



**Doctoral School of
Economics, Business
and Informatics**

THESIS SUMMARY

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**Some Obstacles to Digital Transformation and Their
Elimination Possibilities in the Hungarian Public
Administration**

**Supervisor:
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associate professor

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Institute of Information Technology

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1. RESEARCH BACKGROUND AND RATIONALE

Public administration is a critical element of the functioning of society. Its specificity lays in the fact that it must meet two partly contradictory aspects. On the one hand, the general requirement in European civilization is to provide the highest possible level of service to citizens, client-centredness. In addition, at the same time, high operational efficiency is also a general requirement. It is now commonly accepted that the general organizational options are not sufficient, it is necessary to make extensive use of IT possibilities. This recognition appeared in Europe in the mid-1990s with the advent of the concept of the ‘information society’. As early as 1994, a document known as the “Bangemann Report” (Bangemann, 1994) phrased it this way: *“Information society is a new way of coexistence and cooperation”*.

The term is a collective term used differently in the common language and in the literature. From here on I will use it in the meaning of the transformation process covering the processes and operational models to achieve the vision of the information society, as used in governmental materials, in the same way the introduction of the thematic issue of Management Science (Nemeslaki, 2018) uses the term.

The necessary steps to start the digital transformation have been taken in the Hungarian public administration too. Already in 2004, one of the largest types of business transactions (taxation) introduced the possibility of electronic tax returns; and in 2015, the Hungarian Act CCXXII on E-Administration and trust services (E-Administration Act) made it compulsory for companies to manage public administration business electronically. Despite all this, the expected results from digitization do not seem to materialise. The basic goal of digital transformation from the aspect

of the operation of society is to involve a wide range of people (since this is the only way to achieve the goal, the expected level of development of the information society). Examining the electronic services in the Hungarian public administration, it can be seen that the the number of people accessing the service shows a clear increase. At present, the central element of contact with clients of the public administration is the Government Portal, because the c receive all notifications in the associated storage space (ie even though they may have another means of identification (for example, a foreigner covered by the eIDAS regulation), except for a few cases, they cannot transact electronically without the Government Portal). In September 2018, 3,624,229 people were registered, representing approx. 43% of the active population, by September 2020, the registrations had grown to over 4.3 million. This would be reassuring in terms of increase, but it is worth looking at the data specific to actual use. Although only a few data sets on usage are available, the evolution of the number of individual visitors casts doubt on the actual spreading of usage.

Based on the data, the number of visits in 2016 can be taken to be 800 thousand, 1 million in 2017, and 1.4 million in 2018, but from then on the increase in the number of visitors does not match the significant increase in the number of registrations. Although the number of individual visitors is not equivalent with the number of electronic contacts, the feedback and notifications arrive at the Client Gate storage, which is accessible through the Government Portal, so for the number of actually active users this can be considered a good approximation.

According to the data of the Hungarian Central Statistical Office, there were 1,846,101 business organizations in Hungary in December 2016 and 1,870,415 in December 2017. When maintaining relations with public

administration businesses had to changeover to electronic case management first in taxation and then from 1 January 2018, in accordance with the provisions of the e-Administration Act, to full electronic administration in all their transactions with public administration (which requires the registration of at least one of their representatives). In addition, in the hiring and employment of all civil servants (government and state officials), personnel documents are sent through the Client Gate, which represents another 100,000 persons potentially obliged sooner or later to use the Client Gate. Grants can also be applied for more often electronically, which requires the so-called Client Gate registration. In May 2019, the number of individual visitors reached 2 million, in which the successful introduction of the new e-PIT (electronic Personal Income Tax draft review, and correction, disposal of 1 + 1% of the tax) system presumably played a significant role. This is also comparable to the number of business entities obligated to maintain electronic contact, which suggests that there is a far smaller number of actual clientele behind the 8,5 million active part of society, with a possible explanation being the dominance of corporate business transactions with a further reducing factor to be found in the active electronic contacts maintained by accounting firms that service several business entities.

Significant resources have been available for the development of the Hungarian public administration in the recent period (the State Reform Operational Program, the Electronic Public Administration Operational Program, the Public Administration and Public Service Development Operational Program together accounted for more than HUF 350 billion in IT development resources). Although problems could be identified with the efficiency of conducting the projects in IT development (Kiss et al., 2014),

this does not explain such a modest trend in the uptake. This suggested that the investigation of the causes of delay was justified. As during my work I had got in touch with some public administration institutions, and at the Corvinus University of Budapest I had the opportunity to research topics related to e-government in the field of Hungarian public administration, I chose as my research topic the achievement of the information society vision, the exploration of the factors hindering the implementation of the digital transformation, and the research of the inhibiting factors.

2. RESEARCH APPROACH AND METHODS

The research approach used is the “Design Science Research Method” (DSRM).

The essence of the DSRM approach is to produce “artifacts” with sufficient scientific thoroughness that allow management to put an organization in a “desirable position” (*„... to build and evaluate IT artifacts that enable managers and IT professionals to develop actions that enable them to implement information processing capabilities that move the organization toward desired situations”*), (March and Storey, 2008, page 726.)). Accordingly, DSRM is problem-oriented, more specifically problem-solving-oriented. The "artifact" can be a vocabulary or symbol (*vocabulary or symbol*); model (*model or representation*); method (*method or algorithm*) and something created, instance (*implemented or prototype system*). (Hevner et al, 2004, page 271.).

Wieringa adds to the above idea that the production of artifacts must be interpreted in a particular context. The design of the artifact is in some ways useful to the stakeholders, the operation of the result must be investigated empirically (*„...designing an artifact that improves something for stakeholders and empirically investigating the performance of an artifact in a context”*). In this sense, we can speak of problem solving (Wieringa, 2014, page v.). Wieringa calls validation the step of examining whether a planned artifact actually addresses the problem raised (Wieringa, 2014, pp. 27.). The author distinguishes between the concepts of validation (*validation*) and evaluation. Validation covers the making of a prediction, while evaluation deals with the examination of the completed artifact (Wieringa, 2014, page 31.)

In the course of the research, it was necessary to perform field research tasks too. According to Babbie, "*In qualitative field research, the life of a society and happenings can be observed in their natural environment....*" (Babbie, 2008, p. 315.). The design and conduct of field research requires special consideration in terms of the possible roles of the observer and the relationship with the subjects. Babbie identifies several field research paradigms as options and also outlines (usually) the steps (process) of field research.

Taking into account the above theoretical background, the main characteristics of the specific conduct of the research are as follows.

Many general statements can be made about the operating model and techniques of the (Hungarian) public administration, however, in this area it is especially important to consider the national specificities and the social and legal environment. The applicable research methods were also limited by the fact that data on the internal operation of public administration (such as specific administrative practices) are not publicly available data. It is important to emphasize that according to the current legislation, the organization and operation of government offices are essentially identical, the minor differences that exist do not affect the answers to the questions of this research.

The research was aimed at the field of public administration, however, due to the complexity of public administration itself a doctoral dissertation cannot examine all its aspects. The research carried out at the Corvinus University of Budapest had to focus specifically on the findings that could be used in the further development of the Hungarian public administration.

Additional constraints had to be set for the practical feasibility of the research, as there are thousands of case types at government offices alone. Here, the starting point was partly the book entitled Hungarian Public Administration (Magyary, 1942), partly the Act CL. of 2016 on general public administration procedures, (and Government Decree 335/2005 (XII.29.) on the common provisions of the document management in public administrative bodies detailing certain processing rules). These clearly lay down the principles of the current processing sub-model, so it is suitable to formulate changes at this level of abstraction.

The exploratory part of the present research relied to a large extent on field work at a specific government office, analysis of the data available there, and obtaining information in the form of case studies - in the framework of discussions (“interviews”). Here I took advantage of the fact that under the current legislation, government offices are obliged to follow the same practice, so it was sufficient to get information from a single government office. The situation is more or less similar for local governments, although here there may be differences between very small (for example, district notaries) and very large (for example, municipalities with county status) municipalities, but for reasons of scale I have not dealt with this. I used the local government of a medium sized „small town” as a basis for the investigations.

The staff of the Department of Information Systems of Corvinus University, of the Information Technology Foundation of the Hungarian Academy of Sciences helped to achieve the results of the research, while the staff of the Fejér County Government Office and of Balatonfüred municipality facilitated the acquisition of factual data regarding the different case types. The research questions and the resulting research tasks are the following:

- **In the case of research question Q1** (*When and how to use the data demand-centric processing sub-model instead of the current process-centric processing sub-model and what effects could such a change have?*) **on the one hand the current sub-model had to be described and a new – as the case may be - „better” sub-modell developed, and evaluated (that is validated) based on its expected effects.** In the examination of the processing sub-model, the examination was also extended to certain types of municipal cases in order to better support the general nature of the findings. At the same time, since the predominant part of the types of administrative cases (with the exception of the collection of public charges) is handled by government offices, conclusions can be drawn for the Hungarian public administration as a whole.
- **In the case of research question Q2** (*In the the case of contact with clients against what types of threats do the available technology solutions for the authentication of legal statement provide protection, and what solution could be used to develop a client-friendly authentication procedure to protect against a wide range of threats in personal client services?*) **it was necessary to identify the threats against which the current procedure provides or fails to provide protection; an evaluation criteria system had to be proposed and a authentication procedure had to be developed that was “better” than the ones currently in use.**

Both questions are design problems that produce an “artifact” in the Hevner sense. The nature of the research questions, the way they were answered and the way they were carried out met the expectations of the conditions for the use of DSRM. Both research questions had exploratory parts and constructive, design aspect based on the results obtained there.

3. RESULTS OF THE DISSERTATION

Already at the beginning of my research, I realised that public administration was too complex to identify specific barriers beyond general problems (such as digital literacy, internet access). **In the preparatory phase it was stated that it is appropriate to explore the obstacles of digital transformation in public administration in its “sections” and sub-models.** An approach to public administration development where the examination covers it as a whole obscures detail problems in many ways. When the study was performed according to different aspects (for example, financing, processing concept, data protection concept, etc.), it was possible to identify specific obstacles to the digital transformation, so it is recommended that subsequent studies be performed in sub-models, too. Along this logic, I broke down the problem, I defined sub-models that can be examined independently, for which the specific obstacles can be examined separately. The identified sub-models are the following:

- Case initiation (activation) sub-model
- Processing sub-model
- Verification sub-model
- Legal declarations handling sub-model
- Connection (access) sub-model
- Legality guarantee sub-model
- Data protection sub-model
- Financing sub-model
- (Organization) organizational sub-model

Although an obstacle could be identified as an example for each sub-model, the scope of the research did not allow the examination of all sub-models, so I assessed the effect of a possible sub-model improvement on the

improvement of efficiency and service quality. The combined effect of the two aspects is illustrated in Figure 1 below (green: significant, orange: medium, red: slight effect):

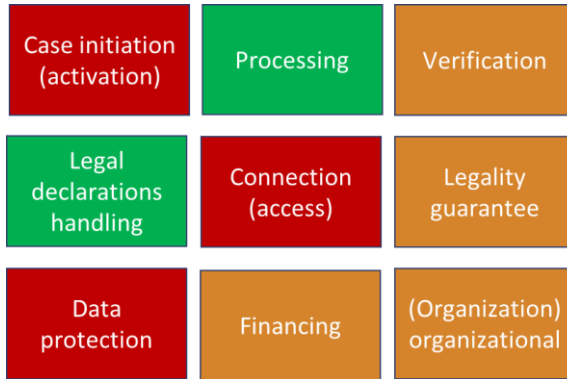


figure 1.: aggregate effect of sub-model change (own editing)

I therefore selected the two sub-models for which the greatest impact is expected, these are the processing and the legal declaration management sub-model. (While for the former it is easy to see the limitations of the traditional records management approach - used in this very same from the beginning of the 20th century - in today's electronic, "big-data" world, increasingly based on artificial intelligence, I considered it important to examine the latter due to its significant neglect. The issue of authentication, authenticity is a fundamental element of trust, without which the legal certainty of society cannot be maintained. In the case of the processing sub-model, I assumed that instead of the current process approach, a data-centric approach would definitely provide better results in terms of efficiency and service quality, at least in some cases. My first research question was related to the verification of this hypothesis. In the field of authentication, I focused primarily on the examination of authentication solutions that ensure the production of an electronic document that can be used in the case of face-to-

face contact, looking for a solution that is more widely accepted than the current ones, and at the same time provides protection against a wider range of abuses.

In the course of my research, I arrived at the following main findings:

1) Obstacles to digital transformation should be explored in public administration in its "sections" sub-models. An approach to public administration development, where it is examined as a whole masks detail problems in many respects. By carrying out the study from different aspects (e.g. funding, processing approach, data protection approach, etc.), it was possible to identify specific obstacles to digital transition, and it is therefore recommended that subsequent studies too be carried out at sub-model level.

2) **Findings related to research question Q1:**

Q1/1: In the case of the processing sub-model, my hypothesis was confirmed that - at least for the types of cases to be included in one-stop-shops or intended for automation - it is justified to move from the current case-based multistep process-centric approach to the data-centric approach. One-stop-shop is already an EU obligation for public services affecting business processes, and efficiency requirements increasingly require automation, which may put the use of artificial intelligence technology at the forefront. Data-centric approach provides more help in satisfying these conditions than a process approach which seeks to define separate processing steps (in order to design a one-step service, the focus is on determining the required information, the emphasis shifts from defining a series of steps to determining the information needed). Here, of course, it should be emphasized that this is about an approach. Where several steps are required in the procedure, the data-centric approach will also show it, but still focusing on obtaining the necessary

information. The finding does not mean that a substantial change can be achieved everywhere (the result depends largely on the boundary conditions). However, the case study examples show that the data-centric approach offers a significant innovative opportunity to rethink individual problems, which can help to rethink and at least partially automate processes that have already been simplified several times with the traditional approach (like the content of the simplification programs of public administrative in recent decades), and implementing one-stop shop, not just for initiating cases, but for case management as well.

Q1/2: A further partial result of my research to help advance the use of the data-centric approach: I proposed a new analysis process to develop the data-centric process. The current „types of cases” evolved based on the traditional paper based case management taking into account their limitations. Considering the final state of the current case management as an artifact, it is worth abstracting it, and then building up the information demand (and, if necessary, the other conditions) back from the actually required final state according to the “what it needs” logic.). The proposed approach:

- I. Exploring the current process "from front to back"
 - Defining the initial business object of the current process (for example, the request)
 - Following the “movement” of the object (monitoring the entry of new business objects if necessary, such as a policy opinion), the current process is explored at the element (item) level (“front-to-back analysis”)
- II. end state analysis. Determining a real artifact (real result requirement)
 - Attempting to abstract the business object of the final state (considering whether a more general formulation of the problem

addressed in the process (for which an administrative decision is required) is justified)).

- If, based on the end-state analysis, it is justified to rethink the content of the analyzed case type, a new (more general or otherwise modified) end-state will be reformulated.

III. data-oriented (reverse) construction of a new process from the modified result

- Examining the conditions (What is required?) for creating the business object representing the obtained (original or reformulated) end state, building the necessary process up to the client (or to the starting point for an internal process), also at the element (item) level (“back to front analysis”). Depending on the scope of the review, two approaches can be taken at this stage:

a. in the case of optimization while maintaining the current regulatory environment, a detailed analysis of the relevant rules (e.g. processing according to the practice followed by rule-based artificial intelligence systems) will define the range of data required and will also determine where such data can be obtained (what will the client provide, and what can be obtained directly from the authority).

b. if there is a comprehensive review, including the regulations, then the system of conditions required for the optimal solution of the problem must be considered consistently, and the regulations system must be adjusted accordingly.

IV. examination of possible IT support, decisions (cost, other boundary conditions, etc.)

- Categorization of each element in terms of IT support.

- Feasibility analysis (cost, other boundary conditions). Moving on from this phase depends on the motive of the review, if at all along there was an intention for implementation, the detailed conditions of implementation (cost, technical requirements, etc.) should be defined. When only the possible directions of development are under consideration it would be better perhaps to deliberate other aspects of the resulting approach (political effects, etc.).
- Decisions on transformation, if necessary iteration (incorporating the consequences of a partially modified decision)
- The proposed approach includes the transition to structured data structures processable by both men and machines (also for applications, decisions, certificates, etc.), in which case the analysis will include in the “what to do” section also the form of information so that processability too is taken into account.

Q1/3: By reworking the current processing sub-model, based on traditional records management logic (based on the process described on Government Regulation 335/2005. (XII.29.) on the rules of document management generally applied in public administration for paper based administrative processes) which can be called a standard, I proposed a processing sub-model that is based on the data-centric approach. Some central IT services have already been introduced under the e-government law¹ at the legal level and some at the actual IT service level, but they do not yet establish a new processing sub-model. By analyzing the traditional processing sub-model, a new sub-model could be identified, which, based on central IT services, adapts to the requirements of automated and one-stop service. The regrouping of the elements of the traditional (current) sub-

¹ Act CCXXII. of year 2015.

model to digitized operation is illustrated in Figure 2:

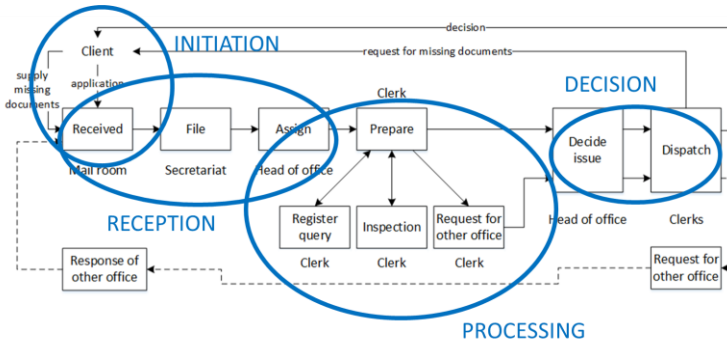


figure 2. cluster of the processing sub- (own editing)

The main steps of the proposed sub-model are illustrated in Figure 3:

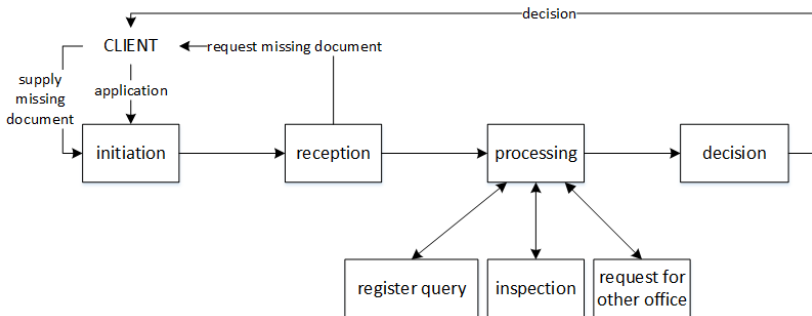


figure 3. Modified processing sub-model (own editing)

In addition to the basic case of remote case management, I also presented the applicability of the proposed approach with examples from categories that can be considered different from the aspect of digitizability (external location, object connected to it).

3) In the framework of research question Q2, I have shown that authentication solutions (such as e-ID), which are perceived to be highly protected in public opinion, provide little protection against certain

forms of deliberate abuse. In the case of face-to-face case management (personal client services), a solution that protects against a wider range of threats, yet has a high social acceptance, can be defined for widespread implementation. This is illustrated in Table 1 below.

	Acceptance			Risk Management				
	client tool independence	coverage	usual solution	client cheats	stranger cheats	acquaintance cheats	clerk cheats	collusion
e-ID + PIN	L	M	L	P	PP	NP	P	NP
password + smartphone app	L	L	L	PP	-	NP	P	NP
passwords +biometry	L	L	M	P	P	P	P	PP
smartphone app + biometry	L	L	L	P	P	P	P	PP
signature + password	M	M	M	P	P	P	P	P

(L: low, M: Medium, H: high, P: protected, PP: Partially protected, NP: not protected)

table 1. Evaluation of identification solutions from the aspect of use at client service (own editing)

To this, I made the following statements and developed a proposal:

Q2/1: I have found that a form of electronic authentication traced back to handwriting (signature) is a widely accepted solution that provides protection against abuse. I had formulated this statement as a hypothesis already at the beginning of my research, meanwhile the solution – currently not providing sufficient security – became the general practice used by banks and telecommunication companies proving its suitability for propagation.

Unfortunately, the practice increasingly used currently (capturing a signature image) does not meet the expected security requirements or legal

regulations.

Q2/2: As part of my research, I developed a procedure for the increasingly expected two-factor security enhancement in the field of information security, which can be developed with minor additions to traditional handwritten signature processing solutions. In essence

- it builds on a sample (store) library-based approach, where biometric data of the handwriting of the sample (speed, pressure strength, etc.) are recorded after a “physical” check of the individuals,
- handwritten signature processing is part of the document authentication, the document does not contain the detailed biometric features, these are authenticated by the service provider (“document authentication traced back to identification” logic)
- One factor is the client’s signature. But according to my proposal the client should handwrite one (or even more) passwords as sample (“knowledge factor”) and then write it (of the one he chooses) down too when the document is actually authenticated. Here not only the knowledge of the password is checked, but also if it was written in the same way as it appears in the sample library.

The logic diagram of the proposed solution in the verification phase:

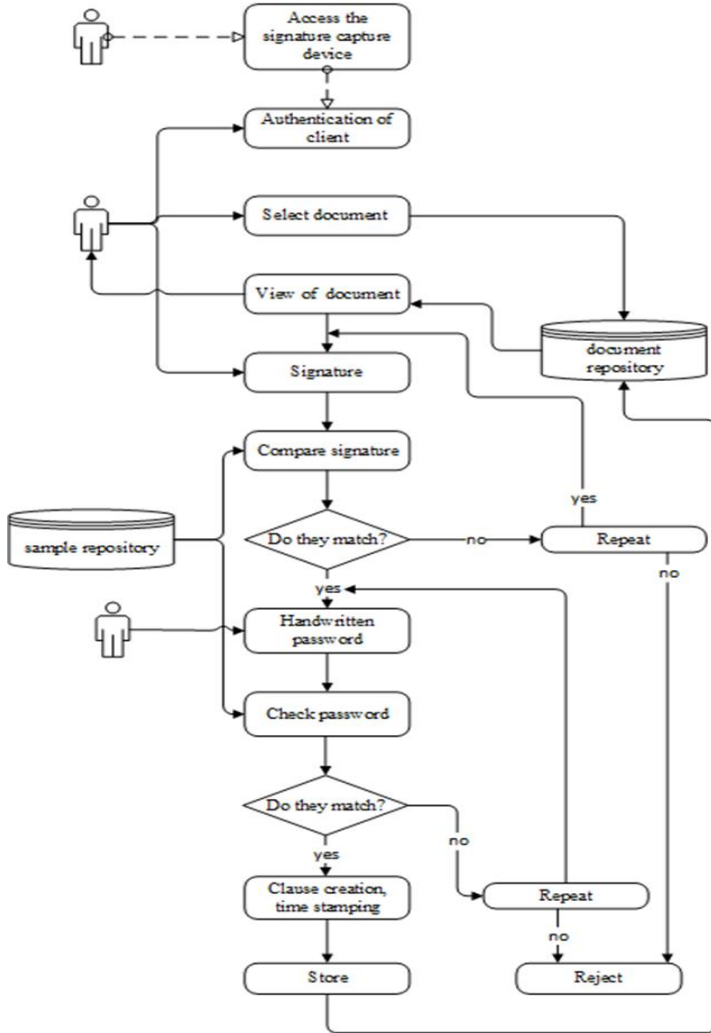


figure 4.: Sample library based authentication (own editing)

In the course of my research, I succeeded in finding a positive, forward-looking answer to both Q1 and Q2 research questions, and working out a concrete proposal.

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