# The Impact of E-government and E-business on Economic Performance: A Comparative Study of Developing and Developed Countries

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ABSTRACT

*In the last decade, there has been a significant growth in applications of e-business as well as e-government in many countries. Research shows that e-business and e-government contribute to the economic performance of countries. The objective of this study is to explore the relationship between e-government as well as e-business and economic performance of developing and developed nations, separately. This paper argues and finds that the relationship between e-government as well as e-business and economic performance varies based on the development status of a country given the differences in the technological, organisational and environmental factors between developed and developing nations. More specifically, the results show that e-government is significantly related to economic performance in the case of developing countries and e-business is significantly related to economic performance in developed countries.*

## Introduction

Over the past several years, nations across the world have implemented e-business (electronic business) and e-government (electronic government). Depending on the complexity of planning and implementation, e-business and e-government are in different stages of growth. It is also observed in past research studies that e-business and e-government contribute to the overall economic performance of the nations.

E-business is the practice of conducting a range of business processes or activities over the Internet and other electronic network technologies such as Electronic Data Interchange. The methods may include buying and selling of products and services, providing services to customers and collaborating with business partners like distributors and suppliers. E-business covers all the components of the value chain including production, distribution, sales, payment, procurement, order fulfillment, inventory, and marketing. There are several e-business models, such as Business-to-Business (B2B), Business-to-Customers (B2C), Consumer-to-Consumer (C2C), and Consumer-to-Business (C2B).

E-government is one of the important concepts introduced in the field of public administration in the late 1990s (Moon, 2002). E-government refers to government's use of technology, particularly Web-based Internet applications, to enhance access to and delivery of government information and services to citizens, business partners, employees, other agencies, and government entities. The need for better government and the provision of improved services to citizens has resulted in many governments making e-government a priority.

How well an economy of a country is performing is measured by the achievement of economic objectives of the country and may include both short-term and long-term goals, or both. A range of economic indicators and indices is used to measure the macroeconomic performance of a country. The Economic Performance Index assesses the overall macroeconomic performance of a nation. The indicator combines several macro variables, such as inflation, unemployment, balance of payment deficit, and Gross Domestic Product (GDP) growth.

Srivastava and Teo (2010) explored the relationship between e-business and e-government and countries' economic performance. They find a significant relationship between both e-government as well as e-business and economic performance. As the technological, organisational and environmental characteristics of developing and developed countries tend to differ (Efebo and Bio, 1984) the relationship between e-business or e-government, and economic performance may not be the same for developing and developed nations. This observation triggered the need for testing whether this relationship stands for developed and developing countries, separately. The objective of this empirical study is to validate the relationship between e-government as well as e-business and the economic performance of developing and developed nations separately. The relationships are examined using secondary data available in the public domain.

This research is based on the economic model of e-government/e-business developed by Srivastava and Teo (2010). The model uses the Technology-Organisation-Environment (TOE) framework to explore relationships between technology, organisation and environment, with e-government and e-business.

This study shows that e-government affects the economic performance of developing nations, whereas e-business influences economic performance of developed nations. Same e-government and e-business measures and criteria may not be applicable for developing and developed nations equally. The present study contributes to the body of knowledge by revealing that the impact of e-business and e-government is different for developing and developed nations. Hence, the outcomes of this research would be of interest to government policymakers as well as business organisations. This research can help practitioners and policymakers in the planning and implementation of e-business and e-government measures and in tailoring them depending on the country's development status.

The paper is organised as follows. In the next section, past research studies are reviewed and the gap in the literature is highlighted. Research questions are also stated in this section. The theoretical foundation of the study and formulation of the hypotheses are presented in the next section. The methodology adopted in this research study is then described. The results of testing of the hypotheses are presented next. The discussion of results section describes why the findings are important. The last section outlines the contributions to literature and practice, describes limitations and points out directions for future research.

## Literature Review

Over the past several years, governments of many countries have been consistently pursuing an agenda of e-government. This action of governments is based on the belief that e-government will result in improved quality of life of their citizens (Karunasena and Deng, 2012). Krishnan, Teo, and Lim (2013) define e-government as the use of information technologies by citizens, business organisations, and other stakeholders to access various government services online, without any third party intervention. The benefits of e-government are assessed by its capacity to enhance transparency and accessibility of government programs (Cherry, 2014). E-government is one of the priority areas of most national governments, including in developing countries (Garimellaa and Kolluru, 2011). As a result, governments have started allocating a substantial proportion of their annual budget for the development and implementation of e-government (Garimellaa and Kolluru, 2011).

Past research on e-government can be categorised into three broad themes: (1) the evolution of e-government; (2) adoption and implementation of e-government; and (3) impacts of e-government on society (Krishnan et al., 2013).

Along with e-government, e-business is another phenomenon in the electronic environment (e-environment) influencing society. The initial adoption of e-government was driven by the evidence

of successful implementation of e-business in business organisations (Raj, Pan, and Huang, 2002). During the last decade, both e-government and e-business have witnessed significant growth (Zhu, Kraemer, and Xu, 2002). Now these phenomena are more than a decade old. Measuring business value of Information Technology (IT), even at a firm level, is difficult (Lee, 2001). Estimating the economic value of e-government is even more challenging (Das and Shobha, 2015). The difficulty of measuring the value of IT investments is known as the "productivity paradox" of IT (Dewan and Kraemer, 1998). Productivity paradox invites discussion of IT and its value contribution (Brocke, Jan, Recker, and Mendling, 2010; Carr, 2003). Researchers seem to be in consensus about the economic value that IT offers (Brocke et al., 2010). Therefore, the doubt is not on what IT contributes to economic value creation, but rather on how it is realised.

Very few studies combine both e-government and e-business in a single research model although the literature suggests that these two are interrelated, and the combination has important policy implications. Srivastava and Teo (2010) used the TOE framework to explore antecedents of e-government and e-business. Using economic theory of technology, they found that e-government and e-business impact on economic performance of countries. Exploring the interdependence of these constructs, the authors found that e-business fully mediates the relationship between e-government and economic performance of countries.

Srivastava and Teo (2010) and Durbhakula and Kim (2011) have used the TOE framework in national level studies into e-government and e-business. Results of their research suggest that the TOE framework informs country-level research on the impact of e-business and e-government development on economic performance. Both e-business and e-government were in a nascent stage when research into their impact on economic performance was carried out by Srivastava and Teo (2010). Over time, with innovations in e-government and e-business, use of these technologies have increased, and countries have gained more experienced in using them. However, still, e-business is considered to be ahead of e-government with regard to the level of adoption. Also, as of recent, there has been increases in the electronic information capacity of the world (Cherry, 2013). Hence, the relationships established in prior research such as Srivastava and Teo (2010) may not hold true in the current context. To address this limitation the present study investigates the relationship between e-government and e-business and economic performance using data from 2014. The above review of the literature and the identified research gap led to the formulation of Research Question 1.

Research Question 1: *What is the relationship between e-government as well as e-business, and economic performance in 2014?*

While there are a few studies on the economic value of e-government and e-business focusing on developed nations, studies on developing countries are rare (Udo, Bagchi, and Kirs, 2012). Also, in past research studies, the differences in the relationship between e-government as well as e-business and economic performance due to variations in income levels of the countries were not considered. It is observed that developed countries have an advantage over developing countries since most of the technological innovations are initiated by the former (Comin and Hobijn, 2003).

Most innovations and adoption of innovations take place in developed countries. Technological, organisational and environmental factors as explained in the TOE framework are more advanced in these countries, and little effort is required to improve them further. Further, a non-linear relationship between digital development and economic performance has been observed (Cruz-jesus, Oliveira, Bacao, and Irani, 2016). It is argued in this research that the impact of the technological, organisational and environmental factors is more relevant to developing countries compared to developed countries. There exists more scope for improvement of e-government and e-business in developing countries than in developed countries. As a result, an incremental change in contextual factors of the TOE framework is expected to create a significant shift in the status of e-government and e-business in developing countries compared to developed countries. Due to the contrasting characteristics of developing and developed countries, it is likely that the economic impact of these technologies differs depending on a country's development status. The above analysis led to Research Question 2.

Research Question 2: *How does the relationship between e-government and e-business, and economic performance differ between developing and developed countries?*

## Research Model and Hypotheses

## Conceptual framework

E-government and e-business are technology-driven phenomena. The TOE framework is commonly used to study the technology adoption process. Developed by Tornatzky and Fleischer in 1990, TOE framework is used to predict the likelihood of adopting a particular technology within organisations (Raus, Flügge, and Boutellier, 2009). The TOE framework identifies three factors of a firm that could influence the adoption and implementation of technological innovations (Dwivedi, Wade and Schneberger, 2012). These are technological context, organisational context, and environmental context. The technological context refers to the level of technology within the organisation. The organisational context is about size, structure, and quality of human resources within the organisation. The environmental context alludes to the field in which an organisation leads its activities. The TOE framework has empirical support for different information systems applications, such as e-business by organisations (Zhu and Kraemer, 2005), Internet adoption by companies in USA and China (Xu, Kevin, and Gibbs, 2004), and E-commerce adoption in Australia and Denmark (Scupola, 2009).

Researchers have adapted this framework to study the likelihood of technology adoption and implementation at country-level (Li, Li, and Shapiro, 2012; Durbhakula and Kim, 2011; Srivastava and Teo, 2010). However, the three factors affecting technology adoption have been operationalised in different ways in prior studies. For example, Srivastava and Teo (2010) operationalise the technological context (concerning IT adoption) as IT infrastructure of the country, organisational context as human resource capability of the country (proxied by the Human Capital Index) and the environmental context as the institutional environment and macroeconomic environment - two indicators borrowed from the Global Competitiveness Report 2005. Durbhakula and Kim (2011)

measured technological context by combining two indicators of ICT infrastructure (i.e., technology innovation and technology readiness); organisational context as a mix of human capital and the corruption level of a country; and environmental context as a combination of business competitiveness and business environment. Business competitiveness was measured by the Global Competitiveness Index taken from the Global Competitiveness Report 2008. The Global Competitiveness Index is a measure of each country's attractiveness as a trading economy and as a destination for business investment, and considers such aspects as the availability of infrastructure, institutional framework and efficiency of labour markets.

Following Figure 1 shows the framework used in the present study to understand the technological, organisational and environmental antecedents of e-business and e-government performance of countries and the overall impact of e-business and e-government performance on countries' economic performance.

**Figure 1: Conceptual framework**
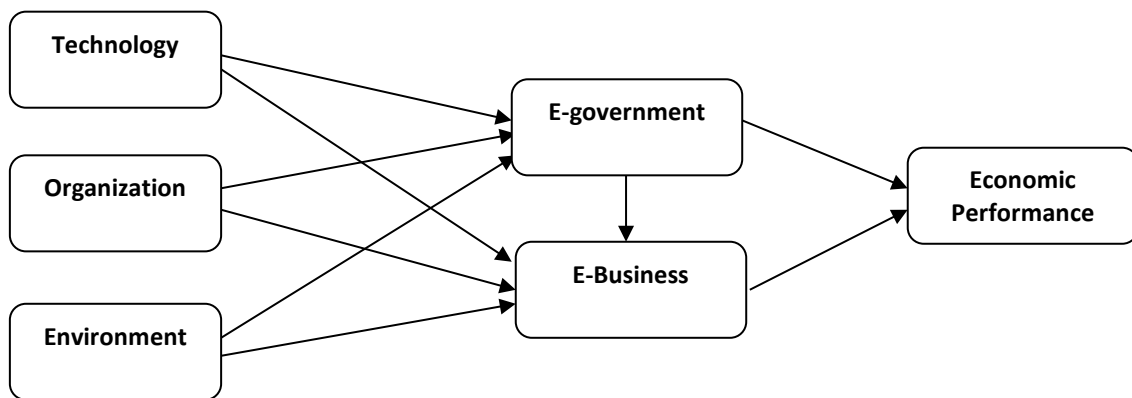


Insofar as e-government and e-business are concerned, the technological context of a country is operationalised as the status of its telecommunication infrastructure. Organisational context is operationalise as the quality of a country' human resources and the environmental context as the national environment of a country that encompasses the institutional framework and market efficiency of a country. This study follows Durbhakula and Kim (2011) and Srivastava and Teo (2010) in operationalising the TOE constructs. The measures of e-government development level and e-business development level of a country are the degree of Internet use for the purpose of availing government services and the degree of Internet use for performing commerce respectively. The study uses per capita gross domestic product as its measure of economic performance. Following Table 1 shows the data sources used to measure each of the above variables.

Data is collected from three sources available in the public domain: (1) UN e-government survey 2014 issued by United Nations; (2) the Global Competitiveness Report 2014 issued by the World Economic Forum; (3) and the Global Information Technology Report 2014 issued by the World Economic Forum. United Nations and World Economic Forum are considered credible sources of data for policy formulation. The United Nations and World Economic Forum adopt a rigorous process for collecting data, ensuring its reliability and validity.

**Table 1: Data sources**

| Underlying construct | Variable definition | Proxy | Data sources |
|---|---|---|---|
| Technological context | Status of the telecommunication infrastructure of the country | ICT Infrastructure Index | United Nations' e-government Survey 2014 |
| Organisational context | Quality of human resources of the country | Human Capital Index | United Nations' e-government Survey 2014 |
| Environmental context | The national environment, which encompasses institutional frameworks | Global Competitiveness Index | World Economic Forum Global Competitiveness Report 2013-14 |
| E-government development | E-government is meant for providing services online to citizens and businesses | E-Government Development Index | United Nations' e-government Survey 2014 |
| E-business development | E-business exists for conducting commercial activities online | Business usage index of Information Technology | World Economic Forum Global Information Technology Report 2014 |
| Economic performance | Value of nation's products and services | Gross Domestic Product per capita | World Economic Forum Global Competitiveness Report 2013-14 |

The sample for this study includes 145 countries. These are the countries for which complete data is available from these data sources. This sample size compares favourably with the 117 countries studied by Srivastava and Teo (2010) and 61 countries by Durbhakula and Kim (2011). The large sample size and the currency of data make the present study relatively more robust and authentic.

## Hypotheses development

Following Srivastava and Teo (2010) nine hypotheses are tested in this study. They are as follows.

$H_1$: The technological context is positively related to the e-government development status of a country.

$H_2$: The technological context is positively related to the e-business development status of a country.

$H_3$: The organisational context is positively related to the e-government development status of a country.

$H_4$: The organisational context is positively related to the e-business development status of a country.

$H_5$: The environmental context is positively related to the e-government development status of a country.

$H_6$: The environmental context is positively related to the e-business development status of a country.

$H_7$: The e-government development status is positively related to the e-business development status of a country.

$H_8$: The e-government development status is positively related to the economic performance of a country.

$H_9$: The e-business development status is positively related to the economic performance of a country.

The hypotheses proposed above are depicted in Figure 2. As shown in Figure 2, e-government and e-business development of a country are dependent on technological, organisational and environmental contexts. E-government and e-business development, in turn, are expected to affect the economic performance of a country.

**Figure 2: The Proposed Research Model**
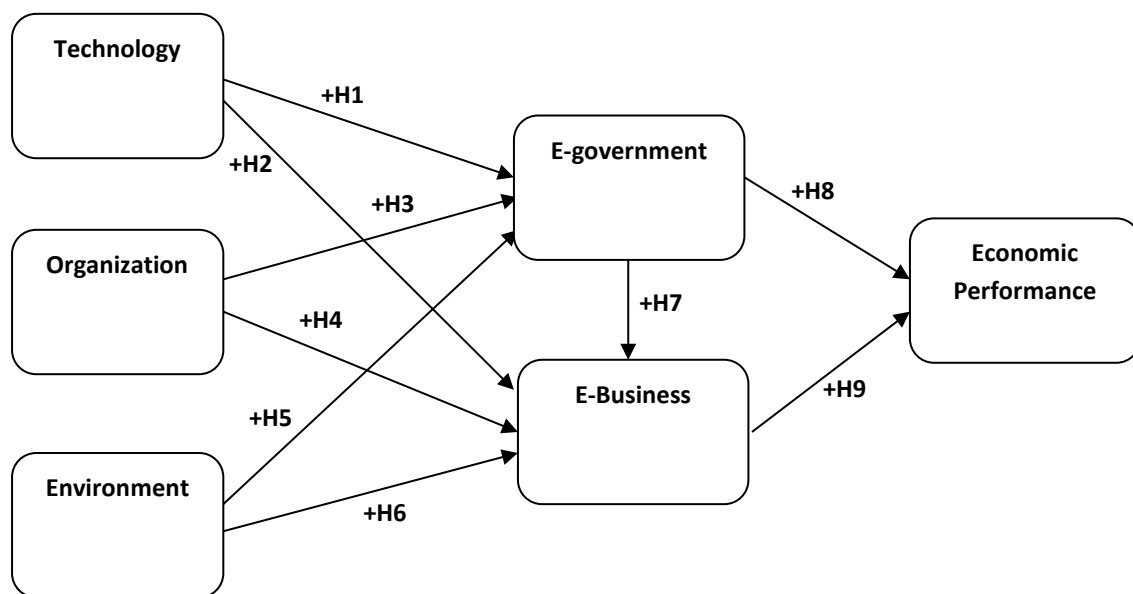


The nine hypotheses are tested for the full sample as well as sub-samples consisting of developing and developed countries. It is argued that the relationship between e-government as well as e-business, and economic performance might differ between developed and developing countries. Also, it is argued that the extent to which e-business development status of a country mediates the relationship between e-government and economic performance differ between developing and developed countries.

The sample includes 59 developing countries and 86 developed countries. The categorisation of countries into two groups is based on the criteria developed by the World Bank Group (2016). The World Bank classifies countries having per capita income less than $4126 as lower-middle-income

economies and low-income economies and equal to or more than this amount as higher-income economies.

Data is analysed using the Structural Equation Modelling (SEM) technique. For this purpose, software SmartPLS2.0 was used. SmartPLS2.0 applies Partial Least Square (PLS) technique for analysis. PLS technique is employed in this study as it is suitable for small samples (Hair, Ringle, and Sarstedt, 2011). Also, SmartPLS calculates p-values through re-sampling, a non-parametric method for estimating statistical significance which is more robust than the Ordinary Least Squares (OLS) technique.

## Results

The descriptive statistics and correlation matrix of all the variables used in the analysis for Model 1 (all the countries), Model 2 (developing countries) and Model 3 (developed countries) are presented in Table 3. These statistics show the mean, standard deviation, and correlation of variables.

Variables used in the models were tested for multicollinearity. The absence of multicollinearity is one of the important measures of goodness of fit (GIF) of a structural model. Table 3 presents the Variance Inflation Factors (VIF) for all the variables in the three models. The observed values of VIF are below five for all the constructs in the three models. The observed values of VIF are lower than the recommended maximum limit of five (Jaradat and Al Rababaa, 2013).The values of average VIF suggest that multicollinearity is within the tolerance limit for the three models.

**Table 2: Tests of multicollinearity between variables**

|  | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| IT Infrastructure | 2.41 | 1.24 | 3.58 |
| Human Capital | 2.31 | 1.84 | 1.22 |
| Global Competitiveness Index | 4.10 | 2.16 | 3.92 |
| E-government development status | 2.54 | 1.37 | 2.25 |
| E-Business development status | 2.54 | 1.37 | 2.25 |
| Average Variance Inflation Factor (AVIF) | 2.78 | 1.60 | 2.64 |

The research model with test results for all the hypotheses proposed earlier are shown in Figures 3 to 5 separately for all the countries, developing countries, and developed countries, respectively.

**Table 3: Descriptive statistics and correlation matrix**

| Variables | Model 1 – All countries | | | | | | | Model 2 – Developing countries | | | | | | | Model 3 – Developed countries | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | (1) | (2) | (3) | (4) | (5) | Mean | SD | (1) | (2) | (3) | (4) | (5) | Mean | SD | (1) | (2) | (3) | (4) | (5) |
| (1) | 4.68 | 0.82 | 1 | | | | | 4.24 | 0.51 | 1 | | | | | 4.98 | 0.87 | 1 | | | | |
| (2) | 0.68 | 0.19 | 0.49 | 1 | | | | 0.51 | 0.17 | 0.18 | 1 | | | | 0.79 | 0.10 | 0.41 | 1 | | | |
| (3) | 4.14 | 0.66 | 0.76 | 0.75 | 1 | | | 3.64 | 0.38 | 0.60 | 0.61 | 1 | | | 4.50 | 0.58 | 0.71 | 0.57 | 1 | | |
| (4) | 0.51 | 0.21 | 0.66 | 0.9 | 0.86 | 1 | | 0.32 | 0.13 | 0.35 | 0.86 | 0.73 | 1 | | 0.64 | 0.16 | 0.62 | 0.83 | 0.77 | 1 | |
| (5) | 3.73 | 0.82 | 0.82 | 0.62 | 0.89 | 0.78 | 1 | 3.23 | 0.35 | 0.89 | 0.38 | 0.78 | 0.49 | 1 | 4.06 | 0.88 | 0.75 | 0.61 | 0.89 | 0.78 | 1 |
| (6) | 15513 | 21066 | 0.65 | 0.56 | 0.77 | 0.69 | 0.77 | 1755 | 1215 | 0.24 | 0.69 | 0.49 | 0.70 | 0.36 | 24951 | 23007 | 0.59 | 0.44 | 0.74 | 0.61 | 0.72 |

Note: (1) IT Infrastructure; (2) Human Capital index; (3) Competitiveness Index; (4) E-government development level; (5) E-business development level; and (6) GDP per capita

**Figure 3: Results of hypotheses tests for the full sample**
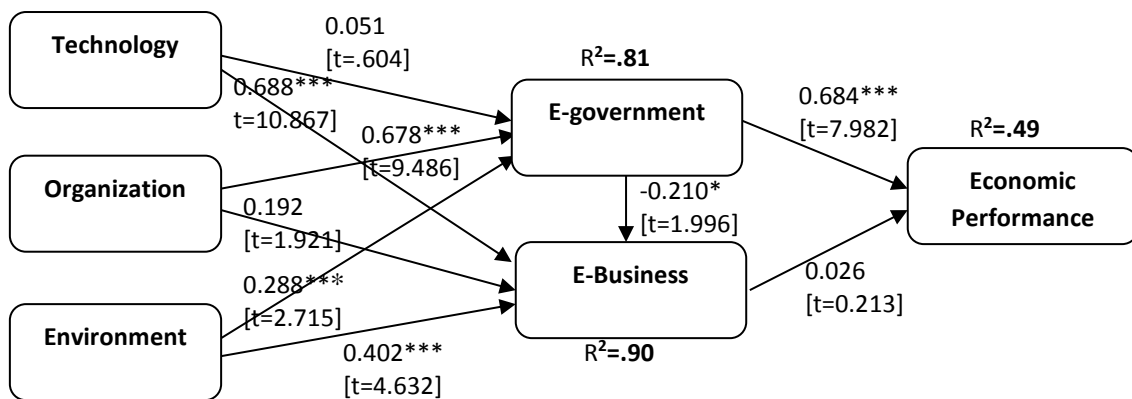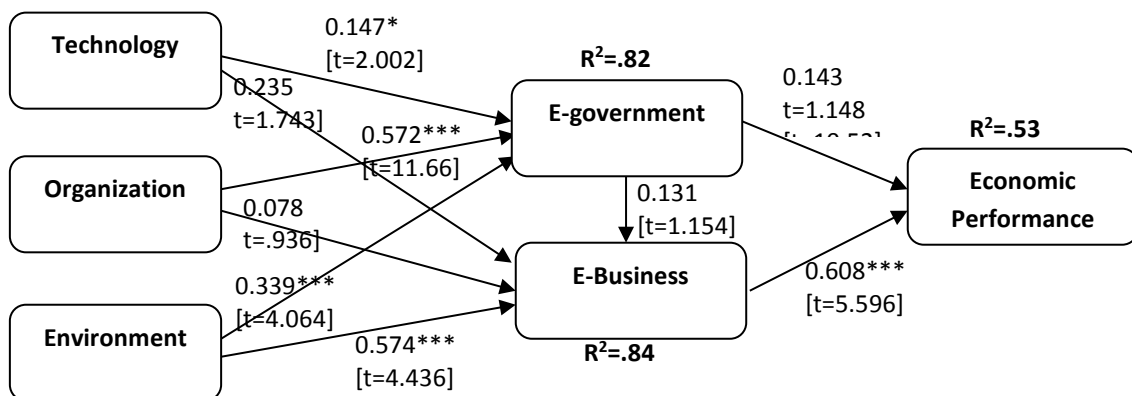


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Technology ──0.109***──────────────────┐
            [t=2.603]                    │      R²=.90
            0.310***                     ▼
            t=2.80]              ┌──────────────┐    0.249***   ┌──────────────┐
            0.605***────────────►│ E-government │───[t=3.42]──► │    R²=.62    │
            [t=16.05]            └──────────────┘               │              │
Organization                            │ 0.204                 │   Economic   │
            -0.163**                     ▼ [t=1.83]              │ Performance  │
            [t=-2.17]            ┌──────────────┐               │              │
            0.330***             │  E-Business  │───0.577***──► └──────────────┘
            [t=5.79]             └──────────────┘    [t=8.47]
Environment                          R²=.84
            0.602***
            [t=4.76]
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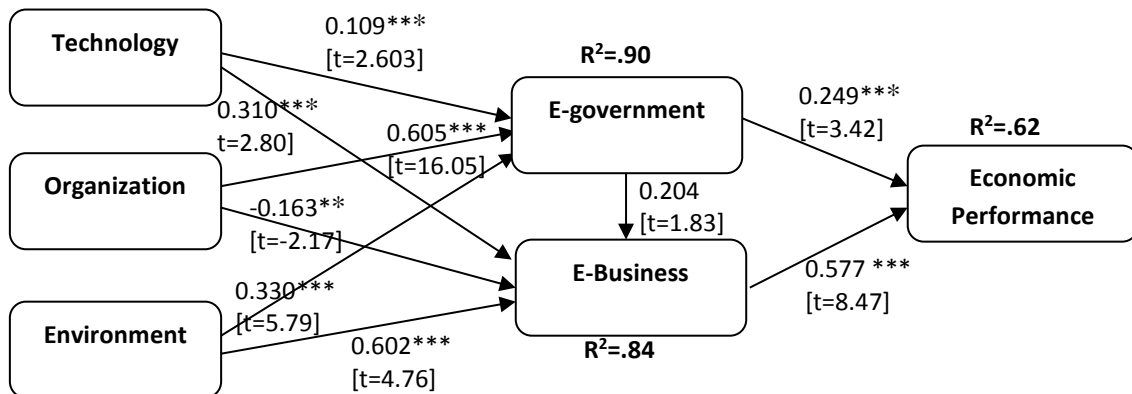
Notes: *** p < 0.001; ** p < 0.01; ** p < 0.05


**Figure 4: Results of hypotheses tests for the developing country sample**



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Technology ──0.051──────────────────────┐
            [t=.604]                      │      R²=.81
            0.688***                      ▼
            t=10.867]            ┌──────────────┐    0.684***   ┌──────────────┐
            0.678***────────────►│ E-government │──[t=7.982]──► │    R²=.49    │
            [t=9.486]            └──────────────┘               │              │
Organization                            │ -0.210*               │   Economic   │
            0.192                        ▼ [t=1.996]             │ Performance  │
            [t=1.921]            ┌──────────────┐               │              │
            0.288***             │  E-Business  │───0.026────►  └──────────────┘
            [t=2.715]            └──────────────┘    [t=0.213]
Environment                          R²=.90
            0.402***
            [t=4.632]
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Notes: *** p < 0.001; ** p < 0.01; ** p < 0.05


**Figure 5: Results of hypotheses tests for the developed country sample**



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Technology ──0.147*──────────────────────┐
            [t=2.002]                      │      R²=.82
            0.235                           ▼
            t=1.743]             ┌──────────────┐    0.143      ┌──────────────┐
            0.572***────────────►│ E-government │──t=1.148───► │    R²=.53    │
            [t=11.66]            └──────────────┘               │              │
Organization                            │ 0.131                 │   Economic   │
            0.078                        ▼ [t=1.154]             │ Performance  │
            t=.936]              ┌──────────────┐               │              │
            0.339***             │  E-Business  │───0.608***──► └──────────────┘
            [t=4.064]            └──────────────┘    [t=5.596]
Environment                          R²=.84
            0.574***
            [t=4.436]
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Notes: *** p < 0.001; ** p < 0.01; ** p < 0.05

Results for all the hypothesis of Model 1 (considering all countries) are consistent with earlier research by Srivastava and Teo (2010). However, the results of Models 2 and 3 are not consistent with the results of the study by Srivastava and Teo (2010). The results indicate that in developing countries, e-business development does not impact the economic performance of the country. Similarly, in the case of developed countries, the relation between e-government development and economic performance is non-significant. The results also highlight the differential impact of technological, organisational, and environmental contexts on e-government and e-business adoption in developed and developing economies.

## Discussion and Conclusion

This study finds significant differences in antecedents and consequences of e-business and e-government development between the sub-samples for developing and developed countries (Figures 4 and 5). Thus, policy formulation based on the results of studies that do not distinguish between developing and developed countries is unlikely to be effective.

Technology does not have a significant role in the development of e-government in developing countries. Rather, human capital and the business environment are the important factors that result in the development of e-government in developing countries. Similarly, for the development of e-business, organisational factors are not relevant in developing countries. Furthermore, the environmental context is significantly related to the development of e-government and e-business.

Results observed in this study have several public policy implications. Countries that emphasise more on IT infrastructure or human resource development for e-government or e-business development may achieve results only by creating a conducive competitive environment. The business environment operationalised using the Global Competitiveness Index has a significant impact on e-government and e-business development irrespective of country's development status. For developed countries, all the three factors of the TOE framework contribute to e-government development, whereas, for developing countries only two factors of the TOE framework (i.e., organisational and environmental factors) are significant. For the development of e-business in developed countries, only the environmental context is significant. However, in the case of developing countries, technological and environmental factors are significant for e-business development. Therefore, separate strategies for e-business and e-government development are required depending on the development status of a country.

Continuous improvement in the economic performance of a country is the desire of most governments. This objective may be achieved by encouraging e-government and e-business within the country. Due to limited resources, governments may not be able to focus on both these aspects. The results of this study suggest that if economic performance is the primary objective of a country, it is e-government that leads to it for developing countries, and for the developed countries, it is e-business. Furthermore, in contrast to earlier researches, it is found that there is no significant mediating role of e-business between e-government development and economic performance.

## Contributions, Limitations, and Future Research

The results of this research make two significant contributions. First, it shows the need for differing policies for technology development depending on whether a country is a developing or developed one. The characteristics, strengths, and weaknesses of the two categories of countries are very different. Therefore, uniform policies for e-government and e-business development are not likely to be appropriate for all countries. This study shows that this is, in fact, the case, and policies for e-government and e-business should be different based on the development status of a country. Also, the results help policy makers understand the role e-government and e-business development plays in enhancing the economic performance of a country. The different relationships between e-government development, e-business development and the economic performance for developing and developed countries separately would guide governments in taking appropriate policy decisions for the promotion of e-business and e-government within countries.

Second, the results show that even for the development of technological phenomena such as, e-government and e-business, IT infrastructure plays only a limited role. Instead, it is organisational capacity and conducive competitive environment that mainly impact e-government and e-business development.

E-business is a new development in many business organisations. We have found that antecedents of adoption of e-business are different for developing and developed nations. Based on the level of these antecedents, a business organisation may adopt a tailor-made strategy of e-business advancement. Therefore, the findings of this study help business organisations to target and expand their e-businesses in suitable territories having conducive factors.

One of the limitations of this study is that the research is conducted using cross-sectional data. Better results could have been obtained by considering longitudinal time series data. Also, the territorial proximity of geographies is another influential variable (Wilson, 2014). The inclusion of spatial proximity as a control variable would have further enriched the understanding of technology diffusion and economic performance. Future research may be carried out in the proposed directions to explore the relationship between e-government as well as e-business, and economic performance of nations, and also to strengthen the model.

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