them were familiar with process modeling and haven't used the quality manual for performing their duties. They just review and try to follow a selected procedure for understanding the impact and effectiveness of the manual. Therefore; final impact and usefulness of the quality manual will be understood after a usage period. On the other hand, effort estimation made for generating the document manually was performed with one person and with a limited number of process models. The total effort and time is calculated approximately after one attendee generates quality manual by hand. This is a limitation for understanding the percentage in the effort decrease when comparing manual method with automatic one.

CHAPTER 5

CONCLUSIONS

In this chapter the conclusions, contributions and future studies are given.

5.1. Conclusion

This study has two main goals. The first goal is decreasing the time and effort required to define quality manuals based on process models and manages changes on them. The second goal is eliminating inconsistencies between process models and the quality manual. In order to achieve these goals, the quality manual preparation process is defined and partially automated.

Quality Manual Definition approach and its automated tool are developed by means of a case study performed with three divisions of a government organization. In the case study, 237 processes are modeled and 666 pages of quality manuals are generated.

A significant reduction of effort in the quality manual preparation process was observed by calculating total efforts in this case study. Total effort for generating quality manuals based on process models, utilizing the tool, takes 5 minutes, whereas

it takes 65 man hours when it is defined manually. Automated tool which converts business process models to quality manuals is developed on ARIS platform. Process models are created in eEPC modeling notation. In addition to the benefits of the automated tool, the approach merges business process modeling and quality manual definition activities and eliminates the redundant effort spent for similar purposes.

Interviews were performed to evaluate the usability of the quality manuals. The results of the interviews indicate that generated quality manuals are portable compared with business process models. That is, manuals can be transferred to any environment and not platform dependent. The result also reveals that quality manuals are easily traceable and readable. The last issue is change management. Automated tool, process models and quality manuals are complementary parts of change management procedures. Any change made in the business processes is reflected to the quality manual with the help of the automated tool. On the contrary, changes made in the quality manual cannot be reflected to business process models.

5.2. Contributions of the Study

Contribution of this thesis study is described by means of improvement opportunities of the previous work in the literature. There are two studies in the literature that have similar purposes and automated process documentation, as summarized in Table 7. However, the products of the studies, level of abstraction required, and effort required for modeling are different.

In previous studies, modeling notations are modified and extended with other ones to get enough information for documentation. On the contrary, in this thesis study, a predefined modeling notation is utilized. Moreover, studies in literature produce process documentation and user manuals after the software design phase. The need to utilize design models requires more concrete modeling which increases the effort and time required. Therefore, the first contributions of this study are time and effort

decrease not only in the generation of the quality manual, but also in the revision of notations for having a required set of information. That is; the time and effort for generating quality manual from predetermined process models is significantly reduced by automating this activity and utilizing the abstract models that can be established within the problem domain.

Second contribution of this study is assisting quality management system by generating a quality manual. Unlike process portals and user manuals, quality manuals meet the needs of most commonly used process improvement frameworks in information technology sector, ITIL, Cobit, ISO 9001 and CMMI, by means of having explicit business processes. None of the automated process documentation studies aims to create quality manual to merge process modeling and quality management activities.

Third contribution of this study is generating quality manual which does not include unnecessary details and appropriate for daily usage compared with process documents generated from business process models in literature.

Table 7- Summary of Study 3

	STUDY 3
Level of Abstraction	Software Requirements
Supports	Day-to-day work
Products	Quality Manual
Quality of Products (validation)	Validated by a single case study
Modeling Notations	eEPC
Advantages	Increase Efficiency, readability, traceability Decrease time and effort Enable change management Consistent and easy communication of workflows and responsibilities across the company
Disadvantages	Activities part will be revised Additional features are inserted to models (time and explanation properties)
Tools Used	ARIS Platform

5.3. Future Study

In this study (or in the interviews) it is revealed that effective usage of the quality manuals can be increased by adding new attributes to process models such as time, prerequisites, and explanation. With the help of these additional properties, related columns will be added to the activities part of the quality manual. By having the knowledge about the timing and prerequisites of an activity, the actualization of the processes can be understood better. Adding explanation attribute is also an improvement in the description of the process. Another improvement opportunity is to add reference attribute to process models. This enables explaining the source of the business rules, inputs and outputs. These sources can either be laws, regulations or organizations' manuals.

Besides adding new attributes to models, quality manual can be improved with available information by changing the documentation options. The sequence of the activities and the condition information are one of the most important limitations of this study. Therefore; conditions and order of the activities can be explained in the activities part of the manual.

As a future study, in order to meet the needs of different process improvement frameworks, tailorable quality manuals can be generated from business process models. This manual includes the selected information from a wide range of attribute sets.

This approach could also be applied in multiple cases. The applicability of the approach and usability of the quality manual can be understood better. In these case studies the time period will be kept longer to identify the effectiveness of the manual after a usage period. As a result, surveys and interviews could be performed with a large number of attendees from different organizations.

REFERENCES

[1] Hammer, M.(1990), Reengineering Work: Don't automate, obliterate, Harvard Business Review, pp. 104 – 112

[2] ISO 9001: 2008, Quality management systems – Requirements, International Standards Organization

[3] Videovic, D. I., & Vuksic, V. B. (2003) Dynamic Business Process Modelling Using ARIS, Univ Zagreb, Fac Forestry

[4] Siegeris, J., & Grasl, O. (2008), Model Driven Business Transformation – An Experience Report, Practice and theory of automated timetabling V : 5th international conference, PATAT 2004, Pittsburgh, PA, USA, August 18-20, 2004 : revised selected papers, pp. 36

[5] Coşkunçay, A., Aysolmaz, B., Demirörs, O., Bilen, Ö. & Doğan, İ (2010). Bridging The Gap Between Business Process Modeling And Software Requirements Analysis:

[6] Aguilarsaven, R (2004), Business process modelling: Review and framework, International journal of production economics, vol.90, no.2, pp. 129

[7] Curtis, B., Kellner, M. I. & Over, J. (1992), Process Modeling, Communications of the ACM, pp. 75 -90

[8] Davenport,T. H. (1993), Process Innovation - Reengineering Work Through Information Technology, R & D management, vol.25 no. 4, pp. 421

[9] Dumas, M., van der Aalst, W. M. P., ter Hofstede, A. H. M. (2005) Process Aware Information Systems: Bridging People and Software Through Process Technology. John Wiley & Sons, Hoboken, New Jersey

[10] Indulska, M., & Green, P.& and Recker, J. C., & Rosemann, M. (2009) Business process modeling: perceived benefits, 28th International Conference on Conceptual Modeling, 9-12 November 2009, Gramado, Brazil.

[11] Indulska, M., & Recker, J., & Rosemann, M., & Green, P. (2009), Business Process Modeling: current issues and future challenges, The 21st International Conference on Advanced Information Systems, Amsterdam, The Netherlands

[12] Rosemann, M., & Recker, J., & Indulska, M., & Green, P. (2006), A Study of the Evolution of the Representational Capabilities of Process Modeling Grammars, Practice and theory of automated timetabling V : 5th international conference, PATAT 2004, Pittsburgh, PA, USA, August 18-20, 2004 : revised selected papers, pp. 447 -461

[13] Aguilarsaven, R (2004), Business process modelling: Review and framework, International journal of production economics, vol.90, no.2, pp. 129

[14] Rukanova, B., & van Slooten, K., & Stegwee, R. A. (2006), Interoperability of enterprise software and applications, Springer, pp.13

[15] Rosemann, M., & Recker, J., & Indulska, M., & Green, P. (2006), A Study of the Evolution of the Representational Capabilities of Process Modeling Grammars, Practice and theory of automated timetabling V : 5th international conference, PATAT 2004, Pittsburgh, PA, USA, August 18-20, 2004 : revised selected papers, pp. 447 -461

[16] Söderström, E., Andersson, B., Johanesson, P., Perjons, E., & Wangler, B., (2002), Towards a Framework for Comparing Process Modeling Languages, In Pidduck et al. (Eds.), CAISE 2002, LNCS 2348, pp. 600-611, 2002, © Springer- Verlag Berlin Heidelberg

[17] Rukanova, B. D., & van Slooten K, Stegwee R. A. (2006), Business process requirements, modeling technique and standard: How to identify interoperability gaps on a process level, Interoperability of enterprise software and applications, New York, pp. 13

[18] Kesari, M., & Chang, S., & Seddon, P. B. (2003), A content-analytic study of the advantages and disadvantages of process modeling, 14th Australasian Conference on Information Systems, Perth, Western Australia

[19] Rosemann M. (2006) , Potential pitfall of process modeling: part a, Business Process Management Journal, vol.12 no.2, pp. 249-254

[20] Rosemann M. (2006) , Potential pitfall of process modeling: part b, Business Process Management Journal, vol.12 no.2, pp. 377-384

[21] SEI, CMMI® for Development, Version 1.2 (2006), PA Software Engineering Institute-SEI, Pittsburgh

[22] Cater-Steel, A., Tan, W.G. & Toleman, M. (2006), Challenge of adopting multiple process improvement frameworks, In Proceedings of 14th European Conference on Information Systems (ECIS 2006).

[23] Levine, D. I., & Toffel, W. M. (2010), Quality Management and Job Quality: How the ISO 9001 Standard for Quality Management Systems Affects Employees and Employers, Management Science, vol. 56 no. 6, pp. 978-996

[24] Terlaak, A., & King, A. A. (2006) The Effect Of Certification With The ISO 9000 Quality Management Standard: A Signaling Approach, Journal of Economic Behavior and Organization, vol.60 no.4, pp. 579

[25] Cater-Steel, A. P., & Tan, W. G. (2005). Implementation of IT Infrastructure Library (ITIL) in Australia: Progress and Success Factors. Paper presented at the IT Governance International Conference, Auckland, NZ.

[26] ITIL – Service Operations. (2007) United Kingdom: The Stationary Office

[27] ITIL – Service Design. (2007) United Kingdom: The Stationary Office

[28] Lainhart, J. W (2000), COBIT™: A methodology for Managing and Controlling Information and Information Technology Risks and Vulnerabilities, Journal of Information Systems, vol 14, pp. 21-25

[29] Cobit Framework 4.1 (2007), IT Governance Institute, pp. 21& 89

[30] Jungmayr, S. , & Stumpe, J. (1998) Another Motivation for Usage Modeling: Generation of User Documentation, Proceedings of CONQUEST '98, Nuernberg, Germany

[31] Su, O. (2004). Business Process Modeling Based Computer-Aided Software Functional Requirements Generation. MS Thesis, Informatics Institute, METU, Ankara, Turkey.

[32] Davis, R., & Brabänder, E.(2007) ARIS design platform: getting started with BPM, Springer Press

APPENDICES

APPENDIX A – User Guide

1. *STEP*

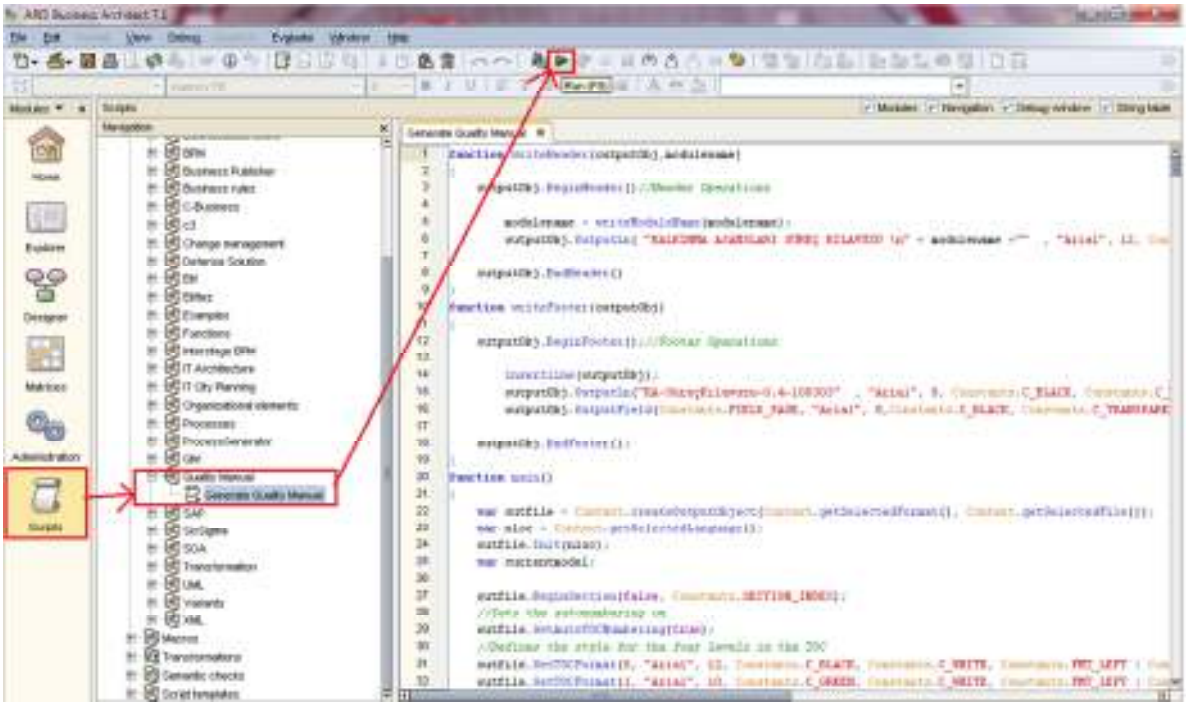


Figure 13 - User Guide Step 1

First Step is opening the "**Script**" menu and selecting "**Generate Quality Manual**" script. Then click "**run**" as shown in the picture in the left hand side.

2. STEP

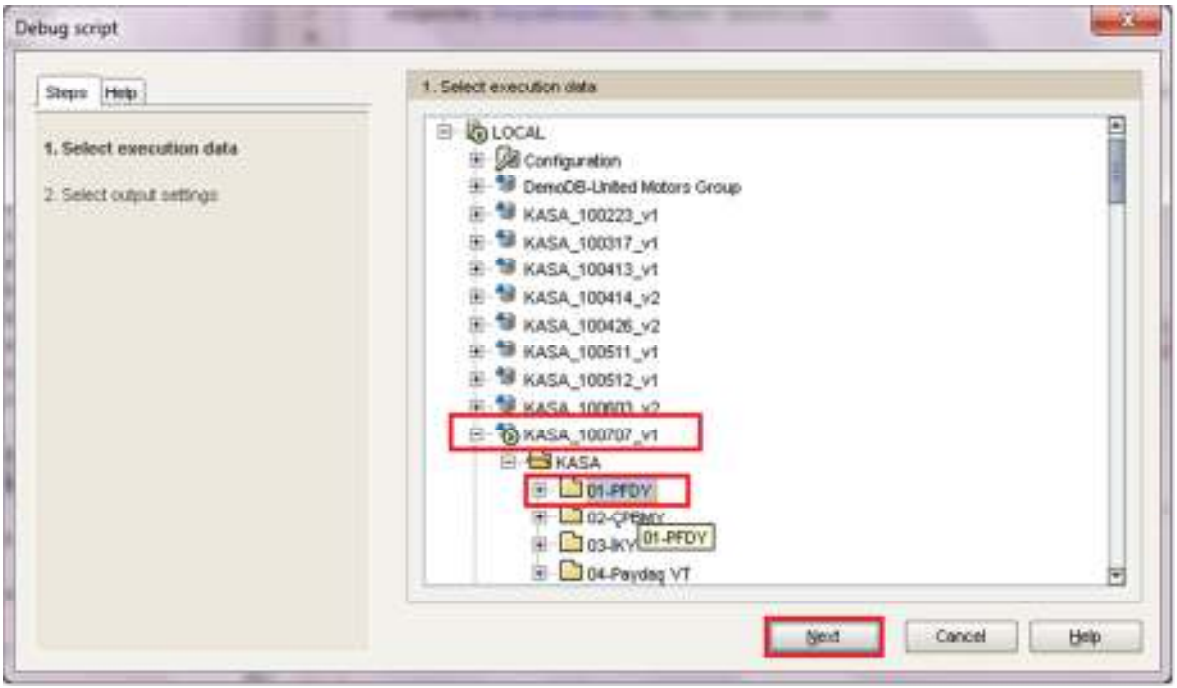


Figure 14 - User Guide Step 2

Second step is selecting the database and then the group to which quality manual is generated. The group corresponds to the module of the system. Then click [**Next**] button.

3. STEP

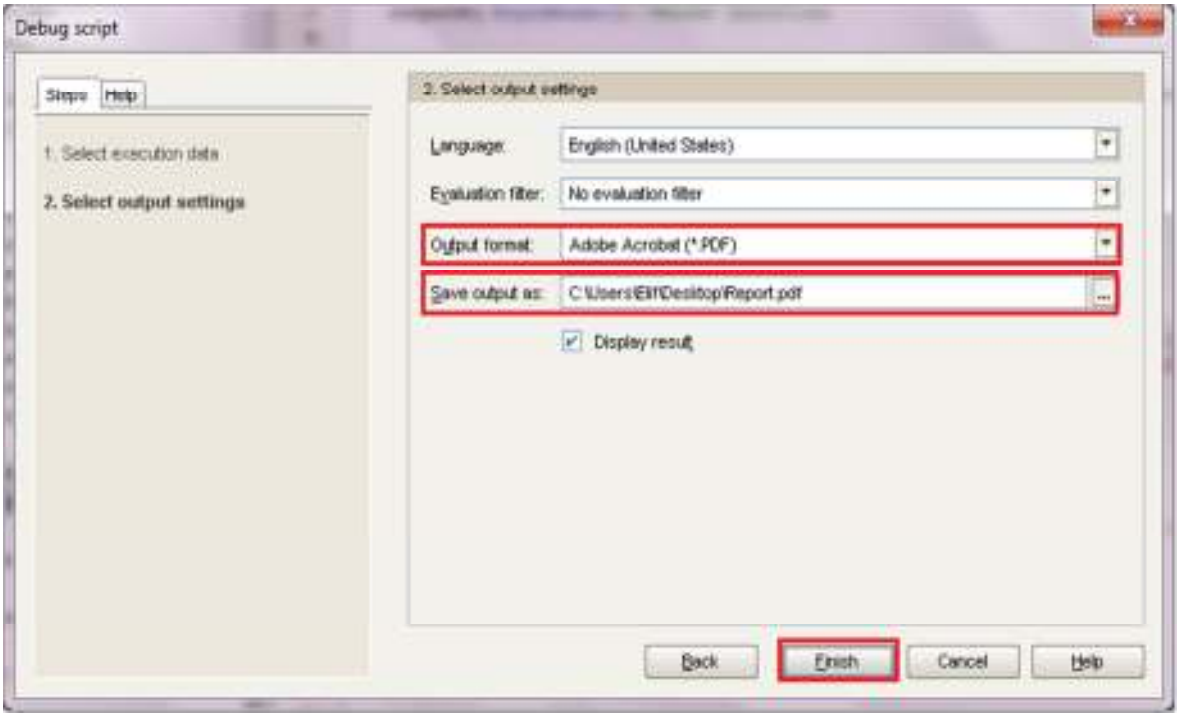


Figure 15 - User Guide Step 3

Third and last step is selecting file format and the destination to save. The recommended file format is “Adobe Acrobat (.pdf)”. Then click [**Finish**] button.

APPENDIX B – Execution Scenario Part 1

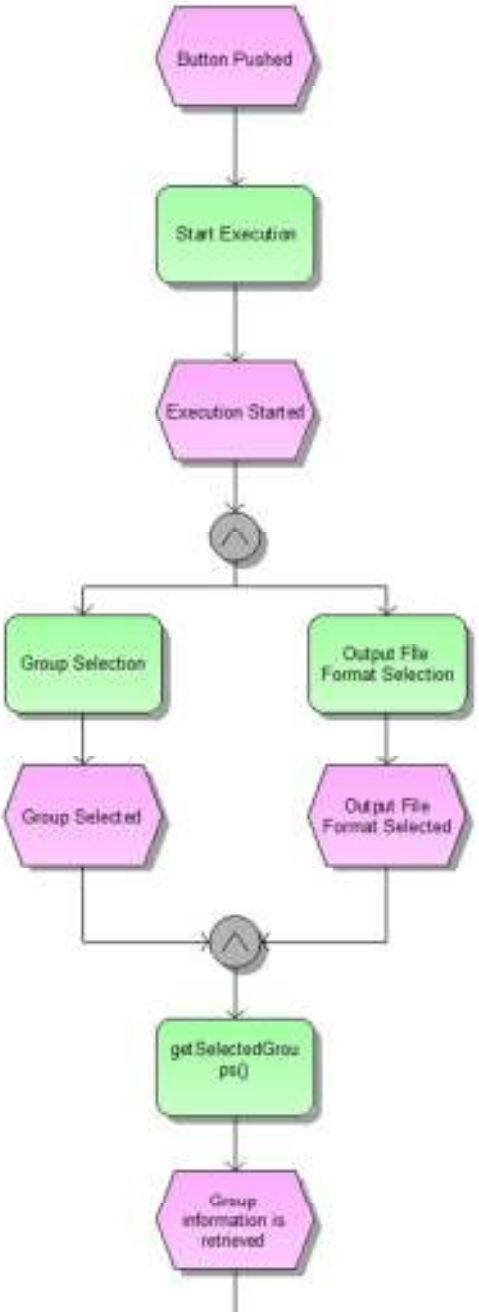


Figure 16 – Execution Scenario Part 1

APPENDIX C – Execution Scenario Part2

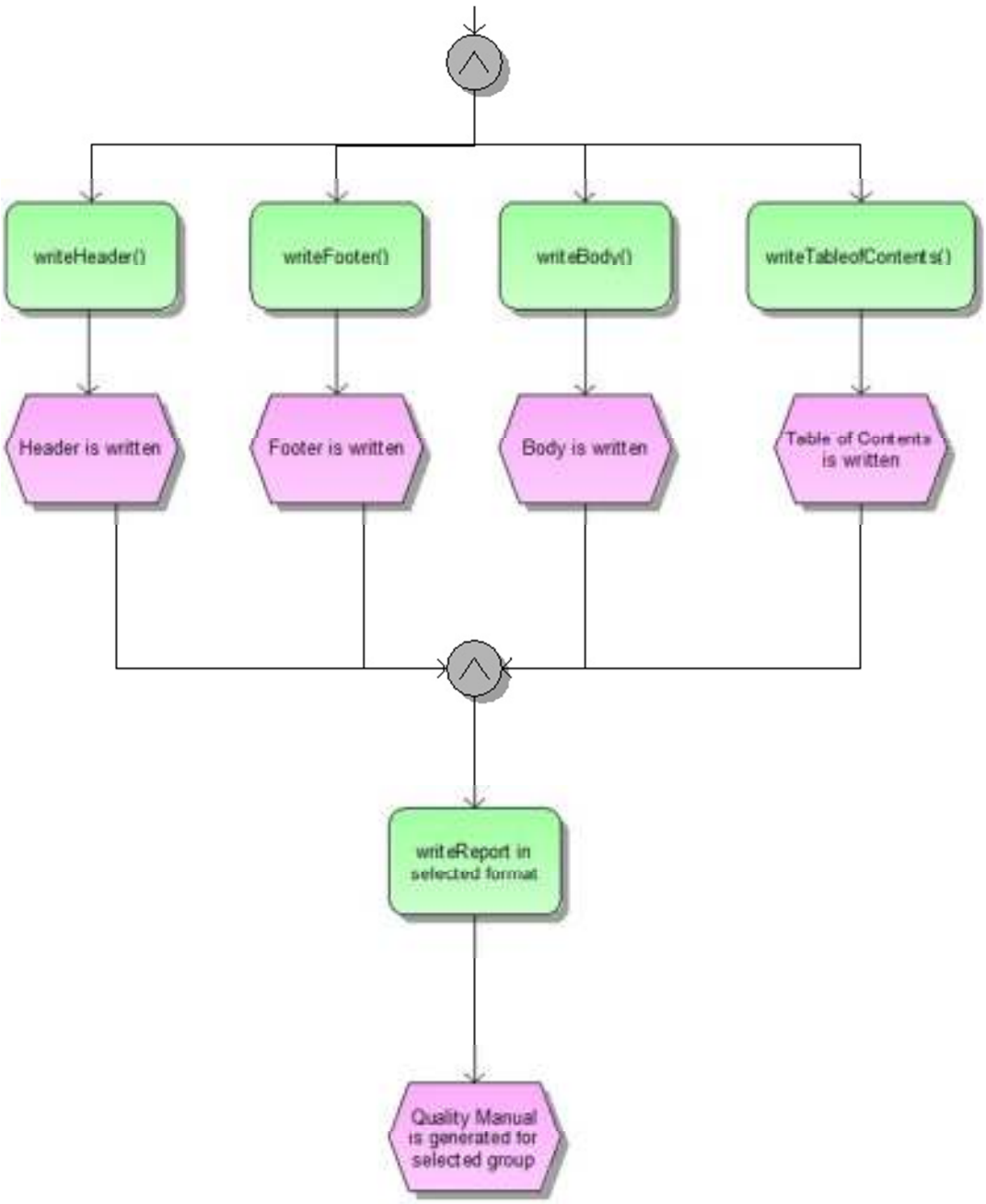


Figure 17 – Execution Secenario Part 2

APPENDIX D – Sample Quality Manual – Function Tree

KALKINMA AJANSLARI SÜREÇ KILAVUZU
ÇALIŞMA PROGRAMI, BÜTÇE VE MUHASEBE YÖNETİMİ

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7. KASA\02-ÇPBMY\03-Harcamaların gerçekleştirilmesi

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1. Sürecin Amacı

Harcamaların gerçekleştirilmesi döneminde gerçekleştirilen fonksiyonları içerir.

2. İçerdiği Fonksiyonlar

- Personel Maaş Ödemeleri
- Harcamaların gerçekleştirilmesi
- Personel Avans Ödemeleri
- Abonelik Ödemeleri
- Satınalma ve İhale Faaliyetleri
- Proje ve Faaliyet Destek Ödemeleri
- Yolluk Ödemeleri
- BD/DK Ödemeleri
- Avans Ödemeleri
- Bütçe Kesinleşinceye Kadar Yapılan Harcamalar
- Tazminat ödemeleri
- Muhasebe Servisleri

APPENDIX E – Sample Quality Manual

KALKINMA AJANSLARI SÜREÇ KILAVUZU
YATIRIM DESTEK OFİSİ

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9. KASA\06-YDO\02-Yatırım tanıtım faaliyetleri\02-Basılı tanıtım materyalleriyle tanıtım yapılması

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1. Sürecin Amacı

Yatırım tanıtım faaliyetleri döneminde Basılı tanıtım materyalleriyle tanıtım yapılması için gerçekleştirilen faaliyetleri anlatır.

2. İlgili Roller

• YDO

3. Girdiler

İsim	Tipi	Kaynak
Basılı Materyal Çoğaltım ve Dağıtım Planı	Doküman	-
Basılı materyal ile yapılacak tanıtım planı	Doküman	-

4. Çıktılar

İsim	Tipi	Hedef
Basılı tanıtım materyali	Doküman	-
Tanıtım materyali dağıtım kaydı	Doküman	-
Basılı Materyal Çoğaltım ve Dağıtım Planı	Doküman	-
Basılı Materyal Çoğaltım Kaydı	Doküman	-

5. Başlama Koşulları

Durum	İlgili Süreç
Basılı tanıtım materyalleriyle yatırım tanıtım zamanı geldi	KASA\06-YDO\02-Yatırım tanıtım faaliyetleri\02-Basılı tanıtım materyalleriyle tanıtım yapılması

6. Bitiş Koşulları

Durum	Kullanıldığı Süreçler

KA-SüreçKılavuzu-0.4-100505

19

Basılı tanıtım materyallerinin dağıtımı gerçekleştirildi	KASA\06-YDO\02-Yatırım tanıtım faaliyetleri\02-Basılı tanıtım materyalleriyle tanıtım yapılması\Basılı tanıtım materyalleriyle tanıtım yapılması

7. Aktiviteler ve Sorumlular

NO	Aktivite	Sorumlu	Girdi	Çıktı	Süre
1	Yazılı ve görsel tanıtım materyallerinin hazırlanması	Dış Süreç	-	-	
2	Basılı yatırım tanıtım materyali çoğaltma için satınalmanın başlatılması	YDO	Basılı Materyal Çoğaltım ve Dağıtım Planı	-	
3	Satınalma ve İhale Faaliyetleri	Dış Süreç	-	-	
4	Basılı tanıtım materyallerinin dağıtımının gerçekleştirilmesi	YDO	-	Basılı tanıtım materyali, Tanıtım materyali dağıtım kaydı	
5	Basılı tanıtım materyalinin çoğaltımı ve dağıtımının planlanması	YDO	-	Basılı Materyal Çoğaltım ve Dağıtım Planı	
6	Yatırım tanıtım materyallerinin Ajans eliyle basılması	YDO	Basılı Materyal Çoğaltım ve Dağıtım Planı	Basılı tanıtım materyali, Basılı Materyal Çoğaltım Kaydı	
7	Basılı materyal ile yapılacak yatırım tanıtımından sorumlu personelin belirlenmesi	YDO	Basılı materyal ile yapılacak tanıtım planı	-	

8. İlgili İş Kuralı

Süreç içerisinde iş kuralı bulunmamaktadır.

9. Sürecin Kullanıldığı Yerler

• KASA\06-YDO\02-Yatırım tanıtım faaliyetleri

10. Kullandığı Dış Süreçler

• KASA\06-YDO\02-Yatırım tanıtım faaliyetleri\01-Yazılı ve görsel tanıtım materyallerinin hazırlanması

• KASA\02-ÇPBMY\03-Harcamaların gerçekleştirilmesi\06-Satınalma ve İhale Faaliyetleri

APPENDIX F – Interview Questions

- Yönergeler, kanun ve tüzükler aracılığıyla yürüttüğünüz işlerden kaynaklanan ihtiyacı kalite el kitabı karşılıyor mu?
    - Bu anlamda yaptığı katkılar nelerdir?
    - Etkin bir şekilde kullanılabiliyor mu?
- Organizayonun süreçleri ile ilgili bilgi kaynağı olarak süreç modellerinin kullanmayı mı yoksa kalite el kitabını kullanmayı mı tercih edersiniz?
    - Hangisi kullanım kolaylığı sağlıyor?
    - Hangisinin anlaşılabilirliği daha çok?
- Sizce kalite el kitabının eksik yönleri var mıdır? Bunları açıklayabilir misiniz?
    - Süreçlerin içersinde var olup da dokümana yansıtılmamış olduğunu düşündüğünüz unsurlar var mıdır?
    - Süreçlerin içersinde olması gerekli veya olsa iyi olur diyebiliceğiniz unsurlar nelerdir?
    - Okunabilirlik, Takip edilebilirlik,
- Kalite el kitabındaki bölümlerin tablo yapısıyla verilmesini mi tercih ederdiniz, yoksa doğal dille yazılmasını mı? Neden?
- Eklemek istediğiniz birşeyler var mıdır?