

Institutional Arrangements for Deploying IT as a Tool of Public Service Delivery – South African Perspective

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ABSTRACT

The purpose of this study is to determine whether public service institutional arrangements of Information Technology (IT) in South Africa serve their mandate. A survey of public service (PS) Chief Information Officers (CIOs) reveal that more than half of respondents do not support more than 80% of services in their respective national departments or provincial governments. The average respondent was appropriately educated in IT or Math & Natural Sciences, highly experienced in IT and PS, and employed at a senior or executive management level. Inferential results reveal that the mandate for overcoming public service Information Technology challenges does not drive activities of the Government Chief Information Office, the PS CIOs, and the PS CIO Council. This study contributes to a better understanding and the improvement of PS IT institutional arrangements in developing countries, for the deployment of IT as a strategic tool of public service delivery.

Keywords: *Institutional Arrangement, Public Service, Chief Information Officer, Chief Technology Officer*

1. INTRODUCTION

The democratic South African government identified IT as a vital tool for PS delivery from inception in 1994. Whence, a Presidential Review Commission (PRC) [23] acknowledged PS IT challenges that needed to be managed and overcome, and such challenges included: Quick obsolescence of IT goods and services; and IT goods and services being predominantly imported.

The PRC [23] clarified challenges associated with importing IT goods and services by observing that local IT skills get displaced through intellectual property rights (IPR) which are embedded in imported IT goods and services. Furthermore, imported IT goods and services are based on volatile foreign currencies; and tend to cause foreign IT companies to insist on choosing their home countries and laws for contract dispute jurisdiction, thus, becoming very slippery in developing economies; and so forth.

The PRC [23] recommended the establishment of a lead IT agency that will, among others, overcome PS IT challenges as they surface. Functions related to PS IT challenges by the lead IT agency would include: Acquiring and retaining scarce IT skills needed for PS delivery; Assisting departments to advance PS delivery through IT; and Management of relationships between the PS and IT vendors, so as to obtain best value from PS IT investments.

The Department of Public Service and Administration (DPSA) was allocated the responsibility to create and maintain an enabling environment for the adoption of IT as a strategic PS tool. Consequently, the State IT Agency (SITA) Act [27] was introduced by DPSA, and the SITA Act [27] was effectively the manifestation of the lead IT agency that was proposed by the PRC [23]. SITA Pty Ltd opened its doors in 1999 on the basis of the SITA Act [27] which included a

requirement for SITA to absorb all IT functions in the PS. However, the absorption of IT functions into SITA did not achieve desired results, and in some instances bordered on hindrance to PS delivery.

In an effort to refocus the State IT Agency and PS IT functionaries on overcoming PS IT challenges, DPSA analyzed PS IT challenges into five themes: Lack of a common understanding of PS IT value-add; IT risks associated with PS delivery; The need to leverage the state's buying muscle to manage unscrupulous IT providers; Unnecessary duplication of PS IT efforts; and Lack of interoperability among PS IT systems.

The thematically categorized PS IT challenges prompted DPSA to create PS institutional arrangements for a Chief Technology Officer (CTO) role, and a Chief Information Officer (CIO) role. A CTO would be responsible for monitoring, assessing, and advising on new technologies for the improvement of PS delivery; and a CIO would be located in each PS department and would support the deployment of IT as a strategic Public Service delivery tool.

The creation of CIO and CTO roles by DPSA gave rise to specific Cabinet resolutions, in 2000, to establish the necessary PS IT institutional arrangements to achieve the CIO role; and also manifested as the SITA Amendment Act [28] to execute a CTO role. The PS IT institutional arrangements from Cabinet resolutions of 2000 to realize the CIO role are as follows:

- A Government IT Officer (GITO) in each national department and provincial government to drive efforts to deploy IT as a strategic PS delivery tool, whilst overcoming PS IT challenges;
- A GITO Council where GITOs would periodically meet to recharge by sharing

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successes and challenges of deploying IT as a strategic tool for PS delivery;

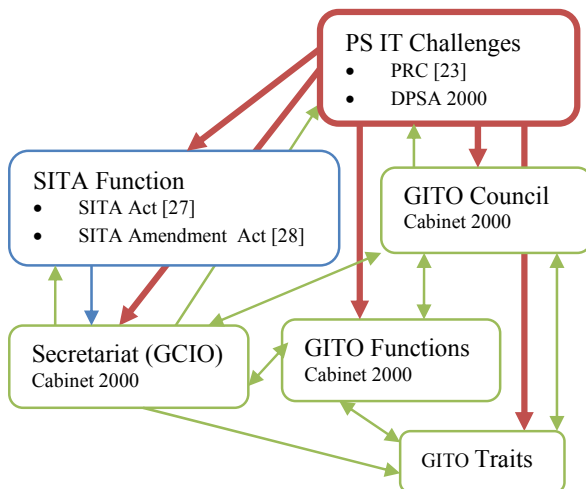
- A Government Chief IT Officer (GCIO), among others, to provide secretariat services to the work of the Government IT Officers' Council; and to centrally coordinate and consolidate Public Service IT endeavours.

The State IT Agency was allocated the CTO role, where the SITA Amendment Act [28] included a mandate for the State IT Agency to solve PS IT challenges and support departments to deploy IT as a strategic PS delivery tool; as well, it rescinded the need to absorb departmental IT functions.

However, a cursory look at DPSA's PS IT work (annual reports) over a decade does not give an idea as to how and which PS IT challenges get overcome, or which PS delivery has been positively impacted by DPSA's PS IT work. A similar observation holds from perusing State IT Agency's annual reports. As well, an analysis of Government IT Officers' Council minutes for 2013-2014 financial year reveals that sharing of experiences on PS IT challenges is rare; instead, IT fashions and flavours of the day seem to dominate the record.

The challenge of Government IT Officers' Council manifests in instances where the same hindrance posed by the same IT provider gets repeated in various other departments. The foregoing challenge should not occur if the Government IT Officers' Council serves to share experiences from deploying IT as a service delivery tool. As well, the State IT Agency could use its central IT procurement role to prevent the same IT provider from replicating PS delivery hindrances.

Institutional arrangements undertaken by the South African government to establish IT as a strategic tool of PS delivery are schematically summarized below:



The foregoing anecdotes suggest that institutional arrangements on PS IT may be oblivious to the goal of overcoming PS IT challenges. This premise is

denoted by thick bold lines in the above diagram. Consequently, advancing IT as a strategic tool of PS delivery become difficult where PS IT challenges unchecked. There are repeated findings on PS IT risks, by the Auditor General of South Africa, because PS IT challenges seem not to drive programs of PS IT institutional arrangement.

The aforementioned anecdotal observations necessitated the DPSA to empirically determine whether PS IT institutional arrangements are driven by PS IT challenges. Public Service CIOs were judged to be the most appropriate informants, since their professional employments exist within PS IT institutional arrangements [1, 6, 8, 9, 12 and 15].

2. RELATED WORK

IT obsolescence is a challenge that needs to be carefully managed, wherever IT gets deployed as a tool of public service delivery [24, 14, 11, 10 and 2]. Obsolescence makes equipment supporting and maintaining hard and costly, while it hurts the equipment reliability seriously [11]. At the same time, IT end-of-life decisions can have significant implications for user effectiveness, the value extracted from IS investments, and organizational performance [10]. Rojo *et al.* [24] identify different activities that may be included in an obsolescence management planning, taking into account not only electronic components but also other aspects of the system such as mechanical components, software, materials, skills and retooling. The recent rapid pace of technological change has made human capital more important, yet it has rendered the employee's knowledge base obsolete more quickly [14]. Workers who experience skill obsolescence appear to learn more on the job and participate more often in training, which decreases the risk of losing employment [2].

Imported information technology poses challenges to the deployment of IT as a tool of public service delivery [20, 26, 29 and 5]. Multinational corporations tend to constrain foreign governments and people through unfavorable clauses in investment agreements [26]. Managing effects of imported technology could include strategies wherein governments strive to nurture indigenous innovation capacity, and improve the efficiency of international technology transfer [5]. Li [20] found that importing foreign technology alone does not facilitate innovation in Chinese state-owned high-tech enterprises, unless in-house R&D is also conducted. Zuniga & Crespi [29] produced results that highlight the importance of fostering in-house technological efforts not only for innovation per se, but also to promote growth in employment.

Institutional arrangements as a factor for enabling IT service delivery are recognized in literature [1, 6, 8, 9 and 12]. Reforming bureaucracy so as to smoothly facilitate IT adoption by governments was identified by studies that included Elsheikh *et al.* [9] and Al-Awadhi & Morris [1]. Providing an enabling

organization to facilitate IT in government was affirmed in studies that included [6], [8], and [12].

Leadership of IT in government, as an aspect of the institutional arrangements, is critical for the adoption of IT in government [16, 4 and 19]. The probability of the adoption of IT in government increases with the presence and leadership of an IT role within a government agency [4]. Even cases where IT managers initiate the adoption of new technology, support from administrative authorities may play a significant role in whether innovation efforts are adopted [16]. IT leadership of top managers is often directly associated with the inclusion of the IT head in the executive team [19].

CIOs deal with sophisticated technical issues such as rapidly changing software packages, platforms, and standards; CIOs face the challenge of leading and earning the respect of a diverse technical staff; They oversee the operations of systems on which business, revenues, and profits depend and, in some cases, are impossible to achieve without [18]. Even so, the position is evolving from a focus on technological leadership to a focus on institutional innovation [3]. Key findings of Lane & Koronios [17] show that the role of the modern CIO has become increasingly business focused and strategic, where soft skills dominate the critical competencies. The position of the chief information officer (CIO) has moved center stage, but this has not always been for the right reasons [22]. Hawkins [13] observed that the concept of a CIO still has a variety of meanings, manners of being defined and operationalized, and methods for integration within the organizational infrastructure, accompanied by an equally diverse set of realistic and unrealistic expectations.

The main goal of the CTO is to integrate R&D strategy with corporate strategy, and to ensure that core technical competencies are aligned with the organization's strategy [21]. Dunleavy *et al.* [7] contends that public managers need to retain and develop their own IT expertise and to carefully maintain well-contested markets if they are to deliver value for money in their dealings with the very powerful global IT industry. Fresh perspectives suggest that CTO's who aspire to have significant influence in their organizations should also build their power bases in ownership position in the organization, strong personal relationships in networks inside and outside the firm, and in general business savvy [21]. Governments spend billions a year to public sector IT operations; yet governments do not generally develop or run their own systems, instead they rely on private sector computer services providers to run large, long-run contracts to provide IT [7].

The South Africa PS IT contains the role of a CIO and the role of a CTO. When both positions are present in an organization, the CIO is generally responsible for processes and practices supporting the flow of information, whereas the CTO is generally responsible for technology infrastructure [21].

3. RESEARCH DESIGN

This section describes how data was collected through a perceptions' survey instrument designed on the basis of the literature review, and section 4 presents results from quantitative and inferential analysis of collected data.

3.1 Data Collection

A survey tool was developed to collect data that would be empirically analyzed to determine whether PS IT institutions are driven by PS IT challenges. Perceptions of Government IT Officers were collected to analyze whether public service IT institutional arrangements are driven by the need to solve IT challenges. Government IT Officers are synonymous to PS CIOs and their employments exist within IT institutional arrangements [4 and 19] of the public service, thus, were deemed best informants for this study. The choice of respondents is significant, because, Irani *et al.* [15] found that public service IT studies conducted between 2002 and 2012 tended to use government IT and general staff as respondents in only 7.70% of all studies.

The role, challenges, and traits of a typical CTO and of a typical CIO were derived from refereed studies as shown in the table below. Further, such studies needed to have been published in the last decade, and needed to have been cited. Other components of the survey were constructed from South African government's laws and policies, as shown in the table below.

Survey Construct				References
Comp	Items	Descript	Measure	
A	10	GITO Profile	Nominal	Cabinet 2001
B	10	CIO Functions	Ordinal	[22, 17, 18, and 3]
C	10	CIO Traits	Ordinal	[13 and 3]
D	10	CIO Challenges	Ordinal	[22, 18 and 17]
E	10	GITOC Functions	Ordinal	Cabinet 2001
F	10	CTO Functions	Ordinal	[7 and 21]
G	10	CTO Traits	Ordinal	[25 and 21]
H	10	CTO Challenges	Ordinal	[7 and 21]
I	10	SITA Functions	Ordinal	[27 and 28]
J	10	GCIO Functions	Ordinal	Cabinet 2000

The questionnaire comprised of 100 items on PS IT institutional arrangements. Participation in the survey was voluntary and anonymity was guaranteed by non-intrusive questions.

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3.2 Research Constructs

Characteristics of research constructs of this study are summarized in the table below.

Survey Construct		Items	Validity (Levin Tests)	Reliability (Cronbach α) Tests
Component	Description			
B	CIO Functions	10	3	0.81
C	CIO Traits	10	0	N/A
D	CIO Challenges	10	3	0.96
E	GITOC Functions	10	4	0.85
F	CTO Functions	10	= CTO Traits	N/A
G	CTO Traits	10	9	0.97
H	CTO Challenges	10	7	0.99
I	SITA Functions	10	8	0.93
J	GCIO Functions	10	7	0.94

The overall reliability of data in this study is 0.83 Cronbach α . Therefore, the reliability and validity of components used to produce inferential results are good.

4. RESEARCH RESULTS

Data was quantitatively analyzed using a software package. Reliability and validity tests were performed on collected data, followed by the descriptive and inferential statistical analysis of the collected data.

4.1 Research Design

The survey tool was administered at the Annual General Meeting of the Government IT Officer's Council November 2013, were 33 of 43 members attended. Reliability and validity tests performed on the collected data present research constructs of this study as reliable and valid for all the Likert-scale based research variables, and are summarized in the table below.

Overall reliability of data in this study is 0.83 Cronbach α . Therefore, the validity and reliability of components used to produce inferential results are good.

4.2 Descriptive Statistics

The analysis of the descriptive statistics computed by this study presents the profile of respondents as summarized in the table below:

Profile Item	Findings
Gender	24.2% Females, 75.8% Males
Highest qualification	48.5% 3 year or 4 year degree, 36.4% Masters degree and above
Educational Field	69.7% IT, 15.2% Math & Sciences
Years of IT Experience	90.9% 5 years & more
Years in PS	90.9% 5 years & more

Profile Item	Findings
Agency Category	69.7% National Departments, 18.2% Provincial Government
Employment Level	30.3% @ level 15, and 51.5% @ level 14
GITO Beneficiaries	78.8% are RSA natural persons
IT Supported Services	51.5% @ Below 20%, and 15.2% @ between 20% & 40%
Legal framework	69.69% unsupportive to IT

The preceding descriptive statistical profile presents a high likelihood of a Government IT Officer being a male, highly educated in IT or Math & Natural Sciences, highly experienced in IT and PS, and employed as a Chief Director or a Deputy Director-General. Unfortunately, the foregoing spectacular traits seem not to translate into the deployment of IT as a strategic PS delivery tool, for, respondents (51.5%) reported that at least 80% of public services are not supported through IT in their respective departments.

4.3 Inferential Statistics

One way ANOVA tests were performed between each profile item of Government IT Officer, and against each Likert-scale based research variable. The correlation analysis of profile items against valid and reliable survey constructs is summarized in the table below:

Profile Item	Correlated Construct(s)
Gender	GITOC Functions (0.01)
Highest qualification	CIO Challenges (0.08)
Years of IT Experience	SITA Function (0.1) and GITOC Services (0.01)
Beneficiaries	CIO Functions (0.04)
IT Supported Services	CIO Functions (0.04)

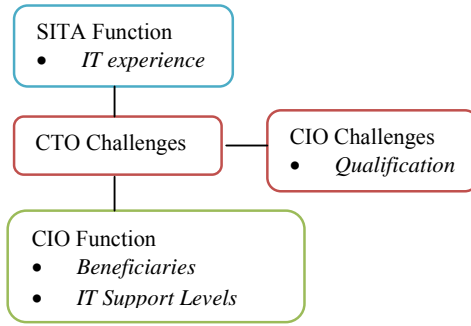
The descriptive statistical profile of the Government IT Officer becomes useful only as it concerns items in the table above. Therefore, the uncorrelated profile items are immaterial to PS IT institutional arrangements, and their descriptive statistical results are deemed unreliable.

A correlation of all valid and reliable survey constructs was performed to determine underlying relationships among the constructs, or analyze whether the DPSA's understanding of PS IT institutional arrangements is confirmed by reality at the coal-face. The results of the correlation matrix are contained in the table hereunder:

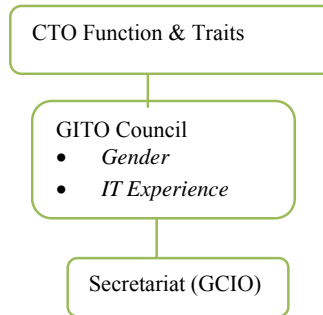
		CIO Functions	CIO Challenges	CTO Functions & Traits	CTO Challenges	SITA Functions	GITOC Functions	OGCIO Services
CIO Challenges	Pearson Corr.	.01	1.00					
	Sig. (2-tailed)	.95						
	N	33	33					
CTO Functions & Traits	Pearson Corr.	.03	-.10	1.00				
	Sig. (2-tailed)	.86	.57					
	N	33	33	33				
CTO Challenges	Pearson Corr.	.33	.38	.08	1.00			
	Sig. (2-tailed)	.06	.03	.67				
	N	33	33	33	33			
SITA Functions	Pearson Corr.	-.05	-.22	.09	-.48	1.00		
	Sig. (2-tailed)	.78	.22	.64	.00			
	N	33	33	33	33	33		
GITOC Functions	Pearson Corr.	-.19	.22	-.30	.02	-.19	1.00	
	Sig. (2-tailed)	.30	.22	.09	.92	.29		
	N	33	33	33	33	33	33	
OGCIO Services	Pearson Corr.	-.06	-.02	-.12	-.03	.10	.40	1.00
	Sig. (2-tailed)	.73	.90	.52	.88	.59	.02	
	N	33	33	33	33	33	33	33

This study expects the above correlation matrix to closely resemble relationships of the PS IT institutional arrangements of the introduction section of this study. Otherwise, either the institutional arrangements of the South African PS IT are unfit for purpose, or their executing model is ineffective.

The correlation matrix reveals two silos that are at variance with intensions of PS IT institutional arrangements as presented in the introduction of this study. Schematic diagrams of the correlation matrix, superimposed with regression results, are presented below.



The foregoing correlation results reveal a silo around CTO Challenges, and a clear disjoint between the work of the State IT Agency and the work of the Government CIO is revealed.



The above diagram reveals another silo around the Government IT Officers' Council. Respondents of this study serve as CIOs of government departments, but, inferential results disassociate them from CIO Challenges. As well, the Government CIO has no association with CIO Challenges.

5. DISCUSSION OF RESULTS

Descriptive statistical results presented a typical PS CIO that is appropriately qualified, has extensive experience in both IT and PS, and is employed at a fairly senior level. Thus, PS IT has the recommended leadership.[4,19]. However, more than 80% of services in respective departments of the same CIOs are not supported through IT. Kamal [16] asserts that IT managers cannot usher the adoption of IT without the support of admiration authorities, and the PRC [23] proves that there is support from South African administrative authorities.

Inferential results reveal that the State IT Agency has a primary relationship with CTO challenges, which validates a lead IT agency role espoused by the Presidential Review Commission [23] and confirms assertions of Dunleavy *et al.* [7] on the need for IT capacity ownership. The State IT Agency has a secondary relationship with CIO challenges, which talks to the State IT Agency's support for solving IT challenges experienced by departmental business owners [21]. Finally, the State IT Agency's secondary relationship with

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CIO function validates the role the State IT Agency plays to support the work of departments [7].

However, the State IT Agency does not relate to the silo that includes: the Government CIO, Government IT Officers' Council, or CTO functions and traits. In the latter silo, the Government CIO has a primary relationship with Government IT Officers' Council, which confirms the Government CIO's role of secretarial services in accordance with Cabinet 2000 foresight. The Government CIO has a secondary relation with CTO functions and traits, which validates the Cabinet's wisdom and literature [1, 6, 8, 9 and 12] for the DPSA role in the oversight of the State IT Agency. Nonetheless, the finding that the CIO Function does not correlate with the Government CIO, asserts that DPSA's designed job description and requirement of a Government IT Officer's may be irrelevant for PS CIO and confirms observations of Hawkins [13] and Peppard [22] on consequent varied conceptualizations of a CIO role.

Inferential results reveal that the Government CIO has a relationship with neither CIO Challenges nor CTO Challenges. The Government CIO is a branch of the DPSA that was a driving force for themes of PS IT challenges (i.e. both CIO and CTO challenges).

PS CIOs of national departments and provincial governments are crucial agents for the deployment of IT as a service tool; but, inferential results reveal that they have no relationship with CIO Challenges and CTO Challenges.

If so, how does IT leadership [4, 16 and 19] from the Government CIO and PS CIOs mitigate challenges that accompany IT obsolescence [2, 10, 11, 14 and 24] and imported IT goods and services [5, 20, 26 and 29]? This inferential finding confirms the descriptive finding that more than 80% of services are not supported through IT, despite the commendable descriptive profile of a typical PS CIO.

The Government CIO drives Government IT Officers' Council. A Government IT Officers' Council that is not driven by solving PS IT challenges cannot nurture Government IT Officers to overcome PS IT challenges in their respective departments, thence, the deployment of IT will be hindered [16, 4 and 19].

The correlation results reveal that the Government CIO is perceived to duplicate the CTO role, which is already fulfilled by State IT Agency [13 and 22]. Interestingly, respondents (Government IT Officers) perceive CTO roles and traits constituting the GITO Council, thus, inferring themselves to be CTOs. Once again, Hawkins [13] and Peppard [22] observations on varied and confused meaning of CIO is confirmed.

6. CONCLUSION & RECOMMENDATIONS

Descriptive statistical results present a typical PS CIO with commendable qualities, but, who does not support more than 80% of services of the provincial or national department. Inferential statistical results tell a story of PS IT challenges that are not driving: Government CIO, Government IT Officers' Council, Government IT Officer's Functions and Traits. As well, findings tell a story of PS CIOs who do not perceive themselves as CIO's.

Therefore, the PS IT institutional arrangements that were setup to nurture and sustain the viability of adopting and relying on IT as a strategic tool of PS delivery, need to be refocused. It is hereby recommended that mechanisms be devised to place PS IT challenges at the core of each and every PS IT institutional arrangements.

The role of a Government IT Officer (i.e. CIO of a National department or provincial government) should emphasize the ability to solve PS IT challenges, and the ability to deploy IT as a strategic tool of PS delivery. Simply, the seniority and success of a Government IT Officer should be determined by the extent to which IT has been deployed to support a national department's or a provincial government's Annual Performance Plan (APP) targets. Extracting PS delivery value from IT providers and the State IT Agency depends on the role of a Government IT Officer; the same principle is supported in literature [20, 26 and 5].

The role of the Government CIO should also be refocused on PS IT challenges, which will in turn ensure that the Government IT Officers' Council is guided to share and learn from collective experiences of deploying IT as a strategic PS delivery tool. Sharing experiences will strengthen PS IT institutional arrangements [1, 6, 8, 9 and 12] to enable the adoption of IT as a strategic tool of PS delivery. PS CIOs should share experiences on challenges related to the obsolescence of IT [2, 9, 11 14 and 24], imported IT [5, 20, 26 and 29], and leadership of IT [4, 16 and 19].

The categorized themes of PS IT challenges need to be revisited to determine whether technological advancements in the last 14 years has not rendered the themes irrelevant; in accordance with cautions literature affirms on IT obsolescence [24, 14, 11, 9 and 2].

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