

# A qualitative study of business-to-business electronic commerce adoption within the Indonesian grocery industry: A multi-theory perspective



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## ABSTRACT

This study explores the business-to-business electronic commerce (B2B EC) technology adoption experience of organizations within the supply chain of the grocery industry in Indonesia using a multi-theory perspective. Through a multiple case study with eight organizations, it provides a comprehensive understanding of the influence of adoption factors. This study shows the usefulness of complementarily deploying several adoption theories and offers important theoretical and practical implications for organizations as they extend their supply chains globally.

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## 1. Introduction

Electronic Commerce (EC) is a broad concept that refers to the exchange of products/services and information via computer networks, including the Internet, Extranet and Intranet [1,2]. Within the B2B EC context, a diverse range of technologies and initiatives have been introduced. Examples of technologies include Electronic Data Interchange (EDI), automatic product identification (barcode, RFID tags), and Electronic Funds Transfer, and examples of initiatives include cross docking, Vendor Managed Inventory (VMI), Continuous Replenishment Program (CPR), and Collaborative Planning, Forecasting and Replenishment (CPFR) [3,4]. Organizations can obtain substantial benefits from their investment in EC technologies, as EC generally enables organizations to improve reach, richness and affiliation [2,5]. Due to the potential of EC, many countries worldwide have rapidly adopted it [6], resulting in a significant growth of EC in developed countries during the last two decades and, more recently, in developing countries [7,8].

In the era of globalization, developing countries have played an important role in world trade and commerce because of their large market potential and low cost of labor [9]. Developing countries are defined as countries with a low to middle income level, a low standard of living, restricted technology infrastructure and limited access to products and services [9,10]. With advancements in information and communication technologies (ICT), large global organizations are increasingly extending their supply chains across multiple continents in order to cut costs and increase their reach [11,12]. Through ICT adoption, developed countries can trade with developing countries more efficiently and, in turn, help those developing countries achieve more sustainable economic growth.

However, due to differences in their social, cultural, economic, political, legal and technological conditions, developing countries encounter a set of problems and concerns that vary considerably from those faced by developed countries [2]. For example, Hofstede's national culture theory suggests that developing countries and developed countries differ greatly in their characteristics, which may affect their organizational behavior toward technology adoption [10,13]. Cultural differences captured by Power Distance and Uncertainty Avoidance dimensions suggest that organizational technology adoption behavior is constrained socially as a result of the attachment of meanings and

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interpretations relevant to that cultural context. Thus, organizations operating in developed countries (with a low Uncertainty Avoidance index) tend to stress both technological development and technological adoption more than organizations operating in countries with a high Power Distance and low tolerance for ambiguity and uncertainty [14]. In another study, Guo et al. [15] find that the way organizations use e-mail, phone and fax in China (a developing country) and Australia (a developed country) is largely influenced by the difference in the Uncertainty Avoidance dimension of cultural difference between these two nations. As a result, different sets of approaches to technology adoption are required to suit the cultural and contextual conditions of developing countries [16,17].

However, at this stage, there remains a relatively limited number of in-depth studies and understanding regarding the adoption of EC technologies by developing countries, despite a growing number of technology penetrations that have taken place in these countries in recent years [7,16]. An understanding of the adoption of ICT, in particular EC technology, by developing countries is thus important for both researchers and practitioners [18]. Moreover, the contextual situations of countries are arguably different in nature. For example, the maturity of the ICT infrastructure, e-commerce readiness, degree of government support, and extent of business competitiveness vary greatly, not only between the developed and developing countries but also among developing countries. Furthermore, it would be inappropriate to assume that various dimensions of national culture remain somewhat similar across all developing countries. In fact, distinct cultural differences are noted among developing countries. Hence, it could be argued that qualitative studies focusing on e-commerce adoption in some developing countries are not necessarily reflective of the e-commerce trends and adoption dynamics of all developing countries across the globe.

In addition, some noticeable gaps have been identified in the existing EC literature. First, in the context of developing countries, there are limited empirical studies on EC technology adoption by large organizations. By contrast, many studies explore the diffusion of EC technologies among small and medium-sized enterprises (SMEs), primarily using surveys [19–22]. Second, most of these studies, especially in the Southeast Asia region, explore only general EC technology and practices (including Business-to-Customers EC and general e-mail practices). Only a handful of studies assess a broad range of EC technologies such as EDI, e-auctions, EFT, and other B2B EC initiatives [10,11,23]. Furthermore, due to the exclusion of the study context, there have been some conflicting findings regarding the impact of adoption factors on actual adoption [21,24]. In addition, several existing studies aggregate the adoption experience across multiple industries within a country using quantitative methods. Therefore, a detailed understanding of organizations' adoption experience is lacking [21,25–28]. Only a few authors focus on a specific industry and employ a qualitative method, for example, Utomo and Dodgson [29], who concentrate on Indonesia's manufacturing of industrial products, and Kurnia [30], who focuses on the Chinese grocery industry. The existing qualitative studies on EC adoption are also generally descriptive in nature. Typically, they identify a number of adoption factors, which are often grouped into technological, organizational and environmental contexts but generally lack theoretical explanations of the underlying mechanisms of the influence.

Thus, in summary, we argue that there is currently a lack of rich understanding of the B2B EC adoption phenomenon in developing countries due to the dominance of quantitative studies and the limited application of adoption theories [31]. In fact, the adoption process involves dynamic interactions among social, legal, economic, political and technological factors that call for more

studies involving several theoretical perspectives to better understand the adoption phenomenon in different contexts of developing countries. Each developing country may have specific contextual factors involving different dynamics and interplays, which may have differing effects on the adoption phenomenon. In-depth studies of how B2B EC technology is adopted in a context that has not yet been thoroughly investigated thus contribute to the current knowledge in this area.

To address the identified knowledge gaps, the main objective of the current study is to develop a rich understanding of B2B EC technology adoption through a qualitative study that adopts a multi-theory perspective. In this study, we investigate how the adoption factors identified in the existing studies influence organizations' actual EC adoption. As EC adoption is complex and heavily negotiated by contexts within which organizations operate [32], we have employed a multi-theory perspective involving Tornatzky and Fleischer's Technology, Organization and Environment (TOE) framework, Rogers' Diffusion of Innovations (DOI) Theory, resource dependence theory (RDT), institutional theory (IT) and Hofstede's national culture theory (NCT) to help us better understand the underlying mechanism of the influence of various adoption factors. As global EC was dominated by B2B initiatives with total revenue of \$559 billion in 2013, which is double the revenue of B2C EC [33], we have restricted our focus to B2B EC to maximize the depth of the exploration. The specific research questions we address are as follows:

1. How is B2B EC adoption by organizations affected by the technological, organizational and environmental contexts?
2. To what extent can DOI, RDT, IT, NCT and TOE be used complementarily to better understand the influence of technological, organizational and environmental factors on B2B EC adoption?

To address these questions, we conducted a multiple case study involving eight organizations with different backgrounds, sizes and positions in the supply chain within the Indonesian grocery industry. These participating organizations represent typical manufacturers, distributors and retailers within that industry. The grocery industry was chosen because it is characterized by high transaction volumes and low profit margins and, therefore, often pioneers technology adoption [25,34]. The study focuses on a single industry rather than multiple industries to allow for thorough and detailed investigations into the interplays among the contextual factors and their influence on technology adoption by organizations within the industry. Indonesia was selected as an example of a developing country because it reflects typical characteristics of developing nations, especially in the Asia Pacific region [23,35]. Although Indonesia enjoyed a steady economic growth at an average of 7% between the period between 1987 and 1997, it has only devoted a small percentage of its GDP to ICT implementation and has a low score on the Network Readiness Index (NRI) and E-Readiness Index (ERI) [36]. Therefore, the findings of this study are likely to be relevant for other developing countries, especially those with similar cultural, political, technological, legal and socioeconomic conditions as Indonesia. At present, there has been no comprehensive study employing a multi-theory perspective to investigate how contextual factors influence the adoption of B2B EC in Indonesia or other countries with similar conditions.

The following two sections briefly discuss the underlying theories used in this study and provide a summary of the observations that we drew from a comprehensive EC literature review. Then, we provide an overview of the multiple case study and the presentation of the findings. Finally, we discuss the findings by reflecting on the existing

studies and conclude the paper by outlining the contributions of this study and proposing future studies.

### 1.1. An overview of studies on B2B EC adoption in developing countries

A rigorous literature review reveals that adoption issues relating to B2B e-commerce have been explored in a number of developing countries across several continents. An in-depth summary of the studies reviewed is shown in [Appendix A](#). The studies were selected based on searches of Google Scholar and multiple online databases using ‘*Electronic Commerce adoption in developing countries*’ as the main search keyword. We only included studies concerning B2B technologies. The list of studies is by no means exhaustive, but it is adequate to provide a general picture of existing related studies. Several important observations deduced from the review are briefly highlighted below.

First, our literature synthesis shows that B2B e-commerce adoption has been reported for various developing countries spanning the Asian, Middle Eastern, African, and South American regions. Most studies have focused on multiple EC technologies. However, a few studies examined the adoption of a single EC technology. For example, Seyal et al. [37] examined EDI adoption only. The most widely cited EC technologies identified by the reviewed studies include EDI, bar code, e-procurement, and online B2B marketplaces, among others. Interestingly, several studies did not specify the type of EC technologies that organizations have adopted [20,38]. Overall, no preference for a particular industry segment was noted across the studies. A few scholars examined e-commerce adoption for a specific industry. For example, Kim [39] focuses on EC adoption in the Korean fishery industry, while Chen [40] focuses on the IT industry in Taiwan. The majority of the reviewed studies examined EC adoption across multiple industry segments.

Second, although the case study method has been used by a number of scholars, a preference for the quantitative survey research method is clearly observed. Studies employing a quantitative method use a number of statistical techniques, including various non-parametric techniques [41], parametric statistical analysis techniques [42], Structured Equation Modeling [26] and regression analysis. There is currently a lack of in-depth qualitative studies involving large organizations, as confirmed by Oliveira and Martins [31].

From a theoretical perspective, our literature analysis indicates that the TOE framework has been widely deployed in the existing studies. Rogers’ DOI theory appears to be a popular theory that has been used in a number of studies [31]. Institutional theory, national culture theory, and resource-based view [43] have also been used by scholars to help explain EC adoption in the context of developing countries but to a lesser extent than TOE and DOI. Interestingly, we do not identify any study in this area that employs the RDT, which confirms the observation of Casciaro and Piskorski [44] regarding the limited number of studies using RDT as a theoretical lens despite its merit in understanding organizational action when power imbalance and dependency are involved.

Furthermore, we identify a trend among EC scholars; specifically, they developed their research models by combining the TOE and other theories such as DOI, institutional theory and RBVF [23,31]. They also included a number of additional factors from the broader IS/IT adoption literature in their research model and then expressed their model in three broad groupings of factors, in line with the spirit of the TOE framework. For example, Seyal et al. [45] developed a model that is rooted in the TOE framework to investigate EC adoption in Pakistan and included constructs from culture theory, motivation theory and DOI. Intriguingly, a few

studies (e.g., [41,46]) are purely descriptive and do not refer to the constructs from a specific theory.

Moreover, a wide range of factors affecting B2B EC adoption have been identified in previous studies. These factors are generally grouped into three broad categories in terms of the TOE framework. However, due to the contradictory findings reported by researchers, we note that no established pattern of findings concerning the influence of factors affecting technology adoption has emerged from these studies. For example, organization size was found to be a significant differentiator between e-commerce adoption and non-adoption [21,41]. However, other researchers [24] did not find organization size to have a significant effect on B2B e-commerce adoption. Likewise, government support was found to have a positive influence on EC adoption in Pakistan [42], whereas it was not found to have an influence in Malaysia [38]. In a similar manner, another much-debated factor is management support. Management support was reported to be important for affecting e-commerce adoption in countries such as Kenya [47], but was not found to be relevant in Brunei, Pakistan and Malaysia [32,38,45]. Arguably, these inconsistencies stem from the lack of exploration of the study context, prohibiting researchers from investigating the underlying mechanisms of the influence of those factors. Deep exploration of the study context can only be done through in-depth qualitative studies such as through the case study research method [48], which is currently lacking in the literature on EC adoption by developing countries. Therefore, in this study, we address the identified gaps by conducting a qualitative study of B2B EC adoption involving a multiple case study with eight organizations within the Indonesian grocery industry; this study is guided by multiple adoption theories. The theories used in this study and the research framework are described in the next two sections.

## 2. Theoretical background

In this study, we adopt Tornatzky and Fleischer’s (1990) Technology, Organization and Environment (TOE) framework, complemented by Rogers’ (1983) Diffusion of Innovations Theory [49], resource dependence theory [50,51], institutional theory [52,53] and Hofstede’s national culture theory [54]. The TOE framework is a useful lens that has been employed in many studies [31]. However, because our study focuses on understanding how adoption factors identified from the extant literature affect the adoption of EC technologies within the Indonesian grocery industry as an example of a rapidly growing industry in a developing country, we show the usefulness of deploying DOI, RDT and NCT as complementary theoretical lenses to better understand the underlying mechanisms affecting EC technology adoption. TOE is thus used as an overarching framework to guide the exploration of various influential adoption factors. Each of the employed theories is briefly summarized below.

### 2.1. Rogers’ diffusion of innovations (DOI) theory

The diffusion of innovations (DOI) Theory proposed by Rogers [55] has been widely used to explain and understand the adoption and diffusion of technological and organizational innovations and to predict organizational outcomes [56,57]. Rogers defined diffusion as ‘*the process by which an innovation is communicated through channels over time among the members of a social system*’ (p5). The diffusion process of innovation is a function of four elements: innovation, communication channels, time and social system. An innovation is defined as ‘*an idea, practice, or object that is perceived as new by an individual or other unit of adoption*’ (p 12, [49]). E-commerce has been considered to be an important

innovation by many scholars [58]. Innovations are not always necessarily beneficial and desirable to potential adopters. Furthermore, they can be desirable for an adopter in one situation but not to adopters in different situations. Therefore, adopting an innovation such as EC involves some risks, and the degree of risk differs from one potential adopter to another. Five key characteristics of the innovation that affect innovation adoption are relative advantages, complexity, compatibility, trialability and observability. Innovations that require major changes in the behavior of the potential adopters create more challenges for adoption than those requiring minor changes because of the greater risks and uncertainty involved. Communication channels used within the social system to share information about the innovation and the time required to share the information also affect the adoption decision. Finally, the social structure – including how work and power is distributed, interconnectivity, communication structure and the established behavior patterns (norms) of members within a social system as well as the existence of opinion leaders and change agents – influences adoption. Thus, the DOI fits well within the TOE framework, which can be used to understand the influence of technological, organizational and environmental factors [31].

## 2.2. Resource dependence theory (RDT)

Resource dependence theory [59] represents another useful lens to understand organizational behavior in terms of actions and decision making by focusing on the influence of the external environmental context [50]. The theory is particularly relevant for explaining inter-organizational relationships and how organizations manage their inter-dependency to access critical and important resources. RDT provides a good theoretical lens to explore the influence of power on organizational actions internally and externally, but few organizational studies have utilized RDT [60]. According to RDT, organizations' capability to acquire critical resources from other organizations within their environment is important for their survival; therefore, they need to reduce uncertainties in accessing these required resources through the use of power [59]. Organizations thus establish strategies to maximize their autonomy and reduce uncertainties. The notion of 'constraint absorption' is conceptualized to capture organizational responses and attempts to restructure dependent relationships to enhance the stability of the flow of critical resources [60]. Two key theoretical dimensions in RDT include power imbalance and mutual dependence, both of which are useful in understanding the conditions under which organizations are motivated and capable of restructuring dependencies by absorbing constraints, such as through mergers and acquisitions or partnerships [60]. RDT is a suitable theory to employ to understand how organizations manage their relationships with other organizations within the industry. Within the TOE framework and the current study context, RDT complements the other selected theories in understanding the underlying mechanism of the influence of other organizations within the external environmental context of the focal adopting organization.

## 2.3. Institutional theory (IT)

Institutional theory is yet another theoretical lens through which many scholars have studied technology adoption and organizational change [24,31,61,62]. It can be used to explain the importance of environmental context on organizational actions and structures. Institutions are defined by Scott (2001) as "multifaceted, durable social structures, made up of symbolic elements, social activities, and material resources" [63]. An organization is considered an institution with particular social structures,

cultures, rules and routines that is embedded within larger institutions, including the supply chains, industry and country. The establishment of organizational structures and norms is affected not only by economic motivations but also by social and political motivations. The theory posits that institutions are pressured to conform to their environments for the sake of legitimacy. Three isomorphic mechanisms for change are mimetic, coercive and normative pressures [62,63]. Mimetic pressures are related to social influence, which may induce organizations to become isomorphic with their environment over time. Coercive pressures pertain to the political influence of more powerful parties within the environment, which exert certain practice and change on the dependent parties. Finally, normative pressures are functional in nature. They motivate conformance to widely accepted norms and structures within the environment [62,64]. Institutional theory has been used within the TOE framework to better understand the influence of environmental factors on the adoption of technologies [31] and is used in the current study to complement other theories.

## 2.4. Hofstede's national culture theory (NCT)

Culture is defined as "the collective of programming of the mind which distinguishes the members of one human group from another" ([54], p. 260). Culture is viewed as humans' mental 'software' that affects how they think, feel and act [13]. It has a profound impact at the national level, as it affects many aspects of a society. Drawing on the notion of culture at the national level, Hofstede (1983) proposes a theory that includes four cultural dimensions: *Power Distance*, *Individualism*, *Uncertainty Avoidance* and *Masculinity* [54]. This theory has been used by many IS and EC scholars to examine the influence of national cultural differences on the adoption of technology [17,54,65–68]. Countries with a low Power Distance index are characterized by minimal power inequality and interdependency between less and more powerful members within the society, including between managers and employees. By contrast, countries with a high Power Distance index accept unequal power within the society and unequal rights between members with different levels of power. Within organizations, power is often centralized, and less powerful members respect and obey their managers. In addition, the individualism index determines how members of a society are interlinked and value their social networks. Countries with a low individualism index are more likely to conform to the values and beliefs of their social groups. The Uncertainty Avoidance index determines a society's level of anxiety when addressing uncertainties and means of reducing these uncertainties. Such anxiety affects the way that members of a society express themselves within their group and resolve conflicts. Countries with a low score on this dimension tend to strive for harmony in the workplace and avoid confrontations. Finally, in terms of the masculinity dimension, a society with a low score tends to be more caring of others and focus more on quality of life compared to a society with a high index on this dimension. Understanding different national cultures helps explain organizational culture and different attitudes toward technology adoption and acceptance [66,68,69]. Therefore, it may be useful to embed this theory within the TOE framework to help explain the influence of organizational and environmental factors on EC adoption in a culturally sensitive context in which culture is expected to play an important role in shaping organizational actions.

## 2.5. Technology, organization and environment (TOE) framework

Tornatzky and Fleischer [70] proposed the TOE framework to highlight the co-influence of various factors that affect an organization's decision regarding the adoption of technological



**Table 1**  
Relevance of the proposed adoption theories within the TOE framework.

Category of contexts	Popular IT/EC adoption theories			
	DOI	RDT	NCT	IT
Technology	**			
Organization	*		*	
Environment	*	*	*	**

\*\* Explain many salient factors within the category.  
\* Explain at least one salient factor within the category.

innovations. The framework shows that technology adoption within an organization is influenced by factors pertaining to technological, organizational and external environmental contexts. Within the technology context, the availability and characteristics of technological innovation have an important influence on the adoption decision. Likewise, how an organization is structured internally, how stakeholders communicate, the size and the availability of slack resources also affect adoption. Finally, influences from the external environment, including the characteristics of the industry/supply chain, market structure, the availability of supporting infrastructure for the technological innovation and government regulation, may affect the adoption of innovations [70]. Some studies have also considered additional national influences, such as social, cultural economic and political conditions, in assessing the adoption of specific technologies (e.g., [11,37,68]. TOE is a general framework that can be used to guide a systematic analysis of the factors influencing the adoption of any technology by individual organizations. However, TOE by itself is not a theory, and it should be treated as an ‘interactionism’ framework that demonstrates how various theories can be applied systematically and complementarily to explain an adoption phenomenon [31]. Table 1 below shows how the various theories described in this section can be included within the TOE framework to explain the influence of contextual factors on adoption. We argue that by employing multiple adoption theories within the TOE to explain different contextual factors, we can better understand the influence of technological, organizational and environmental factors on the adoption of technology.

**3. Research framework**

Our literature review reveals that the TOE framework, which originated from the work of Tornatzky and Fleischer [70], has been

widely used in many technology adoption studies within developing countries to identify various contributing factors that have affected the adoption process of EC technologies at the organizational level. This framework is a general, comprehensive and well-received theoretical lens [71,72] that focuses heavily on the examination of an organization and its context related to technology adoption [21,73]. We thus adopt this framework to help us investigate the adoption experience of the participating organizations in a structured manner. However, to develop a deeper understanding of the influence of each adoption factor, we also employ the DOI, RDT, IT and NCT complementarily within the TOE framework.

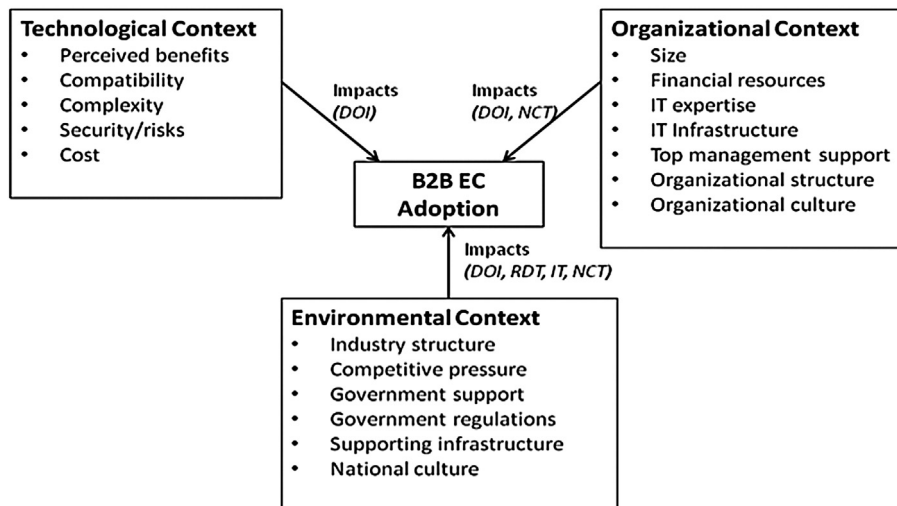
Fig. 1 shows the research framework of this study. We synthesize a number of key adoption factors that were identified from previous studies of EC and IT adoption by organizations within developing countries and include them within our research framework. All of these factors are viewed as necessary but not sufficient for organizations to adopt EC, as other factors may influence adoption. We further indicate theories that are relevant for explaining the influence of different contextual factors on adoption. Our framework is briefly discussed below.

*3.1. Technological context*

Within the technological context, there are several factors that affect the propensity to adopt EC technologies. In line with the DOI theory, these factors are typically related to the perceived attributes of technology [49,70]. First, the *benefits* as perceived by the potential adopters have been an important factor in affecting adoption in many studies [49,71,72]. Other attributes of technology, including *compatibility* with the existing business practices and culture and the *complexity* of technology, are also important determinants of technology adoption [3,49]. Furthermore, the *security and risks* of technology have been identified as another important factor [24,74,75]. Last but not least, the *cost of technology* is particularly critical, especially in the context of developing countries because the cost of manual labor is relatively low compared to that of technology [10].

*3.2. Organizational context*

There are several factors related to the organizational context that influence EC technology adoption. The influence of these



**Fig. 1.** Research framework.

factors is in line with the DOI theory, which explains how innovative an organization can be based on the characteristics of the organization, including its management. First, *size of organization* has been identified in many studies to positively impact the adoption of technology [31,41]. This factor affects the availability of the resources required for technology adoption. Second, *financial resource* also plays an important role in the adoption of technology. As firm size is related to financial resources, small firms are generally slower in adopting technological innovations due to their limited financial resources [5,72]. Likewise, the *availability of IT expertise and IT infrastructure* affects the ability of organizations to adopt EC technologies [30,76]. In addition, *top management support and involvement* in an organization is commonly identified as an important factor for any technology adoption within an organization. Management support and involvement help increase awareness of the merits of technology across an organization through formal communication, provide the required technology infrastructure, and sponsor training in the use of the technology, increasing the likelihood of materializing the benefits and reducing resistance to change within the organization [28,76,77]. Moreover, *organizational structure*, which concerns how power is distributed and how decisions are made, and *organizational culture*, which pertains to openness among members, respect to authority and attitudes toward change, may affect the adoption of B2B EC [21,78]. As organizational culture is likely to be affected by national culture [69], Hofstede's NCT is expected to contribute to a better understanding of how organizational factors affect B2B EC adoption.

### 3.3. Environmental context

Several studies in developing countries indicate that factors related to the environmental context play a more significant role than factors related to the technological and organizational contexts [3,29]. Other useful theories that are considered in our framework to explain the influence of factors within the environmental contexts are the RDT, IT and NCT. According to RDT, organizations may adopt B2B EC technology to better manage their dependencies on their trading partners and uncertainties in accessing critical resources. Therefore, *industry structure*, including power distribution among industry players and their corporate, communication, and economic relations, affects their dependency and their propensity to adopt technologies to manage dependency. Institutional theory also aids in the understanding of organizational actions in relation to technology adoption through the influence of three isomorphism mechanisms. In addition, the NCT helps explain the impact of cultural factors on technology adoption, as national culture is espoused by the individuals who are part of the organizations [69].

Generally, *competitive pressure* can strongly influence an organization to adopt technologies, and it may affect an organization's perceptions of those technologies [72,79,80]. Moreover, *government support* plays an important role in influencing organizations to adopt technologies. Government can create a favorable environment and provide impetus for technology adoption [24,81]. In the context of EC, the government must provide legal protection for EC activities and privacy and security measures [25,82,83]. Likewise, government plays a major role in providing the required national ICT infrastructure such as reliable Internet connection with reasonable speed and appropriate technology standards [82–85]. Finally, aspects of *national culture* related to the national background, such as preference for sharing information via personal networks and face-to-face interactions rather than technology, resistance to change and unwillingness to change current business culture and practices, are

all known to affect technology adoption in various countries [10,82].

## 4. Overview of the Indonesian grocery industry

Indonesia is an archipelago consisting of over 17,000 islands and is located in Southeast Asia. Its population is estimated to be over 250 million, and it is the fourth most populous country in the world [36]. Indonesia has 33 provinces, and the capital city is Jakarta. In terms of the national culture, Indonesia has a relatively high Power Distance index (78), low Individualism index (14), and moderate Masculinity index (46) and Uncertainty Avoidance index (48) [54]. Therefore, Indonesians generally accept power inequality within the society; value collective actions, traditions and norms; tend to avoid actions such as confrontations that lead to ambiguous consequences; and strive for harmony, the establishment of a caring society, and quality of life.

Indonesia has many natural resources, and its economic position has developed rapidly. The Indonesian economy is ranked 16<sup>th</sup> on a global scale based on GDP, and its purchasing power is ranked 15<sup>th</sup>. Indonesia has been an important trading partner for many countries, including China, India, Australia and many other developed nations [86]. In particular, foreign retailers quite naturally seek to develop a presence in any country with a large population base. In addition, given years of continuous impressive and sustained economic growth in Indonesia during the 1990s, the grocery industry presented tremendous potential for future growth in the eyes of foreign retailers [86].

Strong growth in Indonesians' personal disposable income has led to steady escalation in grocery retail sales since the end of the 20th century. This reflects a substantial increase in the minimum wage, high inflation rates, and recovery from the 1998 crisis. Indonesia is viewed as a market that is closely associated with continuous economic recovery and steady adoption of consumerism. In 2002, retail sales in Indonesia amounted to nearly US\$ 7 billion, and the sector employed approximately 17.7% of Indonesian's total labor. In 2012, grocery retail sales in Indonesia amounted to approximately US\$ 36 billion and are estimated to increase to US\$ 64 billion by 2016 [87]. These figures show the potential impact of the grocery industry on Indonesia's overall economic situation for years to come.

The current Indonesian grocery retail market can be divided into the traditional market format, which includes traditional stores and wet markets, and the modern market format, which includes mini markets (convenience stores), supermarkets, and hypermarkets. In urban areas, the high concentration of different retail types has intensified competition. Hypermarkets, with their large product offerings of approximately 60,000 items, are strongly competing with supermarkets for market share, and both are in tight competition with the traditional market format. The traditional market format, however, continues to dominate the rural market, where competition is much less intense [86].

In the last five years, the modern market format has been the fastest mover in the modern grocery retail sector in Indonesia. During the period of 2004–2008, the modern market grew by as much as 19.8% per year, the highest among the retail types [88]. Supermarkets continued to have the largest share of the modern market up until 2004, with up to 42.5% of the total market share. However, since 2005, the Indonesian modern market has been dominated by hypermarkets, which are the most profitable type of modern market. In 2008, supermarkets accounted for only 26.2% of the market share, following hypermarkets, which had 41.7% of the market share, and minimarkets, with a 32.1% share [88]. Of the three different types of modern market formats, the hypermarket is predicted to be the strongest retail model for the next 5 years. The hypermarket, also well known as Mass Grocery

Retail (MGR), is estimated to grow from the starting position of US\$ 2.4 billion revenue in 2008 to US\$ 3.9 billion in 2013 [89]. The influence of these modern market formats and MNC has generally driven technology adoption within the industry.

## 5. The research method

This study employs a multiple case study approach [48] to explore the B2B EC adoption by organizations within the Indonesian grocery industry. Case study research enables researchers to conduct in-depth investigations of a phenomenon of interest over a period of time, which is currently lacking in the literature on B2B EC adoption by developing countries. This study is at the *theory building* stage, contributing to the accumulation of knowledge related to EC technology adoption, particularly in the context of developing countries. The case study approach is considered an appropriate method for theory building research [90]. In comparison to the single case study approach, the multiple case study approach is often considered more compelling and more robust, although it typically requires extensive resources and time beyond the means of a single researcher. Multiple case studies are preferred over single case studies, as analytical conclusions independently arising from multiple cases tend to be more powerful than those from single case studies alone [91]. This argument serves as the main motivation behind the selection of a multiple case study as our research method. The use of multiple case study involving different types of organizations within the industry that have trading relationships is particularly valuable for the purpose of this study in that a more comprehensive understanding of the adoption experience, particularly in terms of the influence of external environmental factors, can be developed.

Several local and foreign-owned companies, including manufacturers, distributors, and retailers within the Indonesian grocery industry, were selected for the multiple case study. An overview of the participants of the multiple case study is provided in Table 2. Several interviews were conducted with various key people involved in IT-related functions within those companies during two field trips to Jakarta in 2010. Interviews were *semi-structured* with open-ended questions and were recorded upon official signing of a disclosure and confidentiality agreement with the interview participants. Follow-up phone interviews were conducted following the initial interviews, and further company-related digital artifacts were gathered. Once recorded, these interviews were subsequently transcribed for further qualitative data analysis using a three-level approach of open coding (initial grouping of themes from original transcripts based on the factor level of the TOE framework), axial coding (linking of themes and higher-level analysis), and selective coding (in-depth and cross-case analysis) techniques [92].

Neuman [92] defines unit of analysis as the unit, case, or part of social life under consideration. Unit of analysis is essential in concept development, empirical measurement or concept observation, and data analysis. This study uses a single organization within the Indonesian grocery as the unit of analysis. However, as some participants have trading relationships with each other, when describing the B2B EC technologies or initiatives used by the participants, we may include their trading partners for clarity.

Rigor is addressed in this study by following the guidelines of Yin [91] and Neuman [92]. To ensure construct validity, four techniques are used, which include triangulation through the use of multiple sources of evidence, a thorough literature review on relevant areas related to the research topic, interviewee reviews of the case study reports to ensure the accuracy of the transcription and translation and to establish a chain of evidence through the use of case study repository, and the use of a case study protocol. External validity is addressed through the use of the replication logic technique. The design of the multiple case study approach helps increase the generalizability of the overall study findings. Internal validity is addressed by a careful selection of cases and interviewees, sound data collection procedures, correct selection of theory and literature review that can explain the EC adoption phenomenon. Internal validity is tested to ensure that the causal relationship identified in the study reflects the theoretical ground.

Reliability is addressed in this study through the use of a case study protocol for all interviews, the use of case study repository to store all research data, and a pilot study to ensure interview questions are appropriate. The use of a pilot study is advised by Neuman [92] as a method that can increase the *reliability* of measures. Two preliminary studies with a manufacturer and a retailer were conducted to assess the feasibility of investigating the research topic among some organizations within the Indonesian grocery industry. The pilot study serves as a solid foundation for further follow-up interviews in the study and helps identify subsequent case study participants.

## 6. The case study background

Table 2 lists the participating companies and the interviewees involved in each case study. A brief profile of each company is provided in Appendix B. Overall, we involved two large foreign consumer product manufacturers, one large local manufacturer, three local distributors and two retailers, one of which is foreign. For the foreign players, IT has always played a key role in the strategic direction of their organizations since the very beginning of their establishment in Indonesia.

There are existing trading relationships among the case study participants. All manufacturers (Companies A, B and C) involved in this study supply products to both retailers (Organizations G and

**Table 2**  
Overview of multiple case study participants.

Company	Type	Ownership	Interviewee(s)	Interview Period <sup>a</sup>	Annual Revenue
A	Manufacturer	Foreign	Unit Account Manager	1,2	US\$ 84 billion
B	Manufacturer	Foreign	Business Logistics Manager	2	US\$ 68 billion
C	Manufacturer	Local	Managing Director Head of IT	1,2 2	US\$ 1 billion
D	Distributor	Local	Business Manager, Director	2	n/a
E	Distributor	Local	Managing director	1	n/a
F	Distributor	Local	Owner	1	n/a
G	Retailer	Foreign	IT Director	1,2	US\$ 38 billion
H	Retailer	Local	VP Logistic, Head of IT, Operational Manager	2	US\$ 1.2 billion

<sup>a</sup> Interview period: 1 (Oct 2008–Feb 2009), 2 (Dec 2009–Jan 2010).

**Table 3**  
Overview of the B2B EC technology initiatives used by the participants.

B2B EC Initiatives		Manufacturer	Distributor	Retailer
Barcode		All	All	All
EDI	Web portal	C	E	G
	3rd party	A, B	–	G, H
	PDA	A, C	D, F	–
VMI		A, B, C	D, F	H
Cross docking		A, C	D, F	–
CPFR		A	–	G

H). The distributors (Companies D, E and F) distribute different manufacturers' products to various regions in Indonesia. Company D distributes Company C's products and those of a few other large manufacturers within West Java, while Company F distributes the products of Company A and other manufacturers within East Java. Company E is the only large local sole distributor of a large processed food company that supplies to both participating retailers.

In terms of B2B EC technologies, all organizations use the barcode system and a range of EDI capabilities, as summarized in Table 3. In addition, some also embrace other B2B EC concepts such as VMI and cross docking. However, only two organizations have sufficiently matured to adopt the CPFR practice. The study shows that more advanced B2B EC initiatives, such as VMI, cross docking and CPFR, rely on barcode and EDI. Each of the adopted B2B EC initiatives is explained briefly in Appendix C.

## 7. The study findings

In this section, we describe how the adoption factors captured in our research framework drive or inhibit the adoption of various B2B EC technology initiatives currently adopted by the organizations involved in our study. Table 4 summarizes factors affecting the adoption of B2B EC by the participants. Each factor is discussed below.

### 7.1. Technological context

Within the technological context, the study findings highlight three salient factors that affect adoption: perceived benefits, compatibility and cost of technologies. Each factor has a different

influence on EC adoption. Other characteristics, such as complexity and risks, do not appear to significantly affect the B2B EC adoption by the participants and, hence, are not discussed in this section.

#### 7.1.1. (+) Perceived benefits

Within the technological context, our study indicates the positive influence of the perceived benefits of the adopted B2B EC technologies. Most organizations find that this is a very crucial factor in every technology initiative that they decide to pursue. Some of these perceived benefits include accuracy, speed and efficiency, which all finally lead to cost savings for the organizations. These benefits are the main drivers behind the pursuit of B2B EC initiatives such as barcode, EDI, and cross docking. B2B EC initiatives such as the handheld PDA system are perceived to have additional benefits. Apart from speed and efficiency, participants acknowledged other benefits of implementing these initiatives, including the following: (1) ability to control and monitor human factors, imposing discipline and strict policy to ensure a sufficient level of salesmen performance, (2) ability to increase information visibility for both its own employees and external customers, and (3) ability to maintain good relationships with trading partners by maintaining face-to-face interactions. According to the Managing Director, Manufacturer (Company C):

We need to do things more efficiently and faster. Automation [the use of PDA] reduces human errors, which results in efficiency and speed, leading to more sales. It increases our speed of processing data. Also, it helps to control and impose discipline on our salesmen. We can track down all their activities in the field.

Managing Director, Manufacturer (Company C)

As technology adoption would typically require substantial investment capital, it is very important for organizations to foresee the perceived benefits to be gained from such an investment.

#### 7.1.2. (+) Compatibility

The case study confirms the importance of introducing IT-enabled business practices that are compatible with the current organizational practices and expertise. Because there are different IT sophistication levels across organizations within the industry, B2B EC technologies and initiatives have been adapted in different ways

**Table 4**  
Overview of factors affecting adoption and their influence.

Role	Manufacturer			Distributor			Retailer		
	Company	A	B	C	D	E	F	G	H
<b>Technological context</b>									
Perceived benefits	+	+	+	+	+	+	+	+	+
Compatibility	+	+	+	+	+	+	+	+	+
Technology cost	–	–	–	–	–	–	–	–	–
<b>Organizational context</b>									
Size	+	+	+	+	+	+	+	+	+
Financial and IT resources	+	+	+	+	+	+	+	+	+
Top management support	+	+	+	+	+	+	+	+	+
Organizational structure	+	+	+	+	+	+	+	+	+
Organizational culture	+	+	+	+	+	+	+	+	+
Expertise/human resources	–	–	–	–	–	–	–	–	–
<b>External Environmental Context</b>									
Influence of large TP				+	+	+	+	+	+
Coercion				+	+	+	+	+	+
Foreign influence	+	+						+	+
Government support and regulations	–		–					–	–
Supporting infrastructure	–		–					–	–
National culture	±	+	±	±	±	±	±	+	+

+ Positive influence, – Negative influence, ± Mixed influence.



to ensure compatibility. For instance, in the case of EDI implementation, several adaptations to the EDI data format and technique are prevalent. For example, companies G and H (retailers) need to adapt their EDI system and data format, which involves a third party when dealing with foreign manufacturers because manufacturers do not permit a direct connection to their internal SAP ERP system. Similarly, large manufacturers provide their distributors with a PDA system to facilitate electronic exchange of demand information between small retailers and manufacturers via distributors. The use of a PDA system is also compatible with the current practice of having distributors visit retailers regularly to maintain relationships and understand market needs. All participants believe that the compatibility of technologies is critical for adoption.

### 7.1.3. (–) Technology cost

High cost of technology is found to be one of the main obstacles for nearly all of the participating organizations when they are deciding to adopt new B2B EC technology initiatives. A number of specific examples of this cost barrier to B2B EC technology adoption are identified in the case studies. For example, participating retailers indicate the reluctance of their smaller suppliers (manufacturers) to adopt barcode technology when they discover that it involves service fees and other necessary investment costs. This has sometimes caused smaller suppliers to reverse their decision to adopt the new technology. Furthermore, while the use of a PDA has been useful for Companies A and B to facilitate EDI implementation with their distributors and small retailers, the scalability is limited due to the high price of the PDA unit and the large number of distributors involved in covering the entire market within the country.

## 7.2. Organizational context

Within the organizational context, the study findings indicate the importance of all key factors for the adoption of B2B EC technologies by the study participants. For brevity, some related factors are discussed together.

### 7.2.1. (+) Size and resources

The multiple case study indicates a positive influence of organization size on B2B EC adoption technologies. Large organizations have adequate financial resources to acquire and develop the required system and infrastructure to support B2B EC. The interviews with various managers clearly indicate that B2B EC adoption within the industry has been initiated by large organizations, typically retailers and manufacturers. In general, the participating distributors are smaller than manufacturers and retailers. They adopt B2B EC because of the mandate from their larger trading partners. Likewise, small manufacturers and retailers within the industry that have trading relationships with our study participants generally have limited exposure to B2B EC technologies and simply follow what is required by the large trading partners. For example, Company G (retailer) provides its small suppliers with a customized B2B web portal to exchange and monitor purchase orders (POs). In addition, participating manufacturers, both local (Company C) and foreign (Company A), initiate the use of the PDA system among the salesmen of the distributors to eliminate any manual data entry of demand information from their small trading partners. Both companies provide the distributors (Companies D and F) with these handheld PDA devices, along with other necessary hardware or software. According to the Unit Account Manager, Manufacturer (Company A):

We provide our salesmen, under the distributors, with the PDA systems. The PDA systems remain as our property.

Similar evidence is found in the cross-docking initiative. Company G (a large retailer) introduced this initiative. With its strong financial resources, the company provides a warehouse (distribution center) with all the necessary IT infrastructure and technology for the purpose of practicing cross-docking initiatives with its smaller suppliers. Moreover, this retailer consolidates all the orders from various outlets, performs the planning and calculation, and conducts the sorting and delivery activities for its suppliers. This sentiment is expressed by the IT Director of the retailer (Company G) as follows:

In cross docking, we are the ones who set up our warehouse, do the planning, calculation, and sorting for our suppliers. We want to make sure all delivery is on time and as efficient as possible in order to save cost.

### 7.2.2. (+) Top management support

The next crucial factor that positively affects B2B EC technology adoption in the Indonesian grocery industry is the support and commitment from top management. Top management support leads to a strong commitment and less resistance from employees in the lower level when a new technology initiative is pursued. It helps ensure a clear line of communication across the entire organization and provides the required IT infrastructure. Interviews with the participating manufacturers and retailers revealed the importance of top management support in the adoption of B2B EC initiatives. Most of the B2B EC initiatives that are adopted are driven by the top management, who serve as opinions leaders within their organizations. According to the Vice President Logistics of a retailer (Company H):

VMI was initiated and directed in the beginning by our Australian manager, who already had 30 years of experience in supply chain and logistics.

However, in the case of participating distributors, no evidence is found regarding support from top management. Distributors are smaller in size and less powerful than manufacturers and retailers. All distributors in our study are engaged in B2B EC initiatives because their larger trading partners require their engagement. This factor is considered an external one and is discussed in the following section.

### 7.2.3. (+) Organizational structure and culture

The positive impact of organizational structure and culture on the adoption of B2B EC is also observed in our study. Organizational structure involving a *top-down* organizational hierarchy, particularly within the participating manufacturers and retailers, has proved to be essential in most of the implemented initiatives. This factor is related to the influence of top management support and commitment to promote and mandate the use of B2B EC technologies across the business functions. The adoption decision process is centralized, and the effect of the decision flows through smoothly to relevant business units, including the IT division. As a result, there is an adequate level of cooperation in implementing the decision and managing the required changes. The acceptance by various units of the top management of the decision to incorporate new technologies and new business processes has been relatively easy because of the culture of respecting the authority embedded within the organizations.

### 7.2.4. (–) Expertise/human resources

Human resource readiness is found to be a major inhibitor to EC technology adoption initiatives in Indonesia. Low levels of education of the Indonesian workforce are a reality mentioned by several

organizations. For example, lack of skilled personnel poses a major challenge in implementing and enforcing the use of PDAs for the manufacturers (Companies A and C) and the distributor (Company D) due to the undisciplined, dishonest, and unprofessional work practices of some salesmen and floor workers. Another challenge of the introduction of PDA is posed by the requirement for each salesman to adapt and upgrade him/herself to the role of an ‘analyst’ rather than simply a ‘salesman’. For this role transformation to be successful, these salesmen will require more analytical and critical thinking, along with better knowledge of the overall *business*. This clearly presents a major challenge for any company in Indonesia.

### 7.3. Environmental context

Within the environmental context, noticeably more factors negatively affect the adoption of B2B EC technologies compared to the other two contexts. The impact of industry structure is assessed through the influence of large organizations, coercion and foreign influence.

#### 7.3.1. (+) Influence of large organizations

Larger organizations, which typically have greater bargaining power compared to their smaller trading partners, often influence the direction of B2B EC technology adoption initiatives. Large organizations within the industry are fewer in number, but they dominate a significant proportion of the total market sales. Therefore, as expected, ‘influence of large organizations’ has been identified as a major driving force in the technology adoption process within the Indonesian grocery industry. This is evident, for example, in the way that Company E (distributor) is influenced by Company G (large retailer) to make use of its EDI solution (B2B web portal) through various free seminar and informational sessions offered by the retailer and the way that Companies D and F (both distributors) are influenced by Companies A and C, which provide handheld PDAs for the distributors’ salesmen to use, again through various training and awareness programs initiated by the larger manufacturers. Similar examples are found in the adoption of VMI, as a large manufacturer (Company B) influences a large retailer (Company H) to adopt VMI by offering help and support to forecast its stock level. These large organizations impose technology adoption on their smaller partners in the hope of attracting more actors in the industry to use their chosen technology, thereby reducing the overall cost of that technology in general and gaining more bargaining power over these smaller partners.

#### 7.3.2. (+) Coercion

The multiple case study indicates that influential large organizations in the Indonesian grocery industry often use force or threats to persuade unwilling parties or trading partners to participate in the EC technology adoption process. Coercion appears to be a very strong factor in the EC adoption process within the Indonesian grocery industry. For example, as a large retailer, Company G is in a position to force its distributors (Company E) to use its B2B web portal due to its greater bargaining power. Meanwhile, in the case of the handheld PDA system, the coerced party consists of distributors (Companies D and F), which have comparatively little power compared to the participating manufacturers. For these distributors, non-compliance with this requirement could lead to the termination of contracts by the larger manufacturers. Internally, salesmen’s unwillingness to comply with their employer’s requirement to adopt the PDA could cost their jobs at the company. Through coercion, these companies could prevent or suppress any resistance to the adoption of a new technology initiative from their unwilling employees or trading partners.

#### 7.3.3. (+) Foreign influence

The case study indicates that the presence of foreign multinational companies (MNC) within the industry is one of the most important factors influencing the adoption of B2B EC technologies. Most foreign MNCs already have advanced IT systems and practices in place when they enter the country and require local branches to implement them. The headquarters of these MNCs provide full support and offer the required IT infrastructure, knowledge, expertise, support, and other forms of resources to their local branches. This driving factor is highly visible for Companies A, B, and G, which are all foreign MNCs. The influence of the foreign headquarters of the MNCs is not only felt at the beginning of their establishment in the country; rather, it remains a constant driving force that strongly influences further technology adoption throughout the journey of these participating organizations. This causes local branches and their employees to be more ‘IT-savvy’, more aware of new innovations and trends in the industry and, more importantly, more aware of their potential benefit to their organizations. These foreign MNCs also influence the whole industry and its local players with regard to the introduction and usage of new EC technology. This view is supported by the Vice President Logistics of a retailer (Company H) when he made the following remarks:

Foreign companies surely influence technology adoption in the local industry as well. They are the trend-setters when it comes to new technology initiatives.

#### 7.3.4. (+/–) National culture

The impact of culture on technology adoption cannot be underestimated in developing countries with cultures that are different from those of the Western countries in which technological innovations are developed. Culture is beyond the control of one single organization. A given society’s values, perceptions and principles related to general business conduct are established over long periods of time. We observe both positive and negative influences of Indonesian culture in our study. The positive impact of culture is demonstrated through the cooperation and willingness of large trading partners to provide the necessary technologies to their less powerful trading partners. Thus, the concept of EDI or DIE, as observed in the early stage of EDI adoption in the West prior to the availability of Internet EDI [93], does not seem to be applicable in Indonesia because its culture values long-standing relationships.

However, we found that there was a certain degree of resistance among the salesmen when the PDA system was first introduced. This was experienced by both manufacturers (Companies C and A) and distributors (Companies D and F). Salesmen often resisted change and refused to go beyond their “comfort zone”. This might relate to the general culture of Indonesian people, who are somewhat more conservative (also in terms of technology) and fairly cautious when new technologies require them to change their usual habit or way of working. As such, people often feel that their old way of working is *better* and less complicated, thus making them less enthusiastic about ventures involving new technology. People are skeptical and have a certain pre-judgment that “new things” are not good for them. This sentiment is expressed by the Head of IT of a manufacturing company (Company C) as follows:

Our culture is very different from Western culture. In our culture, people tend to sit within their comfort zone and do not want to change. People sometimes are afraid of new things and do not want to learn and adapt. They are concerned that these new things are of bad influence and will harm them.

Furthermore, face-to-face communication and personal networking are also strong characteristics of East Asian culture and are still ingrained in every aspect of conducting business. In Indonesia, in regard to business relations, it is still very important to meet directly face-to-face with business partners. A good relationship with partners sometimes extends beyond the technology itself and can guarantee greater success than technology alone. Therefore, in our study, we observe that the adaptation of EDI concept facilitated by the use of PDA enables distributors to maintain face-to-face communications with non-EDI capable retailers and transfers the demand information electronically to the manufacturers. Thus, culture appears to have both positive and negative effects on adoption, particularly for the participating distributors. Overall, however, the positive influence is stronger.

### 7.3.5. (–) Government regulations

There are no real government regulations that regulate the use of IT in Indonesia. As such, this poses a considerable threat and generates uncertainty for most actors when deciding to pursue new technological initiatives. Most organizations are therefore somewhat reluctant or unwilling to be *adventurous* in their search for new technological innovations. Because of unclear laws relating to IT, software piracy and other violations of electronic intellectual property continue to be a major issue in the country. Other examples of how Indonesian government regulations restrict technology adoption can also be demonstrated by the fact that they still require organizations to provide original *printed* invoices for official taxation purposes. Therefore, according to an IT director in Company G, a large retailer, although *Electronic Fund Transfer (ETF)* is a common practice among organizations, the organizations still do not exchange invoices *electronically* with other capable trading partners.

### 7.3.6. (–) Supporting infrastructure

Insufficient Internet infrastructure is clearly a major difficulty in the technology adoption process in Indonesia. Internet speed in some places remains slow, and Internet coverage remains very limited beyond major urban areas. Moreover, in rural areas, Internet connection is considered costly and can only be afforded by a small fraction of the population. This unfavorable condition has affected smaller suppliers and distributors in remote areas, who have limited Internet access for conducting business with Company H (retailer) via its B2B web platform. This is worsened by the fact that during peak hours, Internet connection becomes even more sluggish and less reliable. As a result, business processes that rely heavily on smooth Internet connection are affected. High-speed Internet connection is still considered expensive and a luxury. According to the Head of IT of Company H, a retailer, due to this unreliable Internet connection, frequent connection breakdown is inevitable, causing critical functions within organizations to halt when the Internet is down. This, in turn, leads to an extensive amount of loss, as reflected by the number of missed sales transactions.

## 8. Discussion

By employing the TOE framework complemented with four adoption theories, this study has investigated the impact of technological, organizational and environmental factors on the adoption of various B2B EC technologies by organizations within the Indonesian grocery industry. The most salient factors that are found to affect EC adoption negatively in this industry are related to the external environment rather than technological or organizational in nature. This observation confirms the findings of a number of previous studies [94,95].

Although there is some skepticism about the relevance of perceived benefits of EC technologies for developing countries [10]; we find that the benefits offered by B2B EC are still appealing and attractive for organizations within the Indonesian grocery industry as ways to improve their process efficiency. This observation is particularly relevant for large organizations, which are the concern of our study, as they have adequate resources for IT investment and have large transaction volumes that can easily justify that investment. Our study, however, indicates that Indonesian grocery companies consider the costs of technologies to be quite high relative to the cost of labor, which, in turn, affects the adoption rate within the industry. This is true especially among small and medium-sized enterprises (SMEs), confirming Vatana-sakdakul et al.'s [10] findings on EC adoption in Thailand. This matter further impacts the scalability of diffusing technologies within the distribution channels of large manufacturers, as in the case of the PDA-based EDI.

Compatibility also affects the adoption of B2B EC by the participating organizations. Our study indicates that some efforts have been directed by companies to ensure that the level of technology complexity is acceptable to the different trading partners involved and that the use of the technologies is not in conflict with widely acceptable business practices and current skill levels. We observe significant differences across industry players in terms of their IT capability, which leads to the prevalence of different options for the facilitation of EDI within the industry. Although the effect of complexity is not explicitly discussed in the findings section, it has an impact on the adoption and is indirectly addressed in the discussion on compatibility.

Our study further indicates that organizational size affects the availability of the financial and IT resources required for EC technology adoption. Likewise, top management's role in championing technological innovations is found to be crucial within the participating organizations. The typical top-down hierarchy structure within organizations in Indonesia assists in effectively communicating the organizational vision to all levels. However, large organizations continue to lack adequate skilled resources to materialize their vision for electronic trading with all business partners due to the limited availability of IT professionals in Indonesia. Finally, by deploying several theories complementarily, our study highlights the dynamics and rich interplay among factors related to the technological, organizational and environmental contexts. While Rogers' DOI theory can explain the influence of technological factors, organizational factors and, to a certain extent, environmental factors, additional theories are useful in better understanding the interactions among these factors.

The study highlights the particular relevance of the two theoretical dimensions of the RDT: power imbalance and mutual dependence. Large organizations and foreign MNCs, which often have greater financial capital and bargaining power, have created power imbalance within the industry. This has resulted in a situation in which smaller organizations are often required to adhere to the requirements of their larger trading partners. The issue of power imbalance is also identified in the Chinese grocery industry, where large retailers frequently influence small manufacturers and distributors in their choice of technology adoption [30]. Using the lens of RDT, we have observed how large organizations make use of their advantageous position in the supply chain to reduce uncertainties by equipping the distributors with PDA-based EDI systems. Such systems increase their ability to capture real-time demand information from all retailers, which is necessary for more accurate demand and production planning. Mutual dependency between manufacturers and distributors drives the successful adoption of PDA-based EDI systems. The manufacturers are willing to provide the infrastructure and the

associated training to the distributors, as they acknowledge that such efforts would make the distributors more dependent on the manufacturers. At the same time, the distributors recognize that by accepting those PDA-based EDI systems and receiving the free, associated training, they would help make the manufacturers more reliant on them in conducting business. Hence, a perception of mutual dependence is reinforced between manufacturers and distributors, which greatly facilitates the uptake of PDA-based EDI systems in the supply chain.

Thus, based on the RDT, we can observe the positive impact of dependency and power inequality between manufacturers and distributors on the adoption of PDA-based EDI systems, regardless of initial reluctance among the distributors. Despite the negative perception of the exercise of coercion [24,72], it appears to be an effective means of imposing technology adoption because of the complementary support provided by the parties exerting coercion. Furthermore, the issue of mutuality of costs, benefits and risks, which was identified as an inherent barrier to the adoption of B2B EC in developed countries [96], does not appear to be significant in our study, as reflected by the willingness of large organizations to subsidize the provision of the required technologies to the distributors. Moreover, the positive influence of foreign companies on the adoption of B2B EC by local industry players reflects how mimetic pressure posited by the institutional theory plays out within the industry to achieve isomorphism/homogeneity among industry players.

Interestingly, normative pressure currently appears to be absent within the industry. The industry bodies and the government do not seem to be actively advocating and supporting wider adoption and penetration of B2B EC technologies. No particular directives, incentives, subsidies or regulations that encourage B2B EC adoption, as observed in some other developing countries such as Malaysia, are visible in the Indonesian context. For many SMEs and remote areas, access to high speed Internet and mobile networks is limited either because of high cost or inadequate network coverage. Thus, the presence of government support, which is one of the most frequently cited driving factors in many studies of EC adoption in developing countries [23,24,30], is not identified as an important factor in this study. However, while government support is minimal, the industry seems to be proactive and self-sufficient in B2B EC technology adoption because large organizations are willing to drive the adoption within the industry. However, the legal framework, such as the requirement to have printed invoices, may hinder the adoption of a complete electronic trading system, as achieved in many developed countries [97].

Considering the NCT, we can further explain how various adoption factors interplay and impact the B2B EC adoption of the participating organizations. Based on Hofstede's cultural dimensions, Indonesian culture is characterized as having high Power Distance, low Individualism, low Masculinity (high Feminism) and relatively moderate Uncertainty Avoidance. The introduction of most B2B EC initiatives has been a relatively smooth process due to the culture of following mandates from senior management. This might be explained by the high Power Distance characteristic of some developing countries including Indonesia, where, as opposed to developed countries [13], people are expected to be instructed and led by a more senior and respected party. Therefore, although many employees are still conservative and unwilling to change their current business practices, it has been relatively easy for participating organizations to adopt B2B EC initiatives that are directed by the top management. Subordinates who espouse the national culture are likely to show obedience to their superiors. Likewise, the coercion of trading partners with less power has worked relatively smoothly because challenging the influential trading partners conflicts with the

culture, which respects important others and avoids uncertainty in the consequences of their actions.

Furthermore, in line with the caring attribute of the society, as reflected in the high feminism index, our study shows the goodwill of large trading partners in supporting the different needs of their less capable trading partners with alternative methods such as EDI, barcode and cross docking. Large manufacturers are indeed willing to provide the required PDA units, including the software and additional support, for the distributors to comply with their requirements for electronic data interchange. Thus, when coercion is coupled with the willingness of large organizations to provide support and costly infrastructure to smaller players, this can lead to an intriguingly positive outcome in terms of B2B technology adoption.

PDA-based EDI is also in line with the long-standing tradition of Indonesians that values face-to-face communications, personal networks and close relationships within the society. This is also observed by Vatanasakdakul et al. [10], Kurnia and Peng [11] and Humphrey et al. [82], who recognize the importance of maintaining personal network contacts through regular face-to-face meetings and a strong preference toward using traditional work methods rather than using technology. Efficiency and accuracy can be enhanced by capturing demand information on the PDA and transmitting this information electronically to the manufacturers; however, this cannot be done at the expense of eliminating human interactions. This arrangement works well in countries where the cost of labor is relatively cheap and, hence, technology adoption does not necessarily reduce the use of labor. However, the nature of the labor required may change as basic IT skills to complement business and other skills are expected.

In short, our study indicates that Indonesian culture generally leads to an overall positive impact on B2B EC adoption. By considering the national culture in which adopting organizations are embedded, we have gained richer explanations of how various contextual factors interplay and affect B2B EC adoption. Our study also demonstrates the major role played by national culture in shaping the influence of other adoption factors. Although there are unfavorable contextual conditions such as high cost of technologies or lack of government support, our study shows how cultural factors play out in ways that overcome the negative influences of other contextual factors. Considering a cultural perspective, employing the NCT has therefore enabled us to complement the understanding obtained from other adoption theories, specifically DOI, RDT and IT, regarding the influences of the adoption factors related to technological, organizational and environmental contexts. Thus, we have demonstrated how these four adoption theories can be used complementarily within the TOE framework to better understand the influence of contextual factors on the adoption of B2B EC in Indonesia, as an example of a developing country.

## 9. Conclusion and implications

Motivated by the need to better understand the underlying mechanisms of the influence of technological, organizational and environmental factors on the adoption of B2B EC in developing countries, our study employs a multiple case study involving eight organizations to explore the adoption of various B2B EC technologies by organizations within the Indonesian grocery industry. Due to the richness of the interplay among contextual factors affecting EC technology adoption by an organization, we adopt a multi-theory perspective to gain a better understanding of the influence of those contextual factors. In particular, we use the TOE framework as an overarching framework and embed four adoption theories: the Diffusion of Innovations Theory, resource



dependence theory, institutional theory and national culture theory. We have demonstrated the usefulness of complementarily applying these theories to develop a more comprehensive understanding of how technological, organizational and environmental factors play out over time and impact adoption. In a broad sense, we thus find the TOE framework to be suitable and useful when using organizations as the unit of analysis because it enables us to focus on certain contextual factors and apply relevant theories systematically and complementarily to advance the understanding of the impact of those factors.

We believe that this study adds richness to the current literature by offering a better understanding of B2B EC adoption in developing countries, complementing the findings of other previous studies and providing some directions for future research. While the TOE framework has helped explore various factors affecting the adoption of B2B EC technologies in different countries, the framework only allows limited flexibility to capture the dynamic changes of various factors and their impacts throughout the course of the adoption process over time. Deeper explanations are required to better understand how contextual factors affect adoption. These cannot be revealed without applying other theoretical lenses. In particular, the rich environmental factors and their significant influence on adoption can only be investigated thoroughly by incorporating adoption theories such as RDT, IT and NCT, as illustrated in this study. Among these environmental factors, national culture has been found to play a major role in shaping the influence of other contextual factors. Likewise, power imbalance and mutual dependence, which are two key constructs in RDT, are found to have relevance in explaining the uptake of EC technologies by the supply chain members. In the past, most electronic commerce researchers relied on the Diffusion of Innovations theory as the dominant theoretical lens to explain the technology adoption behavior of organizations. However, our contribution is reflected by the use of constructs from multiple theories under the broader umbrella of the TOE framework. In particular, the use of RDT (a powerful yet less commonly used theory) in our study helps provide a richer explanation of the dynamics of EC technology adoption in the Indonesian context. This represents a genuine contribution of our work as reported in this paper.

Another major contribution of our study is the detailed focus and explanations provided on EC adoption for a single industry context. As contextual situations vary across different industry contexts even within a country, a rich discussion of how various factors influence the dynamics of EC adoption in the retail industry context provides useful insights into the peculiarities of, and situations unique to, that industry context. This aspect also contributes to improving our understanding of the overall EC adoption phenomenon.

Our study has also demonstrated that when studying the adoption of technologies that transcends organizational boundaries, limiting the unit of analysis to a single organization simplifies and gives better control over the study design and analysis process to enhance rigor. However, a complete understanding of the adoption phenomenon can only be obtained by acknowledging the inter-organizational nature of such EC technologies and initiatives, which require the unit of analysis to be extended [98]. Therefore, although the unit of analysis in this study is the individual organization, detailed examinations of the participants' EC technology adoption experience would naturally lead to the inclusion of the interactions between the focal organization and its trading partners. Thus, to complement the findings of this study, a further study that involves a larger unit of analysis such as pairs of organizations (dyads) or supply networks would be useful in further exploring the inter-organizational interactions to better understand the adoption

phenomenon and what could be done to achieve successful adoption. Similar studies involving other industries in Indonesia and other developing countries would also complement the findings of our study. Last but not least, it would also be interesting to explore the cultural aspects of technology adoption in other developing countries, as well as developed countries, to compare findings and open up new discussion in this relatively unexplored terrain.

The findings of our study offer valuable insights into the current application of B2B EC technology initiatives in the Indonesian grocery industry. It is useful to know which B2B technologies are relevant and currently in use and how the B2B EC vision of having paperless trading can be achieved differently by organizations in Indonesia, as an example of a developing nation. This understanding is especially beneficial for most domestic Indonesian players within the industry should they wish to keep up with the latest B2B EC technologies and initiatives to remain competitive with any foreign-based companies in the ever-more competitive and saturated grocery industry. The identification of factors affecting adoption also helps other organizations to assess their position and devise an appropriate adoption strategy. In addition, the findings improve our understanding of the current situation of EC within the Indonesian grocery industry and, thus, may guide other countries, particularly developed countries, in devising strategies to address organizations within the Indonesian grocery industry more effectively and efficiently as they extend their supply chains. In particular, for those foreign corporations aiming to enter into or expand their market penetration into developing countries' markets, this study reiterates the importance of how these companies can influence and better implement new technological implementation in these countries by (1) taking a proactive approach in initiating and driving the overall direction and end-to-end technological implementation, (2) exercising careful coercive-controlled measures and initiatives with their local trading partners, (3) providing guidance, education, and up-skilling opportunities for local labor forces, and (4) creating a better sense of awareness and respect for local cultural customs and traditions, which can help smoothen dealings through mutual understanding and collaboration.

Despite the contribution of our study, it is not free from limitations. First, we only consider organizations within the Indonesian grocery industry. Other industries with different characteristics (e.g., power distribution in the supply chain) may have different experiences with B2B EC adoption. Second, we do not explore the role of industry associations and standard bodies in assisting organizations in adopting various EC technologies and resultant benefits. By including such third parties, a more comprehensive understanding of EC adoption could be developed. However, from the interviews with the participating organizations, we discover that the industry associations and standard bodies are currently not playing an active role. It would be useful for future studies to investigate how the roles of such bodies change over time and the impacts of this change on the EC technology adoption process within the industry. Finally, as our study is based on a multiple case study involving eight organizations within the Indonesian grocery industry, the findings should be interpreted carefully within the relevant contexts. This study compromises statistical generalization to obtain a more detailed understanding of the adoption experience of the participating organizations.

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## Appendix A. A detailed summary of B2B e-commerce studies undertaken in developing countries

Country	Literature sources	Type of EC	Industry type	Research approach	Data analysis	Theoretical frameworks	Significant factors
Botswana	Olatokun and Kebonye (2010)	Point of sale, E-wallet, e-billing, e-cheque, biometric	SMEs in such industries as wholesale & retail, manufacturing, and hotels	Survey ( $n = 120$ )	Computation of means and frequency distribution	Broader EC adoption literature	Security, high costs, lack of technical manpower, slow Internet speed
	Shemi and Procter (2013)	General B2B initiatives	SMEs in ICT and Tourism	Qualitative case study	Electronic coding and qualitative data analysis	TOE	Slow Internet speed, lack of skilled IT personnel, high costs, lack of regulatory framework
Brazil	Barbosa and Musetti (2010)	EDI, barcode used within logistics information systems	Agriculture, industrial, and transportation	Survey ( $n = 38$ )	Kruskal–Wallis and Mann–Whitney’s non-parametric analysis	No specific theory	Organization size, nature of operations (domestic, international), type of industry
Brunei	Seyal and Rahim (2006)	EDI, e-mail, website	Various industries including retailers, construction, IT companies, printing	Survey	Regression	Broader literature on EDI adoption. Developed a model in somewhat TOE format	Perceived direct benefits, perceived cost
	Looi (2005)	Websites, Internet, e-mail, and general EC technologies	SMEs (retail, construction, transport, mining)	Survey	Pearson correlation, regression analysis	Diffusion of Innovations, general IS adoption literature	Competitive pressure, IT knowledge, relative advantage, security and government support
Chile	Grandon and Pearson (2004)	Traditional EC systems	Cross-national study (USA & Chile)	Survey			Organizational readiness, external pressure, perceived ease of use, perceived usefulness
	Nasco et al. (2008)	Interactional website	Small businesses from various industries (including manufacturing companies, and exporters)	Survey ( $n = 212$ )	Hierarchical regression analysis	TPB, Culture theory	Subjective norms, attitudes toward EC, adoption intentions, perceived behavioral control
China	Tan et al. (2007)	B2B e-commerce initiatives	SMEs	Survey ( $n = 134$ )	Spearman rho	TOE	Organization size, intolerance of failure, incapability of dealing with change, lack of enterprise-wide information sharing, lack of internal trust
Egypt	Zaied (2012)	Web portals, Internet banking	Wood, paper products, electronics, power and gas, services	Survey ( $n = 150$ )	Descriptive statistics, frequency distribution	Broader literature on EC barriers	Security, high costs, lack of EC standards, lack of government policy
India	Tarafdar and Vaidya (2006)	B2B e-commerce initiatives	Financial industry	Multiple case study	Descriptive analysis	No specific theory, broad literature on IS adoption	Management support, organization culture, organization structure (centralization/ decentralization)
Indonesia	Kartiwi and MacGregor (2007)	Websites and General EC technologies	Various industries (SMEs)	Survey ( $n = 179$ )	Factor analysis, $t$ -tests	No specific theory, general literature	Three factors (barriers) negatively affected EC adoption: too difficult, unsuitable for company, lack of time
Iran	Elahi and Hassanzadeh (2009)	Portals, EDI, Internet, e-mail	Not mentioned	Survey ( $n = 27$ )	Correlation analysis	TOE, broad literature on EC adoption	Organizational leadership, organization culture, human resources, organizational domain, customer pressure, competitive pressure, supplier pressure, compatibility, Internet security, interoperability, speed of Internet network
	Sanaye and Rajabion (2009)	Intranet, Extranet, EDI web portals, EFT, Usenet	SMEs from various industries	Survey ( $n = 50$ )	Descriptive statistical analysis	TOE, broad literature on EC adoption	CEO characteristics, organization size, age of organization, management support, organizational EC readiness, government support, competitive pressure, consumer readiness, communication channels, cost, complexity, relative advantages, security, privacy
Kenya	Kenneth et al. (2012)	Interactional and transactional websites	Tourism (SMEs)	Survey ( $n = 35$ )	Descriptive statistics (frequency distribution)	TOE, Change agency theory (Grandon and Pearson, 2004)	Management support, leadership, EC resources, national infrastructure, competition
Malaysia	Salwani et al. (2009)	General EC technologies	Tourism	Survey ( $n = 165$ )	Structural equation modeling	TOE, Resource-based view theory (Conner, 1991; Caldeira and ward, 2003)	Costs, technological competence, organization size, front-end EC capability, back-end EC capability

## Appendix A (Continued)

Country	Literature sources	Type of EC	Industry type	Research approach	Data analysis	Theoretical frameworks	Significant factors
Nigeria	Olatokun and Bankole (2011)	Point of Sale, E-shopping, e-mail, E-cheque	SMEs from various industries	Survey (n = 60)	T-tests, Pearson correlation, regression analysis	Broad EC adoption literature. A model is developed in somewhat TOE format	Perceived benefits, nature of business, size of organization, owners' EC awareness
Oman	Al-Balushi et al. (2012)	Not mentioned	SMEs	Literature analysis	Not applicable	Broad EC adoption literature	Management support, organization size, IT integration, Human capital, organization culture, government support, industry characteristics
Pakistan	Seyal et al. (2004)	Transactional web site, Internet, e-mail		Survey (n = 54)	Regression	TOE, Culture theory (Hofstede, 1997), motivation theory (Vallerand 1997) and DOI (Rogers)	Organizational culture, government support, perceived benefits, task variety
Saudi Arabia	Al-Somali (2011)	Interactive E-commerce websites	Various industries	Survey (n = 202)	Multiple Discriminant Function Analysis (MDFA)	TOE	Organizational IT readiness, management support, customer pressure, strategic orientation
Singapore	Teo and Ranganathan (2004)	Customer-oriented web-based systems, supplier-oriented web-based systems	Manufacturing and service	Survey (n = 108)	Student t-tests	No specific theory	Industry type, organization type, level of annual IT investment, B2B champion, management support
South Africa	Molla and Licker (2005)	B2B e-commerce initiatives	Various industries	Survey (n = 150)	Structural equation modeling	TOE	EC awareness, management commitment, governance, human resources, business resources, technology resources, government support, market forces, supporting industries
South Korea	Kim (2006)	Websites, General e-commerce initiatives	Fishery wholesalers	Survey (n = 50)	Friedman tests	TOE	Management support, security, ease of use, belief of inter-firm benefits, B2B mindset
Taiwan	Thatcher et al. (2006)	B2B e-commerce initiatives	Electronics, textile	Qualitative study	Interviews with 20 senior managers	Culture theory (Hofstede, 1997) and institutional theory (DiMaggio and Powell, 1991; Shore; 2001)	Government support, national culture, management support, organization size, IT sophistication, multinational companies, industry responsiveness, and industry pressure factors
	Chen (2003)	B2B e-commerce initiatives	IT industry				Pressure
Thailand	Vatanasakdakul et al. (2004)	B2B e-marketplace, E-auction, E-mail	Various industries	Case study (key informants)	Descriptive analysis	Culture theory (Hofstede, 1997); Socio-cultural perspective	Trust & control, motivation, lack of initiative, personal network contact, costs
	Lertwongstai and Wongpinunwatana (2003)		SMEs	Survey (n = 180)	ANOVA	TOE, broader IT innovation literature	Organization size, management support, existence of an IT department, compatibility, competitive pressure, perceived benefits
Turkey	Ulwngin and Uray (2004)	Internet-enabled supply chain systems, EDI, Informational website	Various industries (e.g., textile, food, pharmacy, iron, construction)	Survey (n = 73)	Chi-square	No specific theory	Organization type, industry type, foreign partnership, strategic orientation, cost orientation
	Imamoglu and Rehan (2011)	Government e-procurement systems	Public sector	Qualitative data analysis	SWOT analysis	No specific theory	Government leadership, policy and legal framework, human resources, institutional change
	Latif (2014)	E-procurement	Various industries	Case study	Descriptive analysis	No specific theory	Perceived cost savings, transparency of procurement policies, shortened acquisition time, fear of unknown technology
Vietnam	Huy and Filiatrault (2006)	E-commerce initiatives	Service, construction	Survey (n = 214)	Discriminant analysis (Equality of means tests)	Broader EC and IS adoption literatures	Organization size, strategic orientation, employees' knowledge of e-commerce, competitive forces, management attitudes toward EC, government support, national infrastructure
	Pham et al. (2011)	E-commerce initiatives	SMEs	Conceptual paper	n/a	TOE, Broader IS adoption literature on trust and risk	Organization size, management support, existence of an IT department, perceived benefits, compatibility, industry competitiveness

## Appendix B. A brief description of case study participants

### B.1. Company A

Company A is a foreign consumer product manufacturer with global annual revenues of US\$ 84 billion in 2013. It was established in 1989 in Indonesia. It currently employs approximately a total of 80 people who are principally responsible only for high-level management, strategic directives and development of its brand in Indonesia. It outsources all sales and distribution activities to partner distributors around the country. The head count including all those outsourced sales persons reaches approximately 2000 employees. It does not have a factory in Indonesia. To achieve the economy of scale, it has several factories in different countries within Asia. These regional factories produce different product segment needs (e.g., oral care factory in Vietnam and hair care factory in Bangkok). The IT department of Company A consists only of 7 people, who are mainly responsible for maintenance activities.

### B.2. Company B

Company B is a well-known foreign manufacturer of consumer goods. It is a multi-national company that has established its presence in Indonesia since 1933. It has approximately 3000 employees and 2 main factories in Jakarta (serving West Indonesia) and Surabaya (serving East Indonesia), with annual sales of US\$ 68 billion. It has approximately 40 people in its IT department who are primarily responsible for project support and maintenance activities, as no internal development takes place. It serves 2 types of customers, *general trade* (GT) and *modern trade* (MT) customers. GT customers are typically traditional markets/smaller shops that are mainly served by its appointed distributors, while MT customers are typically large modern retailers in main cities that are served either directly by the company or, in some cases, by a specialized distributor appointed by Company B in a particular area.

### B.3. Company C

Company C is a local food manufacturer with approximately 12,000 employees nation-wide. Since its establishment in 1977, it has been one of the most important actors in the Indonesian food industry. Overall, 90% of its business comes from the local market, with exports to 50 different countries. It has 6 factories around Indonesia and is operating in 7 main divisions: coffee, biscuit, wafer, noodle, beverages, health food, and eastern food. It went public in 1991. The revenues were US\$ 1 billion in 2013. It has its own subsidiary company as the main distributor of its products to its retailer partners. Of the approximately 1000 employees on the staff and management team, there are approximately 75 people in the IT department.

### B.4. Company D

Company D is a local SME operating as a distributor that distributes goods from various food manufacturers directly to retailer outlets. Currently, it has approximately 200 employees and operates mainly in West Java province, with a head office in Jakarta and two local branches, in Bandung and Cirebon. Currently, it employs two people who are responsible for IT support activities.

### B.5. Company E

Company E is a large local sole-distributor of a leading processed food company in the Indonesia food sector. Company E is heavily reliant on its mother company, which is responsible for developing the corporate strategy for all other subsidiaries. It has approximately 10,000 employees, with 100–150 people involved in the IT sector. The company handles approximately 250,000 customers within Indonesia.

### B.6. Company F

Company F is a local distributor operating mainly in the East Java region and Sulawesi Island. The company has developed into eight branches (four in Java, one in Bali, and three in Sulawesi). At the end of 2008, Company F covered as many as 80,000 customers, with supermarket and wholesalers representing 70% of the business. It has a strategic plan to cover a total of 320,000 stores in the future. Company F has been distributing Company A's products since 1988. Their customers are mostly non-modern retailers.

### B.7. Company G

Company G is a leading foreign retailer operating in Indonesia that first entered the country in 1992. It has approximately 20 stores across the country, and it had annual sales revenues of US\$ 38 billion globally in 2013. The company was originally a wholesaler, but it was transformed into a modern market format of *hypermarket*. This shift happened after the company was bought by another leading East Asian supermarket chain in 2008. From the very beginning of its establishment in Indonesia, IT has always played a key role in the company's strategic direction.

### B.8. Company H

Company H is a local modern market chain with total revenues of around US\$ 1.2 billion in 2013. It has approximately 10,000 employees and is part of a larger group, which is publicly listed on the Jakarta Stock Exchange. The group operates in three other areas, namely, department stores, children's entertainment, and bookstores. Company H operates in 3 brand positions, namely, hypermarket chains, convenience store chains and pharmacy stores. It has three main internal distribution centers (DCs) in mainland Java: Balaraja (serving Jakarta area and West Java), Cibitung (serving West and Central Indonesia), and Surabaya (serving East Java). These DCs are fully equipped with warehouse management system (WMS).

## Appendix C. B2B EC Technologies and initiatives adopted

### C.1. Barcode

Product numbering and automatic identification system in the form of barcode technology (including barcode printer and scanner) are commonly used by all participants. The barcode system in use was established in 1993 based on the European (EAN) product numbering system [97,99] and is also known as the Global Standard 1 (GS1) system [100]. The adoption of barcode within the industry was mainly driven by the large retailers in the early 1990s. There are still many small manufacturers that are not capable of producing barcodes for their products. In this case, retailers need to create their own internal barcodes.



## C.2. Electronic data interchange

For EDI, the Internet has become an alternative transmission medium, resulting in a new type of EDI, called the 'Internet EDI' [93,97]. EDI technology, in the form of an Internet-based B2B web portal, is used by Companies C, E, and G. The B2B web portal serves as a platform for exchanging *purchase order* (PO) documents electronically between the retailer (Company G) and its suppliers, which replaces the old-fashioned fax systems. Companies B and G, however, implement the most advanced version of EDI, through direct Internet-based third party EDI services, based upon XML standards. In this scenario, the retailer (Company G)'s server is directly connected to the manufacturer (Company B)'s servers via a third-party EDI provider. Similar to the previous example, Companies B (manufacturer) and H (retailer) also implement direct Internet-based third party EDI services based upon *text file* standard. Companies A and C (both manufacturers), together with their respective distributors (Companies F and D), implement EDI using PDA devices as a tool to capture store-level sales transaction data. These devices are used by the sales and marketing personnel of the distributors, which act on behalf of the manufacturers, to help sales transactions and automate the order-picking process from the outlet of the smaller retailers.

## C.3. Vendor managed inventory

VMI is a replenishment initiative in which manufacturers are responsible for replenishing retailer store inventory based on sales transaction data from the retailers. Moreover, it gives the manufacturer greater visibility of consumers' purchasing patterns. VMI requires all parties involved to have EDI capability in order to share sales data [97,101]. Companies B and H have been employing the VMI (Vendor Managed Inventory) initiative as part of their long-term strategic joint-project commitment since 2007/2008. Through VMI, the retailer (Company H) trusts the manufacturer (Company B) to manage and maintain its inventory level by periodically sharing its sales data and inventory level with the manufacturer through EDI. Between Companies A and C (both manufacturers) and their respective distributors (Companies F and D), VMI is achieved through the use of PDA devices initiated and provided by the manufacturers (through their distributors) to

closely monitor and forecast customers' (retailers') inventory level. When visiting customers' outlets, sales personnel of the distributors, who act on behalf of the manufacturer, control and forecast customers' inventory levels and propose new orders in close collaboration with the customers.

## C.4. Cross docking

Cross docking embraces the idea of a centralized DC without the use of buffer stocks. It promises substantial cost saving with the adoption of relatively simple technology but requires good communication, cooperation, EC compliance and trust among trading partners [102]. Cross docking has been practiced by Companies A and C (both manufacturers) in serving smaller *traditional* stores. The suppliers (manufacturers) have full visibility of the customers' store-level inventory through their representatives (distributors), who capture customers' store-level transactions using the PDA. Therefore, suppliers have the ability to monitor and identify specific store order requirements at any given time. Goods are packed for each store at the supplier's site, delivered to the warehouse of the distributor, checked, and immediately dispatched to customers without any sorting.

## C.5. Collaborative planning forecast replenishment (CPFR)

CPFR is an initiative that envisions two or more trading partners exchanging market information and working closely together to develop a joint market-specific business plan. It leverages collaboration between retailer and manufacturer and requires an infrastructure that can facilitate high-level information exchanges, a sophisticated forecasting system, and an integrated logistic system [103]. Company A (manufacturer) and Company G (retailer) can be considered to have the most mature relationship and sophistication of the B2B EC initiative compared to other participants, as reflected in a form of CPFR activities known as the 'Joint Business Plan'. In a Joint Business Plan, both organizations align all levels of activities, including planning, forecasting, monitoring demand, and integrating other activities, to achieve annual strategic objectives and mutual benefits.

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