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# Digital Transformation of Utility Services Using AI, Iot and ITSM Practices: Evidence from Water, Electricity and Waste Management Systems

1.Sajid Khot*,2.Ashish Raju Waghre,3Malik Hussnain Abbas,4Muhammad Zubair

1. IT-District Technology Management, KAFD Development & Management Company, Riyadh, Saudi Arabia
2. IT-District Technology Management, KAFD Development & Management Company, Riyadh, Saudi Arabia
3. Electrical Design Riyadh Metro Transit, SYSTRA Riyadh Sa, Riyadh, Saudi Arabia
4. Information Technology Surveillance, Nesma Infrastructure and Technology, Neom, Saudi Arabia
*Corresponding Author: sajid3982@gmail.com

| ARTICLE INFO | ABSTRACT |
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| | Digital transformation is now a strategic focus of providers of utility services aiming to increase the efficiency of their operations, the reliability and sustainability of their services. This paper looks into the operationally integrated use of artificial intelligence (AI), Internet of Things (IoT) technologies, and IT service management (ITSM) practices in the utility service industry with a particular emphasis on water, electricity and waste management industries. The research is meant to examine available digital change experiences and its working implications and not the development or assessment of new technical frameworks. They used a qualitative and comparative research design which was founded on a thematic analysis of academic literature of peer-reviewed articles, reports on utility cases, and industry. This analytical framework is centered on three approaches, namely the operational use of AI and IoT technologies, integration of ITSM practices in digital operations, and service and operational outcomes. Thematic patterns were highlighted and compared comparatively in the three utility sectors systematically. The findings reveal that IoT technologies present a base data layer of real-time monitoring of infrastructure and the state of services, and AI-based analytics mainly assist in identifying anomalies, predicting and optimising operations. Nevertheless, the results indicate that the maturity of ITSM practices has a significant effect on the operational value of such technologies. The utilities that incorporate AI- and IoT-generated insights into formalized incident, problem and change management procedures show more positive changes in response time, operational coordination and service continuity. Sector specific priorities can also be found with water utilities being concerned with resource efficiency and network reliability, electricity utilities and waste management services being concerned with asset reliability and regulatory compliance, and operational efficiency and service responsiveness respectively. The article emphasizes the importance of service governance in the transformation of digital capabilities into viable operational changes in utility services.<br><br>**Keywords:** Digital transformation; utility services; artificial intelligence; Internet of Things; IT service management; water utilities, electricity utilities, waste management. |

## 1.    INTRODUCTION

The necessity to work more efficiently, increase the reliability of the provided services, and become sustainable has become a pressing issue of the digital transformation of utility service providers in the world. Examples of utility services include water supply, electricity distribution, and local waste management, which have conventionally been carried out manually and semi-automatically, and therefore tend to be inefficient, might cost resources, cause slow reactions to service interruptions and they may not be able to make foreseeable decisions. The adoption of new technologies in the Internet of Things (IoT) and Artificial Intelligence (AI) is changing all these traditional practices with the ability to monitor processes in real-time, conduct sophisticated analytics, and optimise operations based on data (Zanella et. al., 2014). IoT sensors and AI analytics can be utilized in water organizations to ensure the ongoing

control of the network performance and early detection of anomalies, which would aid in minimizing water wastage and more efficient resource management (Singh et al., 2021).

Digital transformation efforts in the electricity industry led by the IoT, AI and other digital tools have enabled better monitoring of grid assets, predictive maintenance, and better forecasting of energy in the face of dynamic demand. The premature researches reveal how real-time sensor networks that incorporate sophisticated analytics can aid energy companies to optimize their workflows and lengthen the lifecycle of their infrastructure (Erhueh et al., 2024). In the meantime, the implementation of smart technologies in waste management systems has demonstrated a high level of operational optimisation, such as automated waste routes, real-time monitoring of waste volumes, and better recycling results with the help of AI-based systems (Alwar et al., 2024).

Even though there are significant studies regarding the technical implementations of AI and IoT in utility operations, there is a significant gap in the literature concerning the ways of how these technologies are implemented in the systemic frameworks of the governance of services. The available literature does not discuss in sufficient detail how these digital tools are aligned with and support structured IT service management (ITSM) practices, including incident management, change management, performance management, and organisational preparedness to digital transformation in utilities, despite most of the existing literature describing technological deployments, including smart metering, sensor networks, and predictive models. This gap is vital in the sense that the alignment of digital technologies to service management practices is also known to affect not only the technological performance but also the operational performance, co-ordination with the stakeholders, and long-term sustainability of service delivery (Gungor et. al., 2013). A broad vision that examines the utility synergy between AI, IoT and ITSM practices remains a developing concept. Though the digital transformation frameworks have been put forward in business and general organisational research, there are no empirical findings that define the practice of digitalisation in relation to the existing operational management processes in the utility sectors (Majdalawieh and Khan, 2022). The research aims to fill this gap by evaluating the implementation and management of AI and IoT technologies in the context of ITSM-aligned operational processes in water, electricity, and waste management services and investigating the subsequent consequences on service performance and operational efficiency (Li et al., 2020).

Rather than suggesting or experimenting with any new technical models, the study assumes a comparative thematic analysis of the already existing case studies, industry reports, and scholarly literature in order to know how the practices of digital transformation are operationalised in utility environments. With its emphasis on both the technological and managerial aspects of digital transformation, the work makes its contribution to a more holistic approach to the utility digitalisation strategies and offers the empirical insights, which can be applicable to the policymakers, the utility operators, and the academic researchers alike.

## 2. LITERATURE REVIEW

### IoT applications and digital sensing in water companies

Recent research indicates that the use of IoT sensors to monitor volume, pressure and water quality in distribution systems continuously has been rapidly adopted. Both deployments of IoTs with hydroacoustic and vibration sensors can detect and localise leaks near-real-time to aid in reducing non-revenue water and responding more swiftly to operations (Boujelben, 2023). Some of the applied studies also indicate that the integration of IoT data with artificial intelligence and machine learning methods can result in a much better leakage detection in the actual water distribution system (Alvarez et al., 2024).

### Artificial intelligence and predictive analytics in the power industry

Artificial intelligence and machine learning approaches have broadly been implemented in the electricity sector demand forecasting, fault diagnosis and predictive maintenance. Current surveys show that AI-powered analytics have enhanced grid stability, minimised unplanned shutdowns and assisted in evaluating children of assets in case of transformers, substations as well as transmission lines (Tan et al., 2017). Machine learning-based predictive maintenance models are becoming popular to assist in maintenance prioritisation and operational decision-making in smart grid settings, despite the difficulties associated with data quality, system integration and explainability (Serrano et al., 2021).

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## Making waste management services operational with IoT and AI

According to the waste management research, the use of smart bins, which can be controlled through the IoT, vehicle tracking and real-time data platforms is increasing to enhance service delivery and planning in the collection. Optimisation models based on AI are frequently used in the processes of dynamic route planning and demand-responsive collection scheduling with measurably decreased distances of travel and fuel consumption (Kapadia, 2023). Systematic reviews also confirm that routing optimisation using an IoT system contributes greatly to the efficiency of the collection and the sustainability of operations in the municipal waste service (Czekała et al., 2023; Mukherjee et al., 2021).

## HIT operational governance and practices of IT service management

Studies, on the topic of IT service management (ITSM), have highlighted the significance of organised procedures, including incident management, problem management, change management and fulfilment of service requests in maintaining quality in services and consistency in their operation. The thorough reviews of the ITSM literature reveal that there are common issues concerning organisational change, process integration, performance measurement and skills development (Serrano, 2021). Empirical research also suggests that when formal ITSM processes are introduced, service transparency has been enhanced, operational teams' coordination has been advanced, as well as the quality of services provided in complex service organisations (Jäntti, 2013).

## AI and IoT outputs of the operations and service management.

Even though these studies indicate numerous technical advantages of AI and IoT systems, less research has explored how digital analytics are realised in the context of formal service management processes (Islam et al., 2015). It can be inferred by the experience of water and infrastructure management that the benefits of operation are significantly increased when the results of digital monitoring and analytics are directly incorporated into the formalized incident and problem management procedures (Boujelben, 2023; Serrano, 2021). These results reveal that service governance mechanisms have an intermediary role in converting digital insights into positive operations interventions.

## Organisational and implementation issues.

In utility sectors, it is observed uniformly in the literature that the obstacles to data integration, interoperability, lack of digital skills and organisational resistance to change are a fact (Cater-Steel et. al., 2009). The authors of the literature note that the use of technology by itself cannot lead to the sustained improvement of operations without the alignment of organisational structures and service management practices (Serrano, 2021; Jäntti, 2013).

## 3. METHODOLOGY

### Research design

The research design of this study is based on qualitative, comparative, and practice-oriented research design. It is not aimed at development or testing of any technical model or system; the purpose of the study is to investigate the current use of artificial intelligence (AI), Internet of Things (IoT) technologies and IT service management (ITSM) in utility service activities. This analysis is based on three utility areas namely water services, electricity services and waste management services.

### Data sources

This research is founded purely on secondary data that have been obtained:

- Peer-reviewed academic journal articles,
- Equipment reports prepared by industry and consultancy,
- White papers issued by service providers and technology vendors, and
- Digital transformation case studies of utility organisations published publicly.

Only those documents dealing with the digital transformation initiatives in utility services published in English were taken into account.

**Studies selection and screening**

The structured screening was used and all the studies and reports were included to meet the following requirements:

- they clearly include the application of AI and/or IoT technology in utility services workstations;
- they explain operational or service level applications in water, electricity or waste management; and some of them give evidence of, or allude to, service management practices, including incident handling, service request management, performance monitoring or operational change control.

Articles on hardware design only, communication protocols or algorithm design were not considered as the aim of this study is not on the technical system design.

**Analytical framework**

To analyze all three utility domains the comparative analytical framework was developed that looks at them in the terms of three standard dimensions:

1. operational implementation of AI and IoT technologies,

2.corporation of ITSM practices in digitally empowered operations, and

3. perceived operational and service-level results.

In each of the sectors (water, electricity and waste management), the material collected was analysed to determine the support of digital tools in day-to-day operations of the services, in handling the faults, service continuity and performance metrics.

**Data analysis procedure**

The thematic qualitative analysis was applied in the analysis.  Since the reviewed documents were the initial sources of initial key themes in operational and service management. These themes were consequently concluded under the three analytical dimensions and contrasted in the three utility sectors. A cross-sector comparison was then conducted to determine any similarities and differences in practices of digital transformation, patterns of organisational adoption, and ways of service management integration.

**Validity and reliability**

The triangulation of evidence between two or more independent sources was done where feasible in order to increase the analytical validity. Results obtained in single case studies were confirmed by means of industry reports and academic sources dealing with similar operational situations. All three utility sectors were then analyzed using a consistent analytical framework in order to provide some level of comparability and methodological consistency.

**Ethical considerations**

The study is based on the freely available secondary data only, and no human subjects, individual data or organisational secrets are used. Therefore, an official approval of the ethics was not necessary.

**Scope and limitations**

The research pays attention to the operation and service management facets of digital transformation and fails to evaluate the technical performance of specific AI algorithms or IoT structures. Besides this, the results also indicate practice as noted in published case material and industry documentation and may thus be affected by reporting bias or differences in organisational transparency. Nevertheless, the comparative approach can offer a systematic and credible insight into the process of AI, IoT and ITSM practices adoption within the water, electricity and waste management services.

## 4. RESULTS

This part will show the results of the thematic analysis of the secondary data based on the academic research, industry reports and recorded utility transformation projects. As per the approach, the findings are organized based on four key themes that kept on reoccurring in the context of water, electricity and waste management services.

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*The identified themes are:*

1. Operational use of AI and IoT technology,

2. Integration of IT service management practice (ITSM) and digital operations,

3. Outcomes of operations and service performance, and

4. Enablers and constraints at organisational and process-level.

All the three utility sectors are applied to the same thematic structure to make it possible to compare them systematically. To physically synthesise the thematic findings of this paper, Figure 1 and table 1 shows how the practices of data collection through the IoT, analytics and the management of IT services based on AI and ITSM practices are correlated with service and operational performance, across water, electricity and waste management utilities.
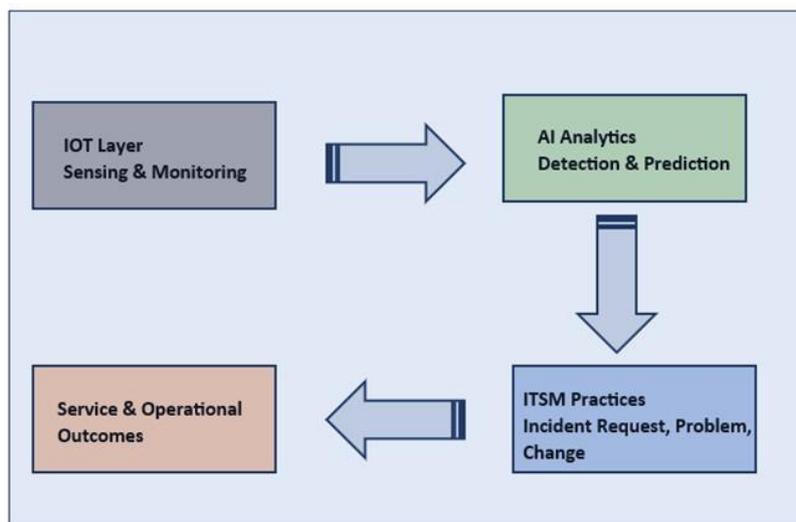


**Figure 1. Summary of thematic results linking IoT, AI and ITSM practices to operational outcomes in water, electricity and waste management services.**

**Table 1. Summary of identified themes and illustrative evidence across utility sectors**

| Theme | Description of the theme | Evidence from water utilities | Evidence from electricity utilities | Evidence from waste management services |
|---|---|---|---|---|
| Operational application of AI and IoT technologies | Use of digital technologies to monitor operations, detect anomalies and support operational decision-making | Use of network sensors and analytics for leak detection, abnormal consumption identification and water quality monitoring | Use of grid and asset sensors with AI-based forecasting and fault localisation tools | Use of bin sensors and vehicle tracking with AI-based route and demand optimisation |

| Theme | Description of the theme | Evidence from water utilities | Evidence from electricity utilities | Evidence from waste management services |
|---|---|---|---|---|
| Integration of ITSM practices with digital operations | Alignment of digital monitoring and analytics outputs with formal service management processes | Incidents and recurring failures managed through service management platforms and maintenance workflows | Outage handling, maintenance scheduling and infrastructure changes governed through structured ITSM processes | Service requests and operational disruptions managed through service management workflows |
| Service and operational performance outcomes | Operational and service improvements resulting from digital transformation initiatives | Faster fault detection, improved maintenance prioritisation and reduced water losses | Improved outage response time, enhanced asset reliability and improved operational visibility | Improved route efficiency, reduced fuel consumption and faster resolution of service requests |
| Organisational and process-level enablers and constraints | Organisational conditions influencing digital transformation effectiveness | Staff training, cross-functional coordination and process standardisation enabling operational use of digital tools | Strong governance structures, regulatory compliance requirements and formalised workflows enabling integration | Limited digital skills and fragmented responsibilities constraining large-scale adoption |

## 4.1 Theme 1: Operational application of AI and IoT technologies

### 4.1.1 Water utility services

At the water utilities level, the implementation of IoT is mainly directed at constant physical infrastructure and quality indicators of the services. These sensors are normally placed on transmission pipelines, pumping stations, reservoirs and customer metering points. The data obtained is employed to give real time visibility of the flow rates, pressure variations and quality parameters. The use of AI based analytics is primarily done to detect anomalies in the normal state of operations. The cases reviewed indicate that utilities have been progressively putting more use on automated tools of anomaly detection in order to identify leakages, irregularity in pressure and abnormal consumption behaviour. Moreover, some of the utilities use AI-assisted analysis to detect possible risks of water quality and events of contamination early on. Operationally, the findings reveal that AI is applied as a decision support tool and not as a control mechanism on its own. Due to the need to validate and intervene, human operators are still in charge, but digital tools mainly increase the level of situational awareness and the prioritisation of field operations.
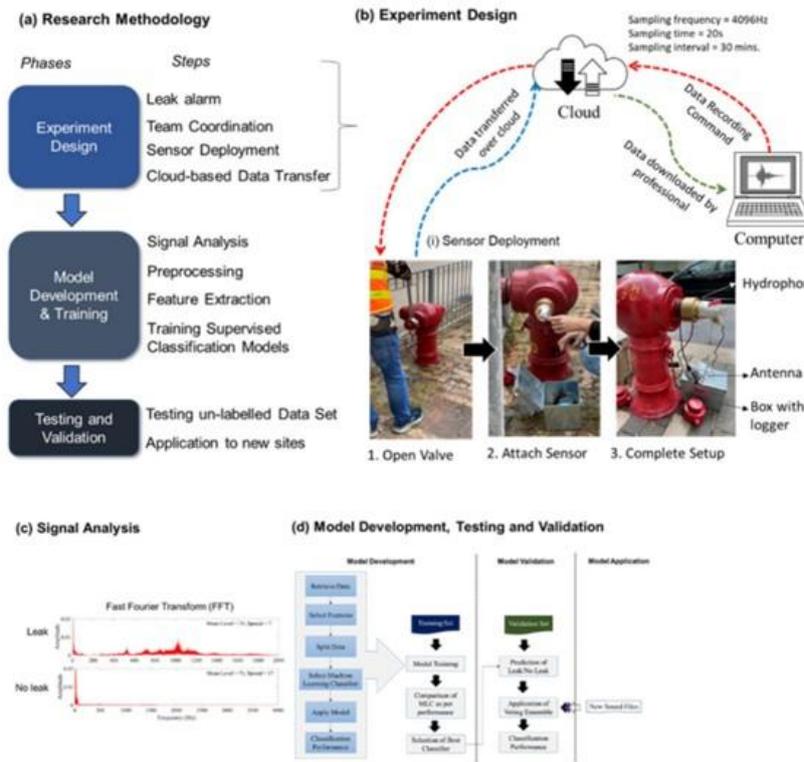
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**Figure 2. AIoT-enabled data acquisition and analytics workflow for leak monitoring in urban water distribution networks (taken from Bakhtawar et al., 2024)**

Generally, the digital technologies applied to the water services are focused on the enhancement of the network monitoring, the detection of the risk at the early stage and the planning of the preventive maintenance. As the demonstrative examples of the existing AIoT-enabled operations of water utilities, Figure 2 displays a hydrophone-linked sensing and analytics workflow as reported by Bakhtawar et al. (2024).

### 4.1.2 Electricity utility services

IoT is also widely used in electricity utilities in grid infrastructure and asset management approaches. The smart meters and substation monitoring, and conditional based sensors are used to give data streams that are connected to load behaviour, voltage stabilization, equipment conditions and environmental exposure. The AI applications are mostly used in short-term and medium-term demand predictions, fault localisation, outage detection and asset condition. Transformers, transmission lines and substations Maintenance planning Predictive analytics is commonly applied to assist with maintenance planning. The electricity providers are more dependent on digital analytics in their operations compared to water utilities. The findings indicate that artificial intelligence forecasts and alerts are becoming part of the operations of the control-room and operational planning cycles. Electricity services digital applications are thus strongly correlated with grid stability, asset stability and regulatory performances requirements.

### 4.1.3 Waste management services

IoT implementation in the context of waste management is mainly a service and not an infrastructural implementation. The primary digital infrastructure is sensor-powered bins, vehicle tracking devices and fleet monitoring platforms. The use of AI-based tools mainly aims at optimising the collection routes, anticipating fill-level trends and forecasting future service demand. Some of the reviewed cases suggest that predictive analytics were used to customize the plans of the collection according to seasonal and behavioural applications. Digital tools in waste management are primarily applied to coordinate the operational process and optimise the logistics, and not to monitor technical assets as done with water and electricity services. The findings reveal that AI applications to the sector are closely associated with efficiency in service delivery and resource leverage and resource planning precision.

## 4.2 Theme 2: The combination of ITSM practices with digital operations.

### 4.2.1 Water utility services

Through the analysis, it has been established that water utilities are increasingly adopting digital monitoring platforms in conjunction with formal ITSM procedures. IoT-based alert notifications are being transformed more into formal incident documentation in service management systems. The practices of incident management are mostly used to handle service disruption, pressure failure and contamination warning. Recurring failures in particular areas in the network or segments of infrastructure are analysed through problem management. The change management practices facilitate the scheduled maintenance and network reconfiguration. The findings however show that maturity of ITSM integration is significantly different across the utilities. The digital alerts are in various instances still being manually transmitted into operational processes which means that it is half baked instead of integrating fully.

### 4.2.2 Electricity utilities services.

Electricity utilities show the most ITSM integration as compared to the other two sectors. Central service management platforms are generally combined with digital monitoring systems, outage management platforms and predictive maintenance tools. The outage detection process and the outage restoration process are closely tied with incident management. Field interventions and maintenance scheduling are supported by service request management, whereas the reconfiguration of the grids and the upgrades of the infrastructure are managed by change management. The findings indicate that ITSM practices within electricity service can be used as not only the coordination mechanisms, but also the compliance and audit tools. Regulatory reporting and accountability Controlled records of incidents, changes and interventions assist in digital records.

### 4.2.3 Waste management services

Within the waste management services, ITSM practices are mostly implemented in customer centric and service coordination operations. Missed collection complaints, overflow reports and special service requests are managed using the service request management. The application of incident management is primarily on the operational disruptions such as car breakdowns and route failure. Formal change management practices and problem management are reported less often. The findings suggest that the digital transformation in this industry is yet to become preoccupied with enhancing service delivery processes, as opposed to developing mature service governance systems.

## 4.3 theme 3: Service and operational performance outcomes.

In the three utility sectors an overview of the analysis will show that there are some common performance related outcomes. The most commonly reported outcomes reported in water utilities are quicker failure identification of the network, a more effective identification of high-loss areas and the prioritisation of maintenance interventions. There are better operating planning and the time to respond to critical incidents were the better results of utilities. The outputs in electricity utilities show more systematised and quantifiable performance gains. These are increased outage response time, better accuracy of maintenance scheduling and better visibility of asset condition. The cooperation between digital analytics and ITSM operations helps to enhance the coordination between the control rooms and field teams and service centres.

Operational efficiency is the main performance improvement in the waste management services. The benefits that have been reported are a decreased fuel use, shorter routes of collection, better service coverage and quicker response regarding customer service requests. The analysis indicates that performance improvements become more long-term when the digital tools are integrated into the formal service management processes than when they are applied as the independent operational dashboards.

## Theme 4: Organisational level and process level enablers and constraints 4.4.

One of the patterns that has emerged in all industries is the fact that technology is not a sufficient factor towards successful digital transformation. Organisational preparedness and alignment of processes have a key role in operational effects of digital initiatives. The more successful in integrating the digital tools into the routine

operations, the utilities that invested in the staff training, process standardisation and service governance structure. Well defined ownership of digital platforms, well defined escalation procedures and standardised service workflows were identified as enabling factors. On the other hand, organisation resistance to change, fragmented responsibility framework and lack of digital competence are identified as significant obstacles in various cases reviewed. Specifically, situations where the operation teams viewed digital platforms as the support system of reporting, but not of operation, demonstrated little transformation impact. The findings also show that inter-departmental integration between IT departments and operational teams is a strategic key success factor. The stronger the collaboration mechanism of the utilities, the more the capability of matching the digital insights and the actual operational actions.

### 4.5 Comparative analysis of thematic trends across the three sectors.

The thematic comparison helps to see not only general patterns but also specifics of the sector. In the three utility industries, the IoT technologies constitute the data layer, with AI tools playing the major roles of analytics and predictive infrastructure. The ITSM practices provide the working connection between digital understanding and service activities. The extent of maturity of this integration varies however significantly. The best areas of integration of digital tools with service governance structures are electricity utilities and water utilities. Waste management services have relatively less service management integration and high efficiency-based digital adoption. The prevailing transformational goal is also not similar in each sector. The efficacy of resources and reliability of networks are the main areas of concern by water utilities. Service continuity, regulatory compliance and asset reliability are some of the priorities of electricity utilities. The services of waste management are focused on service responsiveness and logistical optimisation.

### 4.6. Comparative overview of the digital transformation practices in utility.

In order to have a condensed picture of the thematic results, as well as to enable a direct comparison of the current state of affairs in the utility sectors, this paper summarises the crucial patterns concerned with the operational use of AI and IoT technologies, the interjection of IT service management (ITSM) practices, and the subsequent service and operation outcomes of the water, electricity and waste management services. The relative summary in Table 2 shows both sector-related variations and general trends of digital transformation and how the extent of ITSM integration can impact the efficiency of the AI- and IoT-enhanced utility functions.

**Table 2. Comparison and contrast of AI, IoT and ITSM enabled digital transformation practice within utility services.**

| Dimension | Water utility services | Electricity utility services | Waste management services |
|---|---|---|---|
| Main operational use of IoT | Network condition monitoring, pressure and flow sensing, smart metering and water quality monitoring | Grid and substation monitoring, asset condition sensing and smart metering | Bin fill-level monitoring, vehicle tracking and fleet monitoring |
| Primary AI applications | Leak detection, abnormal consumption identification and water quality risk alerts | Load forecasting, fault localisation and predictive maintenance of critical assets | Route optimisation, service demand forecasting and collection planning |
| Dominant ITSM practices applied | Incident management for network failures, problem management | Incident, service request and change management | Service request management for citizen complaints and |

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| | for recurring leakages and change management for maintenance activities | integrated with outage and maintenance workflows | incident handling for service disruptions |
|---|---|---|---|
| Level of ITSM integration with digital tools | Moderate and uneven across utilities | High and formalised across operational processes | Low to moderate, mainly operational and customer-service oriented |
| Main operational and service outcomes | Faster fault detection, improved maintenance prioritisation and reduced non-revenue water | Improved outage response time, enhanced asset reliability and better operational visibility | Improved route efficiency, reduced fuel consumption and faster service response |
| Dominant transformation objective | Resource efficiency and network reliability | Service continuity, regulatory compliance and asset reliability | Operational efficiency and service responsiveness |

## 4.7 Summary of thematic results

Summing up the findings, it is verified that the digital transformation of utility services can be not mainly determined by the complexity of AI or IoT technologies, but rather by the degree of their operationally combined use by means of organized ITSM guidelines.

Those utilities that effectively implement digital monitoring and analytics tools to formal service management processes are better able to deliver enhanced and more solid improvements in operational coordination, service reliability and performance transparency.

The results also indicate that the concept of digital transformation is a complex technological and organisational change process, whereby service governance practices become a key central factor in providing sustainable operational influence in water, electricity and waste management services.

## 5. CONCLUSION

This paper has explored the digital transformation of utility services by using artificial intelligence (AI), Internet of Things (IoT) technologies and IT service management (ITSM) practices, and specifically the water, electricity and waste management services. The study sought to comprehend how digital technologies are in operationally encoded in utility service processes and not to design or evaluate novel technical models using a qualitative and comparative thematic analysis of published case studies and academic and industry literature. The findings show that IoT technologies are the basic data layer in all the three utility segments providing real-time monitoring of infrastructure state, services and service operations. Mainly, AI-based analytics are applied to assist in the detection of anomalies, predicting and operational optimisation, as well as leak detection of water networks, demand forecasting and predictive maintenance in power systems, and route optimisation and service demand forecasting in waste management services. Nevertheless, the research concludes that the functional utility of these technologies highly relies on how their products are assimilated into official ITSM operations. One of the key conclusions made in this study is that ITSM practices are a vital mediating factor in the process of converting digital knowledge into synchronized operational activities. Services linking AI- and IoT-driven alerts to structured incident, problem and change management processes demonstrate more predictable response time, service continuity and operations coordination. Conversely, utilities that implement digital tools without any service management integration are likely to experience insignificant impact on their operations, even though they have advanced monitoring and analytical capacities. The comparative analysis also indicates transformation priorities in the sector. The main concerns of water utilities are resource efficiency and network reliability, electricity utilities are concerned with service continuity, asset reliability and regulatory compliance, and waste management services are concerned with operational efficiency and sensitivity to service requests by citizens. Irrespective of these variations, one shared pattern of transformation is

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witnessable in all industries, where Internet of Things-based monitoring, AI-based analytics and ITSM-driven service processes, form a hybrid operational ecosystem.

As a practical matter, the results point out that it is not only a technological, but also a process and organisational challenge to promote successful digital transformation in utility services. Digital infrastructure investments have to be complemented by process standardisation, shaping capabilities in the workforce and cross-functional collaboration of IT and operation units. The research hence offers practical information to utility managers and policymakers intending to enhance service performance by implementing digital transformation programs. There are some limitations in this research. It is analyzed using secondary data and published case materials that can be subjected to reporting bias and the differences in documentation quality. More so, the research fails to quantify the performance gains, which it bases its analysis on the operational results stated and on the qualitative data.

The scope of future study could be to take this study forward in the form of empirical field research or survey of utility organisations to determine quantitatively the relation between ITSM maturity and the operational effects of the adoption of AI and IoT. Greater research on regulation and institutional factors of the digital transformation in various geographical settings would also be very insightful.

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