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Determining institutional discrepancies for ERM software applications

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Abstract: This paper is aimed at finding out the preferential criteria in determining institutional discrepancies for Electronic Records Management (ERM) software development. The research objectives include: a) definition of the basic factors determining discrepancies in ERM applications, and b) how the basic factors should managed in ERM projects.
In ERM applications, a comparative study has been carried out in order to see which functions occurred according to different institutional needs and to determine the basic factors forming the discrepancies between selected institutions. Effective parameters variant to institutions are determined according to the discriminant analysis on project phase.
Türksat has not as much diversity as Ankara University in business processes, and it differs from other public institutions because of its incorporated society. Undersecretariat of Treasury is a typical public institution and its business processes and records flows are more appropriate to be standardized. In the transition process to ERM, not only institutional necessities and discrepancies, but also an opportunity for working scalable and flexible software allowing operating these elements has importance. The differences in organization system and management policies and the growths of incoming-outgoing records of institutions necessitate different structuring in ERM applications.

Keywords: Electronic records management, Electronic records management systems, Electronic records management projects, Organizational structure, managerial factors, organizational policy, Organizational recordkeeping, Ankara University.

1. Introduction

The general rules, which the institutions should follow in records management and archiving, can be conducted up to a certain point in a controlled way by means of country-wide regulations and standards. However, this control is especially restricted to facilitating basic archiving procedures such as traditional correspondence, filing and classification. Bayram et al. focused on the Electronic Records Management Software Applications and conducted a preliminary study of Managing Institutional Differences in Turkey (Bayram et al., 2013). As “technological developments have offered not only new tools for managing records but also means for producing them” (Giannakopoulos et al. 2012) Turkish institutions are encouraged to conduct their correspondence, commercial payments and other work procedures in electronic medium thanks to the legal arrangements made as parallel

to operating e-Government services (Bayram et al., 2013). Accordingly, the institutions are requested to manage their records and archives by using digital technology. To adapt the regulations concerning the conducting the functions such as the conditions of producing, storing, preserving, accessing and using of the records, and to define the institutional principals is a process that needed to be fulfilled for transition to electronic records management (ERM). The records concerning public activities should be discussed as a managerial component of work process and they also should be seen as a part of e-transformation (Bayram and Özdemirci, 2011). Even though the best hardware and infrastructure elements are provided, this process cannot be sufficient and analytic on its own. In institutionalization of ERM systems and in transferring the institutional function into the system, some factors ignored technically occur. The head of these factors is the institutional culture factors named non-functional factor. Foscarini's case study findings indicate that there is a relationship between organizational cultures and the ways in which business and records processes are perceived and translated into practice (2012).

Besides being designed for the persons in charge of records and archive, the software applications are the applications frequently used in daily works by nearly all workers of that institution. This indicates that everyone working in the institution has a direct or indirect role in producing records based on work processes. However, the general perception is that "ERM applications typically only manage the "office" type documents, rather than the business systems which create the bulk of records in most organizations. To achieve the goal of comprehensive recordkeeping, we will need records embedded in work processes – to happen wherever business takes place" (Reed, B. 2010).

Haritz (2010) expressed that records management systems supporting work processes of records management are the systems that are developed in order to provide the access to records in following the contiguous procedures. In the access of records, "the capture of appropriate content, creation of metadata, declaration of record type, etc. are best addressed at the record creation stage. E-records management procedures are most effective when carried out at the point of creation or very shortly thereafter" (Iwhiwhu, B.E., 2010, p.267). Furthermore, the workers may stand in the ancient ways in records producing in the transition process to electronic medium. In spite of the recent developments in software world, and interned speed and capacity, "records management systems in the electronic environment are still new and many of their effects are not yet clear, and so cannot be purposefully used. When electronic records come into play the old habits of seeing records as physical units experience their limits (Haritz, 2010, p.12). For this reason, the role of institutional culture in electronic records' replacing the habit of using paper in oral and written correspondence in bureaucracy is emphasized in the literature as well. Like Haritz; Hofstede, Bearman (1992), and Olivier (2004) also stated that the effects of bureaucracy and culture on the functions and work processes of the institutions differ from institution to institution. Johnson and Bowen (2005) found in their review of the records management literature, there is no single fix to system implementation. Thus, to follow the diversity, to evaluate the institutional and functional data that can be useful for ERM applications and to develop strategy is a rational approach. Information advantage lies in matching information to specific strategic processes (Broady – Preston 2001).

In addition to cultural factors, the factors such as the organizational structure, methods of management, and work and records flows of the institution among the

factors affecting functional analysis processes also play important roles in realizing the ERM software in institutions.

The rest of the paper is organized as follows: Section 2 presents the problem statement, the research objectives and the research method. Section 3 presents some discrepancy criteria between the projects and projects' evaluation. Organizational Structure of the Institutions and Managerial Factors are mainly examined. Section 4 discusses other criteria. Finally, Section 5 concludes the paper.

2. Problem Statement, Research Objectives and Method

In ERM project, software can be developed both through service procurement from outside the institution and also using the existing capabilities inside the institution. In both situations, ERM software developed for one institution do not give "turnkey" solutions for another institution at all. Publishing new regulations and standards that can affect ERM applications is a sufficient reason in order to produce a new version. In the development of ERM software, discrepancy analyses on institutions should be made for providing sustainability of a system which is appropriate for the needs and structures of each situation. Discrepancy analyses are helpful in designing ERM system and determining application strategies in each institution. However, it is really difficult to predict that how software can reflect these discrepancies. Therefore, in this study, it is aimed at finding out the preferential criteria in determining institutional discrepancies for ERM software development. The answers are sought for the questions below in the study:

- What are the basic factors determining discrepancies in ERM applications?
- How are the basic factors, which form discrepancy in accordance with the observed and gained data according to the institution type, managed in ERM projects?

2.1. Method

As an In ERM applications, a comparative study has been carried out in order to see which functions occurred according to different institutional needs and to determine the basic factors forming the discrepancies between institutions in this context (Bayram et al., 2013). In Turkey, developing projects in which data on different-sized institutions is encouraged by the government. Türksat A.□. was assigned the task of founding, operating and managing the infrastructure of e-Government services through the coordination of Ministry of Transportation in Turkey in 2006. In 2008, all public institutions and foundations were given the opportunity to receive e-Government and information services directly from Türksat A.□. thanks to the law numbered 5809. Türksat A.□. developed "Electronic Records Management System" that includes safe records management, share and archiving on the web for institutional ERM market. Türksat A.□. targets to undertake an important role in records share inter institutions with ERM software that is in the use and project level in many public institution.

In the study, the criteria, which are considered to be the factors in comparison of ERM projects carried out in three (3) different institutions by Türksat A.□., are determined. In determining the criteria, it has been searched that whether there is any study on this field that can be helpful in this context in literature; but no other comparative study on the same field has been found out. Nevertheless, some views, which support our findings based on our experiences and observations, have been utilized in the literature. Therefore, the criteria we considered effective in evaluation of institutional discrepancy in each criterion have been collected. Major of these

criteria are the organizational structure of the institution and managerial factors. The factors affecting information access functionality and records' contents are mentioned in Section 4. In this context, the records intensity of the institution and the elements of integration with other institutional systems, and metadata as archiving function device, and the effect levels of information security elements are examined.

2.2. Comparison of the Projects

The three (3) Institutions chosen for comparison of their projects are the following: Türksat A□., Undersecretariat of Treasury and Ankara University. The reasons why these institutions are chosen are as below mentioned;

- Ankara University: differing because of being an educational institution and having an academic structure among the institutions in which ERM project has been conducted,
- Türksat A.□: [a company] differing with its hierarchy from other public institutions since Türksat A.□. is an incorporated society, and using the software developed on its own,
- Undersecretariat of Treasury: following the records processes in public clearly since it is a public institution, making and diversifying much technical integration easily due to its developed technologic infrastructure.

3. Discrepancy Criteria between the Projects and Evaluation

The criteria differing according to the institutions are determined by means of discrepancy analysis made in project level. The adaptation of the application to the institutions is provided through institutionalization made on the application in accordance with the determined discrepancies.

The various effective parameters encountered in the projects and their conditions in three (3) projects, which are examined, are given below in detail.

3.1. Organizational Structure of the Institution and Managerial Factors

"Governance context" within the "elements of trusted electronic records management" defined by □smail and Jamaludin (2012, pp136) in the result of literature evaluation, consist of:

- Legal and regulatory infrastructure
- Organizational policy
- Organizational recordkeeping responsibility and accountability

All three institutions are evaluated according to these factors:

3.1.1.Legal and regulatory infrastructure

When Electronic Signature Law numbered 5070 went into effect in Turkey 2004 [14], electronic records were given legal validity providing that signed with reliable electronic signature, and arrangements on electronic records and procedures started to be made as suitable with the necessities of the age in our regulations.

Minimum necessities in executing ERM applications are determined by standards and regulations. All functions of basic records management and archiving, which have been determined in this context, have been put into application in the projects carried out in the three institutions dealt in the comparison. The appropriateness of ERM Software to archive regulations and standards is measured by testing the adaptation to TS 13298 standard in our

country. TÜRKSAT fulfilled the conditions of this standard in the software it developed and prepare a new version to be used as well. The reason of this may be the new demands on the existing software in the application carried out in Ankara University. These matters are dealt especially in the technologic integration part.

3.1.2. Organizational policy

Organizational policy means the official procedures, applications and policies providing management of records in the organization (□smail ve Jamaludin , 2012, p. 137). Considering from this point of view, records flow, authority and approval flows differ in each three institutions. This condition differs from two other institutions especially in Ankara University. Since the university has academic units (faculties, institutions, etc.) differently from the other public institutions, differences also occur in records production processes. In the scope of the application, dynamic approval flows (paraph-signature routes) can be defined in order to execute different approval processes. Dynamic routes can be defined by the users besides forming automatic approval route by the system according to the hierarchy in which the user takes place. These functions give flexibility in the matter of differences between institutions. Thus, the variety in the final signature processes due to the university's academic structure increases the importance of creating dynamic route in the application in Ankara University (Figure 1).Since Türksat A.□. is an institution working as attached to Ministry of Transportation, its records processes execute similar to the public institutions. However, it has some differences since it is an incorporated society. For example, the papers, which are sent to the outside, are sent with double signatures differently from public institutions. However, these differences in the application can be overcome by means of dynamic approval routes created by the user (Figure 2).

Since Undersecretariat of Treasury works as attached to the Prime Ministry, its records' processes proceed in parallel to the public institutions' standard record processes. In this situation, the function of forming approval routes automatically according to the hierarchy in which the users take place gains importance in this project. The approval flow, in which the unit managers of the user preparing the record take place, can be created and arranged according to the preference of the user by the system automatically (Figure 2). As it is seen, among three institutions, although Ankara University is a public institution, due to its academic structure, its business processes and records flow show much more diversity than the other two institutions. Although Türksat A.□. has not as much diversity as Ankara University in business processes, it differs from other public institutions because of its incorporated society. Undersecretariat of Treasury is a typical public institution and its business processes and records flows are more appropriate to be standardized. This situation affects the definitions of the approval routes in the software. Therefore, there can be pre-defined hierarchical routes in the applications of each institution but dynamic routes, which can be created instantaneously, also need to be defined.

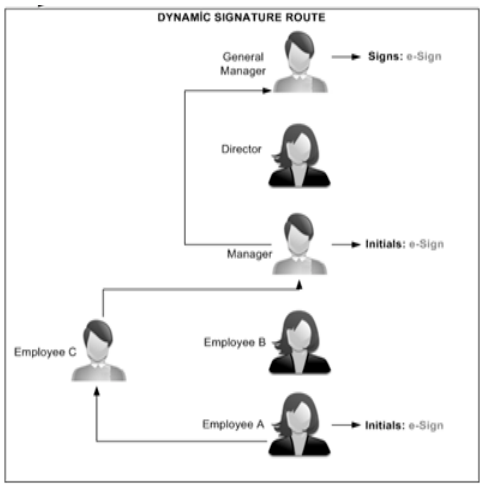

Figure 1. Dynamic signature route

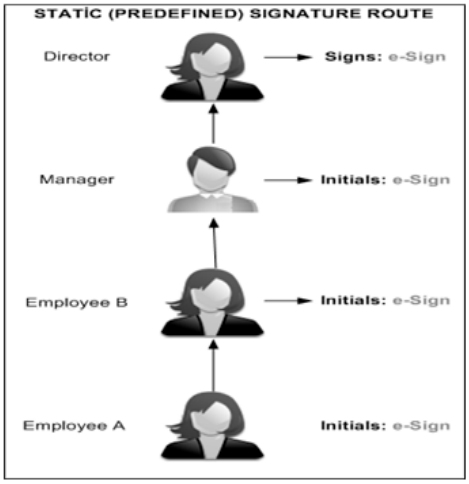

Figure 2. Static Signature Route

The institution's organizational structure consisting of units placed in central or country has importance in test process and education stages. Since the application works on web, the hardware infrastructure is not affected by the organizational structure. The organizational structures belonging to 3 (three) institutions chosen as pilots are given below.

3.1.3.Organizational recordkeeping responsibility and accountability

Existence of units and commissioners that are especially responsible for works on records management is an important factor in all processes for planning and applying ERM systems. Evaluating three institutions in this point of view, it is seen that the period of transition to electronic records management is executed in the responsibility of a different administrative unit in each institution. In Ankara University having scattered campuses, there are separate registries in Rectorship and in each Faculty for tracking and controlling the documents. However, a Records Management and Archiving System Coordinatorship was founded in order to coordinate records and archive works and planning and carry on the ERM activities in whole university scope. This unit works as directly attached to Rectorship in coordination with Data Processing unit. ERM studies are carried out under the coordinatorship of an academic from Ankara University Department of Information and Records Management, with the assistance of an expert graduated from the mentioned department and an administrative officer/chief and a technician from TÜRKSAT supporting temporarily.

ERM project is carried out under the coordination of Directorship of IT Business Development and Project Management and Directorship of Facilities and Social Services in TÜRKSAT. This process will be left to control of Directorship of Facilities and Social Services, which is responsible for document tracking, after the transition to ERM is completed. No professional graduated from the department of information and records management is employed for ERM project in TÜRKSAT.

In Undersecretariat of Treasury, the transition process to ERM is managed by Data Processing Department. In TÜRKSAT and Undersecretariat of Treasury, a separate unit, which is especially responsible for executing records management program conducted in ERM structure, has not been established; the existing unit and personnel were made to adapt to this new process. No professional manpower graduated from the department of information and records management is employed for ERM project in Undersecretariat of Treasury.

4. Other Criteria

The functional necessities that should be existed in ERM systems are defined as two sections by British National Archive (2002). Most of the rules, which are listed in "records related principles" in the first chapter and in "system related principles" in the second chapter of Guiding Principles, are concerned with the arrangement on subjective records management policy and organizational structure of institutions. The criterion on forming metadata as a function concerning especially the system software is considered as a criterion in archiving function in our study. This criterion should also be considered as a function that provides accessing to the records. Volume and growth rate of records is discussed especially in the respect of storage arrangements in the basic standard of records management (ISO/TR 15489:2, 2001). Furthermore, the records growth in the institutions is expressed with the term records intensity, and it is discussed as a criterion affecting access to records in our study. Moreover, in a study on evaluating institutional conditions in developing records management systems, the importance of elements such as access to information, integrated technology applications, security of records is emphasized (Külcü, and Uzun Külcü, 2009, 484). It is discussed that how these elements are managed in the respect of ERM system in the three institutions in below.

4.1. Access to Information

4.1.1. Records Intensity of Institution

The amount of incoming and outgoing records is one of the basic elements affecting the access to institutional records in ERM standards enormously. The traffic of incoming and outgoing records, which differs from one institution to the other one, affect the execution of records acceptance and other records processes. The growth of incoming and outgoing records' amount in periods as yearly and monthly can help to define the technologic infrastructure's features of the system in ERM applications not in the traditional records management. Therefore, the yearly records intensity of the institution plays an important role in determining the hardware infrastructure on which the application will work, and the hardware needs such as scanners and printers which will be used in incoming-outgoing records procedure. Records intensities of three (3) institutions chosen as pilots are given in the below.

Table 1. Records intensity of institutions (yearly)

	Ankara University	**Türksat A□.**	**Undersecretariat of Treasury**
Incoming Records	505.000	26.400	43.000
Outgoing Records	495.000	57.000	60.000
Total	1.000.000	83.400	103.000

Examining records intensities, the conclusion is that Ankara University has an intense records flow in a year. Since records intensity effects the technologic infrastructure (server, storage, etc.) on which the electronic systems work greatly, the estimated server capacities should be determined. An average dimension of a record is supposed as approximately 4 MB. In this situation, the estimated dimensions of servers that the institutions should prepare as their infrastructures are as following (The capacity is calculated for 1 year).

Table 2. The records capacity of institutions (yearly)

	Ankara University	**Türksat A□.**	**Undersecretariat of Treasury**
Number of Records (Yearly)	1.000.000	83.400	103.000
Dimension of 1 Record (Average)	4 MB	4 MB	4 MB
Total Capacity (Yearly)	≈ 4.000 GB	≈ 333 GB	≈ 412 GB

4.1.2. Integration with other institutional systems

ERM software should have the capability to integrate with the other existing systems of the institution and the systems of other institutions as well, according to the regulations. In the projects that become themes of this study, the integrations made with different inner and outer systems mentioned below are compared.

- Database of the Governmental Organization Integration (application of inner system integration)
- Integration with Human Resources Automation (application of inner system integration)
- Mobile application integration (application of inner system integration)
- Electronic Signature Integration (inner and outer system integration)

Database of the Governmental Organization: Special correspondence codes, which are peculiar and must to use in inner and outer correspondence for each institution, were determined and they were put to use of all institutions and foundations through portal or web services. ERM software, the theme of the analysis, presents two alternative methods for transferring correspondence codes of the other institutions and foundation, which will exchange information, to the system. These are (a) interface providing to enter codes manually by the system administrators (b) integration through services presented by Prime Ministry directly without man interruption. Choosing the method that will be used is about the intensity and variety of the institutions' external correspondence.

All three compared institutions preferred method of web service integration in order to transfer correspondence codes of governmental organization to ERM system. However, since Ankara University and Undersecretariat of Treasury do correspondence with various institutions, real persons and legal persons, correspondence codes need to be entered manually besides web sites. ERM software enables to manage both two processes simultaneously.

Integration Requirements with the existing human resources software: If the institution uses an HR Software, in terms of efficiency and maintainability ERM should integrate with the software at either service or database level. This way, the users, their roles, organisational hierarchy, authorization can be managed through

the HR Software. If there is no HR Software used in the customer, ERM should provide interfaces for management of the users. Evaluating the three institutions, the support of HR software can only be provided in defining users' roles and authorities in Undersecretariat of Treasury. In ERM application of the other two institutions, users' roles and authorities are entered through an interface by the super user. Integrations of Human Resources System belonging to three institutions chosen as pilots are given in the below.

Table 3. Integration of Human Resources Software

Ankara University	**Türksat A.□.**	**Undersecretariat of Treasury**
• **No HR integration** • **Users are managed via ERM interfaces**	• No HR integration • Users are managed via ERM interfaces	• HR Software Integration • Database level integration

Mobile Records Integration: As providing the execution of business processes independent from time and place, smart phones will undoubtfully be an important part of the ERM systems in the very near future. Therefore, application of mobile signature, which is an independent platform type of e-signature, will be an indispensable part of the ERM application at Ankara University (Özdemirci, F., Bayram, G. Ö., Ünal, M.A., 2012). An application on mobile approach has not been designed in Undersecretariat of Treasury and TÜRKSAT yet.

E-Signature Integration: There are three dimensions that need to be considered for this integration. (a) The legality of the records/documents is provided with the electronic signature. Legally, all executives must use e-Signature. But paraph (or initials) of subordinates does not necessarily require e-Signature. (b) Electronic certificates which are used for e-signing process can be purchased from either a state organization TUBITAK or from authorized vendors in the Turkish market. (c) E-Signature Application Programming Interface (API) can procured from either TUBITAK or different vendors. E-Signature Integrations of three institutions chosen as pilots are given in the below.

Table 4. E-Signature integration

Ankara University	**Türksat A.□.**	**Undersecretariat of Treasury**
•No e-Signature for the paragh (initials) •Electronic certificates from the state organization (TUBITAK) •e-Signature API from TUBITAK	•E-Signature for all users regardless of executives or subordinates •Electronic certificates from TUBITAK and an authorized vendor •E-Signature API from TUBITAK	•E-Signature for all users regardless of executives or subordinates •Electronic certificates from TUBITAK •E-Signature API of a private company

4.1.3. Metadata as archiving function device

Metadata elements should define records, work processes about records and transaction processes in the life cycles of records; and also support to fulfilling the archiving functions of ERM system (ISO/TS 23081-part 1,2004; ISO/TS 23081-part 2, 2007). Among the criteria listed in Guiding Principles in which functional necessities in ERM systems are defined by British National Archive, it is emphasized that metadata function should be formed automatically by the system (The National Archives, 2002, p.11). Thus, in the software developed by Türksat, appropriate basic metadata elements such as the title of records, producer of the records, records' record date, receiving date and receiver (Dublin Core Metadata Initiative, 2012) should be formed automatically by the system. Metadata template is designed in a dynamic structure as letting new upper data field be defined according to the administrative needs of the institution. Access rights of users are also defined for each record in this template. Making necessary arrangements is possible by associating metadata sets with preserving and using conditions of records according to the current regulations and using authorities. The system administrators of three institutions can make necessary updating in this direction.

ERMS application also provides appropriateness to the package structure that will carry the official correspondence between the public institutions and their upper data and electronic signatures in the scope of "e-Correspondence Project", which was developed by the Ministry of Development for the purpose of developing a common set of rules providing official correspondence between public institutions and foundations in electronic medium in 2011 (T.C. Kalkınma Bakanlı□ı, 2012).

4.1.4. Information security

ISO 17799 and ISO 27001 standards (2005) are basic guides for institutions about general principles and application policies of information security management. In these standards, principles of providing administrative and technologic conditions for enabling secrecy and protection of information and putting the information and information assets under cover with only access authority are discussed. The software configured for the three institutions, which are scrutinized in this study, provides a backup service for preserving institutional information and records in a safe medium in its own structure. Any system's backup servers wanted to be backuped in the scope of this service can be hosted in Türksat and an identical backup can be created with data replication in this institution. This service is a

choice that can be preferred by the institution. However, as a different preference, the institution's backup policy can be applied in the direction of the initiative and decision of the institution. The institutions in our study prefer to enable security of information and records in their own places and facilities.

Giving users passwords in the scope of information security is a matter that can be managed with configuration on the application. For example, in Türksat and Undersecretariat of Treasury access to the system is integrated with domain (e-mail) passwords institutionally used, so the users can access EBYS with their passwords they use when they access their institutional e-mails, not with different passwords. But this integration is not preferred by Ankara University. The passwords belonging to ERM system in the university are kept as crypto in the database of the system and it has no connection with other systems.

Preservation of records by enciphering can be used in security applications. This is a matter about the software's support on this kind of application rather than the institution's support. A separate configuration on enciphering records for each institution is executed in the application developed by TÜRKSAT. However, enciphering of records automatically can be made in accordance with the structure of package in e-correspondence project on inter-institutions records share that is carried out by Ministry of Development.

As understood from the study on comparison, the studied institutions resemble each other in respect of electronic records management. Particularly Ankara University has the differences coming from both being an academic foundation and also having an extensive organizational structure. For this reason, more different policies have been developed than the other two institutions in structuring functions and modules in ERM application of Ankara University.

5. Conclusion

The software developed for ERM applications are informatics devices that increase fertility in work administration and management activities, and decrease the costs. The processes of electronic records management are defined in the standards. However, considering this respect, although developing software functions in accordance with national and universal regulations and standards is necessary, it is not enough. Software of electronic records management should be wholly peculiar to the institutions like their organizational structures and the other information systems on execution. The most important element in enabling the integration of the software architecture to the institution and adaptation is institutionalization (Apaydın, 2009 p. 4). Institutionalization consists of analysis of records management and archiving procedures, design of software components that will be formed after the analysis and adaptation and making widespread. The functionality of software is connected with the design of a suitable model for the institution's peculiar structure and needs according to the institutional discrepancy analyses. EDRMSs provide benefits to individuals and to organisations; however the benefits are not assured, because they depend on well planned and executed implementation projects (Johnson and Bowen 2005, 139; Steward and Galt, 2011). Therefore, in the transition process to ERM, not only institutional necessities and discrepancies, but also an opportunity for working scalable and flexible software allowing operating these elements has importance. The differences in organization system and management policies and the growths of incoming-outgoing records of institutions necessitate different structuring in ERM applications. Especially being in a predefined and changeable dynamic structure for signature-paraph routes is the head of basic necessities. Different policies can be preferred in the application of

technologic infrastructure components such as different technologic integrations of user interfaces, e-signature integrations and security applications on protection of information and records. The important thing is that the integrity of records in institutions' inner and outer correspondence, the flexibility that will provide maximum speed and facility in processes by sticking to the originality should be taken into consideration by both the software and also the institutional organizational behaviour.

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