

Chapter 13

Revisiting Corruption Mathematical Models in the Fourth Industrial Revolution


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ABSTRACT

Analyzing corruption is a topic of interest to many and is indeed very complex due to its inherent difficulties with its identification and quantification. Past studies present several variables, indices, computational models, and approaches, but their relevance in the fourth industrial revolution (Industry 4.0) has been debatable. This chapter addresses the need to revisit the mathematical models and approaches in the Industry 4.0 context. The chapter provides a foundation for this argument through a comprehensive literature review followed by a proposal of a three-stage concept for corruption identification. The chapter illustrates two case studies from which a strong justification derives for considering the digital transformation and use of big data to deal with corruption and improve the external and internal perceptions about corruption in general.

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INTRODUCTION AND BACKGROUND

Corruption is a very well-known evil that most institutions and governments across the globe need to deal with. The World Bank estimates that more than US\$1 trillion annually goes into bribes alone globally, and about US\$2.6 trillion get lost in corruption (PWC, 2017; World Bank Group, 2020). The exact figure could possibly be even higher, and this amount does not include costs resulting from non-completion of development projects.

Corruption or fraud may exist in various forms within the societies, organizations, and trade practices internal to a country. Globalization adds another dimension to corruption. Funds that fraudulently earned or embezzled may be diverted to foreign destinations under the pretense of investments in the absence of effective regulation and control mechanisms. Globalization motivates a few countries to open their doors to foreign direct investment (FDI) from wealthy investors by offering attractive incentives and even citizenship; to strengthen their economies.

One of the critical aspects of globalization in middle and low-income countries is the societal advancement towards a liberalized economic environment in tune with specific standards in first-world countries. Integration into the global world allows the free flow of funds in and out of countries, which is the underpinning aspect of economic liberalization. However, this also opens up avenues for corruption. The relationship between corruption and globalization is a widely researched topic (*e.g.*, Dutta, 2018; Leal & Marques, 2021; Pasculli & Ryder, 2019). Due to globalization and economic liberalization, corruption has been altered in how it once existed and was maintained. Many countries have established anti-corruption policies that advocate for trade and information transparency and the right to access information.

Corruption has been labeled the “dreaded nemesis” in various fields such as logistics and procurement (Tukuta & Saruchera, 2015); public finance and tax administration (Antonakas, Giokas & Konstantopoulos, 2013; Hillman, 2004); mining (Knutsen, Kotsadam, Olsen & Wig, 2017); agriculture and land reform (Muranda, Frank & Saruchera, 2014; You, 2014); international or global business (Asongu, 2014; Bahoo, Alon & Paltrinieri, 2020; Zekos, 2004); innovation and national infrastructure development projects management (Gillanders, 2014; Owusu, Chan & Hosseini, 2020; Saruchera, 2014; Saruchera & Phiri, 2016; Tabish & Jha, 2012); education systems (Deliversky, 2016; Frolova, 2014) and in health delivery (Factor & Kang, 2015), including the administration of the global COVID-19 pandemic (Attila, 2020; Al-Zaman, 2020; Mietzner, 2020).

While past studies present several variables, indices, computational models, and approaches to identify and manage corruption, the application of such models in the fourth industrial revolution (Industry 4.0) has been arguable. This chapter addresses the need to revisit the mathematical models and approaches in the context of the fourth industrial revolution based on a systematic review of the literature. The chapter proposes a three-stage concept for corruption identification. The chapter illustrates two case studies from which conclusions and recommendations are drawn given the nature of industry 4.0.

LITERATURE REVIEW

Several researchers have pursued corruption since the early 60s, and a great deal of information is available in literature in this field. This chapter carefully highlights salient issues and provides the foundation for the discussion in a systematic way. This section defines corruption and its effects and considers various determinants of corruption.

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