

Impact of IT enabled services on the State GDP: A Case of Andhra Pradesh- India

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Abstract

E-government and digital literacy are game changers of development in the new resource constrained emerging economies. Invariably, e-government initiatives have been used to improve public services delivery and enable good governance. By pioneering the delivery of information technology (IT)-enabled public services, the Indian State of Andhra Pradesh has improved their speed, and accessibility resulting in higher citizen satisfaction and productivity which are not reflected in the gross domestic product (GDP). The paper suggests some methods to measure the impact of IT-enabled public services on GDP.

Keywords: E-government, Gross domestic product, India

INTRODUCTION

Andhra Pradesh (AP) is the eighth largest state in India (see figure 1) spanning 1 60 205 square kilometers located in southern part of India. AP population (as per 2011 census) is 4 93 86 799 individuals and a literacy rate of 91.01% (2014). The per capita income of the state of Andhra Pradesh, which represents the average earning of its citizens is ₹ 90517 (in nominal terms, registering a growth of 11.21% over 2013-14) and ₹ 44831 (in real terms, registering a growth of 6.31% over 2013-14, and with 2004-05 as base year). The per capita income is an indicator of the standard of living of the citizens in the state, and is above the national average of ₹ 88 533 (in nominal terms). In real terms, the per capita income at the national level is ₹ 74 193, with 2011-12 as the base year. (USD = INR 66.235) (Directorate of economics and statistics report, Government of Andhra Pradesh, 2015). The gross domestic product (GDP) of Andhra Pradesh, in nominal terms, is ₹ 5 20 030 crores in the financial year 2014-15 and represents a growth of 12.03% over 2013-14. In real terms, with 2004-05 as the base year, the GDP is ₹ 2 64 521 crores in the financial year 2014-15, and represents a growth of 7.21% over 2013-14.

Andhra Pradesh is fast emerging in the information technology (IT) and IT enabled services (ITES) space as a preferred destination for global multinational corporations eyeing the culturally sensitive, and rapidly growing Asian market. IT and ITES contributed ₹ 1692 crores to the GDP

in the financial year 2014-15, implying that its contribution to the state GDP is 0.32%. This contribution from the IT and the ITES sector is based on the value of procurement of goods and services in this sector, and includes the employment generated by the IT and the ITES firms for the specified financial year. Note that this method of GDP computation typically neglects the employment opportunities generated at the grass root level, and the savings accrued from enhanced competition due to IT interventions in public service. In this paper we investigate these dimensions of IT and ITES investments on the state GDP by analyzing the contributions of some popular citizen centric services in Andhra Pradesh.

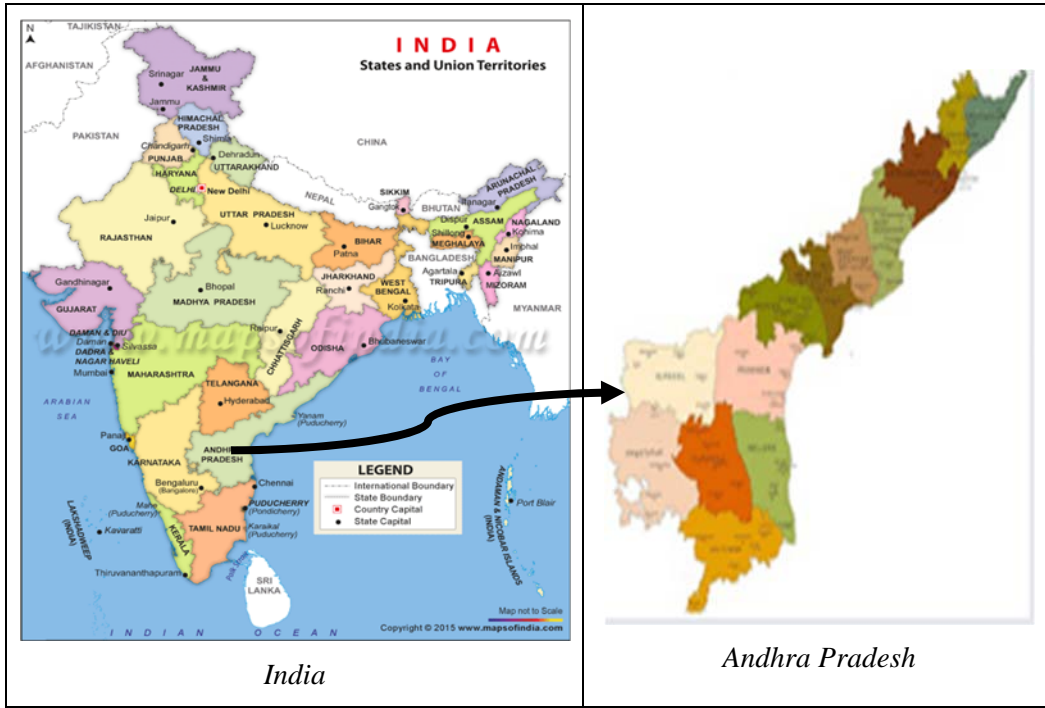


Figure 1: Political map of India and Andhra Pradesh

(Source: <https://www.google.co.in/search?q=political+map+of+India>, <http://www.meeseva.gov.in/Meeseva/intro.html>)

Notwithstanding the meager contribution of the IT and the ITES sector to the GDP, the state has embarked on several novel initiatives to harness the speed and efficiency of public services delivery. The government of Andhra Pradesh has undertaken massive investments in IT like tablets to field staff, fiber grid, and e-pragati as a part of inclusive growth and sustainable development, through effective public services delivery. Documentary evidence and media reports suggest that these IT investments improved the delivery of IT-enabled public services and increased their speed, and accessibility resulting in higher citizen satisfaction and productivity. On the other hand, economists and policy makers argue that such qualitative improvements in public services delivery and other e-government initiatives in general may not be reflected in the state GDP.

In this paper we investigate the impact of IT and ITES investments on the state GDP by analyzing the contributions of some of the popular citizen centric services in Andhra Pradesh State in India.

REVIEW OF EVIDENCE

Conventional macroeconomics studies held, at least till the 2000s, that IT investments by governments and firms did not contribute to productivity and growth in GDP which was against conventional wisdom (Brendt and Morrison, 1995; Loveman, 1994). Economists argued that IT benefits like improved quality, variety, accessibility, customer satisfaction, and speed could not be numerically captured in state GDP statistics. Further, a longer time frame is required for learning and adjustment (by employees) and restructuring (business processes) to realize the full benefits of IT systems which may not be accurately reflected in the year-on-year GDP due to this time lag. It may be noted that software training and investments are expended in the year of purchase and thus artificially increase short term costs while the benefits would not surface till years later.

Take the case of the expenditure of Andhra Pradesh state where ₹ 600 million (9.2 million USD) was spent in the financial year 2015-16 on procurement of tablets from reputed global companies like dell and lenovo.

State GDP, which is the state's output or income, is defined (D'Souza, 2008) as

$$GDP = C + I + G + (X-M) \quad \dots\dots (1)$$

Where

C = Consumption of goods and services by consumers

I = Investment by firms

G = Government supply of goods and services, its expenditure on consumption and capital formation

X is Exports and M is Imports

In the above scenario, ₹ 600 million may not have an impact on state GDP as the value added by this expenditure (in terms of greater accountability in public services, faster approvals and access) would be difficult to capture numerically in GDP statistics. Note that GDP will increase only if there is productivity in citizens (reflected in higher consumption), and more productive investments by firms and government; whereas, this expenditure of ₹ 600 million would appear as a short-term cost for the current financial year.

IT investments benefits firm level output, but did not have impact at the industry or the economy level. An intuitive explanation offered was that IT investments did not produce a wholly new good or service; it only improved efficiency in the processes. For example, with more and more steel, more and more automobiles (a wholly new good) could be produced which increases the GDP output. Whereas, producing more and more tablets and computers does not lead to production of new goods. This view is contestable though, as more computers would foster a new wave of services like software programmers, animation experts and the like.

Some of the studies (Brynjolfsson and Hitt, 1996) find strong evidence that IT investments increased productivity in firms by statistically correcting for issues like time lags, and level of analysis. In Andhra Pradesh, the GDP is computed through the “income originating approach”, where income accrued from the factors of production (land, capital, labor, entrepreneurship) located within the physical boundaries of the state are summed up. This aggregation, thus, represents the value of the goods and services produced within the boundaries of the state, accumulated over a specific time period. It may be noted that the income originating and the expenditure approaches of computing GDP must theoretically result in the same GDP quantity (Directorate of Economics and Statistics, 2015). With reference to IT investments by the government and related productivity, here are some evidences from the first and the third world:

Czernich et. Al., (2009) in their study across 25 OECD countries, find evidence that a 10 percentage-point increase in broadband internet connectivity results in a 0.9 - 1.5 percentage point increase in annual per capita GDP growth. This study is silent on the time lag between the investment year and the visibility of growth results. This is a concern for Andhra Pradesh State as India ranks 129 out of 166 in IT usage. The citizens of the state have challenges with IT learning and adoption, which may take years to evolve. For every rupee (dollar) invested in procuring IT systems, we need to spend several rupees (dollars) more for digital literacy education, implementation, and change processes.

Aker (2011) study on information and communication technologies for agricultural extension in developing countries reviewed and recognized that over 60% of the population in Asia, Africa, and Latin America use mobile telephony, but notes that their impact on extension services and adoption of high yielding technology in the agriculture sector is unclear. Though intuition suggests that mobile telephony may have a strong impact on agriculture productivity by reducing the information costs to rural farmers, evaluation studies have not confirmed this notion.

Jones et. Al., (2012) lament that there are no robust metrics to capture the true gains of enhanced productivity in health care productivity due to IT investments and there is a need to evolve such metrics. Lee et. Al., (2013) developed metrics to measure the productivity of IT investments in public health care in USA and reported that, over the period 1997-2007, an increase of 216% of investments in IT for health care resulted in 6% increase in value added productivity despite high digital literacy levels among the USA populace. This could be roughly true (and even more worse) in the Indian scenario. This also suggests that government initiatives to increase IT investments in health care (via e pragati) may lead to efficiency, but may not transform health care delivery.

Thus, there is mixed evidence regarding the impact of IT investments in public services on GDP. In the next section, we examine some popular public e-services in Andhra Pradesh and note their influence on the state GDP.

IT-ENABLED E-SERVICES AND THEIR IMPACT ON GDP

Electronic Services Delivery (ESD) – meeseva

The electronic services delivery (ESD – meeseva), administered by the office of director (ESD – meeseva), government of Andhra Pradesh, offers 321 government-to-citizen (G2C) services across 31 government departments, and several business-to-citizen (B2C) services to the citizens across the thirteen districts of the state through 5454 common service centers (CSCs). Begun in 2011, popular G2C offered by the ESD – meeseva office include providing computerized birth and death certificates, income certificate, record of rights for land of rural and urban land owners, land encumbrance certificate, and voter identity cards to the citizens of the state through minimum manual intervention. Popular B2C services include aadhar enrollment, banking services, mobile phone top up cards, ticket bookings, insurance premium payments, and utilities bill payments (<http://ap.meeseva.gov.in/DeptPortal/UserInterface/Services.html>).

The ESD office is headed by director, who is assisted by assistant secretary (administration) deputy director (technical wing), and deputy director (finance). These officers are assisted by 25 support staff, which includes five engineers. In each of the 13 districts of the state, the joint collector of the district functions as additional director, ESD, thereby ensuring regional presence.

Essentially operating on a public private partnership (PPP) model, the director, ESD selects private firms through open competitive bidding for managing the CSCs. The private firms, in turn, engage rural youths called village level entrepreneurs (VLEs) through a competitive process to run and manage the CSCs on a commission basis or through a franchisee model. The VLE must invest initially in computers, and internet connectivity. The director, ESD provides buildings (sourced from local bodies) and essential furniture. The revenues earned by the VLE through the sale of G2C and B2C services are shared between the office of the ESD - meeseva, the concerned private firm (s), and the VLE through a tripartite agreement. As on date of writing this paper, the ESD-meeseva has rendered 62049996 (62.05 million) G2C and B2C transactions (indicator of the volume of public services) to the citizens of the state. The citizen has to pay service fee ranging from ₹ 25 to ₹ 35 (US\$ 0.45 to 0.6) per transaction which would be shared between the ESD – meeseva office, the concerned government department, the private firm, and the VLE according to the terms of contract. Table 1 shows the details of revenue sharing pattern between the stakeholders. There are 33 government departments dealing with various state subjects (like revenue, registration and stamps, education, food and civil supplies, health, and housing). In addition to the above sharing, the ESD –Meeseva office retains 3-5% of the revenues for meeting expenditure towards secured stationery certificate costs. The ESD – Meeseva office has entered into contracts with four private partners, and with each partner, the sharing pattern is different and hence the revenue share is varying.

Table 1: Revenue Sharing Pattern of the Stakeholders in the ESD – Meeseva Project

Stakeholder details	Revenue Share (%)
The concerned government department	20-28
ESD – Meeseva office	4-28
Private partner	9-14
Village level entrepreneur	32-47
Source: Office of Director, ESD – Meeseva, Govt of A P	

It may be noted that the ESD – meeseva office has entered into separate contracts with four different firms in the state for managing the CSCs in the state (the state is divided into four zones for the purpose). The VLEs earn 35-47% of the transaction revenues. On an investment of ₹ 900 00 00 000 as grant from the government, the ESD– meeseva office which administers this project, has earned ₹ 980 00 00 000, which has been distributed to the various stakeholders in the project. These revenues include accruals from transaction fee, and streams from new businesses like cash management. Besides, the ESD – meeseva office uses 5% of the revenues for providing secured stationery and retains 10-12% of the revenues for providing infrastructure to VLEs. The united state of Andhra Pradesh was divided into the state of Telangana and the residuary state of Andhra Pradesh on 2-1-2014.

This model has been chosen by the government of India for country-wide replication, and ESD – meeseva project has been a recipient of the computer society of India – Nihilent award 2012 (<http://www.csnihilent-egovernanceawards.org/>), the national e-governance award 2014 (http://nceg.gov.in/sites/nceg.gov.in/files/list_of_awards.pdf), and the skoch order of merit award 2015 (<http://www.skoch.in/>).

Table 2: Earnings of VLEs in the State for the Financial Years 2011-12 to 2014-15

Year	Monthly income from G2C (INR)	Monthly income from B2C (INR)	Average monthly income from G2C+B2C (INR)	Number of VLEs	Income contribution (INR in Lakhs)
2011-12	2562	1061	3623	1834	66.4
2012-13	2371	3578	5949	2844	169.2
2013-14	4144	2991	7135	4852	346.2
2014-15	5324	3138	8462	4565	386.3
% Growth	107.81	195.76	133.56	148.91	481.78
Source: Office of Director, ESD – Meeseva, Govt of A P					

Table 2 shows the earnings of the VLE in the state for the financial years 2011-12 to 2014-15, and indicates a measurable contribution of the ESD – meeseva e-government initiative to the state GDP. The ESD– meeseva project has created a class of grass root entrepreneurs (VLE), and invested them with social status and earning potential. Each VLE, on average, earned ₹ 8462 per month in the financial year 2014-15. The average earnings were increased by around 134% and number of VLEs by around 150%. The ESD– meeseva project employed 4565 VLEs in 2014-15 which implies that the VLE in the state earned ₹ 386.3 crores during the year. Documentary evidence and the first author’s enquiries reveal that VLE spends ~ 98% of their incomes on food, clothing, and other basic necessities. It is thus inferred that the VLE earnings in 2014-15 directly relate to the consumption expenditure in the right hand side of equation (1), which represents the contribution to state GDP.

Further, the ESD – meeseva office has earned ₹10549193 (INR 10.5 million) as revenues in the financial year 2014-15. As table 1 shows, 20-28% of these revenues are ploughed back to the concerned departments which maintains the data and owns the government processes for delivering the public service in electronic form. Assuming an average of 24%, this implies a transfer of ₹ 2.53 crores to the various government departments by the ESD – meeseva office in

the financial year 2014-15. Enquiries with the concerned heads of departments reveal that the departments use this transferred funds for various public welfare activities aligning with the mandate of the department, including hardware and software infrastructure for sustaining the electronic delivery of public services. This expenditure relates to the government supply of goods and services in the right hand side of equation (1). Thus, the ESD – meeseva e-government initiative has contributed a minimum of ₹ 386.3 crores to the state GDP in the financial year 2014-15, which could be treated as a lower bound estimate.

E-Procurement

Procurement in the government sector is a significant economic activity and ranges between 8-25% of the state GDP. E-procurement is defined as the use of internet-based IT tools to undertake procurement activities and includes e-tendering, e-auction, e-catalogue, and using e-procurement software. Evidence suggests that e-procurement can save government 5% on expenditure and 50-80% of transaction costs, and that ~45% of the GDP is accounted for by transaction costs in modern economies (Corsi et al., 2006).

There are varying intensities of the application of IT tools for procurement. At a fundamental level, e-procurement might mean the availability of the news of a tender application online. At a higher level, vendors can upload their economic offers online. At the highest level of IT application, e-procurement implies the electronic management of supplied goods, invoicing, and payments. Thus, in the truest sense, e-procurement would be an integrated end-to-end application with seamless integration of indent management, online bid submission, contract management, supplier management, payments through electronic gateways, accounting, and generation of management information system reports. Such seamless e-procurement systems operate with the highest level of efficiency in Singapore, South Korea, United States of America, and Canada.

In Andhra Pradesh, e-procurement is limited to e-tendering, that is, submission of tenders online. E-tendering in the state is not integrated with supplier database, payment systems, banks, and government treasury, implying that e-procurement is in its infancy in the state. E-tendering, as a basic building block to build a robust e-procurement system, was initiated in Andhra Pradesh in 2003 as a service through the public private partnership (PPP) model. The private partner invested in the hardware, proprietary software and licenses, and was responsible for operation and maintenance of the e-tendering and procurement software. In return, the private partner was entitled to 0.04% of the value of the tendered purchase, which was a transaction fee. Thus, the state built up this e-government initiative without upfront investment of financial and IT resources. As of 2015, the government has ended the contract with the private partner and has assumed ownership of the proprietary e-tendering software. However, the government has engaged a private partner for maintenance. The private partner is entitled to 0.03% of the value of the tendered purchase as her commission, subject to a maximum of ₹ 10 000 for tenders up to ₹ 50 crores, and ₹ 25 000 for tenders above ₹ 50 crores.

How does this e-government initiative contribute to the state GDP?

The government procures goods and service through the reverse auction, where the government (the single buyer) expresses its intention to buy a good or service, and potential sellers bid the price down. Due to transparency, flexibility and open systems enabled through the application of IT tools to the procurement process, e-tendering is likely to attract more bidders than the traditional manual procurement systems. Evidence from the literature supports this claim. Pavel and Babalava (2013) show that in emerging economies, electronically enabled procurement and tender systems promote transparency and fairness which increases the submitted bids by a factor of 0.6, and each additional bid decreases the winning price by 3.4%. The united state of Andhra Pradesh was divided into the state of Telangana and the residuary state of Andhra Pradesh on 2-1-2014. APTS served both the states of Telangana and the residual state of Andhra Pradesh till 9/2015. Due to data migration issues, information pertaining to the value of goods and services procured through the e-procurement portal could not be obtained directly due to server issues. Hence, the transaction fee paid to the private partner through APTS is used to infer the value of goods and services procured through the e-procurement portal.

Table 3: Transaction Fee Received by the Private Partner

Financial year	Transaction fee received (INR)	Y-O-Y Growth (%)
2010-11	4521660	NA
2011-12	18373148	306.34
2012-13	25064538	36.42
2013-14	31711677	26.52
2014-15	10549193	-66.73

Source: Office of Director, ESD – Meeseva, Govt of A P

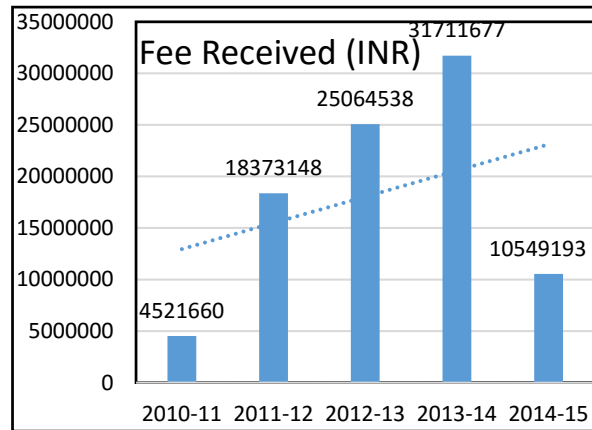


Figure 2: Transaction fee receipt trend

Table 3 and figure 2 shows details of transaction fee (and growth rate) received by the private partner for maintaining and operating e-tendering software in the e-procurement portal for the financial years 2010-11 to 2014 -15. For the financial year 2014-15, the private partner has received ₹ 105.49 lakhs as her commission (0.03% of the tendered value). Due to limits on the commission amounts received, the lower bound of the value of the goods and services procured through the e-procurement portal is computed at ₹ 351 633.33 lakhs for the financial year 2014-15. Assuming that e-tendering has increased the submitted bids by a factor of 0.6 implies that the winning price has decreased in each instance of e-procurement in 2014-15 by 2.02%, which represents a saving of ₹ 7 249.43 lakhs. This savings, no doubt, would have been utilized by the government for expending on welfare goods and services, and relates to the government supply of goods and services in the right hand side of equation (1), and hence a contribution to state GDP for the financial year 2014-15.

Managerial Insights and Conclusions

Investments in IT are the way forward by all means. However, as of now, we do not have sufficiently comprehensive metrics to reflect the productivity gains from IT investments in key sectors like agriculture, and health care. In the short term, the present method of computing state

GDP may have to be adjusted to factor in some of the above concerns, perhaps in consultation with the planning and finance department. These adjustments have been described in this paper. In the long term, we need to steer the computation of GDP by adopting the state-of-the-art and reliable Organization for Economic Cooperation and Development's (OECD) better life index, which captures eleven dimensions of well-being of a person and subsumes quality of governance (see <http://www.oecdbetterlifeindex.org/#/11111111111> and <http://www.worldpolicy.org/journal/spring2012/brave-new-math>). OECD's better life index as a tool for reflecting our living standards perfectly aligns with the vision of the state of Andhra Pradesh to veer towards a knowledge economy. It would be in the fitness of things if Andhra Pradesh could take the lead in adopting the better life index in the country.

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