

National Enterprise Architecture Principles



هيئة المعلومات والحكومة الإلكترونية
Information & eGovernment
Authority

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Governance & Enterprise
Architecture Directorate



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Glossary

Acronyms	Definition
EA	Enterprise Architecture
iGA	Information & eGovernment Authority
GLBP	Gateway Load Balancing Protocol
HACMP	High Availability Clustering Multi-Processing
RPO	Recovery Point Objective
RTO	Recovery Time Objective
SOA	Service Oriented Architecture
VRRP	Virtual Router Redundancy Protocol



1. Executive Summary

The definition of architecture principle is fundamental to the development of any enterprise architecture. National Enterprise Architecture Framework (NEAF) recommends set of principles in different domains to be adopted at the national level. Architecture principles are usually derived by the set of business principles which is aligned primarily with Economic Visio 2030 and with other legal or regulatory compliance needs within the Kingdom.

Architecture Principles in IT domain have been aligned with not only the business principles but also with the business goals, business drivers defined by government entities to consolidate at the national level as reference to be used for individual Enterprise Architecture within ministry/agency going forward. NEAF ensures that the definitions of those business principles, goals and strategic business drivers are current and unambiguous.

Domain specific Architecture gets influenced by relevant architecture principles and hence it becomes critical task for the EA Governance Body to approve the architecture principles proposed by any ministry or agency.

The Problems and Challenges across the government entities have been assessed as part of As-Is EA Assessment exercise and became input to identify the relevant principles. Business and technology drivers were other contributors to refine those architecture principles within the context of Kingdom of Bahrain Enterprise Architecture such as Common Infrastructure for the Integration, Single View of Citizen Information, Single Sign on for integrated authentication and authorization at the national level.

2. Introduction

Principles represent the highest level of guidance for IT planning and decision making. Principles are simple statements of an organization's beliefs about how it wants to deploy IT services over the long term and are derived from business goals and vision.

A good set of principles will be founded in the beliefs and values of the organization and expressed in language that the business understands and uses. Principles should be future-oriented, endorsed and championed by senior management. They provide organization foundation for making architecture and planning decisions, framing policies, procedures, and standards, and supporting resolution of contradictory situations.

The following five criteria that distinguish a good set of principles:

- **Understandable:** the underlying tenets can be quickly grasped and understood by individuals throughout the organization. The intention of the principle is clear and unambiguous, so that violations, whether intentional or not, are minimized.
- **Robust:** Enable good quality decisions about architectures and plans to be made, and enforceable policies and standards to be created. Each principle should be sufficiently definitive and precise to support consistent decision-making in complex, potentially controversial situations.



- **Complete:** Every potentially important principle governing the management of information and technology for the organization is defined. The principles cover every situation perceived.
- **Consistent:** Strict adherence to one principle may require a loose interpretation of another principle. The set of principles must be expressed in a way that allows a balance of interpretations. Principles should not be contradictory to the point where adhering to one principle would violate the spirit of another. Every word in a principle statement should be carefully chosen to allow consistent yet flexible interpretation.
- **Stable:** Principles should be enduring, yet able to accommodate changes. An amendment process should be established for adding, removing, or altering principles after they are ratified initially.

The following template is followed in defining principles:

Principle	Definition
Name	Should both represent the essence of the rule as well as be easy to remember. Specific technology platforms should not be mentioned in the name or statement of a principle.
Statement	Should briefly and unambiguously communicate the fundamental rule. For the most part, the principles statements for managing information are similar from one organization to the next.
Rationale	Should highlight the business benefits of adhering to the principle, using business terminology. Point to the similarity of information and technology principles to the principles governing business operations.
Implications	Should highlight the requirements, both for the business and IT, for carrying out the principle - in terms of resources, costs, and activities/tasks. It will often be apparent that current systems, standards, or practices would be incongruent with the principle upon adoption. The impact to the business and consequences of adopting a principle should be clearly stated.

2.1 Document Objective

The NEAF principles document describes architectural principles for NEAF. It includes Architecture principles for Business, Data, Application and Technology.

2.2 Document Scope

This document highlights the architecture principles for NEAF.

2.3 Intended Audience

iGA project stakeholders (business sponsors, functional and technical personnel) who were involved in specifying the EA scope and goals are the primary audience.



2.4 Reference Document

Please refer to the following report to understand the current business and IT landscape as well as problems and challenges across the Kingdom.

- As Is Architecture Reports for Government entities.
- EA Assessment Report for Government entities.
- EA Assessment Report at Kingdom level.

3. Characteristics of Architecture Principle

Architecture principles define rules and guidelines for the use and deployment of all IT resources and assets across the Kingdom. They reflect a level of harmony among the various elements of the enterprise and help in making future IT decisions. Each architecture principle should be clearly related back to the business objectives and key architecture drivers.

3.1 Developing Architecture Principles

Architecture principles are chosen to ensure alignment of IT strategies with business strategies and visions. Specifically, the development of architecture principles is typically influenced by the following:

- Enterprise mission and plans: The mission, plans, and organizational infrastructure of the enterprise.
- Enterprise strategic initiatives: The characteristics of the enterprise — its strengths, weaknesses, opportunities, and threats — and its current enterprise-wide initiatives (such as process improvement and quality management).
- External constraints: Market factors (time-to-market imperatives, customer expectations, etc.); existing and potential legislation.
- Current systems and technology: The set of information resources deployed within the enterprise, including systems documentation, equipment inventories, network configuration diagrams, policies, and procedures.
- Computer industry trends: Predictions about the usage, availability, and cost of computer and communication technologies, referenced from credible sources along with associated best practices presently in use.

3.2 Applying Architecture Principle

Architecture principles are used to capture the fundamental truths about how the enterprise will use and deploy IT resources and assets. The principles are used in a number of different ways:

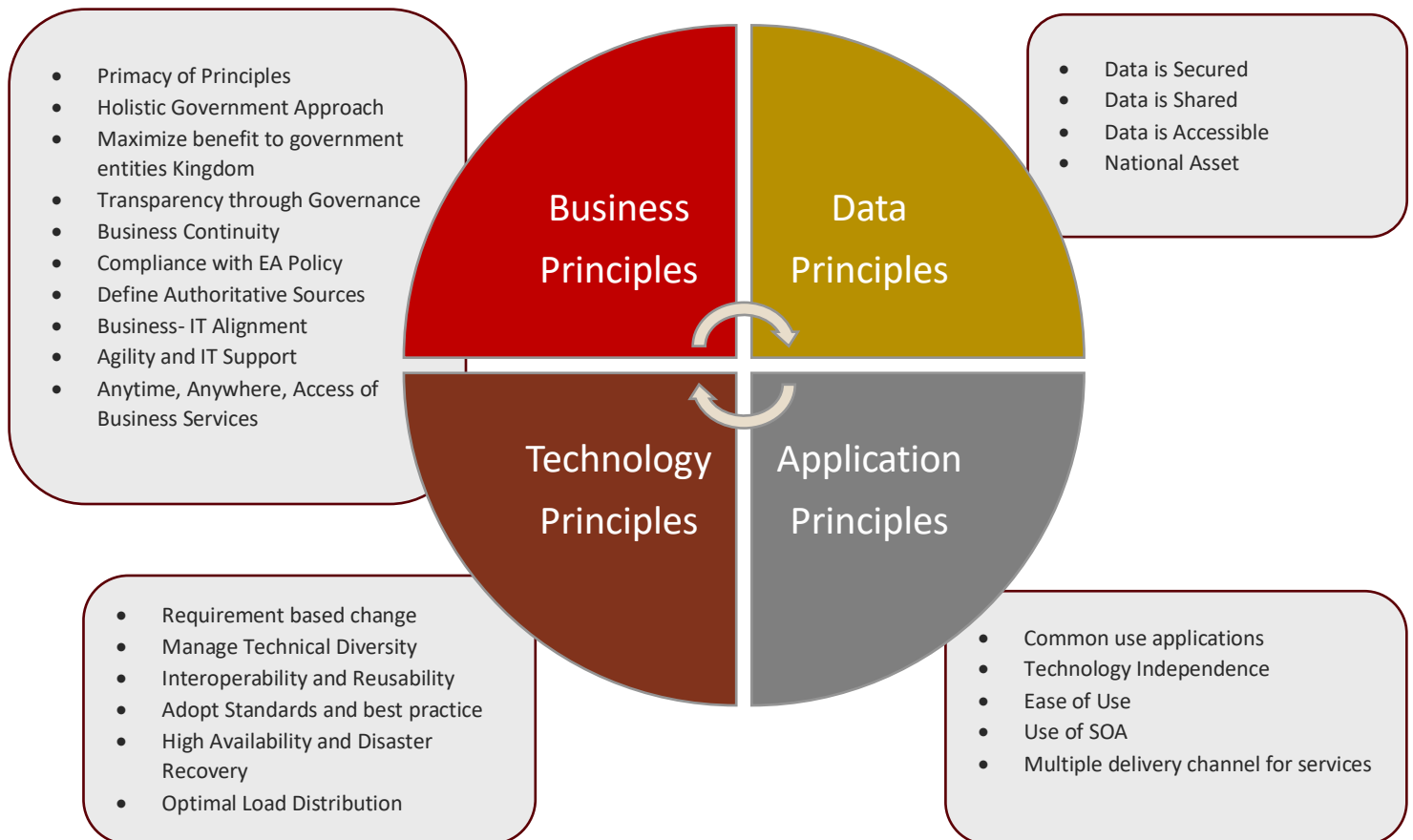
- To provide a framework within which the enterprise can start to make conscious decisions about IT.
- As a guide to establishing relevant evaluation criteria, thus exerting strong influence on the selection of products or product architectures in the later stages of managing compliance to the IT architecture.



- As drivers for defining the functional requirements of the architecture.
- The Rationale statements highlight the value of the architecture to the enterprise, and therefore provide a basis for justifying architecture activities.
- The Implications statements provide an outline of the key tasks, resources, and potential costs to the enterprise of following the principle; they also provide valuable inputs to future transition initiative and planning activities.

4. Overview of Architecture Principles

Listed below diagram give a view of architecture principles for Kingdom of Bahrain:





5. Business Principles

5.1 Primacy of Principles

Statement:

These principles of information management apply to all Government entities within the Kingdom of Bahrain.

Rationale:

The only way we can provide a consistent and measurable level of quality information to decision-makers is if all Government entities abide by the principles of NEAF, while implementing ICT for delivering services.

Implications:

- Without this principle, exclusions, favoritism, and inconsistency would rapidly undermine the management of information across the Kingdom of Bahrain at each level.
- Information management initiatives will not begin until they are examined for compliance with the principles. A conflict with a principle will be resolved by changing the framework of the initiative.

5.2 Holistic Government Approach

Statement:

NEAF will promote a holistic or “whole government” approach while respecting the Kingdom of Bahrain and every government entity role, legislation, and mandates.

Rationale

- Promoting a holistic approach will assist all by promoting trust and cooperation within the Government and Kingdom of Bahrain as a whole.
- To reduce redundancy and associated complexity across the government entities.
- To design IT infrastructure with a "one government" approach, to facilitate changes in government business processes in an easier and quicker way.
- A holistic approach will enable reduction in cost and risk to government through common licensing agreements and sharing of common information systems.
-

Implications

- Consistency will make things work better together and ease integration.
- Decisions making will be faster and solutions will be implemented quickly.
- Government entities must occasionally concede their own preferences for the greater benefit of the entire Kingdom. Trust will be critical to success.
- Promoting a holistic approach will assist in promoting trust and cooperation for abiding by NEAF.
- This will ensure the participation, input, and feedback from all levels of government within the NEAF.



5.3 Maximize Benefit to the Government Entities Kingdom of Bahrain

Statement:

Information management decisions are made to provide maximum benefit to the extended enterprise of NEAF as a whole.

Rationale:

This principle embodies "service above self". Decisions made from an enterprise-wide perspective (Kingdom as Enterprise) have greater long-term value than decisions made from any particular ministry perspective. Maximum return on investment requires information management decisions to adhere to kingdom-wide drivers and priorities.

Implications:

- Achieving maximum kingdom-wide benefit will require changes in the way we plan and manage information. Technology alone will not bring about this change.
- Government entities at individual level may have to concede their own preferences for the greater benefit of the entire kingdom.
- Application development priorities must be established by the entire kingdom as entire enterprise which should be reflected in the Implementation Model.
- Applications components should be shared across organizational boundaries, and it should come out clearly in the implementation model.
- Information management initiatives should be conducted in accordance with the enterprise plan. Individual organizations should pursue information management initiatives which conform to the blueprints and priorities established by the enterprise.
- As needs arise, priorities must be adjusted. A forum with comprehensive enterprise representation should make these decisions.



5.4 Transparency through effective Governance

Statement:

The management and governance of EA will be open and transparent to all stakeholders within the extended enterprises (government entities).

Rationale:

- To have an open, honest, frequent and bidirectional communication between all stakeholders.
- To generate trust and reliability between all stakeholders.
- To encourage buy in from stakeholders resulting in complete and faster adoption of EA.

Implications:

- Will have buy-in from all business and IT stakeholders in the extended enterprise.
- There will be need to develop a communication plan that must be followed across the extended enterprise.
- Will encourage open review forums for feedback in the EA process.

5.5 Business Continuity across Kingdom of Bahrain

Statement

All government services and business activities across the extended enterprise (government entities) should be operational in spite of systems failures and interruptions.

Rationale:

- Service design, implementation and deployment should ensure reliability of service delivery.
- Government premises are able to continue the services regardless of external factors such as hardware failure and data corruption.
- Contingency plan should be devised to deliver the services on alternative mediums.

Implications:

- Risk of business interruption will need to be established as dependency on shared systems is high.
- Risk management and mitigation plan will need to be developed across the extended enterprise.
- These plans will not be limited to periodic reviews, but will also include testing for vulnerability.
- Mission - critical services should be identified and business continuity should be ensured through redundant and alternative capabilities.
- Service design will address issues like recoverability, redundancy, and maintainability.
- Level of continuity will need to be defined along with its recovery plan based on criticality and impact of business service.



5.6 Compliance with National ICT Policies and Regulations

Statement:

Information management processes comply with all relevant ICT policies and regulations applicable to different enterprises.

Rationale:

Government entities need to abide by policies and regulations defined for ICT while implementing business systems. This will not prevent business process improvements that lead to changes in policies and regulations.

Implications:

- The Government entities will comply with laws, regulations, and external policies regarding the collection, retention, and management of information.
- Changes in the policies and regulations may drive changes in processes or applications.

5.7 Defined Authoritative Sources

Statement:

All government information shared between government entities, businesses and public should be validated, authenticated for accuracy by a designated owner from the enterprise before it is disseminated.

Rationale:

Critical information including official records, business/ citizen information must be made available in a timely and accurate manner to stakeholders while delivering services and hence should be from an authorized source. Defined authoritative sources will ensure that government will be accountable for definition and quality of information.

Implications:

- There will be well defined policies for information management.
- Responsibility and accountability for dissemination of business information will be defined.

5.8 Business-IT alignment across the Kingdom

Statement:

Information systems should be designed to be business driven with the consideration of business process that are cross functional within and integrated across the government entities.

Rationale:

- To improve Government service delivery and business processes through the combined perspective of an ICT.



- To promote adaptation of business processes, to advancements of technology.
- To avoid the costs of implementing technology for technology's sake.

Implications:

- Will promote clear, healthy and transparent communication between business and IT stakeholders.
- Will interact frequently and at multiple levels, not just at a management level, but throughout the organization.
- IT investments will be citizen centric and aligned with NEAF strategic goals.

5.9 Business Agility and Flexibility through IT Support

Statement:

Information systems that support business activities must be agile, adaptable and flexible. This will ensure the information systems are responsive to changes arising from legislations, customer needs or the process modifications.

Rationale:

- Agile and flexible business systems will enable government services to be better placed to respond to rapid changes with regards to customer needs, demands and reduce the cost of governmental reorganization.
- To enable business process improvement.
- To make integration easier, faster with less process overhaul.

Implications:

- The information systems developed will better support the business services.
- The information systems developed will have optimum usage and will be able to address the changing business / customer needs.
- The cost of introducing a new system or cost of integration / changing every time to support the business needs will be reduced, though the initial cost may be high.
- There will be a need to define performance metrics to ensure flexibility and adaptability.



5.10 Anytime, Anywhere Access of Business Services

Statement:

Service delivery is to be envisaged to focus on easy accessibility and accountability through multiple delivery channels to the stakeholders.

Rationale:

Multiple delivery channels will mean the stakeholders can continue to access government products and services in a variety of ways and services will be available anytime, anywhere.

Implications

- Government systems will be designed and developed to support the multiple channels for service delivery.
- Multiple delivery channels will make the services more accessible to stakeholders.
- The return on IT systems will be greater, if the services are easily accessed.

6. Data Principles

6.1 Data is Secured

Statement:

Data across kingdom of Bahrain (Enterprise Data) is protected from unauthorized use and disclosure.

Rationale:

- Open sharing of information between government entities and the release of information via relevant legislation.
- Data must be balanced against the need to restrict the availability of classified, proprietary, and sensitive information.
-

Implications:

- Security must be designed into data elements from the beginning; it cannot be added later.
- Systems, data, and technologies must be protected from unauthorized access and manipulation at all government entities.
- Well defined access controls and access constraints must be designed into the centralized metadata repository based on the need of business services owned.



6.2 Data is Shared

Statement:

Government entities should have access to the necessary data to deliver their relevant business services to the citizen/businesses or other government entities; therefore, data should be shared across different business services with appropriate security consideration.

Rationale:

- Timely access to accurate data is essential to improve the quality and efficiency of enterprise decision-making at the national level as well as the organization level.
- It is less costly to maintain and accurate data in a single repository than it is to maintain duplicative data in multiple repositories.
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Implications:

- To enable data sharing, we must develop and abide by a common set of policies, procedures, and standards governing data management.
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- Data made available for sharing will have to be relied upon by all users to execute their respective tasks.
- This will ensure that only the most accurate and timely data is relied upon for decision-making.
- Sharing policy must be defined as part of Metadata Architecture.

6.3 Data is Accessible

Statement:

Data across Kingdom of Bahrain (Enterprise Data) is accessible for users to perform their functions.

Rationale:

- Wide access to data leads to efficient delivery of information and services.
- Affords timely response to information requests and service delivery for Kingdom.
- Using information must be considered from an enterprise perspective to allow access by a wide variety of users (government entities /vendors/public).

Implications:

- Access to data does not necessarily grant the user access rights to modify or disclose the data.
- Accessibility involved the ease with which users obtain information.
- The way the information is accessed and displayed must be sufficiently adaptable to meet a wide range of user's and their corresponding methods to access.



6.4 Data is a National Asset

Statement:

Data pertaining to Kingdom is a national asset that has a value to the enterprise, and it should manage accordingly.

Rationale:

- Data is a valuable resource; it has real, measurable value, Accurate, timely data is critical to quality of service.
- A well-informed stakeholder and accurate information is critical to effective decision making, improved performance, and accurate reporting. It has no value when it remains in isolated pockets and hence must be shared without compromising the security and confidentiality.
- Data must be carefully managed and protected to ensure the data accuracy, accessibility and availability for citizen and stakeholders.

Implication:

- It will improve the information sharing/distribution environment to better disseminate information to the public and government entities of Kingdom.
- Kingdom will identify authoritative sources for information, and agencies to provide access to specified data and information.

7. Application Principles

7.1 Common Use Applications

Statement:

Development of applications used across the Kingdom is preferred over the development of similar or duplicative applications which are only provided to a particular ministry/agency.

Rationale:

Less duplicative capabilities will save lot of effort and cost for the government entities of Kingdom.

Implications:

Applications built across the Kingdom will help not only particular ministry as we all complete Enterprise and it will lead to Enterprise wise resource utilization.



7.2 Technology Independence

Statement:

Applications are independent of specific technology choices and therefore can operate on a variety of technology platforms.

Rationale:

- Choice for different technologies will provide application's ability to run on multiple hardware and platforms.
- Independence of applications from the underlying technology allows applications to be developed, upgraded, and operated in the most cost-effective and timely way.
- This will enable Kingdom to choose different technology platforms otherwise technology which is nearing obsolescence and vendor dependence become the drive rather than the user requirement themselves.
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Implications:

- It will provide portability of application and thus technology and platform dependent.
- It will enable legacy applications to interoperate with applications and operating environments developed under the enterprise architecture for Kingdom.
- Middleware should be used to decouple applications from specific software solutions.
-

7.3 Ease-of-Use

Statement:

Organization owned applications are easy to use. The underlying technology is transparent to users, so they can concentrate on tasks at hand.

Rationale:

- Simplicity of underlying technology will increase productive of user. Compromising user friendliness will lead to less productivity.
- Ease-of-use is a positive incentive for use of applications for Kingdom.
- It encourages users to work within the integrated information environment instead of developing isolated systems to accomplish the task outside of the enterprise's integrated information environment.
- Training is kept to a minimum, and the risk of using a system improperly is low.

Implications:

- Applications will have a common look and feel.
- The common look and feel standard must be designed and usability test criteria must be developed.



- Guidelines for user interfaces should not be constrained by narrow assumptions about user location, language, systems training, or physical capability.

7.4 Use of Service Oriented Architecture

Statement:

- Develop new functionality using a service-oriented architecture (SOA) model and deploy using the enterprise infrastructure.
- Architecture should be based on design of services reflecting set of activities which comprises the business processes within and across the government entities at Kingdom.

Rationale:

- SOA model provides the most flexibility in upgrading and managing infrastructure over time.
- SOA model makes it easier to deploy services that integrate with a wide-range of campus applications without one-off customizations.
- Deploying services via the enterprise infrastructure supports ongoing management and security.
- Service orientation delivers enterprise agility and Boundaryless information flow across the Kingdom.

Implications:

New services are deployed using the enterprise SOA infrastructure (e.g. National Gateway Infrastructure).

7.5 Multiple Delivery Channels for services

Statement:

Application delivery over choice of channels for availing government services.

Rationale:

- Application delivery define how to design and deliver applications.
- It will define how applications interrelate and integrate.
- Promote common standards to facilitate rapid training and implementation of new applications and functions.

Implications:

- Good application delivery enables a high level of system integration.
- Reuse of components, and rapid deployment of applications in response to changing business requirements.



8. Technology Principles

8.1 Requirement Based Change

Statement:

Changes to functionality and technology should be made in only response to change in business at Kingdom.

Rationale:

- It will encourage an atmosphere where the information environment changes in response to the needs of the business rather than having the business change in response to IT changes.
- This is to ensure that the purpose of the information support - the transaction of business - is the basis for any proposed change.
- A change in technology will provide an opportunity to improve the business process and hence change business needs.
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Implications:

Changes in implementation will follow full examination of the proposed changes using the enterprise architecture.

8.2 Manage Technical Diversity

Statement:

Technological diversity is controlled to minimize the cost of maintaining expertise and connectivity between multiple processing environments.

Rationale:

- It will encourage standardization across all government entities at Kingdom.
- Common technology across the enterprise brings the benefits of economies of scale to the enterprise.
- Technical administration and support costs are better controlled when limited resources can focus on this shared set of technology.

Implications:

- Policies, standards, and procedures that govern acquisition of technology must be tied directly to this principle.
- Technology choices will be constrained by the choices available within the technology blueprint.
- Procedures for augmenting the acceptable technology set to meet evolving requirements will have to be developed and emplaced.



8.3 Interoperability and Reusability

Statement:

Software and hardware should conform to defined standards and that promotes interoperability and reusability.

Rationale:

- Standards helps to ensure consistency thus improving the ability to manage systems and improve user satisfaction, and protect existing IT investments, thus maximizing return on investment and reducing costs.
- Interoperability will enable flexibility, reusability and adaptability in sharing information, systems and processes within government, and improve efficiency within government.
- Standards for interoperability and reusability will additionally help to ensure support from multiple vendors for their products and facilitate application integrations easily.
- Deployed IT Infrastructure components should be used reused, where similar needs arises and processes should be planned to be easily interoperable.

Implications:

- An interoperability and reusability standard needs to be followed unless there is a compelling business reason to implement a non-standard solution
- A process for setting standards, reviewing and revising them periodically and granting exceptions needs be established.
- Information used to support enterprise decision-making will be standardized to a much greater extend.

8.4 Adopt Policies, Standards, Guidelines, and Best Practices

Statement:

- Designing and defining business processes, information systems, technology products and services used by government entities should adhere to industry best practices and customized standards.
- Kingdom should employ policies, formal practices, methods, and tools for all stages, it should encourage to use standard protocols/formats to communicate between data, applications, and technology in project architecture.

Rationale:

- Policies, standards, guidelines, and best practices will provide flexibility when there is need to change some element in architecture.
- Using viable open standards will improve services to the community through better interoperability in government, greater flexibility and by reducing risk for government.



- Adopting policies, standards, guidelines, and best practices will ensure quality assurance, repeatability and consistency for business projects with an IT component.
- Adherence to industry specific best practices will ensure that services are being delivered in optimal way.

Implication:

- This will reduce the overhead cost of developing systems as well as the operating cost.
- Usage of policies, standards, guidelines, and best practices will ensure process information interoperability and ease to reuse.
- It will avoid reinventing the wheel as existing research on industry best practices will be reused.

8.5 High Availability and Disaster Recovery

Statement:

- Technology architecture component and services should be deployed and configured in high available mode to provide maximum availability to business services based on business priorities.
- Business services and IT components/infrastructure should be operational in spite of primary IT Infrastructure failures and interruptions due to any disaster.
- A formal business continuity plan and backup policy should be defined and documented to expedite the disaster recovery process.

Rationale:

- Information services are critical to the success of business functionality. Extended periods of service unavailability or loss of identity data could have severe negative impacts.
- It eliminates single point of failure and provide high availability for business services/application.

Implications:

- Maximum availability of business services, which is deployed on redundant or HA (High Availability) configured IT Infrastructure based on business priorities.
- Design documents and implementations plans detail how the service was designed in order to meet or exceed its availability and recovery goals.

8.6 Optimal Load Distribution

Statement:

Load balancing in Technology architecture or IT component should be used for optimal distribution of works for better performance and result of an application or physical IT component deployed within government entities at Kingdom.

Rationale:

- Business need or services which is served through an enterprise application and infrastructure will give better performance and will provide reliability.



- It enhances availability, flexibility and scalability for IT Infrastructure components deployed and business services offered through them.

Implications:

Consistence performance of the business services and IT component/infrastructure, which is used to serve business services for users at Kingdom.

8.7 Adoption of Cloud Computing

Statement:

- Cloud computing is a way of delivering computing services, such as servers, storage, databases, networking, software, analytics, and intelligence, on an internet-based platform.
- Cloud computing technology should be the preferred solution for all automated business services and the technology architecture components implementation.
- Government entities should adhere to government policies and standards regulating the cloud.

Rationale:

- Enhance overall data security by using accredited platforms.
- Reduce the cost of government ICT by eliminating duplication of solutions and fragmentation in the technology environment and leveraging the efficiencies of on-demand provisioning of ICT services.
- Encourage infrastructure standardization across all government entities.
- Improve government resilience and offer business continuity and disaster recovery services.
- Increase productivity and agility, and thus improving citizen services.

Implications:

- Change in government business processes will be easier and quicker.
- Reduce capital expenditure and have predictable costs by providing cloud-based data center with scalable and adaptable resources.