

ACCOUNTING AND SMART CITIES: NEW EVIDENCE FOR GOVERNMENTALITY AND POLITICS

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Abstract

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The concept of a smart city has attracted the attention of many scholars and policymakers in many countries worldwide. The role of accounting as a tool of governance in smart city politics, however, has so far been largely overlooked, especially in less developed countries (LDCs). This paper sets off to fill this research gap and hitherto unexplored linkages between accounting and smart cities. Drawing on the concept of governmentality, the authors conducted a case study based on document analysis, meetings observation, and 42 semi-structured interviews at a branch of a hybrid electricity company owned by New Cairo City in Egypt, during 2018. Findings show that the case company has implemented smart distribution networks of electricity in which new management accounting technology (enterprise resource planning (ERP) system) is used to trace costs, revenues, client complaints and feedback in a timely manner. The new network (of infrastructure and technologies) has represented timely accounting information as a major political power to influence accurate governance decision-making, such as smart electricity pricing and control, and to challenge governance decisions that are not sound. This paper is one of the first studies to explore the socio-political dynamics of accounting in smart city governance in the context of LDCs.

Keywords: Accounting, Smart Cities, Governmentality, Pricing Politics, ERP, New Cairo

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1. INTRODUCTION

The purpose of this study is to explore the ways in which the smart cities agenda has forced the electricity company to reorient its accounting tools. It answers the research question: how smart electricity costs and pricing policies imposed by political decision-makers govern a smart city performance. The question, what is smart city governance, and the purposes for which cities become smart, such as a smart economy, smart mobility, smart environment and smart living, have

attracted the attention of a multitude of researchers in recent years (Broccardo, Culasso, & Mauro, 2019; Hollands, 2015). Factors that explain the success and failure of smart cities goals and projects, such as performance measurement (Argento, Grossi, Jääskeläinen, Servalli, & Suomala, 2019; Brorström, Argento, Grossi, Thomasson, & Almqvist, 2018), public governance (Cowley, Joss, & Dayot, 2018), public accountability (Mizrahi & Minchuk, 2019) and sustainability (Niemann & Hoppe, 2018), are publicly known. Critical case study researches have provided different analytical ways of thinking and acting

through which smart city governance might remain utopian in practice as a new way of governmentality and politics (Engelbert, 2019; Wang, 2017). Although the word 'politics' is a multifaceted word, it can be defined here as a set of activities, projects and procedures related to city governance. It involves making decisions by which the city government can govern the performance of organisations and people, i.e., the organised control of the city community (Grossi, Meijer, & Sargiacomo, 2020; Argento et al., 2019).

The ongoing debate has emerged on the role that accounting information plays in smart city governance (Bunders & Varró, 2019). Much of the smart city governance research (Kitchin, Coletta, & McArdle, 2017; Grossi & Pianezzi, 2017) reveal the need to pay further attention to the role of accounting information in connecting or disconnecting macro-smart governance politics and micro-organisational change practices, i.e., policies, especially in public services owned by the city (Argento et al., 2019; Grossi et al., 2020). Previous research has shown that accounting has the potential to implement various neoliberal initiatives, which explains the proliferation of smart city concepts/governance in emerging economies (Hopper, 2017; Soobaroyen, Tsamenyi, & Sapra, 2017; Alawattage & Wickramasinghe, 2008). The ways in which accounting has been re-oriented in such economic and political contexts shape a central issue in problematising the role of accounting in smart city governance.

In this setting, macro-micro accounting connections have been explored in emerging economies, where economic organisations have been largely rebuilt through postcolonial and neocolonial politics of nationalisation and various structural reforms. Accounting reforms in these organisations, as discussed in current LDCs studies, have been explained based on exogenous political dynamics (Wickramasinghe, Hopper, & Rathnasiri, 2004; Uddin & Hopper, 2001; Hoque & Hopper, 1994). These seminal studies explained how state politics of various structural developments caused inefficiency of accounting to produce the ideal-type techno-economic and rational-bureaucratic function anticipated of it. However, despite their significant contributions, these studies focused only on how state politics affect organisational accounting practices and policies, not on accounting's instrumentality in recognising the city's socio-political ambitions and projects of smart governance. Our paper focuses on the latter - the role of accounting in smart city governance. We argue that cities seeking for smart governance participate in urban development projects re-orienting organisational practices and policies towards desired ambitions and politics, by implementing new technologies of government management and accounting and collaborating with major private sector actors (Grossi et al., 2020; Argento et al., 2019; Mizrahi & Minchuk, 2019).

Our paper uses Foucault's (2008) governmentality approach to explore accounting connections between micro-organisational developments and macro-ideological changes in smart city governance. Drawing on governmentality,

the emergence of modern management and management accounting technologies underpinning smart city governance can be the outcomes of new ways of thinking and acting, which also enable the construction of a new neoliberal mode of governing people/society (Hoskin and Macve (2016) and Armstrong (2015) conducted seminal studies focused on the rise of calculability). Using a case study approach, data came from four-month intensive fieldwork in the case company's management accounting practices, and an extensive review of secondary materials on New Cairo Council reforms characterising smart city governance politics. Data analysis focused on how accounting assumes political meanings when the city government (council) has functioned it as a smart governance technology, thus embedding the aspirations of socio-political transformations witnessed in New Cairo in the past few years.

This paper contributes to smart city governance research, especially from an accounting perspective in a developing economy setting as in Egypt. Theoretical contributions highlight the emergence of accounting as a smart governance practice in companies owned by public sector organisations. Attending to smart city governance and striving to reveal the case company's response to the request of the New Cairo Council, through the implementation of smart distribution networks (hereafter SDNs) and modern management and accounting technologies that monitor daily distribution cost movements, serve as extraordinary contributions to the current literature of smart city governance and critical accounting. The paper also highlights that it is a political response to the needs of governance and power, i.e., management accounting has become subject to the politics of the 'city' government, rather than state politics as discussed in current LDCs studies.

The rest of this paper is structured as follows. Section 2 provides a literature review. Section 3 explains the theory and Section 4 is about research methods. Section 5 analyses the empirical findings and Section 6 discusses the key findings. The paper ends with a conclusion in Section 7.

2. LITERATURE REVIEW

The smart city provides a better empirical space to explain accounting connections with neoliberal governmentality and politics. While corporations and other accounting entities (non-governmental organisations and state-owned enterprises) provide ordinary empirical spaces for exploring this connection, smart cities provide much better empirical space for this connection. Because there is very little accounting literature on smart cities (Argento et al., 2019; Brorström et al., 2018), we locate our literature and theory sections primarily on neoliberal politics and governmentality literature in accounting (Chiapello, 2017; Bigoni & Funnell, 2015). We bring in smart city literature from other fields to provide clarity on the concept of smart city and clarify that smart city governance is a new neoliberal ideology of thinking and acting that can be explained by the governmentality's analytical lenses.

2.1. Smart city governance and neoliberalism

Smart city governance could be perceived as a neoliberal ideology that goes beyond the traditional characteristics and politics of the city. Meijer and Bolívar (2016), for example, suggest three characteristics of smart governance politics, i.e., cities with smart technologies, smart people and smart collaborations. Consistent with this, Grossi and Pianezzi (2017) claim that the smart city paradigm is based on a neoliberal ideology that goes beyond integrating technologies, human factors, and collaborative networks. Cities become smart by implementing the neoliberal urban market restructuring and using different governance politics, such as competitive tendering, privatisation and public-private partnerships (Tomor, Meijer, Michels, & Geertman, 2019).

Smart governance then controls collaboration between people and organisations in order to implement a specific policy and/or reach a specific goal (Tomor et al., 2019). Governance is the work of governing, i.e., using power to lead people and organisations towards a specific goal. Power is the ability to use resources to make people and organisations think and act in ways they cannot do otherwise (Raco & Imrie, 2000). Organisations involved in collaborative (smart) governance are often inter-dependent. Governing collaboration, therefore, emphasises the ways in which specific entities involved in smart governance are governmentalised (Argento et al., 2019; Grossi et al., 2020).

Smart governance literature focusses on inter-organisational leadership and management strategies which generate greater competitive advantages for the entire collaborative network than one organisation can achieve alone (Grossi & Pianezzi, 2017; Tomor et al., 2019). The gap in this literature, however, is about intra-organisational strategies and processes that each organisation implements to improve its performance and enhance the competitive advantage of other organisations that are members of the inter-organisational collaborative network (Argento et al., 2019; Kitchin et al., 2017). Filling this gap begs for analysing intra- and inter-organisational mechanisms of governmentality; i.e., “technologies of government” that governments use to governmentalise collaborations (Foucault, 2008). In a Foucauldian sense, in smart governance politics, city governments use collaborative networks to ‘govern at distance’ (Argento et al., 2019). They use programmes, calculations, techniques, apparatuses, documents and procedures to implement specific neoliberal goals and politics of smart governance (Tomor et al., 2019; Raco & Imrie, 2000).

For this purpose, city governments use calculative resources and data to govern their networked organisations (Bunders & Varró, 2019). Calculative resources, such as costs, budgets and resilience mechanisms, play an instrumental accounting role in shaping the governance structures of smart city networks (Almquist, Grossi, van Helden, & Reichard, 2013). The network includes different organisations (public, private and not-for-profit) that the government uses to achieve its socio-political governance goals and politics (Tomor et al., 2019). For example, Brorström et al.

(2018) present a study of how a public-private partnership organisation implemented an integrated performance management system to improve cost competitiveness and organisational profitability. The case study of Brorström et al. (2018) goes a bit further to show if and how new key performance indicators became a calculative tool for other organisations operating in the same market to influence public accountability policies set by the city government.

2.2. Accounting’s rhetoric role in smart governance

Within the neo-liberalisation of smart city governance, accounting has so far been perceived as being influenced rather than the influencer (Argento et al., 2019; Brorström et al., 2018). This perspective has examined how the politico-economic and cultural conditions surrounding a city’s structural adjustments recognise accounting as an ‘economically ineffective’ politico-cultural ideology rather than calculative processes for rationalising operational decisions and controls. Such research is polarised and dominated by the analytical duality between the politico-cultural realities of management accounting within natural sites and an ‘ideal-type’ image (Weber, 1968), emanated from western experiences of management accounting (Skærbæk & Melander, 2004; Ogden, 1997). Hoque and Hopper (1994), for example, explore how the ‘real’ implementation of accounting and accountability systems (naturally textbook models of resource allocation and hierarchical accountability), had been reduced to ritualistic and institutionalised positions, with the acquisition of exogenous legitimacy being their main objective. Such policies, coupled with political interventions, provided formal organisational control systems not adequate for managers involved in decision-making.

Smart structural adjustments are thus perceived as a specific political episode that penetrated cultural-politics in formal management accounting and control systems. As a tangible mode of post-colonial neoliberalism, privatisation brought a peculiar combination of political and managerial rationalities, on which management accounting researchers concentrated. For example, Uddin and Hopper (2001) conducted a case study of a privatised manufacturing company in Bangladesh and revealed how the political interventions caused accounting control issues at the phase of production. Taking Burawoy’s (1979, 1985) “manufacturing consent” and “politics of production” forward, Uddin and Hopper (2001) argued that control regimes shifted from colonial to market despotism through (smart) structural readjustments that permeated state politics in the politics of production. The role of management accounting here ensures that these politics are reinstated and coerced. Consistent with this, the case study of a Sri Lankan Telecom company conducted by Wickramasinghe et al. (2004) revealed that post-colonial privatisation attempts were not only for Japanese capital but also for work ethics and culture. However, such restructuring attempts were limited due to the regulatory pressures imposed by the political parties and related trade unions. Furthermore, studies in the South Asia context, such as those of a Sri Lankan plantation

(Alawattage & Wickramasinghe, 2008), and studies in the African context, such as those from Ghana, Nigeria and South Africa (Soobaroyen et al., 2017), also revealed similar political narrative, with further analytical involvements of ethnic politics, civil society, bureaucratic budgets, individualisation, etc.

Furthermore, the ineffectiveness of the regulatory and control functions of management accounting, as considered by the political class, was enhanced by extending the political narrative beyond South Asia and Africa. For instance, the mediation of tensions in managerial accounting domains, especially between the local demand for public welfare and new public management's profit-driven neoliberal modes, by (smart) structural adjustments, was highlighted by Sharma and Lawrence (2005) in studying Fiji's Public Rental Board. Also, these tensions were supported from a different perspective, in Sharma and Lawrence's (2015) study of Fijian Telecom. Moreover, these researchers employed Habermas's theory of "social development" to illustrate how the political elites' achievement of politico-economic benefits, including the emergence of varied types of corruption, patrimonialism, and crony capitalism, is assisted by translating privatisation into a suitable managerial and political rhetoric of greater effectiveness, efficiency and consumer awareness (Hopper, 2017).

Despite relying on various theoretical and empirical insights, management accounting research on smart structural developments within neoliberal urban cities promoted the following overarching observations:

1. In typical city development scenarios, and to the extent that it is a market-based performance reporting system, management accounting was the institutional requirement for the effective implementation of the neoliberal market logic. The World Bank confirmed this by investing in the infrastructure development of management accounting, including management accounting education and standardising management accounting practices. With these expectations for modernising management accounting routines, various 'informing technologies' were installed as a prerequisite for obtaining loans (Neu, Gomez, Graham, & Heincke, 2006).

2. Nevertheless, rather than bringing broader city development results, this restructuring brought private accounting and control with a widespread deterioration of working conditions and public accountability. However, the World Bank hegemony on structural developments operated discursively, legitimising smart city developments by measuring narrow profit-based performance, although the accuracy of management accounting information to support such claims proved problematic (Jayasinghe & Uddin, 2019).

By describing how the political governance of smart and neoliberal cities is engendered by the connection between management accounting and other higher order political processes and principles, this paper extends the insights expressed above. In response to global trends towards urbanisation and the current lack of accounting studies in smart cities, our research explores how changes in management accounting are fundamental in governmentalising the political city's changing ideologies of urban developments.

3. THEORY OVERVIEW

This paper adopts a Foucauldian governmentality concept to provide a critical alternative approach to explain how smart cities reflect power-knowledge relations and are featured as new neoliberal politics for the (re)production of techno-centric rhetoric where urban city developments are governed. Neoliberal governmentality is perceived as an appropriate analytical tool for exploring power-knowledge relations in smart cities (Wang, 2017). It has been taken up by different perspectives, for example, urban policy (Raco & Imrie, 2000), the logic of urban control (Kitchin et al., 2017), public administration (Rose & Miller, 2008), and accounting (Argento et al., 2019; Brorström et al., 2018).

These accounting and other researchers echoed, and hinted upon, changes on the relations of calculative practices and accounting metrics - broadly governmentality - and neoliberal modes of development. They provided a variety of research questions, fieldwork practices and meaningful contributions by recognising macro-political environments and micro-organisational structures as explanatory variables, and by identifying the interests served by calculative practices and accounting metrics. This expanded scope of critical analyses opens up a range of models beyond multi-factor regression to social network analysis, discourse analysis, and actor-network analysis such as neoliberal governmentality analysis (Hoskin & Macve, 2016). These analytical expansions revealed that calculative practices and accounting metrics are positioned in many neoliberal urban development projects such as in 'smart city' networks, cloud computing, social media, electronic commerce, artificial intelligence and machine learning, with a focus on financial services (Bigoni & Funnell, 2015).

However, governmentality has been subject to diverse interpretations. Some have broken the concept down into 'govern' and 'mentality', to indicate the process by which citizen mentalities have been governed through powerful techniques that guide them to act in conformity with societal norms. These norms are (re)produced, and sometimes challenged, by the subjects of this system (Raco & Imrie, 2000). Others argue that this concept embraces 'government' and the suffix 'ality', in which 'government/ality' is not about how to govern people's mentalities, but about the processes of (re)constructing specific rationality in order to govern specific behaviours (Kitchin et al., 2017). For example, as in Section 5, the implementation of a smart city governance agenda has resulted in the reconstruction of old 'dispersed' electricity distribution grids into smart 'integrated' distribution networks. These advanced distribution networks were a strategic weapon to reconstruct organisational management accounting behaviours in the case company.

Here, governmentality connects the *macro* level of the subjection of the whole population in the domain of the smart city (i.e., politics) with the *micro* level of individual subjection (i.e., policies), which Foucault studied at earlier work in such governance settings as asylums, clinics, and prisons (McKinlay & Pezet, 2018; Armstrong, 2015). Governmentality

provides a genealogy of disciplinary power at the macro and micro levels of smart cities (Kitchin et al., 2017). Foucault (2008) argues that disciplinary power is viewed as a mode of human subjectivity, and hence, is related to the emergence and development of human and social sciences from the 16th century onwards. It is seen as an aid to smart cities and related political apparatuses in governing new electricity distribution networks at distinct, but interrelated levels (see Section 5).

Smart cities are marked the changing neoliberal form of government power, public governance and accountability, to the extent that Wang (2017) considered governmentality to be a guide to the genealogy of the 'modern city', arguing that this was Foucault's contribution to state theory. However, as Rose and Miller (2008) argue, governmentality is not a theory of the state or even a theory of power. It is more a 'methodology' by which it is possible to analyse governing a smart city, where political power relations, public governance and accountability emerge. The smart city is merely a site or governance setting for the exercise of these forms of neoliberalism. Governmentality offers a means by which to understand the dynamics of smart city governance at its various levels and forms. As explained below, it is more concerned with how power is exercised and how it functions: its rationales, processes, strategies, and techniques (Klauser, Paasche, & Söderström, 2014).

The smart city governance study of Klauser et al. (2014) argues that Foucault's governmentality explains the city government power, and breaks it down, in terms of methods and techniques used in different governance contexts to act on the behaviour of individuals taken separately or in a group. It is to shape, direct, modify their way of conducting themselves, to enforce their interaction ends or fit into overall strategies. These are being multiple consequently, in their form and their place of exercise; diverse, too, in the procedures and techniques they bring into play. Consistent with this, the social impact bonds study of Cooper, Graham, & Himick (2016) explicated that power-knowledge relations characterise the way men govern each other; and their analysis shows how, through certain forms of government, of madmen, sick people, criminals, and so on, the mad, the sick, the delinquent subject is objectified. So, an analysis of this kind implies not that the abuse of this or that power has created madmen, sick people, or criminals, there was nothing, but that the various and special forms of government of individuals were determinant in various objectivation modes for the subject. Here, in our case company, these forms and modes of governmentality are determinant in the New Cairo city council technologies of ERP-based distribution management, cost movement reports and new pricing structures (see Section 5).

Governmentality, therefore, challenges traditional juridical institutional analyses of sovereignty and power, which tend to limit analysis to the exercise of governing power through state institutions and public laws; instead, governmentality provides a more dynamic approach to power (Rose & Miller, 2008). It adopts a broader neoliberalism conception of government that is not limited to the political structure of the smart city but extends to the politics/activities that govern

human behaviour within and without the city's political institutions (Wang, 2017). Drawing on Foucault (2008), Wang (2017) argues that smart city governance is a mode of action upon others' actions at both individual and collective levels in order to achieve objectives within specific institutional settings. It is a 'practice' of everyday life by various kinds of people; it is a mode of power that takes many different forms, of which sovereign juridical power is just one component. Hence, 'government' takes multiple and different forms that range from governing oneself to governing family or interpersonal relations, to the whole society or population coming under the political domain of the neoliberal smart city (Klauser et al., 2014). According to Klauser et al. (2014), these governmentality forms of existing neoliberalism are distinct but interrelated in smart cities.

4. DATA AND METHODS

4.1. The site and access

The case company works in the field of electricity distribution in Egypt and is known here as MEEDCO for confidentiality reasons. MEEDCO is a key electricity and energy (E&E) distribution company in Egypt with 13 branches, 56% market share, 1.7 billion Egyptian pounds (approx. US\$ 10 million) annual profit, and 8718 employees (MEEDCO, 2019). The government-owned Egyptian Electricity Holding Company (EEHC) holds 100% shares of MEEDCO. We chose the MEEDCO branch in New Cairo City (subject to ownership and supervision by the city government) for two reasons. First, it exemplifies the transition of New Cairo city from a traditional military-dominated governance regime to a neoliberal framework that implements a smart city approach. Second, MEEDCO offered full access to its multifaceted and rich data. Personal connections with senior management helped to build trustworthy relationships with interviewees and allowed to observe managerial meetings as well as accounting processes, programs and interactions between accounting technologies and users of accounting information in organisational decision making. We achieved triangulation by using different sources to collect data not only to establish validity and reliability but also to study the political power of accounting for New Cairo's smart governance in the natural situ (Gioia, Corley, & Hamilton, 2013).

4.2. Data collection

We collected data at two different but interrelated levels. The first is the macro-political level at which city politicians and public officials make and implement smart city decisions and policies. The second level is the micro organisational level, with a focus on restructuring organisational structures and processes, i.e., governance and accountability technologies, through which MEEDCO's leadership is changing organisational practices to work smartly when designing smart distribution networks and supplying them to end-users.

Macro-political data came from archival analysis of published materials (reports, periodicals, local newspapers, journal articles and websites). This, in turn, helped to design a semi-structured

interview guide we used for interviews at MEEDCO. Micro data came from interviews with different organisational actors (accountants, executive managers and IT people) and direct observations of their daily activities. We used various research methods to validate internal data from interviews, meeting observations and document analysis. The value of using multiple sources ensures an in-depth understanding of the phenomenon involved and contributes to a strong embodiment of applied theoretical structures (Yin, 2013). In addition, Easterby-Smith, Thorpe, and Lowe (1991) claim that validity is decided by whether the researcher obtained full access to the knowledge and feeling of the interviewees. The validity, then reliability, relates to the amount that the researcher carefully describes the peculiarities of the phenomenon aimed at the description or theory (McKinnon, 1988).

Micro-level data collection began on June 1, 2018, and ended on September 30, 2018. The first author made nine visits to the MEEDCO Head Office in New Cairo city and conducted four to five interviews during each visit in different operating departments. The finance manager accompanied him during his first two visits to the company and introduced him to other key managers. Overall, 42 formal interviews were conducted with 29 different people: sixteen accounting and finance managers and personnel, seven operational managers, five IT staff and the chief executive officer. Interviews were tape-recorded whenever possible and all recordings were transcribed. Interviews were conducted in Arabic or English as per respondents' preferences. In addition, joint meetings were conducted with the finance manager and the marketing manager, as well as with the head of the cost department, the IT manager and the distribution manager.

MEEDCO provided the first author with an office facility next to the finance manager's office, which he used during data collection. This allowed more data to be collected from different decision-makers and key managers during lunch breaks. In addition, he attended eight formal managerial meetings as "participant observations" – seven at the corporate level, and one departmental (Yin, 2013). To ensure confidentiality, meetings were not tape-recorded. However, he was allowed to take notes during meetings and discuss them with the meeting participants afterwards. In a Yinian sense, our meeting notes improved our understanding of how managers and corporate leaders are deploying governance and accountability technologies in New Cairo to manage a smart distribution network project competitively.

4.3. Data coding

We coded and analysed data manually. A manual approach was chosen because language expressions can easily refer to different socio-political and cultural meanings in the New Cairo context of smart governance. As a result, data analysis required reading and re-reading the interview transcripts and field diary notes while reflecting on secondary materials. A software-based coding typically removes human elements from analyses (Gioia et al., 2013). During the first stage, we read the transcripts

while listening to their audio recordings for an overview and to get a 'feel' of the data.

In the second stage, transcripts were re-read and coded into specific categories that emerged from the interaction between data and theory (cost movement reports, new pricing politics, ERP-based accounting technologies that triggered city electricity changes) and socio-political episodes (data on New Cairo's neoliberal transformations accompanied by industrial and technological modernisations). Attention focused primarily on identifying specific data instances that reveal 1) the current city regime of cost and cost management; 2) the previous regimes and how organisational actors make comparisons between them; and 3) specific city urban developments that triggered changes from previous regimes.

The third stage of coding was theoretical. Drawing on governmentality, our analysis was given to instances of coded data that reveal 1) accounting connections between extra- and intra-organisational governing for pricing processes; and 2) urban policies to control the cost movements of the New Cairo smart electricity project. This consistently ensured a combination of literature-based interpretations and empirical data during our analysis, writing, and rewriting (McKinnon, 1988). Throughout our analysis, governmentality was used as the most systematic way in which we analysed how modern management and management accounting technologies have been implicated in a specific smart city organisation as new neoliberal ways of thinking and acting, and their power-knowledge dynamics in governing urban collaborations at the extra- and intra-organisational levels of the city. This is consistent with the governmentality analysis of Brorström et al. (2018) as a wider network of actors, organisations and systems beyond public-sector organisations and public-sector decision-makers. As Almqvist et al. (2013, p. 479) argue, governmentality can be presented as "a concept of structures, rules, procedures and mechanisms for the proper steering and controlling of corporations" (Argento et al., 2019), as described below in our case analysis.

5. ANALYSIS

This section is structured into two sub-sections. The first addresses how smart electricity delivery contributed to install smart governance in New Cairo city. The second sub-section deals with the ways in which modern management and accounting technologies have been implicated in the process of setting-up smart city governance. Management accounting's role here involves implementing advanced ERP technologies (which serve as a managerial and accounting platform for SDNs), cost movement reporting and pricing study production.

5.1. The emergence of smart governance in New Cairo

Smart governance can be perceived as a neoliberal way of thinking and acting in New Cairo city. After January 25, 2011, socio-political revolution, with the old power grid and rapidly growing demand for electricity, Egypt needed innovative ways to generate

electricity and to manage consumption patterns. This created new challenges and opportunities to offer smarter ways to manage electricity, from the utility, all the way down to the individual consumers. The World Bank's urban reforms went through three distinct but interrelated phases of electricity reforms - privatisation, modernisation, and budgetary reforms. Privatisation aimed at selling public sector organisations (or part of them) to private investors. Modernisation aimed at implementing new policy change reforms in public organisations to improve their performance, governance and accountability. Budgetary reforms governmentalised resilience policies to cut costs of public service expenditures.

These global urban reforms were a starting point for transforming various economic sectors and related organisations into the logic of smart city governance. The implementation of these urban reforms in Egypt meant that state-owned enterprises (SOEs) had to start governmentalising new practices that would allow them to operate smart economically, technologically and with increasing citizen participation. MEEDCO Deputy Director explained:

"These structural reforms of New Cairo city became the building blocks of our smart distribution networks (SDNs)."

The Director of the New Cairo City Council provided an additional explanation:

"With the support of New Cairo's development policies, the Ministry of Electricity and Energy (MOEE) and related public companies (such as MEEDCO) announced their desire to remain at the forefront of future smart cities."

In response, the Egyptian government decided to implement modern managerial and accounting reforms in SOEs, rather than privatise them. The City Council's Director added:

"In March 2012, Prime Minister Sherif Ismail announced that the government would stop efforts to (re)privatise SOEs that need to be reformed in the logic of smart governance instead..."

The socio-political logic of installing smart governance in SOEs is to improve the delivery of public services and the welfare of the city's electricity distribution networks. The Deputy Director of MEEDCO stated:

"Prime Minister's decision to transform SOEs into smart governance took place in MEEDCO during the same month. The social, political and organisational objectives of practising smart city governance were to improve the delivery of public services and the welfare of the city's electricity distribution networks. More than half of New Cairo's citizens have now access to smart electricity from our new distribution networks..."

Smart electricity delivery helped to establish smart governance in New Cairo by installing smart distribution networks (SDNs) that are publicly recognised as the future infrastructure for safe and sustainable electricity. Since early 2013, SDNs have become a new way of thinking and acting to transform New Cairo electricity into a smart and sustainable system of neoliberalism and governmentality. By the end of 2017, SDNs have been reconstructed from passive to active technologies of government, especially with the

increasing penetration of SDNs applications such as the applications of distributed supply sources (DSS), electric vehicles (EVs), advanced metering/monitoring infrastructure (AMI) and smart appliances (SA). A Senior Manager at MEEDCO states:

"Compared to the city's old distribution networks, New Cairo smart distribution networks (SDNs) is efficient and optimised system wide, highly reliable and robust, and capable of effectively managing highly penetrated electric vehicles (EVs), distributed supply sources (DSS), and other controllable loads... Responding to the city council demand, in order to govern the city's SDNs implementation, the senior management in MEEDCO uses active distribution management practices, based on smart distribution applications, hybrid control logics and cost minimisation processes."

The city council's socio-political objective of the MEEDCO's SDNs implementation is to act as a unique state-owned company in the city's competitive electricity distribution market. The Deputy Director said:

"Although MEEDCO owns about 56% of the city's electricity distribution market, it still faces strong competition with other distribution companies (public and private). The city council's political aim of the MEEDCO's SDNs implementation is to operate as a unique (state-owned) company compared to others. As the largest distribution company in the city, MEEDCO buys bulk power produced by New Cairo power plants and re-sells bulk power to other distribution companies."

In response to the smart governance initiative, an exclusive contract has been signed with MEEDCO to supply 250,000 smart electric metres throughout New Cairo. The social and political goal of the city council behind that is to install two million smart metres over the next five years as part of the city's urban development strategy to eliminate false readings, power thefts and distribution costs. In the Daily News Egypt (Farag, 2017), the Deputy Director commented on MEEDCO's choice:

"...MEEDCO was chosen as the only distribution company with a unique central governance unit, which connects the city's smart electric metres at a distance through reciprocal signals. The MEEDCO's central governance unit is a Supervisory Control and Data Acquisition Unit (SCDAU), which controls the flow of electricity distribution across New Cairo city. SCDAU is correlated with geographically distributed control sub-units in a city. These sub-units gather data from different distribution stations, transformers, lines and electric metres, and then report the data back to SCDAU in no more than four seconds through advanced SDNs technologies."

Advanced SDNs technologies not only provide the MEEDCO's central governance unit and smart electric meters but also cover various other smart governance issues. These are addressed below:

1. *Maximise the use of DSS in SDNs*: To economically merge DSS into SDNs, the optimal distribution and scaling of the DSS and energy storage system (ESS) were counted through a genetic algorithm, and the outcomes reflected that utilising DSS and ESSs economically promoted the energy-not-supplied index of the SDNs (a Senior Manager).

2. *Effective voltage control through DSS*: DSS have traditionally been managed by distribution

companies in a unity power factor control mode. But it disregards that some DSS also can provide reactive power support. With the increasing demand for reactive power support, new DSS were needed to provide this support (Deputy Director).

3. *Effective management of plug-in electric vehicles (PEVs)*: Transport electrification is seen as a realistic way to reduce carbon dioxide emissions and oil dependency.

4. *Active demand management*: Demand-side management enables customers to take an active position in setting-up smart city governance. With two-way information and communication technology, specifically enterprise resource planning (ERP), customers are urged to convert their consumption to off-peak times to minimise the required limit, thus maximising power security, reliability and efficiency. With increased demand, minimal peak usage and temporary use of DSS, the accounting solutions are increasingly attractive (Executive Director).

5.2. Accounting interventions in setting-up smart city governance

5.2.1. Enterprise resource planning (ERP)

The ERP implementation plays a prominent accounting role in setting-up smart governance in New Cairo. Advanced ERP-based accounting technologies provide MEEDCO with timely data on connectivity between active devices in the city's SDNs, including distributed supply sources, protection devices, and loads. The Financial Manager stated:

"ERP, as an accounting solution, allows remote control of SDNs on an ever-increasing scale and is seen as a critical factor for success in smart governance in New Cairo."

ERP-based smart governance has introduced modern administrative and accounting technologies, which were not in the city's old distribution networks. Modern technologies in the city have governmentalised SDNs to improve distribution quality, performance measurement, and thus cost minimisation. These have included modern technologies of an advanced metering/monitoring infrastructure (AMI), phasor measurement units (PMUs) and an energy storage system (ESS). Each application has a unique administrative and accounting function in the city's SDNs. The Senior Accountant explained:

"The AMI application connects smart meters, customers, energy resources, and various energy (cost) management systems together. It provides enough (cost) data to cover SDNs, it uses a powerful engine to store and analyse (cost) data and employs accurate links between customers, transformers, and sub-stations. Based on these functions, AMI can monitor and manage the costs and performance of transformers, cables, and circuits. By detecting power outages, AMI is also able to anticipate outstanding failures and related costs in the city's SDNs."

The Senior Accountant continued by saying:

"The PMUs application also supports smart governance processes in New Cairo electricity. PMUs measure phase error between SDNs and DSS and

detect voltage loss and related costs. Its functions better protect the SDNs operating costs in the city."

The Deputy Director added:

"The ESS application has also benefited the city's smart governance by postponing network upgrade by shaving peak load, avoiding large-scale outages with demand responses. ESS mitigates the intermittency of some renewable energy resources and performs load and frequency regulations, increasing penetration levels of SDNs in the city. Using storage devices that have extremely fast dis/charge rates, ESS improves the reliability of SDNs and reduces related costs."

ERP has further governmentalised administrative and accounting practices and processes between the city government and the senior management in MEEDCO. Compared to the 'centralisation' of power-knowledge relations in the city's old sources of electricity distribution, management accounting has now received new functions of thinking and acting at the request of the city government: integrating and coordinating decentralised distribution (cost) centres embedded in SDNs. The Financial Manager stated:

"ERP-based administrative and accounting technologies help MEEDCO to produce and send quarterly cost reports requested by senior management and city council in smart governance. Producing these (new) reports is to monitor the monthly cost movement of the city's SDNs. These reports reflect the real performance of decentralised distribution (cost) centres, and thus, help senior management make appropriate decisions in responding to the city council's needs. Monitoring this operational cost movement was not present in the city's old sources of electricity distribution, where centralised power."

In pre-SDNs, monitoring the movement of operational costs was not present in the old sources of electricity distribution in the city, where the centralisation of power. Power was centralised only at that time by the city government. This, in turn, led to a lack of hierarchical and horizontal power relationships. Later, this gave rise to fields of ambiguity and lack of transparency, and thus the inability to employ effective government technologies such as accounting. A collaboration between various distribution (cost) centres did not result in the full alignment of power-knowledge relationships. This apparent lack of collaboration and visibility paves the way for the inclusion of accounting systems in New Cairo SDNs as a more centralised and systematically oriented approach, instead of a decentralised and dispersed approach (Argento et al., 2019). Therefore, when we interviewed seven operational managers how these ERP technologies affect daily smart governance practices, they immediately explained how they 'now' interact with the 'new computerised distribution system' and the various 'new' reports it produces. Even those who suffered from the city's old distribution management system often explained how they proudly see their managerial and accounting functions through advanced ERP technologies and how their current processes of smart governance are guided by SDNs in which the city government's reporting protocols are governmentalised.

5.2.2. Cost movement reporting

Cost movement reporting is one of the accounting contributions for setting-up smart governance in New Cairo city. In line with the smart governance initiative, as sixteen senior accountants and managers interviewed said, “cost movement is what we now have to explain to people in the city council”. Cost movement is the variance between recorded costs, prior period figures and budgeted figures. In classical governance, this is just an accounting system for reporting variances. But, in smart governance and accountability, according to those who have historically lived such a system in MEEDCO, it signifies a ‘new’ cost-management practice provided by the city government’s smart distribution reforms.

Thus, cost movement became a ‘smart calculative logic’ through which government technologies of management and accounting are now represented at MEEDCO. The Head of the Cost Accounting Department mentioned in this regard:

“Each decentralised distribution (cost) centre is responsible for controlling the daily movement of SDNs operating costs in New Cairo city. Daily variances between budget and actual are newly reported to the Head of Cost Accounting Department. The head of the department prepares a formal report afterwards, called the Daily Operating Report, registering the reasons for these variances and explaining increases in distribution costs, if any. For smart governance, the SDNs cost movement became the modern calculative logic of the city council through which MEEDCO’s distribution efficiency is understood and communicated.”

This SDNs cost movement report extends beyond the company to include various government agencies in smart city governance. A Senior Accountant explained that MEEDCO must submit aggregate quarterly cost movement reports to the EEHC, the Central Agency for Accountability, and the City Council Board by the tenth day of the month following each quarter. This, as reflected by a Junior Accountant, is to ensure that MEEDCO keeps SDNs operational costs under control and to ensure that the company is not a “financial burden” on the city council or other various government agencies. The idea of “financial burden” on the city government has been firmly registered in the minds of MEEDCO managers. Now, periodic financial statements are not the most important factors for smart city governance, but detailed SDNs cost movement reports.

5.2.3. Pricing study

The production of pricing study is another accounting contribution to establishing smart city governance in New Cairo electricity. Detailed accounting reports, specifically SDNs cost movement reports, have an influential political power in governmentalising smart electricity prices for citizens. Regular accessibility and affordability of smart electricity distributions to citizens as end-users are politically sensible issues. The city government, therefore, uses detailed SDNs cost

movement reports as a political instrument to govern smart electricity tariffs. The Financial Manager explained:

“The price tariffs that we offer citizens as end-users are issues of political importance. Therefore, the city council uses detailed accounting reports as a political tool to control smart electricity prices. MEEDCO has no authority to produce its own tariffs as it deems appropriate. Instead, MEEDCO can only produce a pricing study, justified by quarterly cost reports that reveal various operational movements regarding costs, distributions, outages, employees, etc...”

This pricing study is an intermediary accounting device in negotiations between MEEDCO and the city government on the tariff structure of smart electricity distributions. The Financial Manager continued:

“With smart governance, MEEDCO must submit a pricing study to the city council having prepared its annual budget. The council has some specific criteria for granting us approval for proposed supply costs and selling prices. Costs and prices must be proposed within the policies and structures set by the Council Board. If the review team of the Board members finds that our pricing study does not comply with these specific policies and structures, it will reject the proposal...”

The Financial Manager concluded our discussion on a pricing study by saying:

“...So producing a pricing study, based on detailed SDNs cost movement reports, is now our biggest assignment to establish smart city governance in New Cairo electricity. It is perhaps the most important thing we discuss in our accountability meetings with the various government agencies in the city.”

6. DISCUSSION

This paper extends prior accounting studies in two ways. Firstly, it demonstrates how the political role of management accounting gradually developed in line with the changing ideologies of smart city governance (Argento et al., 2019). By focusing on policy changes that have caused effective governance impacts, our smart city analysis provides an in-depth understanding of governance and governmentality, and thus changes in the political role of management accounting. During the neoliberal governmentality regime, the political role of management accounting information served, on the one hand, as an instrument used by the city government to stifle privatisation, and on the other hand as a technology for reform. Hence, this portrayed its paradoxicality (Grossi et al., 2020). The fraudulent nature of the politicised accounting system was exposed by the privatisation programme led by the World Bank. One of the outcomes of the exposure of shortcomings of the system is that it discouraged private investors, resulting in the failure to achieve a transfer of ownership from the public to private. That notwithstanding, the smart calculative logic of managing for profit within a state-owned enterprise, governed by the city’s neoliberal managerial reforms, was forged ahead by

the World Bank (Brorström et al., 2018; Jayasinghe & Uddin, 2019).

The governmentalisation of the neoliberal method of managing enterprises with state-ownership enforced the culture whereby components of the smart logic of capital accumulation (i.e., costs, revenue and profits) became the critical components of performance monitoring and control for the city (Argento et al., 2019; Klauser et al., 2014). Accounting information played a significant role in effecting the neoliberal managerial change in the smart governance project of New Cairo city (Mizrahi & Minchuk, 2019; Engelbert, 2019; Bunders & Varró, 2019). An ERP-based private mode of accounting information, reintegrated into the cost management protocols of the city government, ensured that the regulatory apparatuses and fiscal reporting of New Cairo city stayed connected to this private mode of accounting. This ruling change in the city government resulted in managers recognising cost movement responsibility as a significant managerial challenge to solve. Therefore, these changes have resulted in cost management becoming a critical aspect of both operational and strategic management (Mizrahi & Minchuk, 2019).

Secondly, by ruling the profit-driven management accounting information within the regulatory mechanism and state-owned enterprises, the type of smartness developing in certain marginal countries is exhibited (Cowley et al., 2018; Meijer & Bolívar, 2016). This is very similar to the common evaluation of 'neoliberalism' as a political doctrine that governs the ideology of free market and right to private property as the foundation of city development (Grossi et al., 2020; Chiapello, 2017; Hopper, 2017; Alawattage & Wickramasinghe, 2008). That notwithstanding, the idea of an emergent market and its resultant accountability system should be carefully dealt with. This is because there is no actual free and competitive market in this Egyptian context; rather only the free market ideology actualised by governing the practices of calculating costs and profits, and reporting (Bigoni & Funnell, 2015). For the subsidiaries of a state-owned holding enterprise, the planning and structuring of competition are through specific governance arrangements. Such governance arrangements were incorporated into the market structure of the regulated environment by granting each subsidiary (including MEEDCO) a near-monopolistic control in different geographical regions. In this quasi monopolism, market-determined prices are non-existent, but rather prices are based on a regulated pricing structure. The effect of this is a competitive environment that is based on institutions validated through a specific accounting mode, rather than based on market forces (Hopper, 2017; Covalleski, Dirsmith, & Samuel, 2003).

The financial performance and financial position of the EEHC are not significantly disclosed in its published annual reports. Rather, comparative statistics on the costs of electricity production and distribution in the different geographic regions within the control of each subsidiary are disclosed in the reports. The income statement, statement of financial position, and statement of cash flows are

not presented in the EEHC's annual reports. In the five years to 2014/15, the word profit is indicated only on two occasions in EEHC's annual reports. Firstly, profit is mentioned as an element of corporate vision, in its annual report of 2008/09 (EEHC, n.d.a., p. 7) as follows: "EEHC's main role is to coordinate, supervise, monitor and follow-up its affiliated companies' activities in the fields of generation, transmission and distribution of electric energy in order to improve and develop the technical, operational and financial performance of the companies to achieve the main goal of optimising the use of all resources and maximising the profit". Secondly, following the implementation of smart cities projects and subsequent sustainable development goals (e.g., SDNs) in Egypt, a net profit of 2,020 million Egyptian pounds was reported in the table of "Financial Situation of EEHC and its Affiliated Companies", in the 2014/15 annual reports (EEHC, n.d.b., p. 11). Because these statistics render the comparability of subsidiaries firms possible, thus giving a sense of competitiveness between the subsidiaries, the annual reports could be likened to league tables of operational performance of subsidiaries. This apparent competition serves as a motivational force for each subsidiary company's management to aim to achieve an efficient cost per kilowatt hour of distribution, in order to be better positioned in the comparative statistics. This is because the most important statistics by which corporate managers are assessed against their peers is the cost per kilowatt hour of distribution (Argento et al., 2019; Mizrahi & Minchuk, 2019; Brorström et al., 2018).

The multi-agency accountability through multiple regulatory organs (mainly EEHC, MOEE, and the city government) forms the basis for MEEDCO's competitive industrial structure (Broccardo et al., 2019). This is consistent with the view that for micro-organisational practices to be transformed in neoliberalism, continuous government intervention is required (Engelbert, 2019; Klauser et al., 2014; McKinlay & Pezet, 2018). The political intervention was reinvented by providing a sense of competition among governmental actors through the transformation of New Cairo city government into interconnected regulatory organs. Miller (2010) argues that the desire for intervention to uphold the non-interventionism is a great contradiction of neoliberalism and governmentality. This is because neoliberalism and governmentality consider that without substantial policing by regulatory organs (e.g., the apparent non-governmental role of the city government), tenets of market competition as the natural foundation of efficiency and effectiveness would not be possible (Hollands, 2015). Therefore, in New Cairo smart city neoliberal politics, with politics featuring as non-politics, participants often assert that they are no longer subjected to political manipulation (Engelbert, 2019; Kitchin et al., 2017; Klauser et al., 2014).

There is a seeming 'smartness' in neoliberal structural reforms, however, they are highly imposing and controlling. A governmental environment that presents an incorrect impression of deliberative governance with less political intervention is a characteristic of smart city projects

(Argento et al., 2019; Brorström et al., 2018). However, neoliberal smart governance is presently comprised of the subtle link between the city government and global development funding organs (World Bank) which are the regulatory organs (Engelbert, 2019; Broccardo et al., 2019; Meijer & Bolívar, 2016). Even this environment makes 'no difference' since there is 'no room' for social actors (e.g., managers, trade unions and professionals) to enact their interventions by repetitive governmentalisation and non-governmentalisation (Hollands, 2015). As is evident in the New Cairo smart electricity project (e.g., SDNs), the only 'visible' change in this complex context is the neoliberal 'policies' of governance and governmentality; however, neoliberal 'politics' could not be altered even due to massive political events such as the Arab Spring.

7. CONCLUSION

The purpose of this study is to explore the ways in which the smart cities agenda has forced the electricity company to reorient its accounting tools. The study was based on the concept of governmentality (Foucault, 2008) for the question: how smart electricity costs and pricing policies imposed by political decision-makers govern a smart city performance. Empirical data came from field research conducted in 2018 at MEEDCO, i.e., a state-owned energy company in New Cairo city. The findings show that MEEDCO has smartly operated in New Cairo city by executing SDNs and subsequent technologies of government management and accounting that enable profitably monitored operations and costs on a daily basis. At

macro-micro organisational levels, however, MEEDCO does not operate in free-market settings. Political decision-makers at regional/local government levels (for example, EEHC and City Council) arbitrarily set smart electricity distribution price tariffs. MEEDCO was forced to apply structured price tariffs in daily operations to ensure its socio-political legitimacy and power in the city. In this politicised pricing governance, MEEDCO's senior managers monitor the operating movements of smart distribution costs through detailed quarterly "cost reports".

A critical issue, here, is that an exclusive focus on distribution costs cannot provide politicians with a full (right) picture of the cost movement of MEEDCO's smart networks. Operating cost movement reports might be 'misleading' and cannot be assumed to ensure proper governance and accountability of public funds used to finance such a complex smart electricity project. Our contribution is to show new evidence on the socio-political impetus of smart city projects, which were formed in governmentality and politics, and the subsequent smartness of management accounting technologies at extra- and intra- organisational levels. As in other case studies research, our findings cannot be generalised to smart cities and companies other than New Cairo and MEEDCO studied. Therefore, as a future research trend given the existing lack and hitherto unexplored linkages, comparative and multidisciplinary studies can be conducted in order to analyse specific contextual differences and implications for the interaction between the multiple functions of management accounting mechanisms in smart cities (Grossi et al., 2020; Argento et al., 2019).

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