Smart government in local adoption – Authorities in strategic change through AI

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Abstract

The digital revolution is an issue for local authorities to actively shape the dynamic change of service expectations.

The Objectives of the research project are investigations in how AI-support can speed up decisions of authorities in unknown, dynamically changing situations professionally. The scientific interest lies in the question of possible linking options between learning theories of adult human education and deep learning strategies of machine learning approaches.

The Prior work serves the element of service optimization for citizens or business concerning the use of AI-applications for direct interaction and for process optimization in the background of processing.

The Approach is in addition to an introduction to the basic user scenarios of AI technology in the public task spectrum of local governance. In this respect, it bases on the empirical findings of the study 'Artificial Intelligence in Public Administration - Fields of Application and Scenarios".

The Results concern the understanding that human and AI-basic technologies are action-oriented learning systems performing in the fields of creating services in the web 4.0, such as the internet of things. Development learning theories, such as transformative learning for Data Scientists and Public Managers, should have an impact on more customer related AI-applications.

The **Implications** of this interdisciplinary projekt should give an impact to academics in the public management and data sciences as well as specialists of learning in the field of human and machine-interaction. For practioners and leaders of local authorities, the possibilities of implementing AI-services should become clear. The **Value** of the paper lies in the combination of administrative, learn-strategic, technological, and ethical requirements to be proposed in order to get the application scenarios of AI off the ground, also in the sense of acceptance management in the face of persistent innovation blockades of general 'smart government' measures.

Keywords: Innovation Management, Learn and Improve, AI as game changer for Transformation.

1. Introduction and current situation in the field

Even in today's civil service, characteristics such as legal commitment, hierarchy, and loyalty are formative. Along diverse customer expectations to this public administrative system, today's requirements of service have changed completely. Authorities and non profit organisations have to actively shape social change and work on permantable service optimization and service expansion. Technology as a driver for change requires addressing user scenarios in the public interest-oriented range of tasks through collaborative projects with business and science, especially in the provision of services to companies and also citizens [1].

This plays a role in smart government strategy, i.e. the intelligent use of data for modelling towards more user-friendly services, more efficient processes and risk-analyzed decisions in public administration. In addition to internal and external services, the smart governance approach is based on the provision of additional services, such as the innovative usability of "open data" [2].

In addition to the innovative use of technologies, strategic partnerships with start-ups, non-profit institutions and business are also an opportunity to create the manifold challenges of an ecosystem of value. Artificial intelligence (AI), machine learning and data analytics have become core technologies in a wide range of industries that have a significant impact on the daily lives of the population. This is already the case in 2020, with an increasing trend in the future. It is predictable that artificial intelligence will be given another field of application with increasingly complex application scenarios.

2. Research interest and methodology

After having found the level of acceptance in society, the two perspektives safety and quality in the public sector are still obligable to key figure-driven processes "optimization" and "economic service quality". Due to the barriers of innovation, approaches are part of this paper as well as theoretical modelling on learning of human and machines thought to give advice on improvement in outcome of AI-technology.

2.1 Research interest

After defining Artificial Intelligence in context of public administration, finding conducive technologies and use cases is relevant. Following the interest in knowledge, research-leading questions according to the key points of the Federal Government for an artificial intelligence strategy are:

- How can design options of human-machine interactions be used in administrative processes and how can mistakes be detected at an early stage?
- How can the principles of transparency and traceability of administrative action be implemented in the use of AI procedures?
- What framework conditions and measures are necessary for AI use and how can acceptance be increased?

In this paper, the term "artificial intelligence" is widely interpreted and used as a collective term of technologies and systems of different degrees of automation and maturity. The background lies in the complexity of real interactions between influencing factors of actionable performance systems.

2.2 Methodology

The methodology includes a heuristic-exploratory approach in survey and evaluation design. In order to obtain an increase in complementarity to a research subject that has not yet been studied in the field of research, different approaches were chosen by means of a mixed-methods approach. In the deductive data collection, a method triangulation with parallel design studies was used by a quantitative secondary data analysis as well as qualitative studies with different focus orientations. The two qualitative surveys on attitudes and potentials have different orientations and are only combined in the interpretation of the results [3].

The following is to characterize the studies used, so that the direction of the target and added value for the research questions can be asseted:

1. **Bitkom Research Study (2018) [4] 'Künstliche Intelligenz - Von der Strategie zum Handeln'** on the development of a 'period system of artificial intelligence': the representative survey included telephone interviews with 1,007 German citizens aged 16

plus after random selection. The set of questions leaves both the aim of a 'I' and the area of life that is accepted for use and also rejected, how quickly AI is a key instrument in society, which areas of application are available, and whether AI causes fears concerning the workplace. Different scale levels are used to represent the cumulative results.

2. **Nationales E-Government Kompetenzzentrum e. V. – NGRZ – (2018) [5] 'Digitalisierungsverständnis von Führungskräften'** in the civil service: 16 heuristic-exploratory expert interviews with employees and managers of public institutions on all of the three German federal levels. The partially structured focus interviews were based on an interview guide with the topics of digitization understanding, status of digitization, IT skills, and leadership measures. In particular, the connection between leadership behaviour and the acceptance of employees for the initialization of digitization projects is at the heart of the research questions.

3. **Frauenhofer IAO und Zeppelin Universität Friedrichshafen (2020) [6] 'Künstliche Intelligenz in der öffentlichen Verwaltung - Anwendungsfelder und Szenarien'**: Three stakeholder workshops with fifty employees of local and state administrations were held on application possibilities, concrete application potentials, and an overview of the capabilities of AI in the public sector. The open SWOT identification process was discussed on the basis of the AI strategy of the federal state of Baden-Württemberg and different ideas and requirements from municipal practice were deliberately approved and evaluated in a peer process. In this respect, the objective was the relevance of the topic, the opportunity to fundamentally revolutionize the administrative processes of tomorrow and to create a world of work with AI support on the basis of three future scenarios.

For the research topic in the field of trend research, a qualitative-quantitative study design is possible in order to prepare the complexity of real-causal relationships in framework conditions for generalizability [7].

The integration of secondary results is intended to derive the need of reform for AI strategies of public administrations using qualitative analysis methods. The interpretation was carried out by means of qualitative text analysis, forming the formation of core sentences and summary of categories by descriptive presentation of the range of statements. The operationalization of the categories was carried out by the comparison of intersections of the statements from the qualitative studies by content-analytical, theory-guided coding methods according to Kuckartz [3].

Restrictive of the survey should be noted that no absolute statements can be derived in the absence of primary surveys in the domain of the General Internal Administration. In addition, the framework conditions and starting points of systematic learning processes for the development of innovation structures were not collected.

3. Theoretical framework: Management approaches to manage learning, innovation, and automation

In addition to previous values of strict legal conformity and quality orientation, the basic prerequisite for a change in attitude towards innovation is conceptually identified by the model of the 'learning organization'. Accounting for the performance of AI approaches can therefore be converted into a comparison scheme using stimulus and reaction methods, system architecture, and thought and reflection process algorithms [8].

Stimulus-response processing results in pattern recognition based on pre-associated parameters in both AI-based text recognition, speech recognition, or video analysis. In addition to the logic in the programming of algorithms, the pattern interpretation of unstructured data requires, in addition to identification by means of predefined or combinatorial laws and rules, above all beliefs in unpredictable and novel circumstances, in order to transform structures from them. Complex maturity analyses of persons or organisations have parallels to learning and explanation approaches to adult education. In this respect, basic technologies for simulating diverse human actions through deep learning approach have different starting points for explaining developments in autart learning [9].

4. Results and value

In this section, the main results from the cross-comparison of the above mentioned studies are transferred into a status-increasing of acceptance, concrete fields of application of the public administration, and parallels of the acquisition of competence between human and artificial processing intelligence of data.

4.1 Results

The representative survey conducted by the digital association Bitkom in 2018 among 1,007 German citizens confirmed that as many as 4 out of 10 respondents (44 percent) see the federal government as having the duty to establish rules for the use of AI. One in five (19 per cent) believe that AI technology already has a significant impact on society, and two-thirds (66 per cent) believe this will be the case in ten years at the latest.

Since one in two respondents (54 percent) already uses AI services such as voice assistants, and another 21 percent would like to do so, 62 percent of German citizens say they see artificial intelligence more as an opportunity.

In the work context, however, the confidence of completing complex processes is different, as the following graphs show:
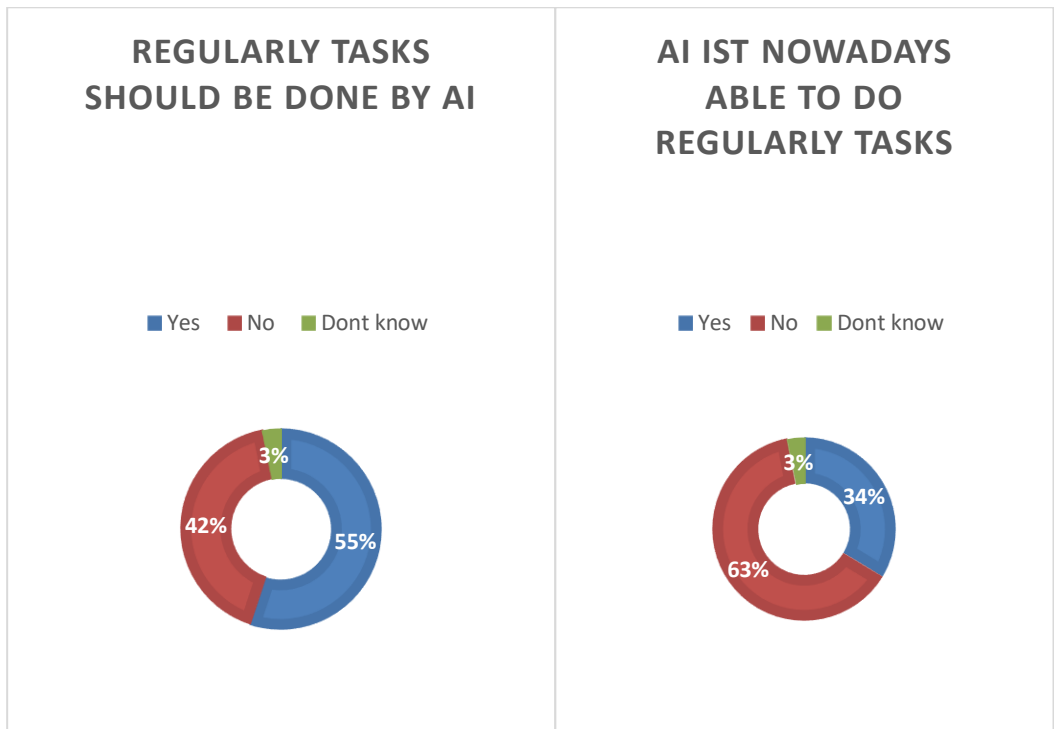
Figure 1. (a) AI Support; (b) AI Skills.
Source: own diagram in order to Bitkom Research (2018)

Thirty-two percent of participants are expected to support AI-driven systems for administrative functions, at least humanoid service delivery. Overall, administration in offices and authorities is also one of the major areas of life in which respondents want to be involved.
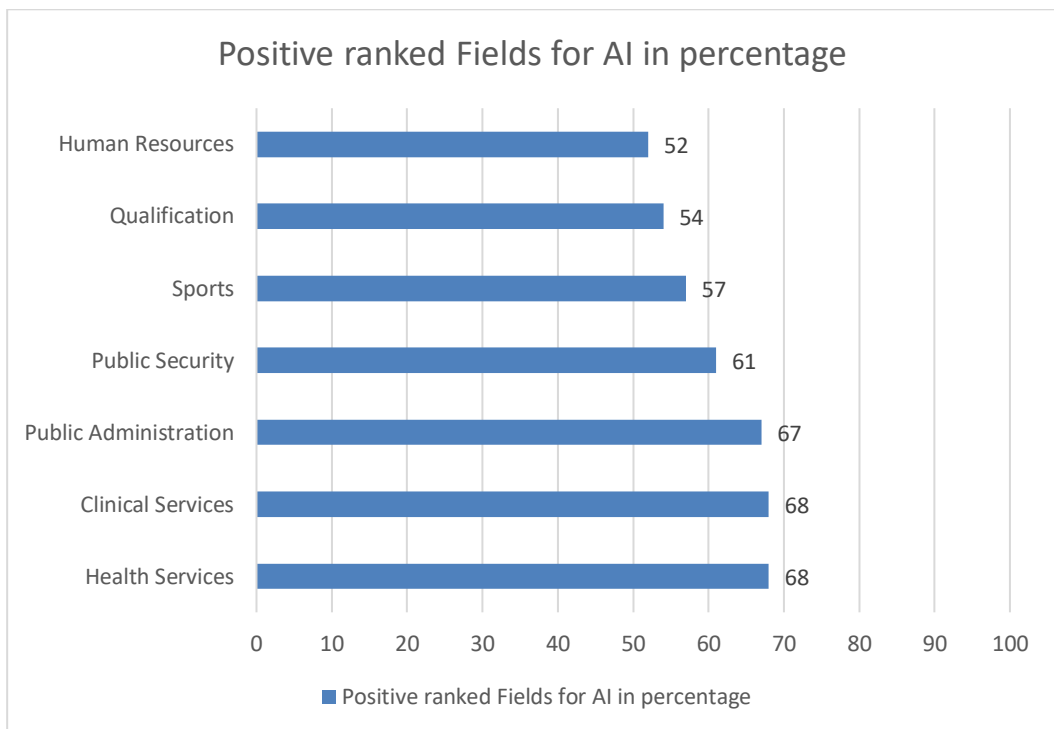
Positive ranked Fields for AI in percentage

Figure 2. Accepted Fields for AI.
Source: own diagram in order to Bitkom Research (2018)

In other areas of life, however, such as school or justice, there are still reservations about the lead use of AI. Nevertheless, eight out of ten respondents believe that a disproportionate number of occupational profiles are changing significantly, or will even disappear, or add up altogether.

AI can help in the design of processing processes of information, such as the collection of data from unstructured documents, the processing of business processes, and the automated preparation of reports and meeting documents. In particular, the function of 'augmentation' as a method of advanced text comprehension is necessary in order to find out relationships between the data through different analysis scenarios.

The augmentation can therefore support various process steps relevant for the public administration, and in some cases perform completely self-sufficient in the case of differentiated training data [10]:

• Contract analysis as a mass procedure: An AI-based document analysis based on the most important legal content, reference judgments and clauses gives lawyers more time to detach themselves from standard procedures and to deepen individual decisions in risky cases or reference case judgments for their specialist offices.

• Automated customer service through a sample solution developed by the specialist offices in an FAQ database, so that the service personnel can access information for querying documents, deadlines, and competent bodies without much training.

- Information security analysis: Managing personal data via ERP or CRM systems requires access, deletion or use in the case of requests for information. Fully automated information systems can be set up via AI.
- Fact-finding in legal cases: Identification of investigative data from structured or unstructured data sources, examining the relevance for case handling.
- Evaluation of machine-generated data: Sensor data from IoT applications can be used for modelling services for prediction and recommendations for action after protocol data has been evaluated for training [11].

In addition to chat bots, the most common application scenarios in public administration are for real-time, citizen contact response requests, recruitment, training through knowledge assistants, and virtual assistants in procurement processes or health data analysis.

However, the 'Period System of Artificial Intelligence' developed by the industry association Bitkom describes 28 AI services, which represent functionality and applicable applications on an AI basis. However, these will not be conclusive, as a dynamic element of the further development or development of novel offerings, services and platforms lies in the disruptive work of the designers of smart objects and cyberphysical systems (CPS) by providing networked infrastructures such as the Internet of Things (IoT) and the Internet of Services (IoD) as self-referential systems.

These elements of networked physical and virtual information and communication technologies are also used in the public sector in smart government strategies, mainly smart cities, for the intelligent networking of government services and administrative services in cities. Here, the study on artificial intelligence in the public administration of the Frauenhofer IAO and the Zeppelin University Friedrichshafen (2020) has developed further possible future scenarios for integration into everyday official life with workshops of practitioners. By taking part at the final workshop in this study, the practical use of the technology was in focus of the discussion.

The following table is used to show the possible applications according to different fields of application and to classify a class of future scenarioes:

Table 1. Fields of use in future scenarios

Field of application: FRONT-OFFICE –ADMINISTRATION FOR THE CITIZENS' CONTACT	
AI application	**Future scenario**
Chatbots und persönliche Sprachassistenten	AI system dominated administration
Service robots as digital assistants on site	Constructive combination of human and artificial intelligence
Signposts systems	AI system dominated administration
Citizen participation	Constructive combination of human and artificial intelligence
Field of application: BACK-OFFICE -FOR THE MATERIAL PROCESSING	
AI application	**Future scenario**
Workflowmanagement	AI system dominated administration
Recruitment	Constructive combination of human and artificial intelligence
Tax	AI-based surveillance state
Augmented Reality	Constructive combination of human and artificial intelligence
Field of application: DEVELOPMENT SUPPORT: CONSULTATIVE SYSTEMS	
AI application	**Future scenario**
Processing of data treasures and novel smart data bases	AI system dominated administration
Intelligent operational planning and predictive maintenance	AI system dominated administration
Risk management	Constructive combination of human and artificial intelligence
IT-Helpdesk	AI system dominated administration
DECISION AUTOMATION: DECISIVE SYSTEMS	
AI application	**Future scenario**
Simple tied decisions	AI-based surveillance state
Plausibility check data inputs	AI system dominated administration
Assignment of tasks / assessment of responsibilities	AI system dominated administration
Stakeholder analysis	AI system dominated administration
KEY SYSTEMS WITH REAL-TIME DECISIONS	
AI application	**Future scenario**
Traffic management	AI-based surveillance state
Disaster management	AI-based surveillance state
Parking management	AI-based surveillance state
Road condition detection	Constructive combination of human and artificial intelligence

Source: own table in order to Frauenhofer IAO and Zeppelin University (2020)

Authorities already need to define their AI strategy to reduce systematic biases due to the influence of assumptions or prejudices of developer or user records. Insufficient data

management and incorrect parameter sets can lead to poor quality results, which is why performance control mechanisms must be agreed on.

4.2 Value

With regard to digitization as a driver of these transformation efforts, qualitative research statements also show that competences in process optimization and strategy orientation must massively be applied by public sector employees in the networked world of work. For example, the survey conducted by the National E-Government Competence Centre (NGRZ) in November 2018, based on 16 focus interviews conducted by executives from the federal, state and local governments

Thus, digitization in public institutions generally seems to be driven rather slowly. With regard to the digitization potential of public administration managers, the survey shows that while digitization is recognised as a driver of changes in processes, this is seen as critical of the higher workload of the implementation of IT-supported procedures. This critical attitude of managers also seems to have an impact on the behaviour of employees, as an active background as well as early and continuous communication and information to employees is required by this group of people. While individual projects can be identified in particular in cross-cutting tasks, there is a lack of a holistic strategy across all levels and areas of responsibility to create broad acceptance and commitment for AI-based procedures. In this respect, the NGRZ identifies the creation of an open organisational culture through the mission statement of courageous leaders, who can serve as pioneers for digitization initiatives methodically and value-based, as a key success factor for AI. The variety of standardizable processes, thanks to the multitude of training data with current technology, also enables the AI to develop its own capabilities [12].

Innovation development must be endorsed and demonstrated by the highest level, in order to reflect the dynamism and desirability of participation from all levels. New functions such as the CEO (Chief Executive Officer) or CTO (Chief Transformation Officer) may also need to be re-implemented at top level to demonstrate the sustainable importance of change. In this respect, significant changes in the mindset of modern forms and values of work, the position of potential carriers and the lived beliefs in relation to networked, performance-oriented work are also recommended by Bitkom & McKinsey [2].

5. Conclusion

It becomes obvious, generalized across all federal levels of the public sector in Germany, that the discussion about innovation approaches is mainly interpreted as a technological challenge. When talking about strategy, process automation, and standardization, requirements are understood through workflows. In this respect, there is a lack of methodological systematization or organizational strategies to increase administrative modernisation in the state administration or at municipal level.

It is agreed that barriers such as separate data silos within the authorities or access to public administration data for cooperation partners and service providers have a significant influence factor for the further development and development of the maturity of automated systems.

In this respect, coming up with a phrased stategy with goals and principles of action is the first and necessary step in many authorities to deal with a concept of data usage and the associated ecosystem.

This also includes fast and binding communication, the use of digital technologies, and a casual culture of ideas without hierarchical barriers in decision-making practice. In order to experience this, company ambassadors with recognised standing and interdisciplinary skills, methodological competence, and digital background are required in work processes that are critical to success.

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