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Building the Record Keeping System (RKS). Process Improvement Triggered By Management Of Archival Documents

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Abstract

This paper results from a research project at Tilburg University in which organization, information and archival studies have been integrated. We argue that the archival concept of the record keeping system (RKS) can be used as an instrument for improving the performance of the document-flow in a business process, and, as a result, of the process. Archival documents contain information related to the result of an activity, to the circumstances of their creation and to organization and business processes. The elements of a RKS are context, quality, appraisal, warehousing and logistics. The translation of our conceptual model is the process-specific archival document-file, a meta-file that operates as an engine managing document management. The approach was tested in a case-study. It became clear that our approach leads to considerable improvements in the flow of documents and thus in the primary processes supported by these documents.

1. Introduction

As Hammer and Champy said, there is not a company in the world whose management would not like an organization to be flexible enough to adjust to changing market conditions and dedicated enough to deliver maximum quality and customer service [25]. Rapidly advancing technology creates possibilities undreamed of in earlier years. 'Nobody can drive to the future on cruise control' [22]. So each corporation wants to create a responsive organization.

In short, three forces are responsible for this drive to responsiveness: customers, competition and change [25]. Consequence of this drive to responsiveness in information-intensive organizations [41] is that more demands are

made on the performance of time-critical processes and the work- and document-flows linked to those processes.

2. Research Question

Operational processes in information-intensive organizations are generating and manipulating information, in such a way that the end product, most often an item of information too, will be willingly accepted by the customers of the organization. This means that the work-flow in such an organization is a flow of information items. The drive to responsiveness demands greater performance of this flow, not only in terms of effectiveness and efficiency, but also in terms of legitimacy and accountability [9, 5, 37]. In improving performance these four dimensions have to be considered. Neglect of one of them will raise costs in realising the other dimensions.

Better performance can be realized, as Davenport stated [13], by including in the operational process the information 'value chain', that is a definition of the information requirements, and the collection, distribution, receipt, use and storage (or better: record keeping) of the information. One of the most neglected elements within this 'value chain' is record keeping. From a legitimacy and accountability point of view, record keeping influences all the other elements in the chain. The neglect of record keeping thus influences the realization of the dimensions of effectiveness and efficiency in a quite negative way [38, 17, 18, 3].

It is interesting to see what Davenport calls 'higher-level and more understandable information units' within that 'value chain': not data, but documents. 'Because the flow of documents often defines the flow of a business process, (...), returning to a document-oriented view of information (...), means a return to greater simplicity, less

detail, and the ability to accommodate less-structured information' [13]. So, within Davenport's theory, the quality of the document-flow has far-reaching consequences for the process-flow (or work-flow). The theoretical implications of the quality requirements, collection, distribution, receipt, use and record keeping of documents connected to business processes are studied in records management [42, 23, 29].

An important records management theory concerns the record keeping system. The ICA defines this as 'an information system developed for the purpose of storing and retrieving records, organized to control the specific function of creating, storing, and accessing records, to safeguard their authenticity and reliability' [27]. In order to achieve legitimacy and accountability, documents should be 'authentic' and 'reliable'. Therefore they must not only contain the information related to the result of the activity that is documented. They must also contain information on the circumstances of their creation and on the organization and business process that created them. We think this can be realized by taking care of the most indispensable parts of records management: context, quality, appraisal, warehousing and logistics of documents [26].

The question which we want to answer in this paper is whether the concept of the record keeping system within information-intensive organizations can be used as an instrument to improve the quality of the document-flow in a process, and, as a result, the quality of the process.

3. Definitions

'Document': irrespective of form, a (reproducible) collection of interrelated data, carried as a unity, reproduced or communicated by means of a storage medium.

'Archival document' (or 'record'): all 'documents' which are by their nature intended to be processed by the organization, person or group of persons, which have received or created these documents on account of activities or accomplishment of assignments, and which, because of their context, are of importance for the organization for their informational and evidential value.

'Legitimacy': the possibility of demonstrating that procedures have been executed in accordance with laws, rules and good practice.

'Accountability': the possibility of accounting for actions and the way these actions have been performed.

4. Research Methodology and Conceptual Model

4.1. Research methodology

The method we used in researching the problem consisted of an extensive review of the organization, informa-

tion and archival literature. We focussed on methods to improve the management of archival documents in business processes. Based on this review, we developed a conceptual model in which an hypothetical 'record keeping system' is an important element.

With the help of this conceptual model, we developed an approach. We checked the conceptual model by implementing the approach in several case-studies, using the method of analytic generalization [50]. In each of these cases, we used the techniques of action research and experimental evaluation [19, 44].

Very important in our case-study strategy were the application descriptions made by the workers within the organization, which contained detailed (positive and negative) criticism on the methods used [6].

4.2. Conceptual model.

The conceptual model we developed is, in essence, a simple one. Our basic assumption is that a record keeping system influences the performance of the document-flow within a process; see Figure 1.



Figure 1. The conceptual model: the general view.

It is necessary to decompose this view of the model. In Figure 1, the record keeping system is presented as a 'black box'. When this 'black box' is opened, the essential elements of records management will appear: context, quality, appraisal, warehousing and logistics. Within the record keeping system, these elements are interrelated. Each of them affects the document-flow; see Figure 2.

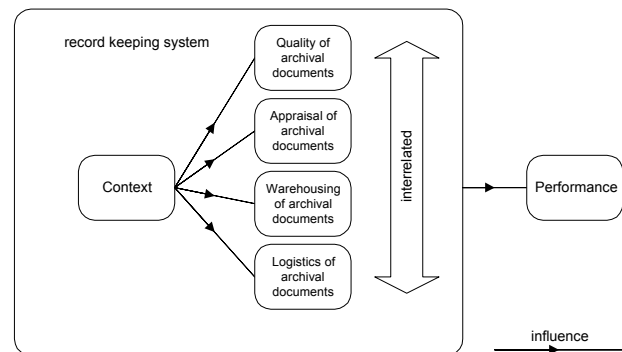


Figure 2. The conceptual model: decomposed view.

5. The elements of the conceptual model

5.1. Context

The notion ‘context’ means ‘connection’, ‘coherence’, ‘environment’ or ‘surroundings’. Clark and Carlson complain that the denotation of the word has become murkier as its uses have been extended in many directions. They deliver the widespread opinion that context has become some sort of ‘conceptual carbage can’ [11]. Strong analytic frameworks focussing on assorted aspects of context have been contributed by researchers working in a number of different fields including anthropological linguistics, ethnomethodology, sociolinguistics, natural language processing, artificial intelligence, logic and mathematics [15, 1, 2, 4, 10, 14, 24, 20, 40].

According to Lewicki, organizational context is ‘a combination of intraorganizational variables and some notion of organization environment’ [35]. Within records management, ‘context’ is an essential part of a record keeping system. For understanding archival documents and for using them as evidence, it will be necessary to record business processes and activities, the way the information household is organized, the way internal and external information flows are organized, the way archival documents are stored and classified, and the rules dictating all of this [27], at any given moment in the lifecycle of the organization or the flow of a business process. ‘Context’ creates, first, an interrelationship between archival documents and, second, an interrelationship between archival documents and organization. Legitimacy and accountability require that the archival documents be set in its social, historical and organizational background, so that it becomes clear how that the situation in which the particular archival documents were created, emerged. This is not easy, because organizations are not static and the relationships between people, organizations and technology are constantly changing. Context in records management is recording a moving target [30].

In short, we can define ‘context’ as the state of affairs in which a system operates for each moment in the lifecycle of the system at which archival documents are created [40]. The elements of the contextual model, i.e., quality, appraisal, warehousing and logistics, are all influenced by this contextual information.

5.2. Quality

All archival documents within a business process are process-bound. To use them *at any moment* after they have been created means that they will have to meet certain quality requirements. These requirements are completely independent of the information systems used.

These requirements are:

- Integrity, which means that it must be impossible to wrongly add or delete data in archival documents;
- Authenticity, which means that the archival document must have the right form (as required by law, rules and best practice) and the right contents, irrespective of the compression used;
- Controllability, which means that the document and the data it contains can be tested on reliability;
- Historicity, which means that the data as they are at the moment the archival document is created are retained for as long as is necessary, so that it will be possible to maintain integrity, authenticity and controllability.

The requirements have to be met to guarantee that each archival document is correct and complete in spite of all handling that could be necessary (e.g., conversion, compression) [28].

5.3. Appraisal

Appraisal is the process of establishing the ‘value’ of archival documents, qualifying that ‘value’ and determining its duration [16, 12, 31, 47]. The objective of appraisal is to identify archival documents according to the time they have to be kept, which is influenced by criteria like legal evidence, fiscal duties, evidence for business transactions and historical reasons. The criteria and the period that archival documents have to be kept are part of the ‘context’.

Appraisal has to be applied to all the archival documents in each process, their mutual relation and their form. Depending on the importance of the integrity of the file or archive of which the archival document is a part, it is possible:

- to physically destroy the documents;
- to delete the pointers only; or
- to preserve the destructible archival document until it isn’t necessary anymore to preserve the file for reasons of integrity.

The effectiveness and efficiency of process-management imply an appraisal of archival documents, so that the right archival documents can be destroyed at the right time and, if they have to be preserved, kept for the right period. Appraisal affects warehousing in giving management directions for the preservation of archival documents and for the organization of the information infrastructure.

5.4. Warehousing

Archival documents can have two appearances:

- non-virtual: those documents which (1) exist in a physical shape or (2) occur as a (digital) substitute (not the same storage medium, but with identical data and form). The data relate to each other by way of a fixed connection.

- virtual: those documents which (1) don't have a physical shape (anymore), but (2) can get this physical shape as copy or print. The data aren't bound to the specific document in which they are used. They can be (or in most cases: are) used in more virtual documents.

Warehousing needs to realize two aims: (1) short- and long-term preservation, based on the 'value' of archival documents attached to them in the process of appraisal [7, 45, 46, 49]; and (2) accessibility and retrieval [34]. Based on this 'value', it is possible to make a deliberate choice in the storage media and systems to be used. It is clear that for archival documents that are to be destroyed at short notice, it is not necessary to use long-lasting, almost indestructible and mostly expensive storage media.

Warehousing must guarantee that the chosen storage media can maintain all the above quality requirements of the archival documents during the period they have to be kept. Standardisation is therefore an necessity [48, 32]. A finding aid system must be created containing descriptions of the archival documents, indexes and classification schemes bound to specific business processes. Such a system makes it possible for users to find and consult (but not change) all the archival documents they need [39, 36].

Warehousing affects all dimensions of performance. In realizing short- and long-term preservation and in maintaining all quality requirements of archival documents, it influences legitimacy and accountability. In realizing accessibility and retrieval, it influences effectiveness and efficiency.

5.5. Logistics

Logistics concerns the way archival documents are distributed in the business process [8, 33]. The aims of logistics are: (1) simplification of the structure of the flow of archival documents and of the process; and (2) management of the document-flow.

'Just-in-time' concepts are important in reaching responsiveness. 'Just-in-time' means production and distribution in the right quantity, in the needed quality and at the right moment [43]. Applying 'just-in-time' to information-intensive organizations means making adjustments in the archival document-flow. The first step is to analyze the existing flow to identify the archival documents which are part of it. Some archival documents that are created don't have any surplus value with respect to the production of the end product. It will be necessary not only to clean up the flow of that sort of archival document, but also to prevent its creation. At the same time, restructuring of the archival document-flow means restructuring the process flow. As Davenport stated, the document-flow defines the process flow.

Logistics affects performance in the dimensions of effectiveness and efficiency. The restructuring of the archival document-flow and of the process influences effecti-

veness and efficiency and the realization of a responsive organization.

5.6. Performance

Organizations have been faced with challenges like never before. Increasing competition from businesses across the world has meant that organizations must be much more careful about the choice of strategies to remain competitive. Everyone (and everything) in the organization must be doing what they're supposed to be doing to ensure strategies and improve performance. All of the results across the organization must continue to be aligned to achieve the overall results desired by the organization for it to survive and thrive.

To reach performance four dimensions are important: effectivity, efficiency, accountability and legitimacy. Most methods to increase organizational performance concentrate on effectivity and efficiency. A RKS concentrates on all dimensions. In that way it will improve performance in a more responsible way [5, 9]. It will be an important instrument for performance management.

6. Translating the model into an approach

6.1. The process-specific archival document-file

In implementing the model, we developed an instrument. This instrument is what we call a process-specific archival document-file, a meta-document file in which all elements of the record keeping system are implemented to guarantee the record keeping functionality of a business process. Changing a business process means changing the file; all process-specific archival document-files are attached to the business process and the archives it has created. The archival meta-documents in that file describe process-bound archival documents, the data that are part of these documents and the document systems used. In fully automated environments, a part of the file will be the IT-engine that manages the document- and process-flow. In all environments, the file operates as a 'working order' in the work-flow, acting as a steering device for the process-bound archival documents, received, created and used in producing the end product of the business process [21]. It will be captured as a XML or a STEP file [9].

6.2. The three interrelated levels of a process-specific archival document-file

The process-specific archival document-file consists of three interrelated levels.

The *first level* is what we call the '*contextual aspect*'. It consists of a description of:

1.1. the environment in which the organization operates and the influences on the organization, including those legal regulations that are important for the operating activities;

1.2. the organization, the way it is structured, the rules fixing the quality requirements and the way they are met, the business processes that exist within that organization and the way they are interrelated;

1.3. the specific business process, its structure, the logistics of the document-flow, authorization aspects, the information systems and applications used, the existing process-bound archival documents and the way they are arranged, indexed and stored.

The *second level* is the *'document profile aspect'*. It consists of document profiles for each of the process-bound archival documents appearing in the process. Each document profile consists of:

2.1. pointers to the viewers or the standardized software for the retrieval of the digital process-bound archival documents or pointers to the finding-aid system for the retrieval of non-digital archival documents;

2.2. definition (name, form, storage medium, used data and pointers to these data);

2.3. role played by the archival document in the business process;

2.4. authorizations concerning the specific archival document;

2.5. appraisal of the specific archival document;

2.6. used warehousing of the specific archival document.

The *third level* is the *'trigger and register aspect'*.

3.1. trigger data for creating, retrieving and using all necessary specific process-bound archival documents at the right moment;

3.2. audit trail, which retains all data of the use of the archival documents within the process.

The relationship between the aspects of the conceptual

model and the elements of the process-specific archival document-file is shown in Table 1. The *'document profile aspect'* is attached to each of the process-bound archival documents. When these are the result of a non-standardized ad hoc case, element 1.3. will also be attached.

7. The test: a case-study

7.1. The administration: an overview

The model is implemented in a town near Eindhoven with approximately 40,000 inhabitants. The city has many responsibilities, such as assigning individual rent subsidy, developing spatial plans, taking care of welfare, local education, local culture and garbage collection.

The management of the Departments is confronted with the following problems:

- performance is lacking, partly as the result of parallel-running document-flows, one consisting of paper-based archival documents, the other of digitized archival documents.
- record keeping and IT management do not seem to fulfill the growing demands for support from the operational workforce.
- as a result, it is difficult to realize responsiveness.

The management of the Departments sees IT as a tool for realizing performance as regards effectiveness and efficiency by managing and controlling the document-flows of digitized and non-digitized archival documents. But in using IT, realizing performance in terms of legitimacy and accountability becomes necessary too. This wasn't realized in the existing situation.

In our case, we concentrated on the Department of Public Welfare and, within that, on the unit of Social Service. Figure 3 shows the organizational structure of the city.

Table 1. Relationship between conceptual model and process-specific archival document-file.

Elements of the conceptual model	Elements of the process-specific archival document-file											
	1.1.	1.2.	1.3.	2.1.	2.2.	2.3.	2.4.	2.5.	2.6.	3.1.	3.2.	
Context	√	√	√	√				√				
Quality		√	√		√						√	
Appraisal	√		√				√	√			√	
Warehousing			√	√	√	√	√		√		√	
Logistics			√			√	√			√	√	

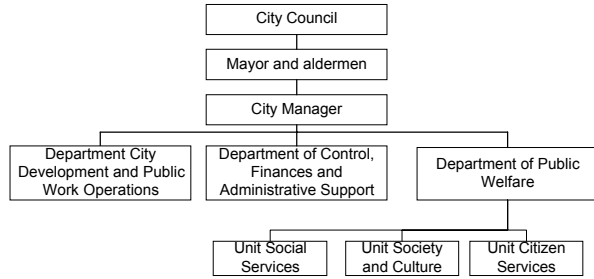


Figure 3. Organization chart of the city

7.2. Law Provisions for the Disabled.

We concentrated on the business processes, which are responsible for the execution of the Law Provisions for the Disabled. The execution of this Law concentrates on provisions concerning accommodation, transportation and making wheelchairs available for disabled citizens. It is possible to provide other things, but only in exceptional cases. Table 2 shows the demand for deliverables in the execution of this Law in 1996.

Table 2. Demand for deliverables in 1996

Products	Demand
Accommodation provisions	219
Transportation provisions	589
Wheelchair provisions	99
Other provisions	13
Second investigations	468
Appeals	17
Not specified	101
Total products	1506

Subject to our case are the three processes concerning the execution of this law: accommodation provisions, transportation provisions and wheelchair provisions. It is possible that a citizen requests more than one of that provisions on the same application form.

These processes have the same structure, with only one exception, and are modelled as shown in Figure 4.

Within this process we analysed 13 different archival documents on different storage media. Some of those archival documents were stored more than once. All those documents are linked to the phases of the process.

7.3. Analyzing the situation with the developed conceptual model.

Analyzing the process using the elements of our conceptual model, we came to the following conclusions:

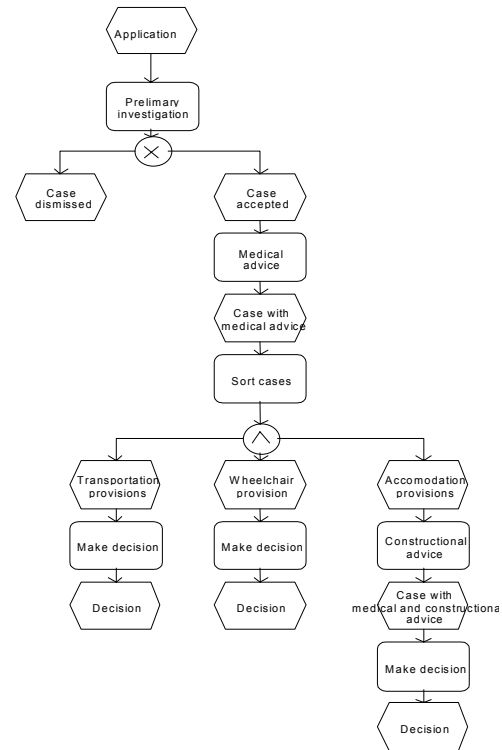


Figure 4. The structure of the process

- *Context*: no contextual information was attached to the business process and the process-bound archival documents, which created problems of legitimacy and accountability. It was very difficult to find information about the way the workflow was handled in different cases. In a random check we found out that, for that reason, it was not easy to compare similar cases.
- *Quality*: no measures were taken to guarantee the quality requirements for the digitized virtual and non-virtual archival documents. The workers didn't know if the documents they were working with contained the most actual information.
- *Appraisal*: the case-file of non-digitized archival documents was appraised, not the individual archival documents. Digitized archival documents were not appraised at all.
- *Warehousing*: the arrangement of the paper-based case files is based on the process. Despite a special archival unit, retrieval and accessibility of these case files (at the right moment) is doubtful. Because of a lacking appraisal many more archival documents are kept than necessary. There are no rules or procedures for the warehousing of the digitized archival documents. There are doubts whether all the existing case-files are complete.
- *Logistics*: the workers most of the time use digitized archival documents, but the quality of those archival do-

cuments is lacking. So it is often necessary to ask the archive unit to retrieve specific case files. When these case files are in use in another place within the process, retrieval and accessibility aren't possible. At that moment, the worker can't deal with the case in hand.

7.4. Creating a new situation

In using the elements of the conceptual model, we developed a model for a new situation in which the above-mentioned problems were solved. We decided, especially for reasons of logistics, to combine both flows of archival documents in one digitized flow, of course taking into account that it must be possible for one or more archival documents also to be kept on paper or microfilm for evidential reasons. Subsequently, we constructed and implemented a process-specific archival document-file to create a new situation. This file was implemented by the use of

IT-tools; see Table 4.

7.5. Benefits of the use of the process-specific archival document-file

The process manager was made responsible for the warehousing of archival documents, assisted and consulted by the specialists of the former archival unit. Retrieval and accessibility became more effective. The digitized archival documents could be used at more places at the same time. The paper-based archival documents that are kept for evidential reasons only weren't used in the process operations. They are arranged according to the arrangement of the digital case-files. A finding-aid system was necessary for retrieval and accessibility for older paper-based files. The decision was made to store the digitized archival documents on WORM. The process-specific archival document-file now functions as an engine, mana-

Table 4. The process-specific archival document-file and its implementation

<i>The process-specific archival document-file</i>		<i>Implementation</i>
1.1.	Detailed descriptions and indexes (legal regulations, societal influences and relationships, time-schedules for the destruction of archival documents).	<i>Knowledge base implemented in work-flow-engine. STEP files.</i>
1.2.	Detailed descriptions of procedures and rules fixing quality management (e.g. imaging-procedure), organization schedules and lists of business processes and their relationships.	<i>Knowledge base implemented in work-flow-engine. STEP files.</i>
1.3.	Detailed description of the specific business process (structures of process- and document-flow, logistics, authorization, used applications, appraisal and warehousing aspects). SDW and ARIS-files. Pointers to necessary software for retrieving process-bound archival documents.	<i>Knowledge base implemented in work-flow-engine. STEP files. This engine sets the rules for the used document management software. In ad hoc-cases attachment of knowledge base concerning 1.3. to each of the process-bound archival documents (including viewer for SDW- and ARIS-files).</i>
2.1.	Description of used viewer(s), used software-standard and finding-aid system.	<i>Document management software, linked to viewer software (images, text, spreadsheet, database) and finding-aid system for the retrieval of non-digital archival documents. Based on 1.3.</i>
2.2.	Detailed description of the process-bound archival document and the data that are part of it.	<i>Knowledge base implemented in work-flow-engine and (document management) software; representation and handling set by rules in knowledge base. Based on 1.3. STEP files and XML.</i>
2.3.	Detailed description of role of each process-bound archival document in business process.	<i>Knowledge base implemented in work-flow-engine. Based on 1.3. STEP files.</i>
2.4.	Detailed descriptions of authorizations concerning each process-bound archival document.	<i>Knowledge base implemented in work-flow-engine. Based on 1.3. STEP files.</i>
2.5.	Used appraisal for each process-bound archival document.	<i>Knowledge base implemented in work-flow-engine and (document management) software. Based on 1.3. STEP files.</i>
2.6.	Used warehousing for each process-bound archival document.	<i>Knowledge base implemented in work-flow-engine and (document management) software. Based on 1.3. STEP files.</i>
3.1.	Description of triggers for creating, retrieving and using each process-bound archival document according to 'just-in-time'-concepts.	<i>Knowledge base implemented in work-flow-engine and (document management) software. Based on 1.3. STEP files.</i>
3.2.	Audit trail, data of the use of the archival documents. Pointer to necessary software.	<i>(Document management) software, event logging. ASCII file.</i>

ging all the elements of the conceptual model. The flow of archival documents became more efficient and, as a result, the business process could be more responsive too. The performance of the business process is improved, and, besides effectiveness and efficiency, legitimacy and accountability are guaranteed too. For each task, the re-

sults of the implementation are shown in Table 5. In analyzing these results, we considered the parallelism and branching between tasks and the use of archival documents.

The average results are shown in Table 6.

These results are valid for simple cases: one request on

Table 5. Results of the implementation of the conceptual model

	<i>Before the implementation of the contextual model</i>			<i>After the implementation of the contextual model</i>		
	Accomoda- tion	Wheel- chairs	Transport	Accomoda- tion	Wheel- chairs	Transport
Making paper-based file	15 min.	15 min.	15 min.			
Registering and indexing paper-based file	10 min.	10 min.	10 min.			
Retrieval of paper-based file	5 min.	5 min.	5 min.			
Transportation of the asked-for paper-based files	20 min.	20 min.	20 min.			
Other document-handling	10 min.	10 min.	10 min.			
Making digitized case-file	2 min.	2 min.	2 min.	2 min.	2 min.	2 min.
Registering and indexing digitized case-file	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.
Retrieval of digitized case-file	1 min.	1 min.	1 min.	1 min.	1 min.	1 min.
Registering new cases	60 min.	60 min.	60 min.	30 min.	30 min.	30 min.
Preliminary investigation	180 min.	180 min.	180 min.	45 min.	45 min.	45 min.
Waiting for medical advice	72 hours	72 hours	72 hours	72 hours	72 hours	72 hours
Extra document-handling for constructional advice	10 min.					
Waiting for constructional advice	72 hours			72 hours		
Make decision	180 min.	180 min.	180 min.	30 min.	30 min.	30 min.
Total	152 h. 16 m.	80 h. 6 m.	80 h. 6 m.	145 h. 51 m.	73 h. 51 m.	73 h. 51 m.

Table 6. Average results

	Transportation	Wheelchairs	Accomodation
<i>Working time benefits for each case</i>	6 h. 25 min	6 h. 25 min.	6 h. 42 min.
<i>Working time benefits for each case in money (1 hr. costs Euro 23)</i>	Euro 144, --	Euro 144, --	Euro 148, --
<i>Total cases according to Figure 5</i>	589	99	219
<i>Working time benefits for all cases</i>	3779 h. 41 min.	635 h. 25 min.	1467 h. 30 min.
<i>Working time benefits for all cases in money</i>	Euro 84.816,--	Euro 14.256,--	Euro 32.412,--

Table 7. Average results for each case in combined processes

	Transportation + Wheelchair	Wheelchairs_ + Accomodation	Transportation, Wheelchair + Accomodation
<i>Working time benefits for each case</i>	9 h. 27 min	7 h. 26 min.	12 h. 29 min.
<i>Working time benefits for each case in money (1 hr. costs Euro 23)</i>	Euro 218, --	Euro 171, --	Euro 287, --

one application form. By a combination of requests the process will split in separate cases after receiving the requested medical advice. We don't have detailed numbers for the total amount of combined cases for 1996, but the implementation of our model gives the results for each case as shown in Table 7.

8. Conclusion

The question which we wanted to answer in this paper was: can the archivist concept of the RKS within information-intensive organizations be used as an approach to improve the document-flow in a process, and, as a result, the process. We demonstrated that context, quality, appraisal, warehousing and logistics are necessary elements for improving the document-flow. Control of the document-flow can be organized in a more effective way by using our conceptual model and implementing the process-specific archival document-file. Not only the document-flow becomes more effective and efficient, legitimacy and accountability are guaranteed. Besides that, the responsiveness of the process is improved.

Ofcourse, applicability and benefits of the conceptual model only can be demonstrated more clearly in the near future. But we are optimistic about its global application: other case studies confirm the validity of the applied conceptual model. We emphasize that a document-oriented view is a very effective means to solve complex problems within dynamic organizations: it is a real 'document revolution'.

9. References

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