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IT Deployment and Integration – An Assessment of Enabling and Inhibiting Factors

Lesley Matshwane  
*University of Johannesburg, Department of Applied Information Systems*, lesleymat@gmail.com

Carl Marnewick  
*University of Johannesburg, Department of Applied Information Systems*, cmarnewick@uj.ac.za

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IT Deployment and Integration
– An Assessment of Enabling and Inhibiting Factors

Ontiretse Lesley Matshwane
University of Johannesburg
Department of Applied Information Systems
lesleymat@gmail.com

Carl Marnewick
University of Johannesburg
Department of Applied Information Systems
cmarnewick@uj.ac.za

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ABSTRACT

Although delivery of services in South Africa is the responsibility of all spheres of government, the provision of basic services lies at the doorstep of local municipalities. Local municipalities have, for many reasons, frequently been unable to live up to this mandate despite the fact that some of the challenges that they face can be addressed by using IT. This paper assesses factors enabling and inhibiting the efficient deployment and integration of IT in local municipalities. The technological, organizational and environmental (TOE) framework was deployed to assess the factors. A multiple case study in which semi-structured interviews were conducted produced qualitative data and thematic analysis was carried out. This paper suggests that effective deployment and integration of IT is not solely dependent on technological factors but that organizational and environmental factors also influence the outcomes to a significant extent.

Keywords
Technological, organizational, and environmental (TOE) framework, municipality, municipal technological solutions, South Africa

INTRODUCTION

South Africa is in dire need of effective and efficient local government administration to assist in managing and supporting basic service delivery (Lehohla, 2015). Municipalities have come under fire for lack of efficient delivery of services and this has placed considerable pressure on them to find innovative ways of serving their constituencies (Booyens et al., 2019). Already in 2002, a report by the South African Local Government Association (SALGA) classified most municipalities as inefficient (Ovens, 2015). This continues to be an issue as highlighted by the Auditor General of South Africa (2022). Revenue collection is poor, quality of services rendered is low and municipalities are often perceived to be neither mindful of their customers nor customer-centric in their operations and existence. There are various interventions which can be utilized to improve the capability of municipalities so that they become more efficient and more able to fulfil their constitutional mandates.
These remedies include ethical leadership, good governance and the use of information technology (IT). Ethical leadership in organizations is defined as the process of influencing others by entrenching values, beliefs and principles that are widely accepted as behavioral norms (Alshammari et al., 2015). On the other hand, good governance is defined as a process by which sound decisions are taken and implemented in organizations (Institute of Directors Southern Africa, 2016).

Lunt and Ekstrom (2008) define IT as a discipline concerned with both organizational and individual needs through the deployment, support and maintenance of computing technologies. IT is seen in almost every economic domain as a catalyst for innovation and efficiencies (Letseka & Iyamu, 2011). This, however, does not suggest that by simply sourcing technology components and solutions, organizations and municipalities would immediately realize efficiencies in their service offerings. There is still a need for IT artefacts to be deployed and integrated, transforming them into usable services which organizations may be able to exploit to improve their processes and thus remain competitive. The focus of government programs is frequently limited to the deployment of telecommunication infrastructure and e-literacy training (Kassongo et al., 2018); however, this is usually not enough as a way of promoting or even guaranteeing efficient service delivery. While IT is generally recognized as an effective way to bring about efficiencies, there are additional important factors that need to be considered to improve the likelihood of its successful deployment and integration. Therefore, the research question was: How can municipalities use IT to address inefficiencies in the delivery of services to the communities they serve? The efficient deployment and integration of IT in municipalities and the lack thereof is thought to be due to particular factors which are either enabling or inhibiting.

Firstly, the concepts of government administration and the relationships between government administration at various levels and IT are presented. Secondly, the relationship between IT and service delivery is explored, followed by a presentation and discussion of key findings. These provide perspectives and evidence of experiences obtained from municipal employees and management as well as from the users of services in the communities in which the municipalities operate.

LITERATURE REVIEW

Municipalities in South Africa have been set up in such a way that they are the closest sphere of government to civilians. Simply put, municipalities are the delivery arm of government. As such, municipalities assume immediate responsibility for identifying the crucial needs of citizens in their vicinity (Makhaya & Roberts, 2013). They are tasked with delivering services deemed necessary in ensuring that citizens’ quality of life is acceptable and reasonable (Mawela et al., 2017). Identifying the needs of communities cannot be accomplished without a methodical approach and it requires access to various kinds of data. This data assists in service delivery by establishing where people are concentrated, what their needs are and what is required in deciding how best to deliver services to them.

The absence of such services results in the public health and safety of citizens being compromised or endangered. There are, however, various challenges pertaining to the delivery of these services in the context of municipalities in South Africa (Mawela et al., 2017). Municipalities are reported to be very slow in responding to the needs and requests of communities. This is largely because municipal officials do not focus sufficiently on a customer-centric delivery model as is envisaged in the Constitution of the Republic of South Africa. Further, the fixed operating hours of municipal offices pose a hindrance to interaction between their staff and members of communities; this is exacerbated by the distances between communities and the location of municipal offices (Khale & Worku, 2013).
By moving away from the traditional delivery model of government to a digital platform, municipalities would be able to improve their service offering (Budding et al., 2018). For example, a municipality that adopts IT as part of its service delivery strategy and deploys and integrates IT components adequately would improve service turnaround times, thus increasing public confidence and trust. It would also enhance public participation in democratic processes and generally improve efficiencies. Simply put, it is in the best interest of municipalities to move away from a traditional paper-based government operation to a digital electronic service model. For this to be achieved, issues such as the digital divide, up-skilling and re-skilling, budgetary provisions, and the functional and technical readiness of municipalities would all need to be addressed timeously (Anabila & Awunyo-Vitor, 2013). As in any transformation project, change management interventions and strategies would need to be clearly defined and applied.

In the case of municipalities, an opportunity exists to exploit IT more fully to aid in the delivery of services. This, however, does not obviate the other challenges that municipalities face in terms of fulfilling their mandate, and several of those hinder the realization of an IT-enabled customer-centric and service-oriented operation.

**Service Delivery at Local Government Level**

Of the three spheres of government, local authorities have assumed the most significant role in the advancement of socio-economic developmental targets because of their closeness to communities (Koma, 2014). In essence, their immediate responsibilities are to address and respond to the needs and interests of residents. For this reason, the operational efficiency of local authorities has, since its inception, come under the scrutiny of local communities and humanitarian organizations. This kind of on-going scrutiny is not limited to South Africa, but is the case globally (van der Westhuizen & Dollery, 2009).

To advance the operational efficiency and to meet constitutional imperatives, the South African government has devoted increased resources and attention to local authorities (Koma, 2014). Based on their size and service delivery goals, municipalities are allocated infrastructure grants to efficiently, effectively and timeously attend to the requirements of local communities. This entails the provision of water, collection of refuse and access to sound sanitation infrastructure among other services.

Although the overall provision of basic services has improved since 1994, municipalities are constantly confronted by a great deal of displeasure and frustration from local communities because the social and economic circumstances have remained unchanged for most people (Allan & Heese, 2022; Morudu, 2017). Their displeasure is shown by means of increasingly frequent and serious public protests, the formation of robust ratepayers’ associations, and in public opinion surveys. Although protests may not be the only way public opinion is made visible, they have increased in frequency, as represented in Figure 1.
Noteworthy is that from 2004 to 2020, the average number of such protests annually has trended upward, suggesting that communities are becoming more and more dissatisfied with the standard of service from their municipalities. Poorer communities tend to be the ones that resort to protests to display and convey their discontent, but in particular they intend to gain the attention of the national government for intervention. Their more fortunate counterparts (usually in urban areas) are more inclined to form ratepayers’ associations, which are provided for in Section 102 of the Municipal Systems Act of 2000. Ultimately, ratepayers’ associations administer funds (from ratepayers) and withhold them from municipalities until their grievances are adequately addressed. In some instances, the funds are even used to acquire the services from private providers.

**Relationship Between Service Delivery and IT**

Communities in municipalities generally register their concerns and dissatisfaction by embarking on service delivery protests that are at times marred by violence and result in damage to infrastructure. Highest among communities’ concerns are inconsistent and unreliable access to basic services such as water, sanitation, healthcare and housing, as well as a lack of economic opportunities – these grievances are believed to be as a result of general operational inefficiencies at municipalities (Fourie & Poggenpoel, 2017). Though the South African Constitution makes provision for cooperative governance, where national, provincial and local governments co-function, municipalities remain the key agencies in terms of basic service delivery.

*Figure 1*

*Service Delivery Protests, 2004 to 2020*

*Note.* Adapted from Allan and Heese, 2022; Morudu, 2017.
De Beer (2007) posits that poverty alleviation and improved quality of life can be achieved using IT, facilitating easier access to information and knowledge, education and a digitized healthcare system. Those without easy and affordable access to IT and sound usage proficiencies can easily be left behind and are at a disadvantage in as far as fully benefiting from an equitable share of socio-economic opportunities.

There is an existing strategy by the South African government which seeks to use IT to accelerate the delivery of government programs thereby enabling efficiencies, improving controls and cost savings, increasing transparency and public accountability and ultimately reducing costs. However, service delivery challenges continue to plague municipalities, suggesting that their IT systems may not be functioning optimally. Hence, the expected synergies between efficient delivery of services and IT exploitation are yet to be achieved. Challenges with technology exploitation in municipalities have been found to be related largely to deployment, interoperability of systems, access to information, the digital divide and security (Kimura et al., 2019).

IT is underpinned by technology, people and processes. On the other hand, the configuration of government is such that communities (people) are at the center of everything that municipalities do. Also, efficient delivery of services can only be fully achieved when IT is deployed in an integrated manner, that is, with ways of connecting municipal systems and other government agencies’ systems (interoperability between various systems). As noted previously, municipalities are at the forefront of delivering services as they are the closest sphere of government to communities and in this digital era municipalities cannot be entirely successful in their mandate without IT. Thus, there is a direct link between IT and service delivery.

The marriage of IT and service delivery was therefore central to this study, particularly with IT known to stimulate efficiencies in other sectors of the economy. This relationship was explored to understand how IT should be deployed and integrated at local government level to enable efficient delivery of services in municipalities.

**TOE Framework**

The successful implementation of IT systems depends on several enabling and inhibiting factors. This summary identifies key factors that influence the deployment and integration of IT and their impact on organizational outcomes. There are various generic enabling factors.

- **Organizational culture:** A supportive culture that values innovation, collaboration and continuous learning enables successful IT deployment and integration (Bortolotti et al., 2015; Sieber, 2019). Organizations with a culture that embraces change and empowers employees to adopt and utilize new technologies tend to have smooth IT implementation processes.

- **Leadership and management support:** Strong leadership, commitment and support are crucial for IT deployment success (Almubarak, 2017; Mouakket & Aboelmaged, 2021). When top management provides clear goals, allocates resources and actively participates in the implementation process, this fosters a positive environment and encourages employee engagement.

- **Skilled workforce:** Having a skilled workforce that possesses technical expertise and a willingness to adapt to new technologies is vital for IT deployment and integration (Mata et al., 1995). Organizations must invest in employee training and development programs to ensure that the workforce can utilize and manage IT systems effectively.
• Effective change management: A structured approach to change management facilitates the smooth integration of IT systems (Kohnke, 2017). By addressing resistance, communicating benefits and involving stakeholders at various stages, organizations can mitigate the negative impacts of change and foster a more positive IT adoption environment.

Various inhibiting factors contribute to the non-deployment and integration of IT. Some of these are:

• Resistance to change: Organizational members’ resistance to change poses a significant challenge to IT deployment and integration (Khoza & Pretorius, 2017). Fear of job displacement, lack of perceived benefits and resistance from influential individuals or groups can impede the successful implementation of IT systems.

• Inadequate IT infrastructure: Limited or outdated IT infrastructure can hinder the deployment and integration of advanced IT systems (Kashanchi & Toland, 2006). Organizations must invest in reliable hardware, software and network infrastructure to support the seamless functioning of IT systems.

• Budget constraints: Insufficient financial resources allocated for IT deployment and integration can impede progress. Organizations must carefully plan and allocate budgets to cover not only the initial implementation costs but also ongoing maintenance and upgrades.

• Security and privacy concerns: The increasing complexity and online nature of IT systems introduces security and privacy risks, which can slow down IT integration efforts (Sommestad et al., 2011). Organizations must prioritize cybersecurity measures, establish robust data protection policies and comply with relevant regulations to mitigate these concerns.

This study assessed factors which enable and inhibit sound and effective deployment and integration of IT at local municipality level. There are three types of municipalities in South Africa all of which are at the level of local government. Metropolitan municipalities exist in the six biggest cities in South Africa; areas that fall outside metropolitan municipal areas are divided into local municipalities; district municipalities are made up of several local municipalities that are located in one district.
The TOE framework was adopted in this study as a theoretical lens to investigate this phenomenon. Figure 2 depicts the TOE framework. The TOE framework is based on three fundamental constructs: the technological context, organizational context and environmental context (DePietro et al., 1990). These contexts are argued to have a significant influence on the adoption and implementation of technology innovations (Baker, 2012). The appropriateness and application of this framework could therefore be regarded as being at all levels or contexts of municipalities when these constructs are taken into consideration. The technology which an organization deploys, organizational resources, and both internal and external factors (environment) have an impact on how an organization adopts and uses technology (DePietro et al., 1990).

**Technological Context**

The technological context refers to the influence that technology components have on the adoption of technology solutions (Hoon Yang et al., 2007). Technology in general is regarded as an enabler and a catalyst enabling efficiencies across a broad spectrum of economic sectors (Ali Khan & Ismail, 2013). The benefits brought about by the deployment, integration and adoption of technology in municipalities, including their characteristics, should be recognized and appreciated when deciding on technology adoption and use (Oliveira & Martins, 2011). Further, when deciding on what technology to implement, the municipality needs to identify the features of technology components and how they will meet the municipality’s requirements. This is a key aspect of benefits realization as technology is only likely to
be adopted and used effectively once there is a clearly stated reason for its deployment. In the context of municipalities, the transition from or merger between legacy systems and new technology are crucial in the adoption of new IT systems. The acquisition and integration of technology must be well planned and managed so that the expected efficiencies are realized, and benefit both municipalities and communities.

**Organizational Context**

This context refers primarily to the characteristics and resources of an organization (Baker, 2012). These include structures of the organization’s business units, communication processes, the size of the organization and the number of underutilized resources that could be redeployed to the new initiative.

In the case of organizational structures, there is no one-size-fits-all approach. Structures are diverse and differ from organization to organization and even from one local municipality to another. Some are flexible and decentralized and others highly organized. Flexible, organic and decentralized structures are perceived to adapt easily to technology innovation, whereas inflexible, mechanistic structures are seen as being most suited to technology implementations (Baker, 2012).

Communication processes in organizations are important enablers and, inversely, poor communication inhibits technology adoption. This may depend on top management’s approach to innovation; they either foster organizational contexts that allow change and are supportive of innovations which directly impact on and influence the organization’s interests, or they may prefer very stable and predictable operations. Top leadership must have insight into their own behaviors and communication processes relating to innovation, with constant awareness of attitudes to technology adoption and how it links to the organization’s overall strategy.

There are varying views regarding slack resources (those that are being left unused or have been forgotten). Some scholars are of the opinion that slack resources promote technology adoption (Gangwar et al., 2014), whereas others indicate that innovation and the adoption of technology can take place even when there is no slack (Baker, 2012). Similarly, the size of an organization has drawn varying views. It is argued that the larger the organization, the more likely innovation is to occur because of the availability of resources, and hence technology is satisfactorily adopted and used (Hossain & Quaddus, 2011). However, this is refuted by Deng et al. (2015), who argue that innovation and the adoption of technology can thrive even in small organizations.

**Environmental Context**

The environment in which an organization operates includes internal and external factors, pressure and forces (DePietro et al., 1990). External and internal factors include industry regulation, competition, infrastructure maturity, and the availability of suitable technology service providers. How the firm innovates and adopts new technologies can be triggered and influenced by how the industry-dominant players perform, as high-performing competitors will need to be matched or outperformed. Regulations are imposed by governments and industries and organizations need to operate in accordance with them. Such regulations may advance and promote innovation and technology adoption or deter and constrain it.

Figure 3 is a graphical presentation of how the TOE framework can be applied in the context of local municipalities.
Depending on their characteristics or states, attributes pertaining to the three contexts of the applied TOE framework may influence IT deployment and integration positively or negatively. They can serve as innovation stimulants where their presence creates an enabling environment for innovation not only to emerge, but to be adopted as well. However, these attributes can sometimes serve as inhibiting factors and could derail the efforts of the organization to encourage innovation. It becomes critical, therefore, for organizations to continuously monitor these contexts and each of their attributes. In relation to local municipalities, for example, government regulations (external environmental context), either when very stringent or when ambiguous, are likely to hinder the commissioning of technology solutions and subsequently their service delivery capabilities.

The argument is that government should consistently provide an environment that is conducive for economic growth and allows all its entities to operate efficiently and to fulfil their mandates. The same is applicable to and important for local government administration. Similarly, in the context of the organization, internal processes such as formal and informal reporting structures and communication processes, are key in enabling the seamless and effective adoption of technology. The size of the municipality, in terms of employees and resources in relation to the population size they are serving, also plays an important role. Furthermore, if a municipality is adequately resourced, it will be able to match the demands of its constituents.

Regarding the technological context, clearly technology solutions can only be adopted if they exist and have been commissioned. In other words, availability becomes a crucial issue that municipalities must contend with. The characteristics, i.e., the use, accessibility and capabilities of technology solutions and
how well they are integrated should be known and be apparent to all who are expected to use and adopt the solutions. With this understanding, users will be open to using the technology, leading to the uptake and sustained use of the new IT system.

**RESEARCH METHODOLOGY**

This was an exploratory qualitative study based on an interpretivist approach. The objective was to analyze how technological, organizational and environmental factors influence the deployment and integration of IT in local municipalities of South Africa. A multiple case study research strategy (Yin, 2014) was employed using two cases in the North West province of South Africa.

Data was collected from respondents in two local municipalities in the North West Province of the Republic of South Africa (RSA). These municipalities share demarcation borders and are similar in a few respects and yet there are several significant differences between them. In line with ethical considerations pertaining to privacy, the anonymity of the selected municipalities and their employees is maintained. For this reason, the two municipalities will be referred to as Case 1 and Case 2.

- Case 1 serves predominantly urban areas as well as a few rural communities - these are its constituency. Administratively and with matters pertaining to financial support, Case 1 is able to interface with and account directly to the provincial government. In terms of population, the municipality studied in Case 1 has more than 500 000 people, 80% of whom are black Africans, more than 9% are whites and the rest come from other population groups.

- Case 2 has only two townships which are eligible for rates and services payments, and about 107 rural communities which do not pay rates and services levies. In contrast, a ‘regular’ municipality like Case 1 would remain confined to a district municipality regarding administrative and financial support, including the reporting structures as embedded in the Municipal Systems Act of 2000. Case 2 has a population of over 250 000 people with black Africans accounting for the majority at 98,3%, whites at 0,8% and the rest other groups.

Economically, both municipalities are in dire straits, with an average of 30% unemployment, and the youth being the majority of those without work but not studying at schools or tertiary institutions. As in all municipalities, both municipalities are tasked with the provision of water, sanitation, transport facilities, electricity, education, safety, healthcare services and a habitable environment. The preference for and selection of these two municipalities was not only to offer a balanced view of the results, from an urban and a more rural perspective, but also as a way to unearth rich data reflecting the perceptions, experiences, opinions and understanding of the participants who participated in the research. The results are hybrid in nature as they are based on input from people in both rural and urban settings regarding how technology is and should be deployed and integrated into municipalities to enable efficient delivery of services. Furthermore, the key challenges of communities, and whether there is a direct correlation between those and the role which IT can play, are identified. Thus, the urban and rural settings add to the comprehensiveness and richness of the results by presenting a mix of accounts on the status quo and what the community members’ expectations are for efficiencies and benefits to manifest in future.

Semi-structured interviews were conducted with members of the communities and with officials representing the two municipalities as recommended by (Myers & Newman, 2007). Thematic analysis was carried out with the aid of the predefined themes in line with the constructs of the framework (Braun & Clarke, 2006). Non-probability sampling uses non-random approaches to derive the sample from the research population, from which information about the subject of investigation will be
collected (Faryadi, 2019). Purposive sampling was adopted for this study. Purposive sampling is concerned with the selection of the units of analysis from the entire research population (Mlitwa & Van Belle, 2011). The units of analysis were selected because they had characteristics that were needed in the sample. In other words, units are selected “on purpose” in purposive sampling. The common characteristic was that the purposive sample had either implemented IT to improve service delivery or had used IT as a function of service delivery. Members of the community as well as officials from the two municipalities were interviewed for triangulation purposes. The purpose of triangulation is to enhance the credibility and validity of the findings by corroborating information obtained from multiple sources. Table 1 presents a consolidated view of the sample selection.

Table 1

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Unit of Observation</th>
<th>Actual Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Municipalities and communities</td>
<td>• IT manager (1 per municipality)</td>
<td>• IT manager x 2</td>
</tr>
<tr>
<td></td>
<td>• Technicians/IT engineers (3 per municipality)</td>
<td>• IT technician x 5</td>
</tr>
<tr>
<td></td>
<td>• Customer service agents (4 per municipality)</td>
<td>• Customer service agents x 7</td>
</tr>
<tr>
<td></td>
<td>• Supply chain management (SCM) administrator (1 per municipality)</td>
<td>• SCM administrator x 2</td>
</tr>
<tr>
<td></td>
<td>• Municipal manager (1 per municipality)</td>
<td>• SCM manager</td>
</tr>
<tr>
<td></td>
<td>• Ward councilor (1 per municipality)</td>
<td>• Ward councilor x 3</td>
</tr>
<tr>
<td></td>
<td>• Community members (2 per municipality)</td>
<td>• Community members x 4</td>
</tr>
<tr>
<td></td>
<td>• Billing practitioner</td>
<td>• Billing practitioner x 2</td>
</tr>
<tr>
<td></td>
<td>• Billing manager</td>
<td>• Billing manager</td>
</tr>
</tbody>
</table>

Note. IT = information technology.

Elements of the sample selection table are the research question, theme of investigation, data source, unit of analysis, unit of observation and the total number of participants. There is an existing relationship between these elements; that is, a research question element is intertwined with an area of investigation, as it might prove challenging to address it outright in its current form. To answer the research question, therefore, the factors in the technological, organizational and environmental context needed to be assessed. In other words, with the understanding that municipalities are an integral part of communities and that they do not exist in isolation, care was given to identifying and comprehending factors influencing IT deployment and integration. The focus in this area was therefore on the analysis of technological, organizational and environmental factors influencing the deployment and integration of IT. The goal was that, by understanding the end-to-end ecosystem in which municipalities have their being, adequate planning and coordination for deployment, integration and adoption could be implemented. The researchers opted for richness rather than saturation. They felt that they gathered enough data to achieve a thorough understanding of the phenomenon being studied. This is in line with Morse (1995) and Saunders et al. (2018) stating that saturation does not necessarily apply to all qualitative studies.
DISCUSSION OF FINDINGS

This article is dedicated to assessing the factors enabling and inhibiting IT deployment in municipalities of South Africa. This assessment was conducted using the three contexts of the applied TOE framework (Figure 3). The study reveals that these contexts provide an adequate summation of influential factors where deployment and integration are concerned. Though the factors were predefined, they have been validated as they also emerged from the findings of both municipalities and the communities they serve.

Factors in the Technological Context

The findings, interpretation and factors identified or seen to play a role in the deployment and integration activities within the technological context are summarized below.

IT Landscape

While there is evidence that some people in the municipalities know about the broader IT landscape, the findings show that only a few members of the IT teams have an understanding of the ‘big IT picture’ of the organization. There are no documented blueprints; everyone knows just enough about their respective areas, and the overarching view of the IT ecosystem is neglected. This creation of silos of information can be very detrimental to the effective deployment and integration of IT solutions, and to the reliability of commissioned applications in the live environment. Several inferences emerged during the collection and consolidation of information about the current IT landscapes for both municipalities. An IT manager, after indicating the non-existence of an architectural landscape, said “after now, what needs to happen is that firstly we believe that an enterprise architecture needs to be developed, a blueprint needs to be developed”. When responding to the same question, a different IT manager responded by simply saying “…we do not have that…”. After confirming that no consolidated, up-to-date view of the IT landscape was maintained, an IT technician indicated that, although that was the case, he could still give an oral account of the state of affairs of the IT landscape: “…no, but I can give you a layout of our servers layout in general…”. On the same point, one of the managers indicated some evidence of reliance on the service providers by stating:

Basically, I wouldn’t be so sure, to be honest with you, because we also have a consulting company that basically works with the broader issues of IT. Because some, we are only limited, I think, to knowing certain things.

Security and Privacy

With regard to privacy and security, the users’ responses varied as follows:

In terms of security we are confident, particularly with applications that are residing in. We have the firewall in place, and we also have an analyzer in place. So, in terms of physical or network security, we are confident. That is why I say on a daily basis what we do is, we have an individual who draws a report from the firewall and the analyzer to check if there were any threats and so on. We also have email security and that is working efficiently and effectively.

We do security awareness, we have policies in place as well, we do security awareness, security campaigns every three months. Your password policy, how do you ensure that users… because that is the other danger, if I would share my password with you.
Change Management

The study sought to understand the management of system changes to the broader technology ecosystem, i.e., processes embarked upon by municipality IT personnel and external service providers to implement changes or new solutions or enhance use in the live environment. Both municipalities showed some adherence to change management processes. Requests were logged and approved for implementation. However, actual deployment and integration approaches were suspect, unclear and varied from one service provider to another. Adherence to change management processes by municipalities was in line with the prescripts of literature. This practice is expected to improve the alignment of IT and business in terms of prioritization and increase visibility of changes, thus reducing risks, and essentially results in more reliable services and ability to measure benefits (de Andrade et al., 2016).

In response to the question of whether service management processes or change management processes existed and were implemented in municipalities, IT managers responded as follows:

No, unfortunately we do not have, I do not have as an IT manager. What we are currently implementing or are trying to implement, with limited or no budget, is at least to try and have a view of that.

Another one stated:

We are currently developing the IT services management processes. Obviously starting with the ones that I think are more urgent and important. Because we have implemented incident management, we have implemented change management, we have implemented… we have not yet implemented problem management because we need configuration management system that we… The system we have but in terms of the process, we have not developed the processes yet.

Normally, like for monitoring of these service providers, we have monthly meetings, engagement meetings as and when they send in their monthly reports on what they have been doing as per the contract. As per the SLA, we have monthly performance meetings. When there are system maintenance, even if we do system maintenance let’s like say our overall service provider for IT there’s a procedure that we have put in place. They will have to fill the change request form, which needs to have details, must be authorized, must be signed by the Head of Unit and authorized or approved by the Head of Corporate Services.

Compatibility

System compatibility and integration are intertwined concepts. One cannot be fully achieved without the other being in place. Compatibility refers to the ability of two or more systems to integrate and share information seamlessly. These are systems that have been developed and built adhering to common standards. Because the design processes from the two cases were found to be unstructured, the implication is that there is little or no consideration of compatibility during the design and architecting phase and ultimately in the build/development stage. A large contingent of systems in the two cases were found not to be integrated with each other. As per the literature, the lack of compatibility prevents systems from being able to share and transmit information to one another, consolidate functionality, centralize reporting capabilities and contain costs.

The insights from the analysis highlight that the two municipalities are not adopting, integrating or utilizing technological innovations within their operations to the fullest extent. The two municipalities could benefit from adopting industry standards such as TOGAF (Shanks et al., 2018) and COBIT.
(Khther & Othman, 2013) to ensure that technologies are properly integrated and utilized. This is evident from the security and privacy factor where only basic security is in place. The municipalities could introduce two-factor authentication, for instance. In summary, service delivery to the constituents is not taking place as the IT environment is not optimally managed.

Factors in the Organizational Context

Factors within the organizational context that play a role in the deployment and integration activities of IT are discussed and interpreted in the following sections.

**Strategy**

Municipalities are required to have five-year strategic plans for the promotion of economic and social development. This is usually achieved through the integrated development planning processes. The integrated development plan (IDP) should coincide with the term of the municipal council and be true to the principle of adequate consultation and participation. The relationship between the IDP and IT is similar to that between budgeting, reporting structures and the governance framework, and the IT strategic plans are also captured in the IDP. Both municipalities claim to adhere to this and to have correctly outlined their respective strategic plans concerning the IT delivery roadmap in the IDPs. Further, in alignment with the prescripts of the Municipal Systems Act of 2000, the IT strategies embedded in the IDP are drawn upon by the respective municipalities to develop executable plans in the form of a Master System Plan or in other instances simply IT plans. While these are generally good instruments to have, both unit cases were found to be misaligned in terms of execution and strategic direction. This poses a serious challenge and raises concerns regarding municipalities being able to reach their strategic goal of promoting economic and social development through the aid of IT that is effectively deployed and integrated.

**Organizational Structure and Size**

This sub-theme sought to determine the nature and capacity of the organizational structure that has been formed to achieve the strategic goals of municipalities as captured in the IDP. This focused primarily on the IT departments or domains. Findings revealed that overall hierarchical organizational structures were developed and approved by the respective councils. A shortcoming within the IT departments was that there were several key positions that remained vacant, posing risks in terms of internal capacity building, sustainability and delivery (Lair, 2019). Asked whether they had adequate human resources to fulfil their mandates, IT managers responded as follows:

Yes, all three are not occupied. So, you have, I would try as much as possible to utilize the senior technicians in those roles even though they are not appointed for those roles even though they are not, they might not have all the requisite skills for particular positions, but we try and use them in all those things. So, I should tell you that it would affect the effectiveness of IT functions in the Municipality.

What I want to do is to fill this structure because if you can’t fill this structure, we going to continue depending on service providers, which will mean we have to cough out money. If I have to change IT overnight, I want to fill this structure so that I prepare for skills transfer from the service provider because the service provider has specialized skills.
Partnerships

This sub-theme encompasses the relationships that municipalities need to build and maintain to ensure consistent and successful deployment and integration of IT. The municipalities need good working relationships with the communities they serve. This enables them to recognize the needs of the communities as they arise, and to plan collectively as how best to address them. There are also relationships with service providers and the provincial and national governments. There is evidence in both Cases 1 and 2, derived in part from document analysis, that communities engage intensively in the development of IDPs. The IDPs also outline the technological roadmaps of the municipalities and the communities also contribute to this. This is important for cohesion and public participation and is in line with the prescripts of the Municipal Systems Act of 2000.

Skills Development

IT is constantly evolving. The Fourth Industrial Revolution is one instance of this progression where automation raises the possibility of the IT workforce being displaced (Kim et al., 2014). To maintain IT as a catalyst for efficiencies, there is an urgent need for IT resources from diverse disciplines to maintain and advance their efforts in acquiring new sets of skills. If this is not done the skills will become irrelevant and the staff will not be able to keep up with the demands of the digital economy. The findings in this respect provide evidence of municipal IT teams attending some forms of training during their tenure, but this is not necessarily structured and in line with the requirements of municipalities. Skills development should be seen as a collective practice. Municipalities should carry this out intentionally and line managers, including direct reports (IT professionals), should collectively identify knowledge gaps and devise development plans that need to be embarked upon. Technicians in municipalities did not always feel certain that they were adequately skilled for the roles they were expected to execute. For example, an IT technician said, “We don’t have a server engineer in here, someone who knows and understands servers. We don’t have a server engineer. I think we need someone who understands servers 100%. We don’t have...”.

Technology Adoption

This sub-theme is particularly concerned with how users of the municipal technological solutions have accepted technology and its use. The findings suggest that because there is limited consultation in deciding on new technologies and participation in quality assurance and training, users tend to be somewhat unenthusiastic and do not widely and easily accept and adopt such solutions. No formal, online or instructor-led training was ever afforded to them: “…Every time when the system comes, they only give us a couple of hours to be trained on the system”. However, in the other municipality the situation regarding business enablement, the adoption of technology and the enforcement of change management strategies was not as dire, as a user maintained that “… Ja usually when there is a new version, we go to training yes…”. This same user indicated that consideration and care were given to users’ ability to use and work on the system when changes or enhancements had been applied. Practices of exclusion from training and testing feed into the two beliefs of the technology acceptance model, namely perceived usefulness and perceived ease of use (Rampersad et al., 2012). If the training of system users is neglected and users are only trained informally when systems are already in commission, and do not participate in comprehensive testing of solutions, their perception of the usefulness and ease of use of the system will be negative. This results in systems being neglected immediately after commission and users reverting to old systems about which they already have a positive perception and comprehensive knowledge of their use.
It is evident that IT strategies are in place as dictated by the various Acts. However, although the IT strategies highlight the IT roadmap, their implementation is not necessarily taking place. This can be seen from the various vacancies within the two IT departments. There are no people to implement the strategies from a tactical perspective and as a result the IT strategies are not implemented. This also leads to slow or non-adoptions of technologies. Municipalities are not in a position to foster sustainable relationships with their constituents and any communication that does occur nowadays takes place via social media platforms such as WhatsApp. Maitra and Rowley (2021) demonstrated the value of WhatsApp in poor rural areas. To create sustainable relationships with their constituents, the two municipalities need to find ways to create a proper IT platform as highlighted in the previous section and need to use this platform to communicate with their constituents. In conclusion, the identified organizational factors (structure, culture, resources and capabilities) negatively influence the adoption and successful implementation of new technologies.

Factors in the Environmental Context

This section focuses on factors within the environmental context with an impact on IT deployment and integration.

Political Landscape

This sub-theme considered the effect of the dynamics of the political landscape on the decisions of the municipality, especially where the deployment and integration of IT are concerned. There is evidence to suggest that in both cases there was unwarranted interference, either intended or not, regarding retirement and commission of certain technological solutions. Decisions were generally made by political heads without necessarily complying with the governance prescripts for commissioning or retiring solutions, with the administration team expected to implement the decisions. For example, one municipal employee mentioned that “…You know what happened is there were officials who were instructed to come here, install it and train the agents”. The need for separation of powers has been widely explored in South Africa. For example, Sengiwakhile (2020) found that undue influence impacts directly on the delivery of services. Municipal officials are largely subjected to high levels of stress and fear owing to this inappropriate influence. Consequently, the very plans outlined in the IDPs are at risk of not being implemented. This is something that municipalities in South Africa cannot afford, with the high rate of unemployment and the population largely living below the poverty line.

Economic Climate

The context in which this study was conducted was in two local municipalities in the North West province, which is largely rural. The technologies that communities wanted municipalities to implement included a) the short message service (SMS) as a means of mass communication to send key updates, as well as b) rolling out self-service portals at regional centers to assist communities that are far from municipal offices.

One community member stated that:

…at least warnings when the water is being put off or the electricity’s being put off. Not sitting, busy baking and losing, like yesterday and losing batches and batches of ingredients and losing hundreds of rands…So we should be warned. They’ve got everybody’s cell phone numbers, it should be sent via WhatsApp or per SMS to residents, account holders anyways.
What is clear from the findings is that adequate provision of basic services (water, sanitation, electricity, access to amenities) tended to be preferred rather than advanced technological requirements, even though there was an appreciation that technology can aid in seamless interaction (communication) with municipalities. It can thus be argued that economic, social, political, cultural and geographical elements impact directly on sound IT deployment and integration.

**Governance and Regulatory Considerations**

Local government constitutes the third sphere of government in the RSA, and is enshrined in the Constitution, which directs its functions and the allocation of resources. Municipalities are therefore bound and governed by certain statutory and regulatory prescripts. The local municipal officials in both cases, especially those in management echelons, were aware of and were comprehensively appraised on the prescripts (as they should be) and suggested that they were always striving to comply with them. The impact of the prescripts on the successful deployment and integration of IT was clearly understood. For example, the procurement of services and infrastructure for technology deployment and integration needs to adhere to the prescripts of the Municipal Finance Management Act of 2003. Similarly, the Municipal Systems Act of 2000 makes provision for each municipality to build resource capability internally so as to minimize reliance on external service providers.

Unfortunately there are reports that the environmental context does not contribute positively to service delivery (Jonck & Swanepoel, 2016). The political landscape is flawed by corruption and when senior officials enforce the implementation of new IT systems, questions should be asked (Adeleye et al., 2020). Service delivery is hampered since the constituents in the case of the two municipalities are poor and cannot afford to pay for technological services.

**Envisaged Technology Deployment and Rollouts**

Although most community members preferred face-to-face communication, they identified several deployments that they would like municipalities to roll out in and for their communities. These ranged from open free Wi-Fi to bulk messaging:

…personally because it’s a situation that you need immediately request it or immediately answer, they should maybe because we have communication at our fingertips, like WhatsApp. I think they can send a broadcast message to the whole [area] and say, ‘this is the problem in that area’. I think because we are in an era that has communication at their fingertips, it would perfect if we have a broadcast communication group, just for that.

“…they should be doing something about these systems, complaining enough to their superiors to do something about it. It’s totally unjoyful, to try and communicate with them at all, at this point. If there was some number, a website, once again, a website where you could log in, with proof that you’ve logged in and been to your account or that you’ve sent a direct message there to them.

On the same issue pertaining to envisaged IT deployments in municipalities, the same community member emphasized, over and above emails, a website and broadcast messaging capabilities as crucial.

Because email doesn’t go through, it just comes back and email addresses that they’ve given to us specially for account queries. I had the old ones, that was understandable, when they didn’t work anymore, but the new ones came back not delivered…If there’s a WhatsApp. Everybody’s using WhatsApp. If they’ve got a WhatsApp number, even if it’s just to put your complaints in.
they should have one for accounts, one for sewage and stuff, one for electrical and one for water. Just for basics, your basic needs you have. Refuse, sewerage, all those, they can put together.

Some community members had not thought about what technology they would prefer to be deployed for their communities:

We have not thought it through yet. It [information] should be available on their website… I have been trying to get into their website for quite some time where you should be able to with your password and your login username and password, should be able to access your own account.

It could be argued that social media is also regarded as a space in which the municipality should strategically engage:

If there’s a WhatsApp… everybody’s using WhatsApp. If they’ve got a WhatsApp number, even if it’s just to put your complaints in. they should have one for accounts, one for sewage and stuff, one for electrical and one for water. Just for basics, your basic needs you have. Refuse, sewerage, all those, they can put together.

One of the committee ward members suggested using email technology to alleviate travel constraints regarding the issue of correspondence with municipal stakeholders.

The municipality is still hand-delivering letters and memos to the villages’ chiefs… these villages are not always close to each other but are scattered… what could be better is if these correspondences are sent electronically to the chiefs and minimize the costs of travel and bring about efficiencies.

When thinking about the central issue, namely, municipalities fully benefiting from the adoption of technology in bringing about efficiencies in their service offerings, communities alluded to advancing skills development in the technology domains as a fundamental requirement:

Further, the municipality should consider IT skills’ training for ward committee members and provide them with laptops... this way they can communicate easily with the municipality structures, and they will in turn transfer these skills to their respective communities.

Suggestions and preferences such as chatgroups and broadcast messaging, including self-service portals across regional service centers, were common. Community members felt that the rollout of self-service portals would be beneficial to communities as they would even bring about efficiencies: “…Yes that [self-service portals] will work because it will even save my time… the problem is if they will be able to check those emails and respond on time...”. However, they cautioned that efficiencies would only be realized if the municipality officials also played their part. A community member said, “…yes, I think with a self-service portal, it will be easy that way…”. This person added that self-service portals "could also be used to validate billing as supplied by municipalities instead of just relying on statements as provided”.

In terms of broadcast messages, a community member mentioned that “…I think because we are in an era that has communication capabilities at their fingertips, it would be perfect if we have a broadcast communication group, just for that [communication]…”.

Another member stated the following:

…at least warnings when the water is being put off or the electricity’s being put off. Not sitting, busy baking and losing, like yesterday and losing batches and batches of ingredients and losing
hundreds of rands…So we should be warned. They’ve got everybody’s cell phone numbers, it should be sent via WhatsApp or per SMS to residents, account holders anyways.

In the case of a municipality in an urban setting, a ward committee member indicated that they were seen as the interface between the municipality and communities. This member made suggestions ranging from the use of email, laptops being provided to the community leaders and providing ward committee members with relevant skills. For community development purposes, they further suggested a computer center that members, particularly the youth, could use as the hub for communication and primarily research.

**Reported Service Delivery Challenges**

There are several challenges that municipalities could reflect upon and address to bring about efficiencies and improvements in their service offering. These are service delivery oriented and do not necessarily involve technology deployment and integration, but through assessment, suggestions can be made regarding how efficiencies could be realized with the aid of technology.

The vast number of challenges facing both Case 1 and Case 2 communities can be classified as follows:

**Data Integrity**

Ordinarily, ratepayers are charged and taxed for post-paid services, and it is a case of pay-as-you-consume for pre-paid customers. Strangely, communities mentioned that, although the conversion had been done from post-paid to pre-paid, they were still being charged as though they were post-paid customers. One community member said,

…like for instance with us, we’ve been on prepaid for more than three years. We have been charged for more than 3 years [post-paid] and we have been charged for electricity and we have been cut off due to electricity not being paid but we’ve got prepaid. We went there 2 days in a row, sitting there the whole day.

The same member indicated that this could partly have been a result of the municipality running the billing function on two different systems. Further to statement issues, another member stated that they occasionally had to validate and query what they were being billed against their perceived monthly consumption. Data quality issues also seem to be manifesting in the form of incorrect addresses or locations. A community member stated that each time an issue had to be addressed at their residence, the technicians seemed to be directed elsewhere and not to the address provided.

**Provision of Basic Services**

This key finding pertains to the delivery of basic services such as electricity, water, shelter and sanitation. The community of the urban local municipality cited the sudden interruption to services such as water and electricity for days without prior notice as one of their major challenges. With power outages, services such as cell phone reception were also compromised. For municipalities in rural settings, even though interruptions to services such as water, leaking of communal taps and electricity were reported, the response by the municipality was not consistent. Sometimes it was immediate and satisfactory and at times delayed, but in most cases, there was no acknowledgement by the municipality whatsoever.
Communication

It could be argued that due to communication challenges, there is a high reliance on ward councilors and ward committee members and walk-ins are preferred to any other interface methods at the communities’ disposal. Complaints were:

- It doesn’t help us to call municipality, because usually there is no reply. Should you send an email, same thing, no reply at all. So, we got 2 very nice councilors and some helpers that we report it to.

- We get, either the recording or you get on hold. You cannot use all your airtime and if there is load shedding for instance, power lines are off, and so Telkom lines. So, we can’t get landlines to approach the municipality.

Concerning communication, it was stated, “…because sometimes when you call, they will take you to this department, they will hang up so it’s better to go there personally…”.

One community member said that there had been no delivery of statements for over a year, and although the municipality claimed that delivery of statements was via email, statements were not being received.

Quality of Drinking Water

The community of Case 1 is largely dependent on communal boreholes and the municipality endeavors to have water accessible within a 200-meter radius of each household. Regarding this issue, there were no reports or concerns registered on the quality, except for technical issues relating to generation and leakages. In Case 2, the quality of water being delivered to residents was said to be concerning, leading to residents in some cases resorting to privately sourcing their drinking water. One community member mentioned that “…I’ve got permanently, plastic bottles, I’ve got 50 liters. This is my drinking water. You cannot drink tap water [from the municipality] …”.

Accessibility of Municipal Offices

Communities cited difficulties in accessing the municipal offices as there are no distributed regional centers. This was followed by limited services available where the regional offices operate. Communication from the municipality was in most cases inadequate – communities preferred direct, regular messages about matters such as interruption of services or account statements.

Table 2 presents a summary of findings in relation to the factors in the technological, organizational and environmental contexts. Based on the applied TOE framework and with the aid of the literature, the elements in all three contexts were predefined and had the potential to either enable or inhibit efficient deployment and integration of IT in municipalities.

Table 2
Summary of Findings

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<th>Contexts</th>
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<td>Technological</td>
<td>IT landscape</td>
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<td>Security and privacy</td>
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Varying results emerged from the preceding sections of this paper, obtained from staff at both municipalities and their respective communities. However, this is an overall view and does not go beyond drawing a comparison between the two municipalities. Although both municipalities are local municipalities and hence serve communities directly, one serves predominantly urban areas and the other rural areas.

A summative view of the findings is as follows:

- IT landscapes for both local municipalities are found to be incomplete, and thus do not assist IT departments with troubleshooting or to identify technologies that are sound and enable efficient delivery of services.
- The security aspect is reasonably reassuring. Overall, controls seem to be in place to guard the IT solutions against unauthorized access. This achievement can however easily be eroded if local municipalities do not set password expiry dates across their applications.
- In terms of change management, processes governing the administration of change and enhancements to the systems are not well defined and are largely left to the service providers to execute as they see fit.
- Based on the lack of up to date as-is IT landscapes and disparate solutions, the solutions’ compatibility is suspect and thus effective deployment and integration cannot be ensured.
- Both municipalities have developed a five-year view in terms of their strategic objectives in the form of IDPs as required by law. The plans go further to outline how local municipalities intend to use technology in achieving their goals.
- Although local municipalities have approved organizational structures, there are many vacancies, which compromises the efforts of having an efficient IT organization.
- In developing IDPs, it is evident that there are proper consultations with the communities in which they exist.
- In terms of the adoption of technologies, end users are not always taken through the journey of systems development and do not always comprehend how the solutions should work.
• There are indications that political principals often depart from the processes and controls that should be in place for selecting and commissioning new solutions. This occurs while their role is that of oversight and not that of participating in operations.
• There is an urgent need to educate communities in terms of their rightful services.

Given Figure 3 and the results in Table 2, the current lack of service delivery in the two cases can be attributed to the moderate or unsatisfactory integration and deployment of 10 of the 12 (83\%) factors. An improvement in the integration and deployment of any of the 10 factors is likely to have a positive impact on service delivery.

CONCLUSION
In conclusion, existing literature envisages a South African government administration where local municipalities assume responsibility for quickly identifying essential needs of citizens in their area (Makhaya & Roberts, 2013). They are, therefore, seen as the delivery arm of government. Using the constructs of the applied TOE framework, factors enabling and hindering successful IT deployment and integration into the information systems of municipalities were explored for both case studies. The article presents a mixed set of results, with some aspects being assessed as either extremely bad or occasionally very good, but most of the feedback pointed to encouraging patterns which could be turned around with the necessary interventions. The findings suggests that effective deployment and integration of IT does not depend solely on technological factors, but that there are also influences emanating from factors that are organizational and environmental, and external to municipalities. This paper highlights that IT at the level of local government, that is, in municipalities, is an essential tool that should be exploited through sound deployment and integration to achieve efficient delivery of services.

CONTRIBUTIONS, LIMITATIONS AND FUTURE RESEARCH
This study has made theoretical and practical contributions to mainstream Information Systems research as highlighted in the following points:
• TOE is a framework that is regularly used in research related to Information Systems as a way to understand the complex interactions between technology, the organization itself and the external environment. This article highlights how municipalities in South Africa can utilize this framework to deploy and integrate IT to improve service delivery.
• In addition to using the applied TOE framework, a framework has been designed applicable specifically for local municipalities. This framework highlights 12 attributes that can be used to improve service delivery.
• This study explored a topic of particular interest to and importance for South African municipalities. The environment in which the research was done exhibits unique dynamics as it constitutes municipalities in urban and rural settings. The views, opinions and understanding of the key role players (IT staff, end users in the employ of the municipality and citizens) are influenced by cultural, economic, environmental and political dynamics to a large degree. For example, the use and importance of technology to somebody who does not have clean running water and electricity will differ from a person who has easy access to basic commodities and is paying taxes to the municipalities.
No study is without limitations. The following limitations were identified: (i) Data was collected from municipalities only in the North West province of South Africa. Input from participants and observations were obtained relating to only two cases. It is acknowledged that results may differ if the study were extended to other provinces, and the generalizability of the findings is therefore limited. (ii) The positioning of IT as a strategic partner requires the views, opinions and insights of a broader range of stakeholders. Only a limited number of stakeholders were involved in the interviews, thus limiting the opinions and insights. (iii) With a cross-sectional approach, the data collected only provides evidence at a single point in time. Although this does not compromise the findings in any way, a different set of findings would have emerged over an extended period.

Suggestions for future research are as follows: A similar study can be conducted in a different context, expanding the number of cases to other provinces of the Republic of South Africa. Another study can be considered with the focus on different stakeholders, e.g., political leadership (mayors and municipal councils), including provincial and national government perspectives. As IT is a constantly evolving phenomenon, a future study can be considered using a longitudinal design. This could be useful to assess whether the views, opinions and understanding of participants remain the same over time. It would also aid in determining whether practices in deploying and integrating solutions are influenced by this evolution, which factors are involved and whether that influence is for the better or worse regarding IT’s position as a catalyst of efficiencies across various economic sectors.

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