

Untethering from Legacy Infrastructure: Pakistan's Cloud First Policy

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- In February 2022, the federal cabinet approved the Pakistan Cloud First Policy requiring all federal level public service entities to prioritise public cloud for future technology infrastructure.
- The shift from on-premise infrastructure to public cloud can play a catalytic role in Pakistan's digital transformation by optimizing technology spending; increasing scalability; facilitating flexibility, innovation, and collaboration; increasing resilience and cybersecurity; and ensuring compatibility with emerging technologies.
- To enable an effective and sustainable transition of the public sector to a truly cloud environment, a robust planning, implementation, and change management suite of enabling measures should be instituted. The measures span specific interventions focusing on people (skill development), process (technology procurement and policy implementation), and product (cloud offerings).

The Covid-19 pandemic has accelerated digital transformation journeys for countries, ecosystems, enterprises, and individuals. However, embracing this global phenomenon results in a dual challenge for emerging countries like Pakistan. On the one hand, they need to build and augment basic digital infrastructure. On the other, they need to leapfrog directly to next-generation technologies, compressing multi-decade journeys into a few years. Within this context, cloud computing as an accelerator of digitisation merits high attention across the public and private sectors.

Cloud computing is simply defined as the provision of various computing services such as storage, applications, databases, and software over the internet or enterprise instead of via physical means.¹

In a positive first step, Pakistan's federal cabinet approved the Pakistan Cloud First Policy (PCFP)² on February 15, 2022. Introduced by the Ministry of Information Technology and Telecommunication (MoITT), this policy aims to shift digital services and data of all federal level Public Sector Entities (PSEs) to the cloud by mandating a cloud first approach to new technology investments. While the policy is a welcome development, successful implementation of the PCFP – and more importantly, an ecosystem level shift towards going cloud-first – demands a better understanding of cloud technologies, the potential benefits it can accrue for Pakistan, and a closer analysis of the policy in Pakistan's context.

1. Defining Cloud Computing and its Significance

Traditional on-premises IT infrastructure relies on physical storage implements like servers and hard drives, thereby allowing only localised access to data. Cloud computing allows data to be stored in a virtual cyberspace which can be accessed remotely and shared among multiple users. Cloud services are typically offered by third party providers through different cloud models and deployment methods (see Figure 1 below).

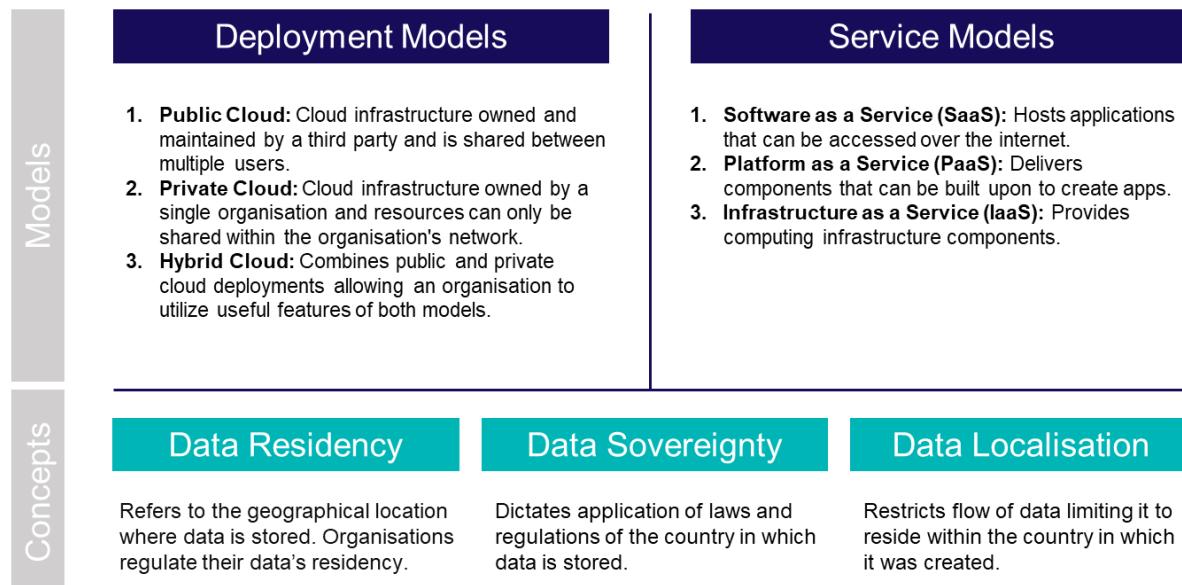


Figure 1: Key Ideas in Cloud Computing³

Futuristic, sustainable, and effective digital transformation necessitates adoption of cloud technology as this allows governments, businesses, and individuals to benefit in the following ways:

Increased scalability: Cloud allows users to easily scale up or down their data footprint based on changing needs. In contrast traditional data centres are constrained by the capability of their physical infrastructure, limiting their ability to process increased data traffic without additional infrastructure investment.

Better cost efficiency: Cloud computing reduces an organization's IT expenditure due to the unique deployment and payment models it offers. Flexible scalability and the pay-as-you-go model of the cloud means that organisations only pay for what they really use, resulting in optimised IT spending. Additionally, cloud also eliminates the need for procuring and maintaining IT infrastructure. In contrast, companies relying on legacy methods must invest upfront in IT infrastructure and pay for maintenance based on assumptions about expected growth.

Improved resilience, flexibility, and security: Data stored on the cloud is evenly distributed across servers in multiple locations and backed up continuously. As such, in the event where one server is damaged, another is instantly ready to take its place ensuring work continuity. In contrast, on-premise IT infrastructure does not offer fast-paced recovery and remote accessibility in the face of adversity unless enterprises make elaborate costly provisions for disaster recovery sites. For instance, during the pandemic remote work and business continuity could only be maintained thanks to cloud technology's resilience and flexibility.

Enhanced collaboration: The cloud facilitates easy sharing of tools, platforms and applications across organisations. This reduces duplication of effort and products, allowing users from across time zones and geographical regions to work together.

Strengthened Sustainability: Moving to the cloud can reduce an organisation's energy footprint by 80% as heavy on-site IT equipment does not need to be maintained anymore. ⁴

Increasingly Future-ready: Cloud computing allows the adoption of advanced technologies like big data, artificial intelligence (AI), and internet of things (IoT) most of which are incompatible with legacy systems.

Despite the many benefits of cloud computing, adoption is hampered primarily by apprehensions around data security and privacy. Organisations fear that they will lose control over their data if the infrastructure where it is hosted is owned and managed by a third party. Additionally, the fact that cloud services are typically accessed via the public internet raises concerns that the frequency and success of cyberattacks are likely to increase. These fears are particularly acute in a country like Pakistan where several organisations have been the victims of data breaches in the past.⁵

Contrary to such perceptions, cloud computing typically offers enhanced security as it enables integration of encryptions, advanced firewalls, and new technologies such as AI. Cloud Service Providers (CSPs), especially global hyperscalers (see Box 1), invest significantly in cybersecurity as their success depends upon the provision of high-end security and data integrity. Notably, most CSPs operate under a shared responsibility model where the CSP is responsible for the security of the cloud, but the hosted organization is responsible for security within the cloud. Since CSPs have to comply with the data policies of the countries they operate in, governments can help allay data security and privacy concerns by establishing strong data privacy laws, and related standards.

1.1. Public Cloud and Digital Transformation

The overarching benefits of cloud technology have globally positioned cloud deployment at the core of several forward-looking digital transformation strategies. **A first step in accelerated cloud adoption is often the creation of national cloud policies (see Table 1) that prioritise public cloud deployments as the default infrastructure for governments.**

For cloud adoption at the national level, public cloud presents itself as the optimal deployment model. Public cloud infrastructure is managed by third party providers and operates on a multi-tenant architecture. This means multiple users/organisations share the same infrastructure once it has been deployed. Migrating to the public cloud then only requires that organizations virtually integrate into the existing infrastructure by following standard protocols. The enhanced benefits of low organisational effort and easy adoption processes that accompany public cloud make it an enticing offering for public sector entities.

Public cloud spending is expected to account for almost 50% of total government IT expenditure in digitally mature countries such as Australia, demonstrating the case for cloud adoption in the public sector.⁶

2. Understanding Pakistan’s Cloud Journey to Date

To date, Pakistan’s journey to cloud adoption has been largely ad-hoc and siloed.

Consequently, the country has not been able to capture the broad-based digitisation that is associated with cloud in other economies. Prior to the PCFP, major regulatory developments in the cloud space were as follows:

2020: State Bank of Pakistan (SBP) issued a circular allowing financial institutions to use cloud-based solutions provided by local and international CSPs for non-core business functions.⁷

2021: Securities and Exchange Commission of Pakistan (SECP) issued a draft of Cloud Adoption Guidelines for Incorporated Companies that offered instructions to businesses on adopting cloud technology.⁸

Pakistan lags internationally and regionally in terms of public cloud adoption. A BCG study on ‘Future of Cloud in Asia Pacific’ forecasts cloud spending in the Asia Pacific to reach USD 200 billion by 2024, growing at a Compound Annual Growth Rate (CAGR) of 20% from 2018-2024.⁹ Zooming in on some comparable ASEAN countries, the public cloud spend CAGR is more than double of on-premise spend CAGR.

In Pakistan’s case, experts estimate public cloud spend CAGR to be well below ASEAN averages.¹⁰ If the PCFP is implemented in an effective way, Pakistan could unlock investment opportunities in the cloud computing space by boosting adoption by the public sector.

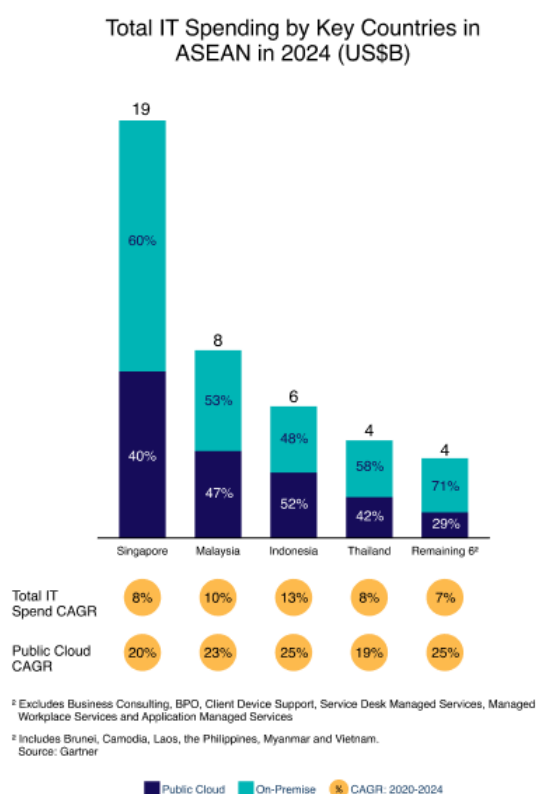


Figure 2: Cloud Vs On-prem IT Spending in ASEAN in 2024¹¹

2.1. Pakistan Cloud First Policy

The PCFP aims to catalyse cloud adoption in the public sector while encouraging the private sector to follow suit.

Key features of the policy include:

- Prioritisation of cloud-based systems/solutions when updating or procuring IT services starting July 01, 2022. The mandate of the PCFP extends to all federal Public Service Entities (PSEs)
- Classification of data into five categories – open data, public data, restricted data, confidential data, and secret data – supplemented with recommended deployment models for each data type.
- Development of governance and implementation structures specifically, a Cloud Board and a Cloud Office.
 - The Cloud Board, as a supervising body, will be chaired by the Federal Secretary for Information Technology and Telecommunications.
 - The Cloud Office will be responsible for supporting cloud adoption efforts across the government and curating accreditation, registration and compliance frameworks for CSPs according to domestic and international standards.
- Encouragement to provinces to adopt a cloud first approach, by reserving provincial seats on the Cloud Board.

Key developments that have materialized since the approval of the PCFP are as follows:

- An interim Cloud Office has been already created within the MoITT to kickstart cloud adoption under the PCFP. The Cloud Office is currently staffed by MoITT officials.
- The Public Procurement Regulatory Authority (PPRA) has been tasked by the Cloud Office to develop the regulatory framework for cloud services implementation in the public sector
- All provinces, including Sindh – which initially cited apprehensions about the PCFP – have agreed to adopt a cloud first policy.¹²

3. Benchmarking and Analysing the PCFP

Although Pakistan’s foray into cloud adoption has been delayed, the PCPF sets Pakistan on the right track. **As global leaders transition from cloud first to cloud native, Pakistan has the opportunity to leverage lessons learnt from their decade long cloud adoption journeys in order to leapfrog and catch-up regionally and globally.**

The table below (Table 1) summarises the cloud adoption trajectories of international and regional digital leaders who first introduced their CFPs in the 2010s. Most of these CFPs focused on federal government entities.

Features		U.S.	UK	Australia	India	Philippines
Policy		Cloud Computing Strategy, 2010	Cloud First Policy 2013	Australian Government Cloud Computing Policy, 2014	Government of India’s GI Cloud (Meghraj) Strategic Direction Paper, 2013	Philippines Cloud First Policy, 2017
		Cloud Smart Strategy, 2018	Reviewed, 2019	Secure Cloud Strategy, 2021		Revised, 2020
Snapshot	Mandate	All federal departments	All federal departments	All federal departments	All federal and state level departments	All federal and local level departments, judiciary and colleges
	Implementation bodies	Established CIO Council Executive Cloud Computing Executive Steering Committee	Government Digital Services	Digital Transformation Agency	Department of Electronics and Information Technology	Department of Information and Communications Technology
		Federal Risk and Authorization Management Program (FedRAMP)		Established Cloud Services Panel	Established Cloud Management office and Architecture Management Office	
	Detailed guide		Cloud Guide for the Public Sector	Provides a two-year action plan for implementation	Guidelines for Enablement of Government Departments for Adoption of Cloud	
Impact		Cloud preferred environment for 70% ¹³ of state and local government executives	90% ¹⁴ of surveyed government agencies want to migrate to cloud	> AUD 2 billion ¹⁵ benefit from moving to cloud 2014-19		

Table 1: Comparative Analysis of Global CFPs

Based on the examples we have looked at it appears that governments globally follow a similar high-level roadmap for cloud adoption across the public sector (see Figure 3). The sequenced process involves:

1. Introduction of a policy.
2. Establishment of a unit mandated with developing processes facilitating cloud adoption.
3. Development of a detailed guidebook spelling out regulations and processes dictating cloud migration.

The PCFP charts a similar path for Pakistan. Currently, Pakistan stands at the cusp of the second step with the MoITT having set up an interim cloud office after the release of the PCFP.

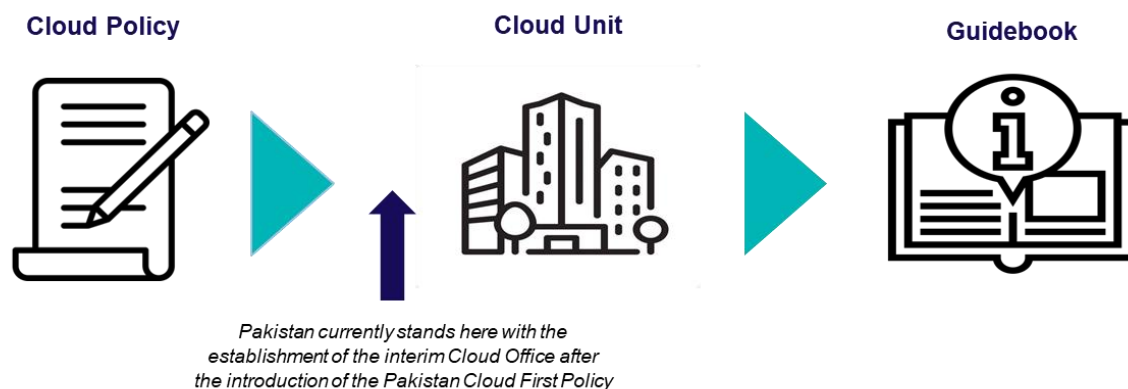


Figure 3: High Level Roadmap for Cloud Adoption

The PCFP is broadly in line with international Cloud First Policies (CFP) for both mature and emerging markets as it covers major topics identified in CFP benchmarking analysis.¹⁶ However, PCFP lacks actionable steps that are needed to seamlessly transition PSEs to a cloud environment. These enabling and guiding details are covered below. Addressing these gaps to ensure successful implementation of the PCFP requires proactive engagement of the Cloud Office.

1. Absence of migration plan

The PCFP encourages an immediate shift to a cloud-first model but **lacks a basic, high-level data migration plan** otherwise present in all global and regional CFPs. Currently, there is an information vacuum about the data migration approach and processes that public sector entities will have to undertake to move services from physical data centres to the cloud.

2. Need for a guidebook

The absence of a migration plan further necessitates the immediate **development of a cloud adoption guidebook**. Policy directives are typically followed by detailed guidebooks that comprehensively delineate activities that departments will have to undertake to adapt to cloud computing.

These guides offer assistance on a range of topics, including data residency, security and certifications. Individual PSEs can then use this broader framework to formulate and anchor their own transition strategies so that they are tailored to match specific department needs. Pakistan's Cloud Office, as the lead implementation body, should develop a detailed action plan before departments initiate their cloud migration. This will ensure a smooth, hassle-free transition to cloud with consistent protocols and principles being adhered to across all PSEs.

Some of the key areas that the guidebook should tackle include:

- Cloud security considerations and benchmarks upfront to manage apprehensions.
- Data sovereignty requirements to allow CSPs to better articulate their potential.
- Developing and publishing accreditation criteria that has been finalised after taking inputs from all stakeholders including government organisations and CSPs.

3. Data residency requirements disincentivizing CSPs

The data residency requirements for CSPs under the PCFP end up limiting the possibility of leveraging regional and global CSPs. Under the data residency rules, PSE data cannot be stored on servers situated outside the borders of Pakistan. This will reduce the market size of CSPs by disincentivising major global players that have data centres elsewhere around the globe for reasons of economies of scale and system resilience.

In a few exceptional cases where departments can establish the critical need for cross border sharing of data while promising complete data security, the policy allows for contravention of the data residency rule. Currently, the major CSP suppliers in Pakistan are local players.

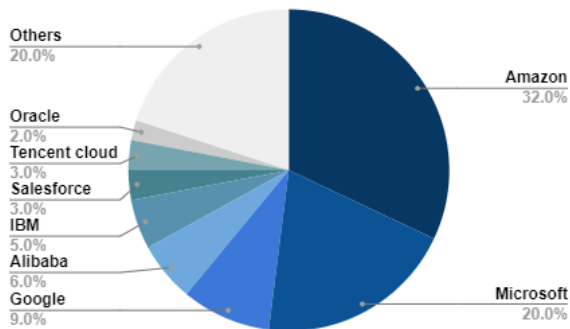


Figure 4: Top Cloud Service Providers

Box 1: Hype for Hyperscalers

The global cloud market is dominated by a small number of very large cloud providers referred to as hyperscalers. Most organisations globally acquire cloud services from hyperscalers due to their infrastructural agility which comes with hard to match scalability, speed, and security. The top five cloud hyperscalers command almost two-thirds of the global IAAS market signifying the pivotal role they play in the cloud space.

Global market share of leading CSPs (Q4 2020)



Source: Synergy Research Group

Currently, none of these hyperscalers have a footprint in Pakistan. Even though hyperscalers offer services in almost all major countries and territories around the globe, they do not have local data centres in most of these locations. Hyperscalers usually cover the globe through 20-40 locations on average, while ensuring maximum uptime owing to expansive architecture and advanced technology. For instance, AWS currently has infrastructure in 25 regions with 81 Availability Zones around the world and guarantees a 99.99% uptime. However, recently, AWS established their local footprint in Indonesia, given the country's growing demand and fast paced digitalisation.

Considering the data residency requirements laid out by the PCFP, it is unclear if Pakistan can still

attract and benefit from these global cloud leaders for a fast tracked, cost-efficient and secure cloud adoption.

4. Identifying and Overcoming Common Impediments to Cloud Adoption

Adoption of cloud comes with its own set of challenges. This section identifies challenges that can be anticipated in Pakistan’s cloud first journey and provides recommendations to overcome these issues in a proactive and timely manner.

People	Develop a cloud-skilled workforce <ul style="list-style-type: none"> • Up/re-skill existing employees with mandatory training • Attract and hire cloud adept talent • Develop public-academia partnerships to increase resource pool 	PSEs to both adopt and adapt to cloud computing <ul style="list-style-type: none"> • Align organisational and employee mindset with technology shifts 		
Process	Redesign government IT procurement budget framework to support flexible payment methods <ul style="list-style-type: none"> • Redesign procurement and IT budgeting in line with the needs of modern tech payment models (e.g., pay-as-you-go) 	Revamp government’s legacy procurement processes <ul style="list-style-type: none"> • Redesign procurement in line with modern ways of doing business with international players 	Increase involvement of industry experts with the Cloud Board <ul style="list-style-type: none"> • Set aside more seats for, and develop adequate autonomy of IT experts within the cloud board • Develop industry consortia 	
Product	Prevent vendor lock-in through hybrid architecture and improved interoperability <ul style="list-style-type: none"> • Adopt hybrid architecture models 	Ramp up efforts to attract global cloud leaders <ul style="list-style-type: none"> • Lead a concerted effort around demand estimation, aggregation and projection to give international players a good sense of TAM and SAM • Improve business and regulatory environment for critical players in the space • Create partnerships between local and global CSPs 	Understand and mitigate cloud security risks <ul style="list-style-type: none"> • Create organisational awareness about the realistic risks around cloud usage • Create stronger policies and standards around data security 	Ensure sustainability of public cloud initiatives <ul style="list-style-type: none"> • Iteratively upgrade the cloud policy • Create a conducive investment environment for development of local CSPs

Table 2: Recommendations for Effective Cloud Adoption

4.1. People

Develop a cloud ready workforce

As with other technologies, effective utilisation of the public cloud is contingent upon the skills of the workforce that operate and utilise it. Human resources trained in operating legacy technologies such as physical servers cannot be expected to efficiently use cloud technology.

To overcome the skills gap, employees need to be upskilled and/or reskilled. To achieve this, departments can introduce mandatory training on cloud technology for technical as well as non-technical teams. The government of Thailand, for example, offers cloud based upskilling programs for its employees in partnership with AWS.¹⁷ In addition to reskilling and/or upskilling the existing workforce, PSEs need to attract and hire resources who are adept at operating emerging technologies. The government can also collaborate with experts in the private and academic sectors to further enhance the available pool of human resources. For example, in Singapore, AWS co-introduced 'Cloud Ready SG' with the government with the aim of preparing a cloud ready future workforce.¹⁸ By creating a cloud ready workforce for which there is existing global demand, Pakistan can further boost its technology talent export.¹⁹

PSEs to both adopt and adapt to cloud computing

Organisations often run the risk of failing to realise their cloud goals because they have a narrow vision of cloud adoption. Too often, this vision focuses primarily on migrating data from one medium to another while maintaining underlying legacy processes and approaches to work.

To accrue the spectrum of benefits offered by cloud computing, technology changes must be accompanied by a shift in organisational and employee mindset/approach. Greater collaboration and innovation should be fostered. For instance, cloud leaders such as the UK and Singapore utilise cloud to offer shared tools and technology stacks across public departments.

4.2. Processes

Redesign IT procurement budget framework to support flexible payment methods

Public Procurement Regulatory Authority's (PPRA) IT procurement model does not support CSPs' pay-as-you-go model. This payment model is core to cloud's easy scalability and reduced costs. Incongruity between procurement and payments models could potentially hinder smooth adoption of cloud services at a large scale.

Budgets for public IT expenditure needs to be redefined to support flexible payment methods that do not require one-time procurement. Debates around rethinking and recalculating CAPEX and OPEX can inform more sophisticated decision-making to optimise technology spending.²⁰

Revamp legacy public procurement processes

Current processes and regulations enacted by Public Procurement Regulatory Authority (PPRA) cater to the procurement needs of legacy infrastructure. For example, the rules dictate that any bidding suppliers must present demos of tech solutions in person, and those suppliers must be based in Pakistan.²¹ These processes should be revisited to create an enabling environment for new players and technologies, particularly those that don't have a localised presence. Improving such procurement guidelines will also facilitate the development of a vibrant and competitive cloud market resulting in higher quality services and better pricing.

Box 2: Pakistan's Procurement Predicament

Public Procurement Regulatory Authority (PPRA) is the government's leading body for all public procurement including IT-related procurement. PPRA's role extends to the development of procurement rules, regulations and procedures that all federal government owned PSEs are required to follow for procurement of goods and services. Although PPRA rules and regulations have undergone several rounds of revisions over the last few years, they remain outdated, cumbersome and are unresponsive to the needs of the emerging technology landscape.

To begin with, the entire procurement process, even for digital goods, is – quite ironically – paper-based from start to finish. For projects worth more than PKR 3 million, procuring departments are required to publish tenders in local newspapers in addition to publishing them on their websites. Bidders are directed to physically visit the relevant department to submit their financial and technical proposals in the form of heavy stacks of printed paper, supplemented by earnest money paid in the form of a cheque/pay order. In the current era of global integration, such heavy dependence on paper-based, in-person processes hampers participation from international companies.

The next step in the process requires bidders to present demonstrations of their IT products to a panel that marks adherence against a checklist of requirements. These checklists are unnecessarily detailed, leaving no room for the type of innovative alternatives which are now driving developments across digital industries. The process is further constrained by panellists who may not be aware of the latest developments in the technologies being evaluated.

These policies are reminiscent of legacy era IT procurements where physical demonstrations could be provided for tangible infrastructure. Today, for products such as the cloud, benefits cannot be shown through a single demonstration but instead require a deep understanding of the subject matter. Procurement policies are in dire need of a complete overhaul and alignment with needs of the digital industry to effectively support Pakistan's digital transformation ambition.

Increase involvement of industry experts with the Cloud Board

To ensure that cloud adoption is in-sync with industry best practices across the public and private sector, linkages with industry expertise are imperative. Currently, the PCFP recommends reserving only two of seven seats for IT experts on the Cloud Board.

Industry leaders, who bring a deep understanding of public cloud and can help Pakistan accelerate its cloud adoption journey, should have greater representation on the board. This can be done by either increasing the number of seats on the Board, or developing structures such as a designated committee/working group through which industry experts can submit formal inputs to the Board.

4.3. Product

Prevent vendor lock-in through hybrid architecture and improved interoperability

The promise of cloud infrastructure and services is based on agility, open architecture, flexibility, and on-demand scale. Reliance on one vendor for public cloud provision drives governments into contractual lock-ins thus reducing the scope of advantages offered by transitioning to the cloud.

To avoid vendor lock-in, hybrid architecture with multi-cloud support can be adopted. This will enable customers to move workloads between cloud providers for cost efficiency, service availability, security, resilience, and geographic survivability considerations. To achieve this, provision for standard-based interoperability backed by tools and professional services to migrate workloads in a multi-cloud environment is critical. There will be a requirement of sophisticated multi cloud migration skills and tools to enable this. For instance, UK's Government Digital Service (GDS) works closely with government departments to offer services that prevent such lock-ins.

Ramp up efforts to attract global cloud leaders

Hyperscalers are crucial to successful public cloud adoption as they offer lower costs, higher scalability, and greater agility. However, attracting these global leaders can be challenging for countries that are just starting their cloud adoption journey. Currently, Pakistan is not a high potential market for major cloud providers. For instance, AWS currently categorises Pakistan as a small- and medium-sized business (SMB) coverage market as there hasn't been much traction in major enterprise, telecommunications and financial services verticals.

To demonstrate the potential of the Pakistani market, the federal government in coordination with provincial governments and the private sector can lead a focused sizing exercise on demand estimation, aggregation, and subsequent forecasts. This will enable global and regional cloud service providers to take a more bullish view on the market. Additionally, focus needs to be directed towards improving ease of business in a bid to attract international service providers who can offer cutting edge technology and enhanced services to Pakistani entities. Local CSPs can also explore forming partnerships with global CSP leaders to offer enhanced services and establish presence of international CSPs. Although some local market players such as PTCL are working in collaboration with global players such as Microsoft, however, the partnerships are at currently a small-scale leaving room for further collaborative efforts.

Understand and mitigate cloud security risks.

As highlighted earlier, fears around data security and privacy can deter organisations from making the shift as they fear loss of data autonomy and data breaches. Organisations need to create awareness around cloud technology amongst their employees dispel misconceptions related to cloud security, and better equip them in mitigating potential risks. Moreover, the government needs to create policies and accreditation criteria that have data security at their core. Singapore's Multi-Tier Cloud Security Standards for accrediting CSPs greatly helped in engendered public sector's trust in and consequent move to cloud computing.²²

Ensure sustainability of public cloud initiatives.

Public cloud initiatives require active effort from the government to ensure they stand the test of time and will continue on an evolution path. This entails keeping up with global trends and engaging in frequent course correction to render tailored cloud adoption journey optimal for the local context.

As such, an important consideration to drive sustainability of the cloud policy will be development of a closed feedback loop. By systematically addressing and analysing experiences of PSEs in their cloud journey, the policy can be upgraded to match the needs of the PSEs more accurately. Moreover, initiative continuity beyond the implementation stage requires exploration and development of funding streams and creation of an enabling business environment for local CSPs by the government. This would not only help jumpstart cloud adoption in the country but also assist in the long-term sustainability of public cloud services.

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Endnotes

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