DEVELOPMENT OF EVALUATION MODEL FOR GOVERNMENT SERVICES PERFORMANCE USING ANALYTIC HIERARCHY PROCESS

by

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Dedication

To my family…

Abstract

Performance Management is one of the main concerns for many organizations in the public and the private sectors. Although the definition of performance could be complicated when it comes to the public sector, different approaches were developed to measure and evaluate performance along its pillars, based on efficiency, effectiveness and quality. Many of the current models which are used for measuring and evaluating government services in the public sector are based on quality dimensions through performance indicators. Depending on one aspect of performance only such as efficiency or quality will not represent a proper measurement for the government performance level. The aim of the study is to develop an evaluation model for government services performance, aligned with the general framework of performance management. The evaluation of the level of performance at which government services are administered will be done based on different criteria, using the Analytic Hierarchy Process (AHP) approach. The AHP technique was used to develop the structure of the model and find the priority weights of different criteria and attributes that contribute to the government performance. Furthermore, actual data from government authorities in the UAE was used to apply the developed model in this thesis, and the results are analyzed and studied. The contribution of this research is the development of an evaluation framework for government performance in the public services, as one unified index for the public services performance. This unified index is closely measuring the performance of various government entities, as well as identifying specific areas to enhance government performance based on the evaluation criteria. Based on results of the AHP approach and experts judgments for the selected criteria and attributes, conformance to service standards, customer satisfaction level and overall service quality attributes are representing more than 40% of the importance to the government services performance. Another finding of applying the developed model in this research to the actual data collected from government services, is that the ranking of the high-performing and low-performing entities depends on the consistent level of performance among the selected pillars and criteria for the evaluation of the government performance.

Keywords: ***Performance Management; Performance Framework; Government Services; Public Service; Analytic Hierarchy Process; Performance Evaluation.***

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List of Abbreviations

ACK	Acknowledgment
AHP	Analytic Hierarchy Process
ANP	Analytic Network Process
BSC	Balanced Scorecard
DEA	Data Envelopment Analysis
GDP	Gross Domestic Product
GE	Government Entity
GPRA	Government Performance and Results Act
GPRMA	Government Performance and Results Modernization Act
PSE	Public Sector Efficiency
PSP	Public Sector Performance
RBM	Results Based Management
SFA	Stochastic Frontier Analysis
SPI	Service Performance Index
UAE	United Arab Emirates
UK	United Kingdom
USA	United States of America

Chapter 1. Introduction

Performance Management nowadays is getting global attention from organizations in both the private and public sectors as well as non-profitable organizations and governments. Different levels of performance management could be found in every organization, starting from individual performance, team or unit performance and up to the overall performance of the organization. Along with that, there are different areas of focus for performance management, such as efficiency, effectiveness, quality and other aspects, which are associated with an activity, service, project or program, or with any other operational task and role.

In this study, the evaluation of government performance in public services will be the main focus, based on different elements and aspects of performance management. An introduction about the government performance in UAE and its importance will be given, followed by discussing the research and its objectives and contribution. Then, a general framework of the government performance management will be presented, along with some of the approaches and concepts used to measure performance. After that, different models which are used for measuring government performance will be investigated, as well as discussing the AHP approach which will be used to develop our model.

In this chapter, a general overview about the government performance management will be discussed briefly. Following to that, more information about the objectives and the contribution of our thesis will be presented. Finally, the general organization of this research will be highlighted.

1.1. Overview

In the last few decades, a great body of research had been conducted in investigating performance management and its importance for organizations. Not only individual performance was focused on, but also the overall performance of organizations in public and private sectors was studied deeply in order to achieve better outcomes and enhanced results. For governments, many systems and models were developed to monitor and evaluate performance, which include performance of public organizations, and the role it plays in improving employees' satisfaction, moral, and productivity, and in achieving targets and organizational objectives, as well as in

improving the level of the governmental services provided to the public sector. However, monitoring performance can only lead to better outcomes when the available performance management system is effective and has a proper framework and solid elements that best fit organizations or their measured objectives.

The United Arab Emirates and its leadership model have become an influential example for many countries and governments, not only in the GCC and Middle East, but also in many countries around world. Every year, the UAE Government announces a specific theme to work on by federal ministries and local entities in each emirate, for the development of the country. This theme is transformed into different initiatives, projects and development programs, which include awareness sessions for the public, coordination workshops between local and federal governments, new partnerships with private sectors and other parties, incubators and accelerators for revolutionary technologies and many other initiatives. In 2017 only, over 120 initiatives for 30 national pillars were launched to ensure the prosperity of the UAE for future generations. Under each initiative, there are many projects and programs, which will serve the community in one of the national pillar, and will help the UAE to achieve its 2021 vision.

In order to help UAE Government to optimize the performance of the federal ministries and entities, as well as monitoring the outcomes of each project and initiative, a performance management system was essential to be deployed, not only for monitoring and reporting purposes, but also to ensure that all planned targets are on track, and to support the strategic decisions related to the planning and changing actions, if required.

The current government performance management system run by UAE Government is called “ADAA System”; the system has been used since 2011 to monitor the government performance & the services on the federal level. The system consists of three main categories; Common KPIs, Strategic KPIs and Operational Indicators. ADAA cycle also consists of three main phases:

- Planning
- Analyzing
- Reporting

Those phases were developed in order to ensure the continuous cycle of improvement throughout the federal government entities [1].

Moving to the local government level, different approaches and programs have also been used to monitor and evaluate the government performance in the local entities, such as Business Plans (Example: Dubai Plan2021), Excellence Programs (Example: Sheikh Khalifa Government Excellence Program and Dubai Government Excellence Program) and other service quality models. Both ADAA System in federal entities and other programs which are used at the local levels focus more on monitoring government performance, either by specific Key Performance Indicators or standard criteria for assessment and evaluation. Furthermore, different pillars of the government performance are being monitored, such as efficiency, excellence levels, service performance levels, and other aspects of the government performance. In the last few years, the UAE Government has been working continuously to announce new programs and initiatives that lay emphasis on improving government performance in all pillars.

A close look at the current performance management systems and approaches used by UAE Government would reveal that the common challenges associated with those models are the number of monitored indicators and assessment criteria, as well as the big number of public services standards and measurements need to be monitored and reported. These measurements could reach up to thousands, without including other indicators which are generated from the on-going projects and initiatives portfolios that are announced by UAE Government.

1.2. Thesis Objectives

The main objective of this thesis is to develop a model for evaluating the government service performance in the public sector, aligned with the government performance management framework. The proposed model will consider different attributes related to efficiency, effectives and quality, and classify them based on relevance and under different pillars or main criteria for evaluation. The research aims at considering the issues and challenges associated with having big numbers of key performance indicators, and the variety of measurements and input data in the current models and approaches, focusing specially on the development of practical model that will overcome this problem.

Another objective of this research is to design a unified index for the government service performance in the public sector, using Analytic Hierarchy Process approach. This index will be calculated based on the determined weights and importance factors for the selected criteria and attributes of the government service performance, and through using the relevant measurements and data gathered by the government entities. This unified index will help in focusing on specific performance pillars of improvements and assigned targets, and will allow to compare the overall performance index between different government entities, or for the same entity, over a specific period of time.

1.3. Research Contribution

The significance of this research lies first in the value it adds to the literature in the field of the government performance management. Most of the research carried out in the area of government performance focused on the definitions of the performance and its framework, considering different ways of measurement concepts and reporting indicators. On the other hand, the majority of the studies in the service quality field have not considered the alignment of those models with the general framework and measurement concept of the government performance system, which could lead to inaccurate outputs and reported outcomes. When it comes to the practical side, 'running by numbers' could be the meaning of using the performance management system by the government; and our model will focus on adding the 'real meaning' of those numbers. The model is assumed to make a significant contribution to the overall government performance.

The contributions of this research work can be summarized as follows:

- Propose a study about the relation between the government performance management system framework and service evaluation models used for measuring the performance of the government in the public sector.
- Propose a study about the importance and relative weights of different criteria and attributes in the government performance, based on the applied Analytic Hierarchy Process approach and gathered experts' judgments.
- Propose a developed model for the evaluation of the performance of government services as One Unified Performance Index based on the determined weights by AHP and aligned with the performance management framework.

- Propose a developed approach for evaluating and comparing the overall performance of public services between different government entities, and for the same entity, over a specific period of time, based on different attributes.
- Propose a practical analysis and comparison between the proposed model in this thesis, and some of the current service models used for measuring and evaluating the performance of government services.

1.4. Thesis Organization

The rest of the thesis is organized as follows: Chapter 2 provides background and literature review about Government Performance Management and its framework, along with discussing some of the concepts used for measuring and evaluating the government performance in the public sector. Literature review about the Analytic Hierarchy Process technique will also be presented, along with some of the related works to this research; and the gaps found in each study will be discussed. The employed methods for developing the evaluation model for government services performance based on AHP will be discussed in Chapter 3. In Chapter 4, the experimental setup of our model will be presented using AHP technique, based on the followed procedures explained in the methodology and the gathered feedback from the workshops and brainstorming sessions with the experts, who are working in the related field in the government. Finally, Chapter 5 will present the results of our thesis along with the analysis of those results based on actual measurements collected from government entities. Finally, Chapter 6 concludes the thesis and outlines the future work related to the government performance evaluation models.

Chapter 2. Background and Literature Review

This chapter tackles the framework of government performance management system and the definitions associated with it. Moreover, it presents different concepts used for measuring Government Performance as well as the employed models in the public service sector. Furthermore, the background and the approach of the used technique in our research, Analytic Hierarchy Process, will be highlighted. Finally, it discusses the current models used for measuring government performance in public sectors and the other service quality models, along with presenting some of the related work in this area.

2.1. Government Performance Management: Definition, Framework, Cycle, and Challenges

Performance management approach is a systematic way, which has been used for improving the results through continuous process of learning and decision making. The levels in any organisation where performance management can be found vary from individual and teams, departments and units, up to the level of the organization itself. Along with that, different concepts of performance management could be found at each level, with an emphasis on the planned outcomes through continuous assessment and monitoring [2], and also taking corrective action, if needed. In the government, performance management has become a leading topic of discussion globally, and the trend nowadays is moving from measuring and reporting government performance, to managing and improving results and outcomes.

2.1.1. Government performance management definition. Government Performance Management is an on-going, systematic approach for improving results through evidence-based decision making, continuous organizational learning, and a focus on accountability for performance [2]. For decades, there was a confusion between the two terminologies; ‘performance management’ and ‘performance measurement’ in governments, which are often used interchangeably, while they are not the same. Government performance management uses performance measurement to facilitate the improvement throughout government entities and support decision making process. However, measuring government performance has rarely led to

improved outcomes [3]. Therefore, it is essential to conduct the measurement process with alignment with performance management framework and its phases.

The objective of performance management in governmental organizations could also be driven by the rules, not only by results. This could be found especially in the traditional bureaucratic public sector, where the performance management system focuses on controlling inputs and complying with set of rules and regulations, which is also considered more important than efficiency and effectiveness [4]. Although this could work well for certain times or in some countries, sustainability of continuous learning and the improvement of results could not be achieved, since the rigidity of such a system will not address any required changes [4]. It could be also considered a weakness in case of complex situations that require flexibility or alteration.

Modern approaches to performance management in governmental organizations focus more on achieving 'better' results, along with promoting the learning process to improve performance, and not only measure it. Such approaches could be considered more 'flexible' than the 'rigid' ones which are mainly driven by rules.

2.1.2. Government performance management framework. Many frameworks of performance management are being used and developed for different models and businesses. Studies have shown that government performance management frameworks have different purposes which depend on the approach (Rigidity), level of performance management and the scope [5].

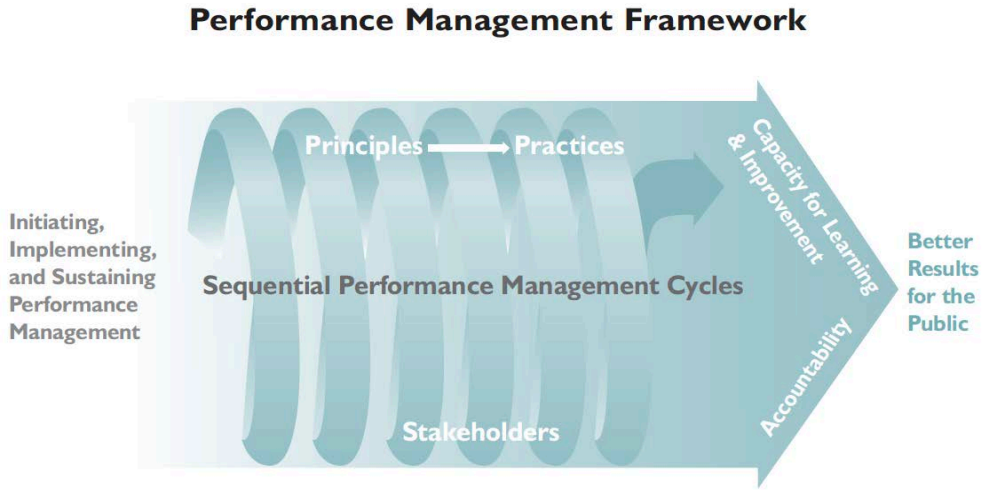


Figure 2.1: Performance Management Framework [5]

For example, the framework applied on the federal government level may differ from the one used in local government entities. The same is also applicable when comparing a government performance management framework for a finance department which is accountable for the financial resources, with entity department which provides services for the public. In general, the aspects of the performance management framework should be aligned with the government's goal for achieving better outcomes [5].

2.1.3. Government performance management cycle. The general approach to performance management is an on-going and systemic approach, which depends on the continuous learning in order to improve the expected outcomes. This approach is transformed to the performance management cycle, consists of different elements. For the government, performance management cycle can be summarized into four main phases or activities [2],[5], as following:

- *Planning and Analysis Phase*
- *Implementation Phase*
- *Measuring and Evaluation Phase*
- *Reporting Phase*

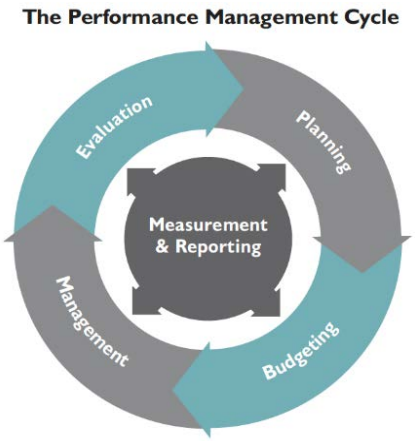


Figure 2.2: Performance Management Cycle [5]

However, in some cases, the cycle of governmental performance management may be represented in three or five main phases, as shown in the example in Figure 2.2, and there are common activities of the process. Those common activities are followed and sometimes are shared between the phases since it is a continuous and growing process. A good example is the ADAA System, the government performance management system used by UAE Government, which consists of 3 main phases: planning, analysing and reporting [1]. Although the number of phases is different, but government performance is managed through those activities by the system, and implementation and measurement phases are carried out by federal government entities.

2.1.4. Challenges in government performance management. For most of the government performance management systems, there are many common challenges, either related to the performance itself (inputs and outcomes), or the management approaches used for dealing with the performance elements. Scanning the different models and systems of government performance management, many challenges could be found, and are as follows:

2.1.4.1. ***Changing the behavior and culture.*** One of the most difficult challenges is to create a results-based culture within organizations and throughout the government [4]. This challenge may lead to resistance, in the government, against the transformation to the modern approach of performance management. It may also affect the current models, which could be an 'accountability and budgeting' system driven by set of rules.

To overcome this challenge, assessment of the government capacity to change needs to be done, together with an identification of the risks and the key barriers associated with implementation [5].

2.1.4.2. ***Implementation scope and duration.*** Another challenge associated with the performance management in governmental organizations is related to the implementation phase. The scope of implementation and standardization is a major issue. Performance management in governmental organizations could sometimes take years or maybe a decade [5]. The aspects and the different levels of the government performance that need to be managed could also be a main challenge, not only on the organizational level, but also on teams and individual levels. This challenge can be overcome by getting support from different levels throughout the government, starting from decision makers up to employees. There is also need for identifying the key purpose and objectives, which is an essential step before implementation. Furthermore, defining the scope and level of implementation 'fully or partially' will impact the success of implementing performance management in governmental organizations. This is not to forget the need for assigning different resources and giving proper time for the implementation.

2.1.4.3 ***Sustaining improvement and continuous process.*** The continuity of improvement process in governmental organizations is also another challenge for

performance management. The level of accomplishment may not be as per the planned outcomes at the beginning. This could be due to lack of monitoring or poor evaluation during implementation, or lack of continuity between one cycle of performance and the next one [2].

Sustaining performance management could be achieved by integrating the actions of the performance cycle with the internal efforts of the government, to ensure that it becomes an on-going and systemic approach for management and improvement, and by creating a culture of continuous improvement and development.

2.1.4.4 ***Measuring performance, process and concept.*** This challenge is related to the 'government performance measurement', which is a term that is commonly confused with the government performance management. There are many issues under this challenge, which result from the quality of information, the methods of measurement and the measurement process itself. In addition to that, selection of measurements and the purpose of evaluation is also another aspect, which needs to be distinguished and defined clearly.

Different concepts have been developed to measure the government performance and evaluate the outcomes. Some of these concepts focus on measuring efficiency, based on different methods of analysis such as Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis [3],[6]. There are also other concepts which focus on different aspects such as effectiveness and productivity, quality [7],[8] along with efficiency, and will be discussed in the coming sections of the thesis.

Key indicators and the outputs of performance in general, are commonly measured as 'numerical values' or ratios. These indicators are usually built, based on the collected measurements from the service input and output data. The main issue with the indicators is not only the differences in weights and dimensions, but also other factors such as definition, units, and the level of complexity in each indicator [9]. Other issues related to the indicators could be the 'additivity' of indices, duplication of factors or measurements and comparing non-equal indicators or outputs [10].

Although there are many concepts and models for evaluating government performance, performance measurement and evaluation is always a challenge. In this thesis, the issue of having many indicators and attributes will hopefully be overcome

by developing an evaluation model which considers many aspects of government performance, and by proposing a practical approach.

2.2. Approaches to Measure Government Performance: Concept, Model's Elements, Public Services and Performance Indicators

When it comes to government performance management, 'running by numbers' could be a suitable meaning for using the measurements to manage the performance. Decision makers and government entities always draw emphasis on measuring performance and monitoring its outcomes by using 'numerical values or performance indicators' [11], either as; percentages, or ratings and or sometimes as scores. In other words, these numerical values or 'indicators' are the main output of government performance measurement and the performance management cycle. Furthermore, the phases of the performance management cycle depend on those measurements.

2.2.1. Government performance measurement concept. The concept of 'government performance measurement' is based on measuring the performance of any activity conducted by the government. This activity may have to do with providing services to the public, budgeting and spending, regulating and policy making or applying programs and initiatives for the communities [12].

Many concepts of government performance measurement were developed to measure 'Efficiency'. Efficiency could be defined in different ways, and could also be measured from different perspectives. Starting with the general definition of efficiency, it is described as 'achieving an output from a given level of resource used to carry out an activity' [13]. Maximizing the efficiency could be achieved by optimizing the results, or in another word achieving 'better outcomes. For economists, overall economic efficiency is attained when individuals in society maximise their utility, given resources available in economy [6].

In the public sector, it is difficult to have specific definition for government efficiency. Although there are some definitions for the efficiency in public sector, such as 'the policy, program or outcome that results in the highest net benefit to the community as whole [6], still the lack of precision about the outcomes and benefits, along with the influence of environmental factors on the input are major issues in such definitions.

On the other side, some concepts added effectiveness of government performance along with efficiency. Many researchers believe that efficiency and effectiveness are related, and are important since they impact the outcomes of government performance [14]. In addition to that, other aspects such as productivity and quality could affect the outcomes of government performance, especially in the field of public services. Many of the developed concepts for public services focused on quality attributes, which are measured easily and could be evaluated directly compared to other aspects such as efficiency and effectiveness, which may include complicated measurements and require more efforts to be determined.

2.2.2. Elements of government performance measurement model. The measurement of government performance is consisting of different elements, which include formulating the systematic way of measuring the efficiency and effectiveness and building the link between them through the outputs. Starting with the first element, the '*Input'*, it represents any kind of resources that are used to conduct an 'Activity', which is the second element. This activity could be a service, task or a unit of work that is done to produce an 'output'. This output effects will result in another element, the 'outcome' which represents the high objective of the activity, and also support the 'goal' element to achieve the ultimate and long-term target of the government [5],[15].

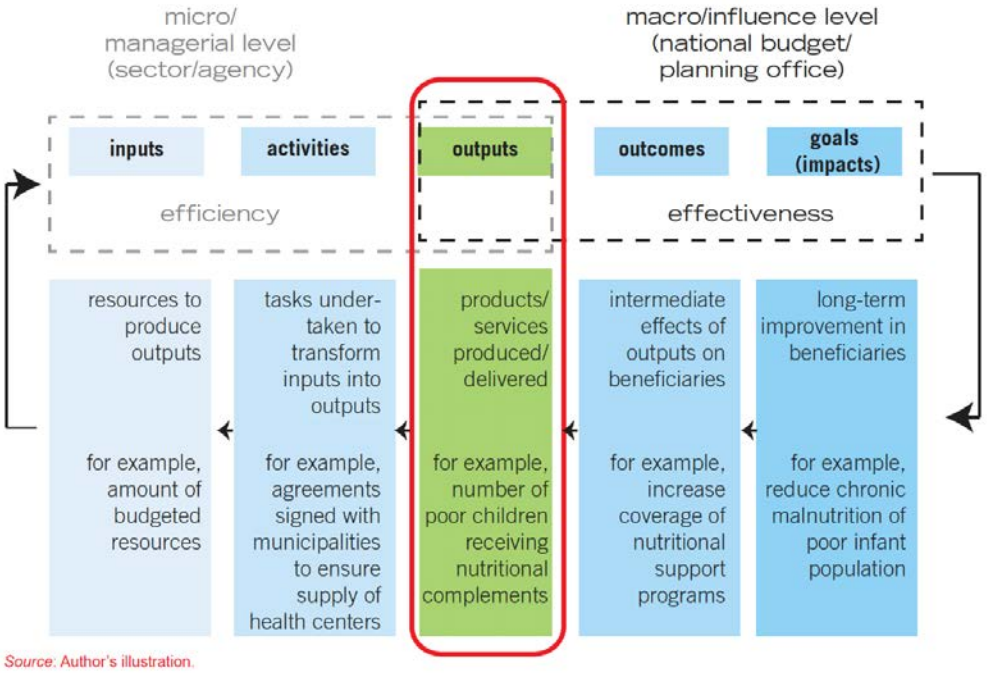


Figure 2.3: Elements of Government Performance Measurement Model [15]

As it could be noticed from the model, the focus on the input resources and the activities are more related to efficiency, whereas for effectiveness, it could be judged through delivering the desired outcome and achieving its impacts. The elements' consequence in the model is aligned also with the government performance framework, which emphasizes sequential performance management cycles in order to achieve better results for the public.

2.2.3. Public services measurement concepts for government performance. In any country, the requirements and needs of the people are usually satisfied by public services. These services may be provided fully or partially by the government, or by the private sector under such kind of governance. When it comes to the performance measurement of any government, the level of service performance in the public sector could be a good measurement of the performance, which can also give an initial indication about the other related fields such as budgeting and spending, regulating and policy making or applying programs and initiatives for the communities.

There are different concepts commonly used for measuring and evaluating government services in the public sector, where efficiency and effectiveness are the two key measures for the performance. Measuring efficiency takes into account the obtained result in relation to the resource used [14], 'which is looking into the first and second elements of the measurement model'. On the other side, measuring the effectiveness is quantified by the ratio of the actual result to its expected level [13] 'which is looking to the outcome and goal, the fourth and fifth elements'.

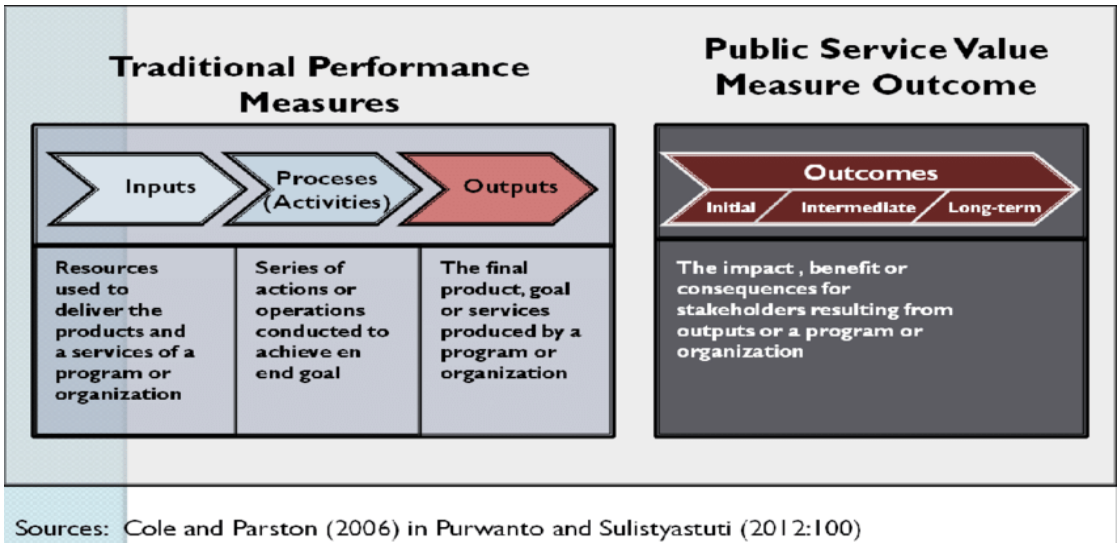


Figure 2.4: Example of Performance Measurement Framework for Public Service [53]

For the efficiency, different techniques and methods were proposed as a mathematical model for measurement; they depend on the selected inputs and outputs for the model. Stochastic Frontier Analysis (SFA), for example, uses statistical methods to identify the relationship between input and output, whereas Data Envelopment Analysis (DEA) is a non-statistical approach, which takes data on organizations' outputs and inputs, and measures the efficiency of a particular organization by its distance from the outer envelope of the data [3],[6].

In practice, most models of performance measurement for the public services are based on 'quality' dimensions. Comparing these models to the government performance measurement concepts, it is very difficult to distinguish between efficiency and effectiveness based on quality attributes only, which are included in those models. Furthermore, different dimensions and standard measurements could be found under the service quality models, which are measured and evaluated by different techniques and for different attributes. Although the concept of quality could be used as a good measurement for performance, but the complexity of the factors and output measurements involved in the results may not represent the precise measurement of government performance.

For instance, most of the service quality attributes measure a specific dimension such as 'reliability' and compare it to a specific target, which could be a good measurement for the effectiveness [14], but there is no involvement of efficiency in this method.

'Key performance indicators' is another issue that could be found in the service quality models. Comparing the key performance indicators of a service quality model is not equivalent to the key performance indicators generated from the government performance measurement concept. The reason behind this conflict is that the dimensions of the service quality model are not the same as those of the government performance framework. Moreover, the elements of the models are also different, since the service quality models are more related to specific dimensions and quality attributes, rather than the inputs and outputs elements which are related to the efficiency and effectiveness of the government performance measurement model.

2.2.4. Performance indicators in government and public services. Nowadays, performance indicators are found everywhere. They take place in both the public and private sectors worldwide. The aim of the performance management framework is to provide the government with well-developed and meaningful indicators that allow agency outcomes and agency output to be measured [14]. After measuring the government performance, the indicators are used to evaluate those outcomes in accordance with the government's goals and planned targets. Looking at the different levels where performance indicators could be found in the organizations, one can conclude that performance indicators are widely used, starting from individual levels, up to the organizational level. In government, the same could be found, and sometimes performance indicators are commonly used as shared indicators between different entities.

In addition to the above, performance indicators differ in terms of priorities and types. In such models, indicators are classified into three types: strategic, operational and local. The classification could also be labelled as financial or non-financial, or the ranking of the class as first, second or third-class indicator and so on [10],[11],[16]. Those classifications are usually defined, based on different criteria, such as the priority, weight, dimension and measured outcome.

There are different purposes for using indicators in the government performance management system. It is worth noting here that performance indicators could be in all phases of the performance cycles. In the planning phase, the cycle starts by defining and selecting the right indicators for achieving government goals, and setting targets for those indicators. Moving to the implementation, continuous monitoring to the performance of the government will be deployed by using the indicators and comparing them to the planned progress with respect to the planned targets. In the evaluation phase, the outputs of government performance will be evaluated by looking at the final achieved outcomes and comparing them with the targets, followed by the reporting phase which will include the analysis and reporting of the indicators [17] to the government leadership management and public sectors. It should be clear here that it is not necessary to have the same four phases as explained, but they all should have the same common activities of planning, implementation, monitoring and evaluation, ending up with reporting the outcome results and doing the analysis.

There are different types of performance indicators that are used for measuring government performance. Most of the indicators are reported as ‘numerical values’ or ‘percentages’, and they may be in the form of a ‘unit-less ratio’ or may have a specific unit which is related to an activity or calculation formula. Those indicators are also used to compare between different countries, entities, sectors, or to monitor and study the same indicators based on specific period of time, as shown in the example below.

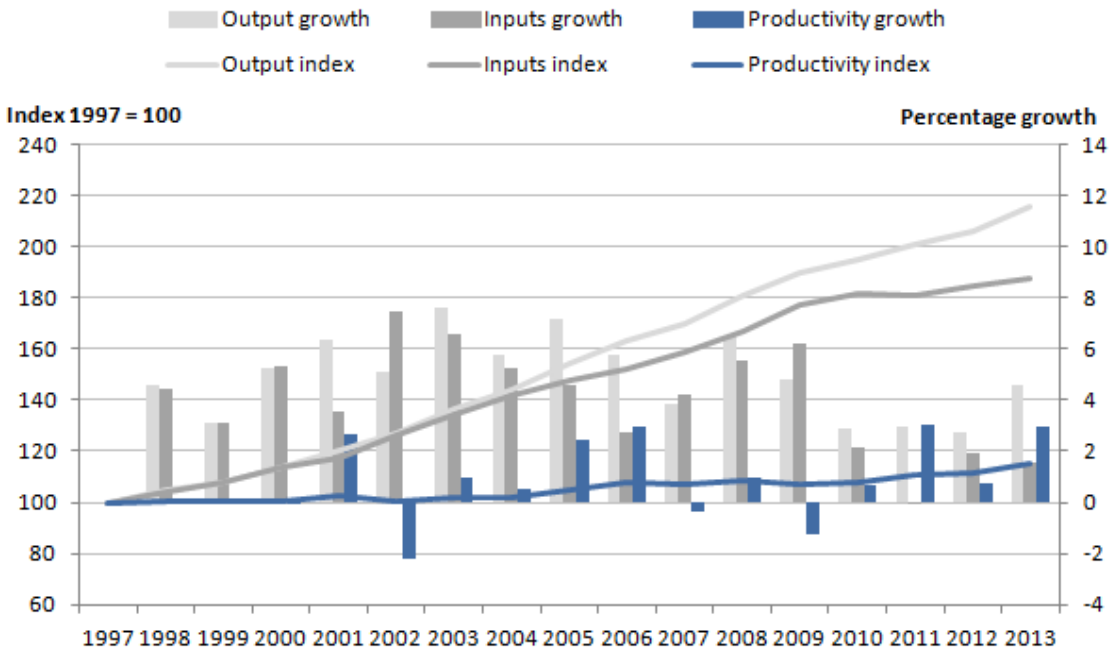


Figure 2.5: Example of Different Indicators

The above example shows some of the previously discussed issues related to the performance indicators considered in this research. Although the graph shows many indicators from different types, the comparison between them would not be valid if they have different dimensions and different units. In addition to that, ignoring the weights of the priorities could be misleading, especially when having huge number of indicators. An example about that could be found specially in public services, when there is a huge number of indicators (which could reach thousands), and the majority of them are showing achieved targets as ‘numbers’ only, whereas their small percentage are not achieved. The indicators in this case could lead to a misleading conclusion that the government is well-performing and achieving its targets, but this is not always correct because the importance of the non-achieved indicators may represent more accurate figure about the actual performance of the government.

2.3. Models to Measure Government Performance in Public Sector: Service Quality Models, Other types of models and methods

Over the past few decades, Performance Management has been one of the main concerns of governments around the world, as an approach for delivering better outcomes and achieving long-term goals. Many researchers, academic institutes and organisations did a lot of work and effort in the field of government performance management, with a focus mainly on maximizing the efficiency and effectiveness in government performance, and improving the quality of the public services. In addition to that, different models and methods were proposed for measuring and evaluating government performance in the public sector, from quality, efficiency and effectiveness, and other perspectives, which will be discussed below.

2.3.1 Service quality models. One of the most common models used for measuring the performance of services in the public sector is the one based on quality. There are different approaches and models used to evaluate the quality of the services delivered, based on different dimensions and scales. Starting with the definition, quality is defined as “fitness for use” in user-based approach and “conformance to requirements” [18],[19]. Moreover, some of the quality meanings are associated with excellence and the ability to comply with standards and high recognizable achievements universally [18]. In terms of service quality, different models were developed and used; they are as follows:

- Grönroos Service Quality Model was the first developed model which measured perceived quality based on qualitative methods. The model introduced the technical quality, functional quality, and corporate image as the dimensions of service quality.

- Parasuraman et al. GAP Model was developed in specific dimensions, such as reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding/knowing the customer, tangibles as determinants of the service quality [19].

There are many models which have been developed based on Grönroos Service Quality Model and Parasuraman et al. GAP Model, and some of its updated versions are still in use by many organizations.

Along with those models, there were also other quality models and approaches developed based on different dimensions. In 1992, Cronin and Taylor developed SERVPERF scale based on SERVQUAL model. This model can be considered one of the first performance models used for measuring the service quality in the private sector based on different dimensions [18],[54] as shown below:

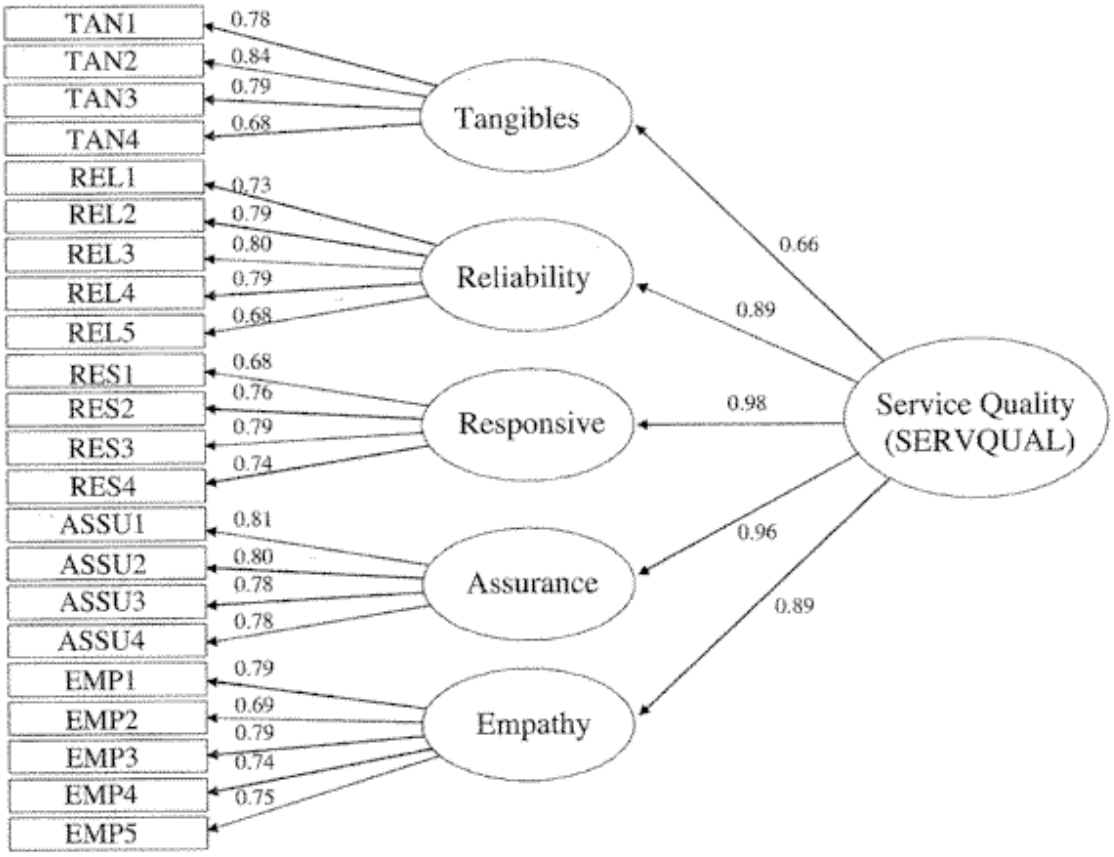


Figure 2.6: Example SERVPERF Model in Retailers' Service Quality [54]

Regarding the service quality models used in the public sector, it is noticed that performance is measured based on the quality dimensions only; other aspects related to efficiency and effectiveness may not be included. Focusing only on the quality aspects of public services may results in having inaccurate measurement of performance, because of the accountability of the government in prioritizing and allocating resources which need to be done mainly based on the efficiency and effectiveness measurements. Although there are some models which have been developed based on SERVQUAL dimensions, such models are not able to identify important areas for improvement in the area of service delivery [20], since they mainly focus on the customers perspective and do not account for other aspects of performance.

2.3.2 Statistical analysis models. Along with the service quality models, different statistical models have been developed and used for evaluating government performance based on performance indicators and measurements. One of the most commonly used method is “Multiple Regression”, which is used to analyse public services in healthcare sector and also study the economic performance for the organization [21]. The models mainly rely on using the multiple regression analysis of different performance indicators and measurements which are gathered from the public sector, and the correlation between different variables is studied. The general equation used in this model is shown below (1);

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \varepsilon \quad (1)$$

where Y is the response variable need to be observed, based on different predictors ‘x_n variables’ and ‘β coefficients’, with considering noise ‘ε’ as random error. The main issue with the Multiple Regression analysis is the assumption that the relation between the response variable and the predictors is linear, which is not always the case. Also, another issue with multiple regression is that the input data should be a continuous variable which is difficult sometimes when it comes to the performance indicators in the public sector. In addition to that, there are different limitations of using this method, due to the complexity, and the practicality as consistent factors which could be used for measuring performance of the public sector.

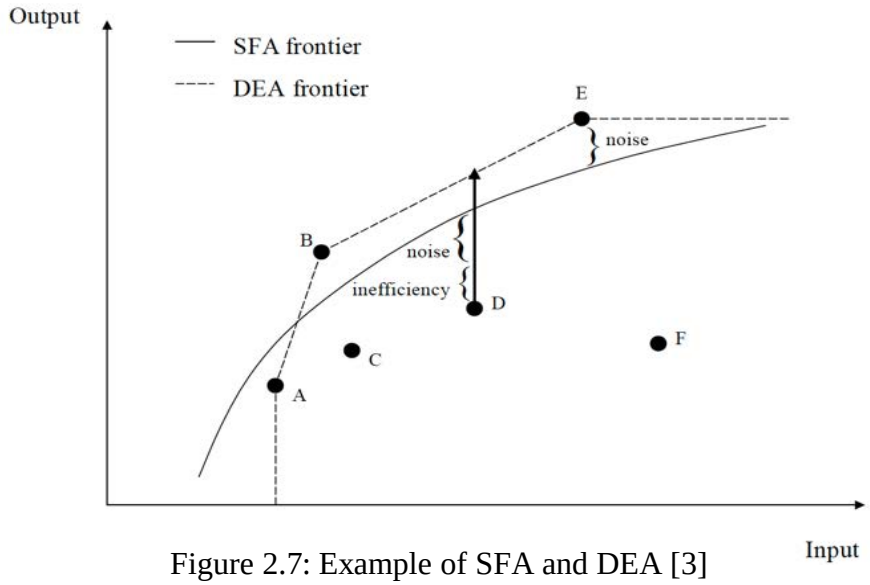


Figure 2.7: Example of SFA and DEA [3]

Another model that relies also on statistical analysis is ‘Stochastic Frontier Analysis’ which been used to measure public sector efficiency. The SFA uses statistical methods

to fit a frontier like the solid curve, in order to identify the relationship between output(s) and input(s), while allowing for two types of deviation from this relationship due to inaccuracy in the measurement and inefficiency of the organization [3]. Along with SFA, Data Envelopment Analysis (DEA) is a non-statistical method used to measure the efficiency of public sector; it will be discussed in the coming sections with some of the others non-statistical models. The main disadvantage of the SFA is that it only focuses on measuring the efficiency, without considering the effectiveness or quality of the public services as a performance measure [3].

2.3.3 Evaluation models based on decision making process. Using the Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) in performance management is not a new approach. Many models have been developed based on both models. The target was to evaluate and support the decision-making process associated with performance management on different levels.

For AHP, the approach was used to choose among different alternatives based on defined criteria and experts' judgements. This approach was also used to prioritize and determine the weights among performance indicators and criteria. There are many industries where the AHP models is used, such as; Teaching and Education, Public Health Sector, Economic Performance [21], financial sector [22], governmental sector and in many other industries. Employees' performance management is an example where the approach has been used for evaluating performance. It is used for evaluating and deciding on the weights of different criteria and sub-criteria for each employee [23] based on the hierarchy of the Evaluation Process as shown in the below example.

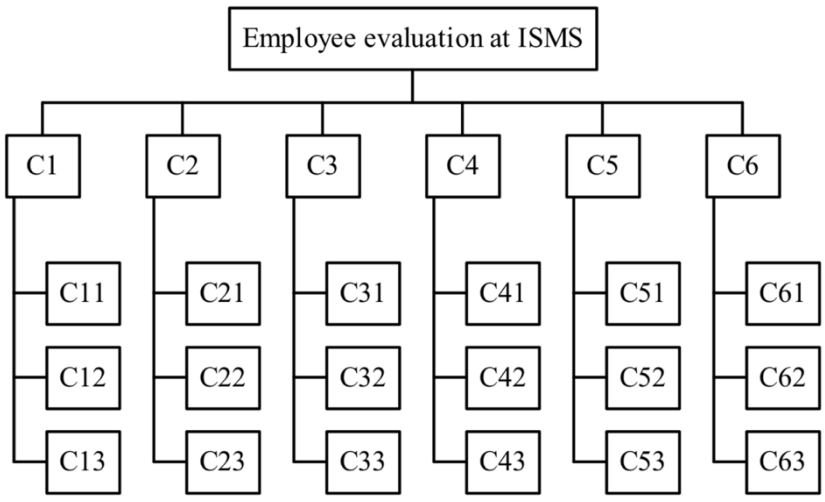


Figure 2.8: Hierarchy of the Evaluation Process for Employee Performance [23]

In the below table, the relative weights for different criteria of employee performance management are shown, using AHP approach to calculate them.

Table 2.1: Weights of different criteria and sub-criteria for each employee based on the hierarchy [23]

C_1	C_{11}	C_{12}	C_{13}	Wts.
C_{11}	1	8	9	0.804
C_{12}		1	2	0.122
C_{13}			1	0.074
CR=0.04				

C_2	C_{21}	C_{22}	C_{23}	Wts.
C_{21}	1	4	8	0.699
C_{22}		1	2	0.237
C_{23}			1	0.064
CR=0.09				

C_3	C_{31}	C_{32}	C_{33}	Wts.
C_{31}	1	8	9	0.804
C_{32}		1	2	0.122
C_{33}			1	0.074
CR=0.04				

C_4	C_{41}	C_{42}	C_{43}	Wts.
C_{41}	1	3	8	0.653
C_{42}		1	6	0.285
C_{43}			1	0.062
CR=0.07				

C_5	C_{51}	C_{52}	C_{53}	Wts.
C_{51}	1	8	8	0.796
C_{52}		1	2	0.125
C_{53}			1	0.079
CR=0.05				

C_6	C_{61}	C_{62}	C_{63}	Wts.
C_{61}	1	8	9	0.798
C_{62}		1	3	0.138
C_{63}			1	0.064
CR=0.10				

The Analytic Network Process, a method that supports modelling dependencies and feedback between elements in the network [24], was used in developing many models related to performance measurement and evaluation in different industries. For example, ANP was used to develop reverse supply chain performance index in consumer electronics industry by linking the various qualitative and quantitative, strategic, tactical and operational, financial and nonfinancial factors [25]. The approach was also used to evaluate performance in the banking sector based on balanced scorecard [26]. The purpose of using this approach for the banks was to find the relative weights of the balanced scorecard performance with respect to different main success factors as shown in the below example.

Table 2.2: Weights of the Balanced Scorecard performance with respect to different success main factors [26]

	Technical factors	Operational factors	Strategic factors
Finance	0.237	0.074	0.046
Customer	0.059	0.285	0.337
Internal process	0.2518	0.234	0.235
Learning and growth	0.4516	0.407	0.383

The use of decision-making processes, either AHP or ANP, for evaluating performance may not directly impact the process of measurement and evaluation themselves. Both methods were used mainly in order to evaluate the relative significance of the strategic perspectives or criteria, and their significance for optimal selection [27]. In the present research, the use of AHP for developing the evaluation

model of government services performance will be discussed in depth: and the steps will be explained in detail in Chapter 3 and Chapter 4.

2.3.4 Other models used to measure performance in public sector. There are also some other models developed to measure and evaluate performance of the public sector, using scoring methods [12],[20] and others. Starting with the DEA which takes data on organisations' outputs and inputs, and measures efficiency with respect to the 'outer envelope' of the data. This outer envelope is shown in Figure 2.7 by the dashed line for the case where there are assumed to be variable returns to scale. One of the main issue with DEA is that since the model is measuring performance with respect to the envelope, it makes it sensitive to any outlier [3],[6].

There are also some models which rely on 'scoring' methods, such as public-sector performance (PSP), public sector efficiency (PSE). The concept of those models relates performance to expenditures, using different functions of economic indicators:

$$PSP_i = \sum_{j=1}^{n} \omega_j \, PSP_{ij} \tag{2}$$

$$PSE_i = \sum_{j=1}^{n} \frac{PSP_{ij}}{EXP_{ij}} \tag{3}$$

Where ω_j is a vector of weights and PSP_{ij} is a scalar that is a function of socio-economic indicators, and EXP_{ij} is the respective expenditure in percent of GDP. The main issue of this scoring model is that since PSE_i is mainly relying on the expenditure, it could show a decline in efficiency if the expenditure increases, which could not always be correct. In the below table, an example of summary of scores using DEA, PSP and PSE for 'Education' and 'Health' sectors are shown [6].

Table 2.3: Summary of Scores using DEA, PSP and PSE methods for Education and Health Sectors [6]

	Mean	Coefficient of variation	Minimum	1st quartile	Median	3rd quartile	Maximum
Education							
PSPE	1.01	0.34	0.25	0.77	1.03	1.25	2.38
PSEE	1.21	0.62	0.26	0.79	1.08	1.44	15.19
DEAE	0.32	0.65	0.03	0.16	0.27	0.43	1.00
Health							
PSPH	1.15	0.28	0.23	0.93	1.23	1.41	1.81
PSEH	1.38	0.64	0.53	0.89	1.10	1.54	8.04
DEAH	0.34	0.63	0.08	0.18	0.25	0.45	1.00

2.4. Government Performance Management Models: An overview for some of the used models in UAE, USA, UK and other countries

After discussing the framework and concepts of government performance management, it is noticed that there are many models developed to measure and evaluate government performance, depending on the flexibility of government systems and the approaches adopted for the sake of achieving better results and outcomes.

2.4.1 Government performance management systems in the United Arab Emirates. One of the main targets of United Arab Emirates is improving government performance. This focus has been translated into many strategic plans and programs, one of which is “UAE Vision 2021” which sets the key themes for the Socio-economic development of the UAE [28]. It consists of 6 main axes and contains many indices and measurements which need to be achieved by 2021 in order to make the UAE one of the best countries in the world by the year 2021, the year in which the UAE will celebrate the Golden Jubilee of its formation as a federation [29].

Because of that, the UAE Government represented in Ministry of Cabinet Affairs is monitoring the performance of federal government entities through a performance management system. The framework of this system consists of four main pillars; Managing the performance of national indicators, Evaluating governmental efforts to achieve national priorities, managing the performance of government enabler indicators for customers and human resources, and managing the corporate performance in terms of indicators of strategic objectives [28].

Those four pillars were translated into different systems in order to monitor the performance of the federal entities and the level of service delivery they provide. In 2013, the UAE announced ADAA 2.0, the second-generation of the government performance management system, followed by the announcement of "MY GOV", the federal feedback gateway for customers.

Along with those systems, many other systems and programs which have been developed and applied on the local government levels. Those systems took the form of business plans like Dubai Plan 2021, or excellence programs like Sheikh Khalifa Government Excellence Program and Dubai Government Excellence Program. Those programs are considered more related to the corporate or the strategic level of

government entities, where specific aspects and performance indicators are monitored and evaluated.

On the other hand, there are also some other models which deal directly with public services. One of those models is “Dubai Model for Government Services”, which focuses on the enhancement of customer experience and service efficiency [30]. On the federal level, the UAE has also launched “Emirates Government Services Excellence Program” in order to raise the efficiency of government services to the level of 7 Star, by focusing on customer centricity and enhancing government efficiency [28].

Figure 2.9: Some of the Government Performance Programs and Models in UAE

Going over the various performance management systems and related programs launched by UAE Government, one can conclude that the main challenges encountered are achieving the integration between different programs and systems and avoid any kind of duplications; and ensuring alignment between the federal entities and local governments. On the other side, the main positive aspect of having different programs and systems related to government performance, is the continuous development and enhancement applied to those models, along with the existence of supporting approach that paves the way for achieving better outcomes and results, rather than focusing only on compliance with set of rules and regulations.

2.4.2 Government performance management in United States. In the United States of America, the federal government issued the Government Performance and Results Act (GPRA) and its updated version 'Government Performance and Results Modernization Act' (GPRAMA) in the year 2010. The congress established statutory requirements for most agencies to set goals, measure performance, and submit related plans and reports [31]. Although the GPRA focuses on the alignment of strategic plans of the federal entities with their performance, and aims at improving effectiveness and public accountability in a systematic way, there is still a big part which focuses more on the reporting and reviewing.

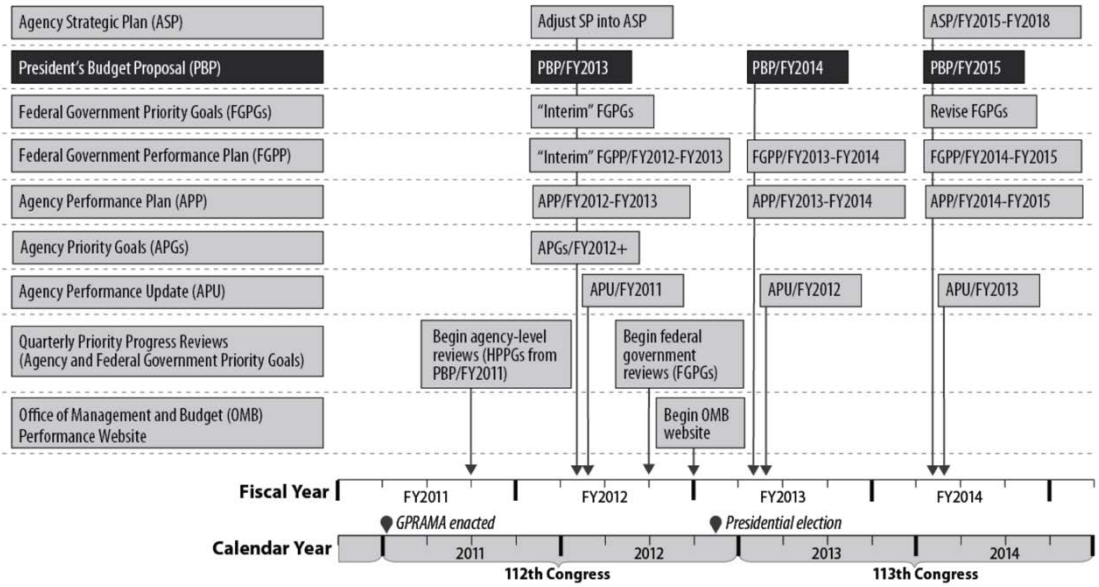


Figure 2.10: Timeline for GPRMA Implementation: Requirements and Deadlines [31]

One of the main issues associated with GPRA and GPRMA is that both emphasize goal-setting and performance measurement rather than producing or presenting program evaluations [31]. Furthermore, since it is an act, federal agencies are required by the law to consult with congress regarding performance plans, goals, reports and results. This level of involvement could struggle the procedures and activities associated with the government performance, since most of the stages are required to pass through Congress. This process could also lead to have an overlap or duplication, especially with the several conducted reviews. It may also open the question about the influence that the congress has on the performance of the government, and the definition of 'success' according to them [31].

2.4.3 Government performance management in United Kingdom. The United Kingdom has one of the oldest governments in the world. As per the definition of the government's planning and performance framework for United Kingdom Government, the government sets priorities, plans, and activities, and allocates money and monitors its progress and performance using a collective set of processes [32]. Although the performance management approach followed by UK Government seems to be the traditional bureaucratic approach, there are many developments and improvements which have been applied on it over time, but still the spending and budgeting process is one of the main processes in its performance framework.

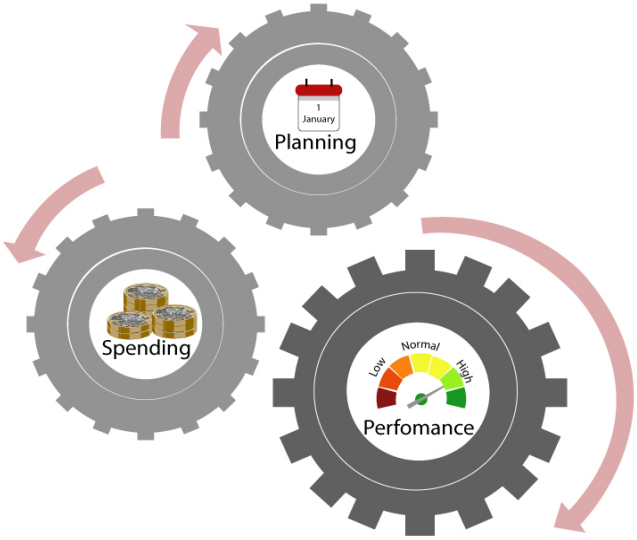


Figure 2.11: UK Government's Planning and Performance Framework [32]

Studying the UK Government's planning and performance framework, it is noticed that the processes included in the framework cover different levels of governance. The framework defines the objectives of Single Departmental Plans and the resource allocations in this level, up to the level of the whole government. In addition to that, the framework includes a budgeting system, which was introduced in 1998, and which deals with the spending reviews, Budget and Supply Estimates plans, along with the annual reports and resource accounts of the government. Based on the planning processes and the budgeting system, the government performance and its achieved outcomes has been analysed, as a result of its spending and activity [32].

Although the government performance management approach in the UK is moving towards controlling budgets, it also aims at achieving efficient spending, ensuring accountability of performance, along with delivering an effective and high level of quality for the public services [32],[33].

2.4.4 Government performance management in other countries. There are also many approaches and frameworks for government performance management which are used in worldwide. Some of these approaches are similar to the one adopted in the UAE, which mainly focuses on results with emphasis on achieving strategic outcomes and KPIs. Other approaches could be similar to the ones in US and UK which mainly focus on reporting, budgeting/ spending processes and expenditures.

Unlike the approach followed by UK which focuses a lot on spending, in Europe, countries like Finland, Netherlands and Sweden focus on many non-financial indicators and link them with performance along with financial targets. Furthermore, the degree of integration between the government performance management system and other management programs such as human resources management system is considered to be weak; and the same could be also found between different organizations and agencies[34]. In addition to that, some countries are influenced by the participation of the public in performance management practices such as planning and policy-making processes among different agencies and sectors. This is different from places like the UK where the government is centralized, and such practice could not be found [34]. Such differences among the performance management systems are not considered to be negative aspects, because the approach followed in each country depends mainly on the government structure and culture and the government's attempt to have the best 'fit' performance management for each system.

In Finland, one of the approaches adopted by the government is Results-Based Management (RBM). The concept is mainly an organizational level management approach which targets public sector agencies, to ensure that all processes, products and services contribute to the achieved results and targeted outcomes [34],[35]. A close look at this new concept would show that it is mainly results-oriented, and that the government performance cycle phases mainly depend on the desired outcomes and their impact, instead of focusing on the planning and measurement phases at the beginning of the cycle only. In other words, and as per the key tool in RBM which is called 'results chain approach', the projects and programs are designed based on pre-defined outputs, outcomes, and impacts as three different levels of results [35].

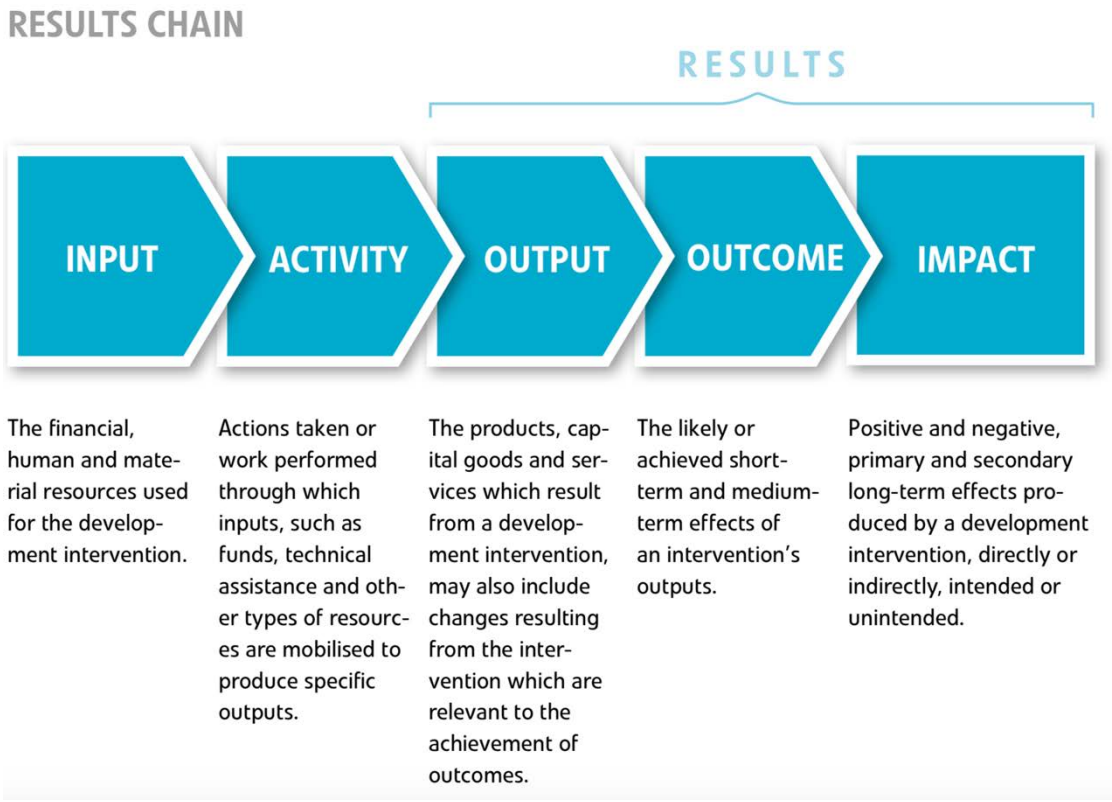


Figure 2.12: Results Chain Approach used in the Results Based Management, Finland [35]

Moving to some other countries in Asia, the government in Japan has developed many mechanisms and systems to manage performance. Similar to the US, Japanese government issued 'The Government Policy Evaluation Act' in 2002 as a guideline to monitor and evaluate government performance. Some of the evaluation systems used in Japan include Policy Evaluation, Top-Down Program Evaluation and Budget Execution Review program. Other approaches are also used. They include Public Sector Activity Screening and Review Approaches [36], which are used to screen and review selected public sector activities. One of the used mechanisms is called 3Es (Economy, Efficiency, and Effectiveness) [37], a concept of policy and activity evaluation based on three dimensions, but it has not been widely implemented [36].

In India, the performance management framework follows the traditional approach, focusing more on the alignment between individual performance and organizational goal [38]. The government supervises performance mainly on 2 different levels: central level and state level, focusing on three different trends; public finances, public administration and community and civil society.

2.5. Analytic Hierarchy Process: History and Background, Process, Pairwise Comparison, Applications, Criticism, Selection AHP over ANP

In most organizations, different decisions and judgments are required to be taken either by group of people, team of experts or higher management. These decisions could be related to operations, policy or strategic decisions, which could be critical and important for the success of the organization. Because of that, many methods were developed for the decision-making process, which requires considering multiple criteria and involves different stakeholders in order to reach a common conclusion and accepted judgment for all parties involved, with respect to different factors. The Analytic Hierarchy Process (AHP), which is a structured technique used to reach a decision among different alternatives based on set of criteria, is a well-known approach which has widely been used in private businesses, public owned companies and government organizations [39][40] around the world.

2.5.1 The AHP history and background. In the 1970s, Thomas L. Saaty developed the AHP, a multi-criteria decision-making approach [39]. The technique was developed as a reaction to the lack of common, easily understood and easy to implement methodology to enable the taking of complex decisions [40]. Since that, the technique has been used in many organizations and companies, starting from government, private and manufacturing companies, research and development organizations, and many other domains. The acceptance of the AHP was mainly because of its theoretical soundness, ease of implementation and the practicality of the methodology which could be used in almost all the fields of business. In 1994, Saaty introduced some modifications to the AHP [41]. Many studies and research papers have been conducted in areas related to this subject.

2.5.2 The AHP process. Since the AHP is a structured technique for decision-making, different steps need to be followed to apply the method correctly and to reach to the desired conclusion with respect to the set of rules. First, the problem or the issue which required a decision, need to be structured in hierarchy model based on different criteria and a set of available alternatives to select from. This step will help to breakdown the multi-criteria or multi-factors that affect the decision and decrease complexity. Secondly, decision makers are involved in conducting a comparison of the criteria or the alternatives, based on the constructed hierarchy in the previous step. One

of the most common methods which helps in determining the importance of the criteria and allows prioritization and scale ranking, is done through applying the Pairwise Comparison by using Delphi Method [42], in order to build the decision matrix and find the related priorities.

2.5.3 The pairwise comparison and decision matrix. To find the priority vectors of the compared criteria or alternatives, Saaty suggested a scale from 1 to 9 based on intensity of importance to conduct a pairwise comparison[39],[41]. Then, the results of the previous step will be summarized into a decision matrix, resulted in a square and reciprocal matrix to find the relative weights. Since the pairwise comparison process is subjective based on the experts and decision makers feedback, the consistency of the gathered entries of the decision matrix need to be evaluated. This will be done by using consistency index and consistency ratio, and the consistency index should not exceed 0.1(10%) as stated by Saaty [39],[40],[41].

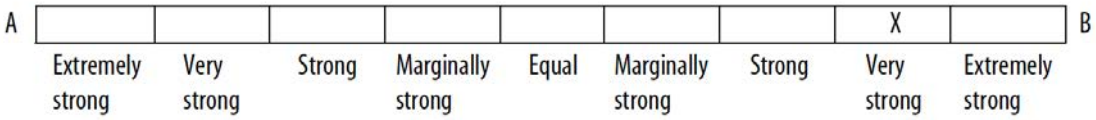


Figure 2.13: Format for Pairwise Comparison suggested by Saaty [40]

2.5.4 Application and companies using the method. Since the development of the AHP technique, it has been used by many organizations and companies from different fields such as:

- Government Organizations

- Private Businesses and Companies

- Manufacturers

- Research Institutes and Consultancies

There are also many applications for the AHP technique which include selection of alternatives, resource allocation, quality management, prioritization, ranking and evaluation of performance. The method was also used in many applications in conjunction with other mathematical techniques and analysis tools in different sectors,

such as health, education, military, space, banking sector, supply chain management and manufacturing processes [40].

2.5.5 The criticism of the method. There is a great body of research which criticises the AHP method and its results. One of the main points that has been criticised was the Rank Reversal Phenomenon, where the ranking of alternatives or criteria may change if a new alternative or criteria is added [40],[43]. Another issue which has also been discussed is consistency. Although the process accepts some inconsistency, still it may also generate inconsistencies due to its calculation. Furthermore, trying to decrease the inconsistency may lead to force or change some of the judgements and ranking in order not to exceed the 10% limit.

Despite all the issues and criticism the AHP method was subject to, the process survived and proved itself as an easy, practical and widespread accepted process for decision-making, in many of the business fields [40].

2.5.6 Selection of AHP over ANP. There are many techniques and approaches used for decision making and selection between alternatives. One of the similar techniques to the AHP is the Analytic Network Process (ANP), a method that supports modelling dependencies and feedback between elements in the network [24]. For our model, since it mainly depends on measurements gathered from government entities and due to the limitations of our thesis, the AHP was preferred over ANP for many reasons. First, the AHP approach is simpler compared to the ANP, and it can be used to have better understanding of the issues related to the performance of public services for government entities. Moreover, explaining the concept of the evaluation model and gathering the inputs for the model from experts' judgements is challenging using ANP. This is not to forget that AHP was simpler and easier for discussion and explanation. Along with that, and due to the limitations of resources and information, verification of measurements and results for the ANP may be difficult especially with the limited time and required verification for many indicators per entity. Finally, as a starting concept for a practical model and tool designed to evaluate government performance, and as a first step to design an index for the government services performance, AHP was found to be more appropriate for the initial phase of the model development, while ANP could be more useful in future phase after reaching to a mature level of understanding and applying the concept of the model.

2.6. Related Work

Over the past few decades, performance management has been one of the main concerns of governments around the world, as an approach for delivering better outcomes and achieving long-term goals. Many researchers, academic institutes and organisations did a lot of research in government performance management fields, with a focus mainly on maximizing efficiency and effectiveness in government performance with consideration of different elements. In addition to that, many models and methods were proposed for measuring and evaluating government performance; some of the related research will be discussed in the part below.

Starting with the first research, Realizing the Government Performance Evaluation Index Additivity in China [10], the paper brought the attention to the high attribute dimensions of the government performance evaluation indexes and investigated the issues related to the additivity of indexes. The binary state variable was adopted to reduce these issues; and different statistical methods and aggregation, along with clustering features were followed to convert the high attribute dimensions to low attribute dimensions based on their clustered dimensions and specifications.

It is noticed that there is no definition about performance or efficiency has been introduced by the researcher in this paper. On the other side, the study focused on the evaluation indexes only without looking to the measurements or inputs and outputs of the government performance measurement. Although the steps suggested in this study reduced the dimension of performance evaluation index, the complexity and theoretical mathematical approach may not be practical for many government business, and seems difficult to apply and understand by different levels of evaluation.

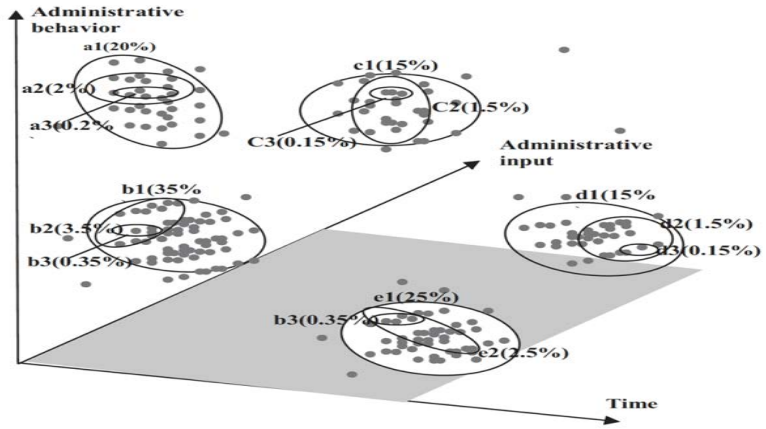


Figure 2.14: Hierarchical Weighting in Government Performance Evaluation Index Designing [10]

In the second paper, Employee Performance Evaluation by the AHP [23], this publication discussed the evaluation and ranking of employees' performance based on their contribution to organizational goals and the achievement of results. The study used the AHP method to analyze and evaluate the performance of 294 employees based on 5 main criteria (quantity/quality of the work, planning/ organization, initiative/commitment, teamwork/cooperation, communication and external factors), and different sub-criteria, based on the absolute measurements and ranking founded based on the AHP.

Although this paper defined the performance aspects related to evaluation, especially for the operational level employees, the organizational performance framework was not linked to the evaluation of the employees. Furthermore, the proposed ranking approach may show inaccurate indication about the differences in performance. For instance, the difference in the weights between 1st ranked employee and 2nd employee is only 0.0037(0.37%), whereas between the 2nd ranked employee and 3rd employee, the difference in the weights was 0.0318(3.18%).

Moving to the next study, Efficiency in the Public Sector: An Analysis of Performance Measurements Employed by the Western Cape Provincial Treasury [44], the term "efficiency" in government was investigated together with its contribution to the government performance measurement. Moreover, the research discussed some of the practices and approaches adopted for measuring and enhancing efficiency in the government, along with some of the related techniques for the measurement process. The thesis concluded by providing some recommendations related to the efficiency improvements in public sector.

The research did not study or discuss the link between performance measurements with other parts in the government performance framework. Although many practices and models were presented and discussed in this research, there was no clear framework or introduced model was found to be the best 'fit' model for measuring the government performance.

In the next publication, Measuring Government in the Twenty-first Century, An International Overview of the Size and Efficiency of Public Spending [45], it focused on the impact of government size and its economic performance and spending outcomes. The research studied different scores from different countries, and used time-series cross-section regression model in order to estimate the economic performance of the government. Furthermore, the Weighted Average (WA) approach and Simple Average (SA) approach for performance indicators were used to evaluate the performance of the government. In addition to that, the researcher considered the GDP of the countries, and studied its relation to the performance of each country in different sectors.

In this study, the considered dimension of the performance indicators for measuring the performance of the government was mainly from the economical side. The research only considered cost efficiency; other aspects of the government such as; non-financial efficiency or effectiveness were not discussed. Along with that, the performance of public services was not considered, and the performance has been analysed as sector-wise (Economy, Health and Social Sectors).

Looking to the other studies where AHP approach was followed, the research; AHP Based Model for Bank Performance Evaluation and Rating [46], a multi-criteria model for the bank performance evaluation was proposed based on AHP model. The model enables the integration of the quantitative financial ratios with some of the qualitative data related internal factors and external environmental factors. The paper also discussed the correlation between the financial measures and efficiency, measured by the DEA method. As for the ranking scale, it was based on different criteria (Support, Significance, Management and Maturity) for the quality.

The model proposed in this study seems practical for the selected banks and criteria of evaluation. On the other side, the framework of the model was not studied from the alignment with the general framework of the performance management. In addition to that, the proposed scale for the criteria may be fluctuated, since some of them are based on the market share and management changes, which can change dramatically depending on many internal and external factors.

Also, another study; Performance evaluation on quality of Asian e-government websites – an AHP approach [47] focused on evaluating the e-government websites based on different criteria, mainly the ones related to quality dimensions. Five Asian countries were selected to conduct the study, and the AHP approach was used to determine the rankings of those countries.

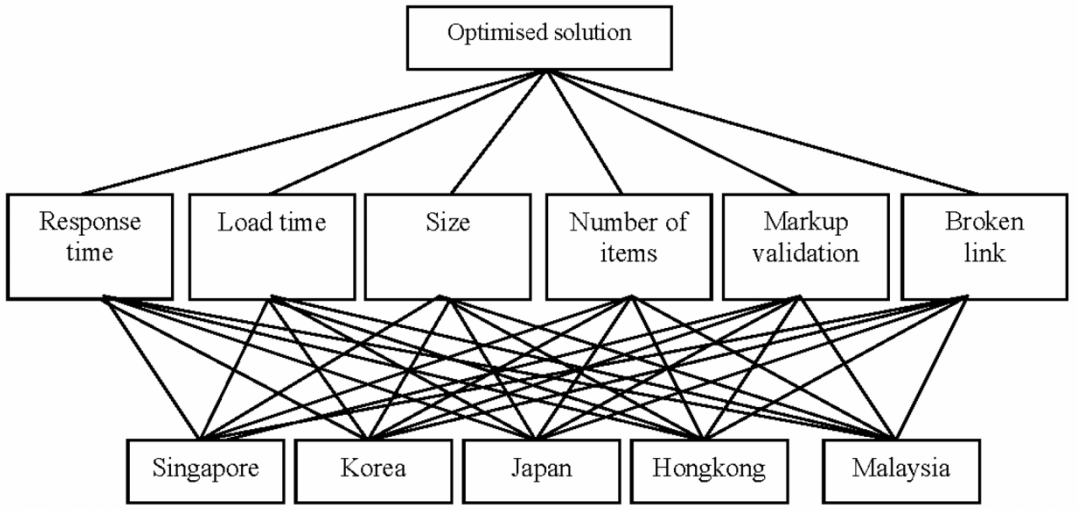


Figure 2.15: Hierarchy of 'Optimized Solution' for evaluating e-government websites [47]

The researcher concluded that some of the presence of the selected websites is neglecting many other performance criteria, rather than the quality dimensions. The researcher also confirmed that the use of the AHP approach and pairwise comparison based on a scale to generate the weights for the criteria is much better and indicate a more fair preference of the criteria.

If we look to the approach and conclusion of this research, we can notice that there are some similarities, in using AHP approach for evaluating the quality of the websites, similar with the proposed model in our thesis. On the other hand, the study only focused on quality dimensions without considering other aspects such as efficiency, customer experience and other related technical aspects of the websites. Although this was concluded by the researcher, still the ranking of the countries could be changed in case other criteria are considered for the evaluation; no countries from Europe, Middle East or America were considered or compared with those countries.

Chapter 3. Methodology

In this chapter, the researcher formulates the problem of having many inputs and indicators for the public services, and the issues of evaluating government performance based on those measurements. The researcher also presents a proposed structure and framework for evaluating the government performance, using Analytic Hierarchy Process approach and aligned with the government performance management framework.

3.1. Problem Formulation

There are many approaches and models used to measure government performance in the public sector, based on the gathered measurements which are related to the public services and other activities. These measurements could be performance indicators, operational facts and values, assessments and survey results, business plans outcomes, and many other sources of measurements [2], which represent the key attributes of government performance.

In the public sector, especially for measuring the performance of government services, most of the current models are developed based on quality and customer experience attributes only [18],[19]. Many attributes which are related to efficiency and effectiveness are not included in these models; this could lead to inexact measurement for government performance. Furthermore, another impact could be found on the planning and budgeting, and may result in reporting imprecise outcomes for government performance. In addition to that, some models do not consider the weights and dimensions of each attribute; the final outcomes of those models are shown as ‘numbers’ or ‘percentages’ only, without reflecting the contribution of each attribute to the service performance. Finally, although there could be an attribute or measurement included in some of those models for the overall performance of the service or the entity, such as; “How do you evaluate this service” or “How was your experience with us” questions, the outcomes of these measurements are very subjective, since there is no base or criteria for giving an overall rating for the service or government performance in the current models.

Moreover, the data or the measurements gathered from these models, could also lead to have huge number of measurements and performance indicators that need to be

monitored and reported by the government performance management system. A good example about this problem is what was found in ADAA System, the government management system used in UAE, which comprises around 3250 KPIs (covered around 2,000 government services and 36 federal entities) that form the UAE government strategy [1]. This number of indicators may confuse not only the decision makers who are relying on these KPIs to support their decisions, but may also make it difficult for government entities to focus on the outcomes related to hundreds of KPIs.

Finally, conducting a comparison between government entities could be very difficult and complicated because of this number of KPIs and measurements. When it comes to the overall service performance of government entities, comparing the overall service performance of one entity to the other entities, or to the historical data for the same entity, could be difficult due to the big number of attributes and complexity of performance measurements. For instance, the current systems will allow to compare between government entities in terms of one ‘attribute’ measurement, and not as an overall service performance level. However, reaching to a conclusion of the difference as a value between different compared attributes may not be possible, or to evaluate the overall performance and to have a ranking for each government entity based on the performance may not be valid.

Based on those issues, the problem with the current service performance models can summarized as follows:

- Current service models rely mainly on quality attributes and dimensions, and don’t include measurements and government performance elements which are related to efficiency and effectiveness.

- The reported measurements and indicators from the current service models to the performance management systems may dissolve the focus on specific areas of improvement or on prioritized outcomes due to the high number of attributes and service measurements.

- Outcomes of current service models make it difficult to compare the overall service performance of a government entity with another one, or for a period of time for the same entity.

3.2. Gathering Measurements and Relative Data related to Government Performance in Public Service Sector: Scope, Criteria and Measurements

To develop an evaluation model for government performance in the public sector, there is need to look at different measurements and attributes related to the public services, in order to have better understanding about them. When it comes to reality, this could be a very complicated and time-consuming task due to the huge scope and availability of resources. Furthermore, the availability of information and the quality of the information gathered from different government entities is very crucial for the research, since the proposed model depends mainly on the measurements and activity outputs of performance.

3.2.1 Research scope: selected entities and public services. Due to the limitations of the study, measurements and performance indicators used in our research to develop the evaluation model, will be limited and gathered from 5 different government entities, as per the following rules:

- The selected government entities have almost similar specifications in terms of size, budget, number of employees, customer base and service scope. The main reason for that is to cover not only one business sector, and to develop a practical model for performance evaluation that is suitable for different government entities.

- The names of the selected government entities will not be disclosed. Instead of that, the names the government entities will be replaced by the alphabetical letter “A”, “B”, “C”, “D” and “E”.

- The selected government entities are from different cities and sectors. The maximum number of government entities in each sector should not exceed two. The justification for that is to develop a practical model for performance evaluation that is suitable for different public sectors with many business perspectives.

The above rules were set for the proposed model due to the limitations of time and resources, and the availability of information, and since the model is in the experimental phase. For the actual evaluation of the government performance for the public services, other rules may be followed and set in order to achieve more accurate and practical results, and the scope could be expanded to cover more government entities and public services from all sectors.

Furthermore, and due to the limitations of this study, the selected services which the gathered measurements are related to, are all from "Customer Service" type of services in each government entity, to ensure consistency of measurements, and to avoid complexity and variety of dimensions between different types of services. The number of services selected for developing the evaluation model will be limited to 5 services, which are almost similar in the customer base, scope and the delivery channel.

Accordingly, measurements from total of 25 public services (5 public services from 5 government entities) will be used to develop the evaluation model. For the selected government entities, they have a customer base of more than 2,000,000 customers, and workforce of more than 1,000 employees. Also, the 5 public services selected from each entity are related to the 'Customer Service' type of services, which are considered to have similar scope and nature of activities. In Table 3.1, the selected government entities with respective sector of each, are shown.

Table 3.1: Selected government entities with respective sector

Government Entity	A	B	C	D	E
Sector	Justice Sector	Healthcare Sector	Healthcare Sector	Society Sector	Infrastructure Sector

3.2.2 Criteria of evaluation and attributes. To develop the proposed evaluation model for government performance, different aspects of performance in the public services will be considered. In other words, the performance of the government services, will be evaluated based on internal and external perspectives, which define the main aspects of performance as "Customer Satisfaction and Complaints" as external perspective, "Employee Satisfaction" and "Internal Processes and Standards" as internal perspectives, along with the innovation as an enabler factor for the internal perspectives to achieve better results.

The main criteria used for the evaluation of government performance are listed under those pillars, and for the proposed model, the researcher re-grouped the selected attributes and measurements and categorized them under 5 main groups or main criteria for evaluation:

1. Customer Satisfaction: The attributes in this pillar measure the quality aspects of the public service, along with the level of trust and satisfaction. The input measurements of this pillar are obtained from customers feedback, and are gathered from different surveys and customer care programs.

2. Internal Service Indicators: This pillar includes the internal measurements of the public service that are related to the cost, service times and other aspects such as productivity and capacity. Those attributes are managed and monitored by each government entity itself.

3. Service Standards: For each public service, different standards are announced and published to customers or are monitored internally. In this pillar, the attributes are related to the measurement of compliance to those standards, along with the compliance to customers complaints and suggestions within specific period of time.

4. Employee Satisfaction: In this pillar, the results of a designed survey for the customer service employees are used to measure the level of satisfaction of those employees in providing and delivering the services based on different criteria and questions.

5. Innovation: One of the important aspects in any service or product is innovation. In this pillar, different attributes and sub-criteria are measuring and assessing the innovation process and creativity aspects in public services, based on the Higher Management support for the innovation in the public services, available tools and resources, enablers and results of innovation and finally the impacts on the government entities and the services.

The main reason for selecting those pillars is due to the strategic priorities of these aspects to any organization. Furthermore, looking at the balance scorecard concept and the public-sector performance measurements, a balance should be established between the types of measures, like balancing External Measures (for customers) with Internal measures (employees measures and Innovation). Moreover, Leading and Strategic indicators should be linked with other objectives and subjective measures (like financial and non-financial indicators) [48]. For the Customer Satisfaction, it measures the related aspects of the Customer perspective, whereas the Internal Service Indicators and Service Standards groups match with the Financial and Internal Business Processes perspectives. On the other side, Innovation and Employee Satisfaction groups are

related to the Learning and Growth Perspective, which all aim to achieve a sustainable culture of improvement and positive change in the organization.

Another reason for grouping the attributes and service measurements under those groups was the availability of measurements for public services. This was a challenge especially for gathering information and measurements related to the public services while considering the confidentially and validity of data, and the time limitation. SERVQUAL and SERVPERF models have also been considered, together with some studies related to both models, where different GAPs were found and Dimensions of services were required to be measured [49][50], and not only the quality dimensions in order to evaluate the service performance.

		Criteria (Pillar)	No. of Indicators	Relation with Balanced Scorecard
1		**Customer Satisfaction** Measured from Customer Perspective	**4** Indicators	Related to **Customer Perspective** in the BSC
2		**Internal Service Indicators** Measured from Internal Perspective	**4** Indicators	Related to **Financial** and **Internal Business Processes Perspectives** in the BSC
3		**Service Standards** Measured based on Conformance Levels	**3** Indicators	Related to **Internal Business Processes Perspective** in the BSC
4		**Employee Satisfaction** Measured from Employees Perspective	**5** Indicators	Related to **Learning and Growth Perspective** in the BSC
5		**Innovation** Measured from Innovation Perspective	**4** Indicators	Related to **Learning and Growth Perspective** in the BSC

Figure 3.1: Summary of Selected Criteria and Indicators for the evaluation model

For the gathered measurements for the public services, 37 attributes measurements were gathered to develop the proposed evaluation model, and were categorized into 5 main evaluation criteria for performance. It should be emphasized here that not all of them will be selected for the proposed model, in order to avoid

duplication and complexity; and also some of those attributes are considered as sub-attributes to others. Based on that, 20 attributes out of the 37 were selected for use in the evaluation model for government services performance.

3.2.3 Gathered measurements and related indicators. After selecting the government entities and their services, and based on the main criteria and chosen attributes for the evaluation, the measurements and indicators will be gathered, and the data will be used and presented based on the below rules:

- The way(s) and process(s) of measurements used by the government entities to measure the attributes and the performance indicators is (are) not validated.

- The measurements were provided with the best knowledge of government entities and are assumed to be accurate and validated.

- The measurements and related outputs are gathered from systems, survey results, assessments and audits. No measurement or service output will be gathered from manual process or measured manually, in order to avoid human errors.

- The measurements will be adjusted by ± 5% as a random noise. This will be applicable on measurements for the "Customer Satisfaction", "Internal Service Indicators", "Service Standards" and "Employee Satisfaction" pillars. The "Innovation" results will not be adjusted, since some of the measurements which are included under this pillar were done based on criteria scoring. The exercise of measurements' adjustment was done through an excel sheet formulas.

- The period of measurements is the same for all measurements, which was a period of 1 year, starting from 1st of January 2016 to 31st of December 2016.

- The average result for the 5 measurements for each attribute will be considered as the result of that attribute for the government entity. The justification for that is for simplicity. Since all services are related to the customer service, and most of the attributes measurements have different results near to each other, the average of those measurements for each attribute will be considered as one measurement only.

3.3. Developing the Hierarchy of the Evaluation Model based on the desired Objective, and Determining the Criteria and Sub-Criteria of the Evaluation

One of the main research's objectives is to develop a Service Performance Index for the government in the public sector, which considers different attributes related to efficiency, effectives and quality and so on. The proposed model also aims at overcoming the issue of having too many indicators and attributes, and designing a unified index for the government service performance in the public sector, using Analytic Hierarchy Process.

Looking at the objective and the measurements gathered from the public services, the top of the Hierarchy Process of our model will be the goal of having a unified index for government services performance in public sector. The result of this index will be calculated based on the priorities or the weights of the main criteria discussed in the previous section, and the sub-criteria "selected attributes" included under each main criteria or pillar. Finally, the alternatives for this index will be the selected government entities where the measurements and indicators have been gathered. The structure of hierarchy of our evaluation model is shown in Figure 3.2.

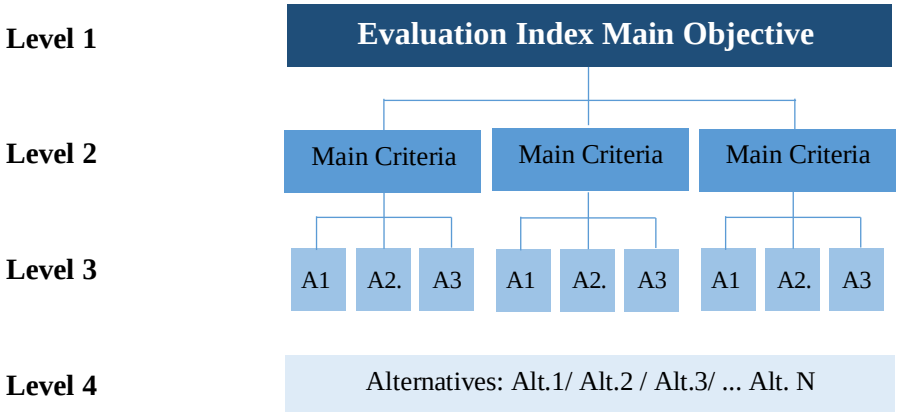


Figure 3.2: Hierarchy of the Evaluation Model

As noticed, different levels of elements are being indicated for the model. Starting with the first level, Level 1 which is the ultimate goal of our evaluation model. Moving to the second level, Level 2 represents the main criteria based on which government performance will be evaluated. The third level, Level 3 includes the attributes under

each main criteria, which are also the sub-criteria of our evaluation. The last level, Level 4 represents the alternatives which are the government entities in our case.

For evaluation purposes, top-down approach is followed [40], starting with the identified goal of our model, the performance is evaluated based on the 5 main criteria and their sub-criteria. According to the selected perspectives of the government performance, all sub-criteria are contributing to the performance of the government entity. Keeping that in mind, there is need for keeping the same level of comparison between the criteria and sub-criteria, with respect to the level of each criteria and the relation between each other [40],[41]. For example, the main criteria from level 2 should not be compared directly with an attribute or sub-criteria from level 3. Also, a sub-criteria under a main criteria, should not be compared with other sub-criteria until the levels are the same and they are under the same group.

For the main criteria in Level 2, and by using Delphi Method [42], decision-makers "Higher Management" group from the selected government entities "Alternatives", supported by experts' opinions from the same entities will participate in conducting the comparison between the main criteria. For Level 3 sub-criteria, different groups of functional managers "middle management" and experts will rate the comparison between the attributes or the sub-criteria.

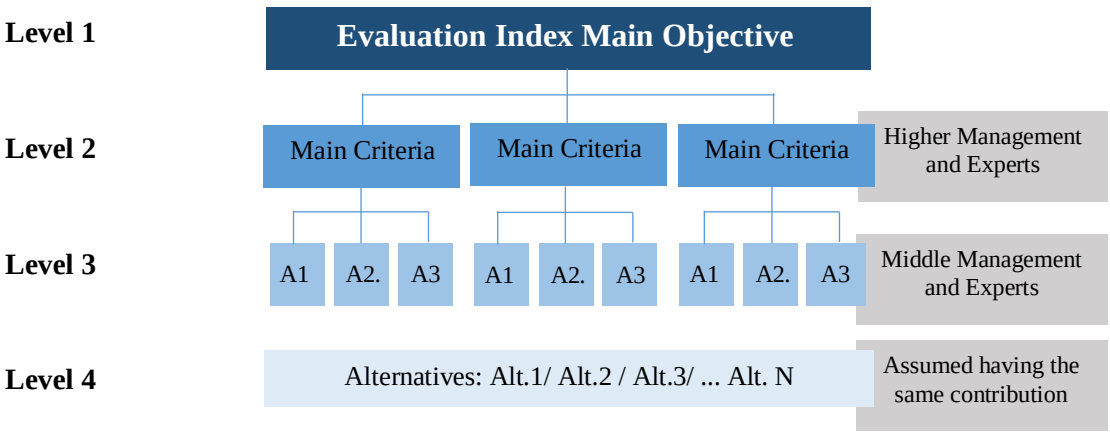


Figure 3.2: Hierarchy of the Evaluation Model

When it comes to the alternatives in Level 4, and as discussed previously, the selected government entities are considered to be similar and assumed to be having the same weights or importance factors to the contribution in the overall performance of

the government. Accordingly, the comparison will not be conducted for this level since it is assumed that all alternatives are having similar weights. This will be discussed in details in the coming sections.

3.4. Calculating the weights of Main Criteria and Sub Criteria which are contributing to the Government Performance Index

After constructing the hierarchy of the problem, pair-wise comparison will be used to build the decision matrix, and the weights of the evaluation criteria and sub-criteria will be derived. The local priorities and the overall preferences for the alternatives will also be determined, based on the rating scale of the experts' input.

3.4.1 Gathered data from decision makers and experts. Before starting the process of calculating the weights of the main criteria and sub-criteria of evaluation, the pairwise comparison exercise requires an input data on a qualitative scale from the experts [40]. Using Delphi Method [42], the input data will be collected from the experts who are participated in providing the public services from different levels of responsibilities; the method will also help in comparing and ranking between the different criteria according to their importance to each other. The gradation scale for quantitative comparison of alternatives which been developed by Saaty [39],[41] will be used, as shown in Table 3.2.

Table 3.2: Gradation scale for quantitative comparison of alternatives, Saaty [40]

Option	Numerical Values	Remark
Equal	1	
Marginally Strong	3	
Strong	5	
Very Strong	7	
Extremely Strong	9	
	2,4,6,8	Intermediate values to reflect fuzzy inputs
	Reciprocals	Reflecting dominance of second alternative compared with the first

The above options will be used for assessing multiple criteria and sub-criteria, which will form the process of multiple-criteria decision-making. This process will help in

evaluating the government performance at the end with respect to multiple attributes, which represent different aspects and dimensions, and also the weight or the importance of each criteria and sub-criteria will be considered in the evaluation of the performance.

3.4.2 Pairwise comparison and building the decision matrix. Based on the input data provided by the experts in the previous step, the decision matrix approach will be followed to calculate the weight or the importance of each criteria or attribute, with comparison to other criteria or attribute at the same level in the Hierarchy or under the same group [40]. This qualitative comparison will be transferred into quantitative number as shown previously in Table 3.2

Starting with Level 2 which represents the main criteria for evaluating performance for the proposed model, the output after gathering the experts' data and applying the pairwise comparison is the decision matrix. For this matrix, each element in row *i* will be compared with another element in column *j*, and rated with a numerical value, where

$a_{ij} > 1$ if the element in row *i* is better than the element in column *j*

$a_{ij} < 1$ if the element in column *j* is better than the element in row *i*

$a_{ij} = 1$ if the element in row *i* is compared with the same element in column *j*

Also, the (*i*,*j*) element of the decision matrix is reciprocal of the (*j*,*i*) element at the same matrix, as shown;

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1j} \\ a_{21} & a_{22} & \cdots & a_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ a_{i1} & a_{i2} & \cdots & a_{ij} \end{bmatrix} \quad (4)$$

For the second level, Level 2, the same approach will be followed. The attributes under the same category will be compared to each other based on the experts' judgement; and different decision matrices will be built for each main criteria. It should be noted here that the result of the importance or weights of each attribute will be relative to the overall weight of the main criteria where it belongs to.

After conducting the pairwise comparison and building the decision matrices, the weights of the main criteria and sub-criteria will be calculated using Eigen Value

and Eigen Vector. At the same time, the consistency of the input scale value need to be evaluated, and should not be exceed the 10% as recommended by Saaty. In case the consistency index exceeded this limit, the pairwise comparison need to be re-evaluated. This will be discussed in detail in the coming sections of this study.

3.4.3 Calculating main criteria and sub-criteria weights. After building the decision matrices by using the pairwise comparison, the principal Eigen Value and the corresponding normalised Eigen Vector will be used to calculate the importance of each compared criteria and relative attribute [39],[41]. Starting with the decision matrix for the main criteria, the priority vector of each criteria will be derived by using the geometric mean of each row, and will then be normalized by dividing them with their sums [40], as shown in below steps:

Step 1: Constructing the Decision Matrix using Pairwise Comparison

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1j} \\ a_{21} & a_{22} & \cdots & a_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ a_{i1} & a_{i2} & \cdots & a_{ij} \end{bmatrix} \tag{5}$$

Step 2: Dividing Each entry in the decision matrix by its corresponding column sum

$$\begin{bmatrix} \frac{a_{11}}{\sum a_1} & \frac{a_{12}}{\sum a_2} & \cdots & \frac{a_{1j}}{\sum a_j} \\ \frac{a_{21}}{\sum a_1} & \frac{a_{22}}{\sum a_2} & \cdots & \frac{a_{2j}}{\sum a_j} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{a_{i1}}{\sum a_1} & \frac{a_{i2}}{\sum a_2} & \cdots & \frac{a_{ij}}{\sum a_j} \end{bmatrix} \tag{6}$$

Step 3: Determining Priority Vector by averaging row entries in the normalised matrix

$$\text{Priority Vector} = \begin{bmatrix} (\frac{a_{11}}{\sum a_1} + & \frac{a_{12}}{\sum a_2} + & \cdots & + \frac{a_{1j}}{\sum a_j}) /n \\ (\frac{a_{21}}{\sum a_1} + & \frac{a_{22}}{\sum a_2} + & \cdots & + \frac{a_{2j}}{\sum a_j}) /n \\ \vdots & \vdots & \ddots & \vdots \\ (\frac{a_{i1}}{\sum a_1} + & \frac{a_{i2}}{\sum a_2} + & \cdots & + \frac{a_{ij}}{\sum a_j}) /n \end{bmatrix} = \begin{bmatrix} a_{i1} \\ a_{i2} \\ \vdots \\ a_{ij} \end{bmatrix} \tag{7}$$

Step 4: Calculating Priority weights for all Criteria and Attributes under each criteria

This will be done through repeating Step 1, 2 and 3 for all criteria, similar to what has been discussed before for conducting the pairwise comparison.

Step 5: Checking Consistency and ensure CR is less than 10% as suggested by Saaty

This step will be explained in detail in the coming sections of this study.

Due to the fact that a large number of attributes and many decision matrices are used in the study, an Excel sheet template was developed to calculate the priority vectors for each main criteria. The pairwise comparison will be conducted through a brainstorming session with experts from higher management level (attached in the Appendix).

For the attributes under each criteria, the same steps will be followed to calculate the local priority of each attribute with correspondence to the main criteria. This will be repeated for each main criteria, and the functional managers and experts group will be asked to compare between the attributes under each main criteria.

After calculating the priority vectors for the main criteria, the overall priority vector of each attribute will be calculated with respective to the relative weight of its main criteria, as shown in Table 3.3.

Table 3.3: Calculated Weights/ Priority Vectors for Criteria and Attributes

Main Criteria	Weight/ Priority Vector	Attribute	Weight within Main Criteria	Overall Weight Priority Vector
Criteria 1	C_1	*Attribute 11*	a_{11}	$C_1 \times a_{11}$
		...	...	...
		Attribute 1j	a_{1j}	$C_1 \times a_{1j}$
...				
Criteria n	C_N	*Attribute i1*	a_{i1}	$C_N \times a_{i1}$
		...	...	...
		Attribute ij	a_{ij}	$C_N \times a_{ij}$

Based on the above table, the weights of different attributes under each main criteria should equal to 1. For the overall weights of all attributes, the sum of all attributes' priority vector values must also equal to 1.

For the main criteria; $$\sum_{i=1}^{N} C_N = 1.000 \quad (8)$$

For attributes in each criteria; $\sum_{i=1}^{n} a_{in} = 1.000$ (9)

For all attributes; $\sum_{i=1}^{N} \sum_{j=1}^{N} a_{ij} = 1.000$ (10)

For our model, the results of priority vector values will be reported up to maximum 3 digits number, and the values will be rounded up to the nearest upper digit.

3.5. Evaluating Consistency of the Judgments and Calculating Consistency Index and Consistency Ratio for Decision Matrices

Although AHP methodology will help in evaluating the performance of the government entity based on assessed criteria; and since this method mainly depends on the knowledge and judgments of the experts, the consistency of the collected data used to build the decision matrices and finding the priority vectors need to be evaluated. The approach of pairwise comparison used to rank the importance of different criteria is subjective, and accordingly an amount of inconsistency could be found and should be minimized, to ensure the judgements used to compare and rank the comparison between different criteria are consistent up to some extent.

The meaning of consistency in our comparison is that if we rank criteria A to be more important than B (A > B) for the government performance, and criteria B is more important than C (B > C) for the performance, so logically criteria A should be more important than criteria C (A > C) for the performance.

Mathematically, the comparison matrix is said to be consistent if $a_{ij}\, a_{jk} = a_{ik}$ for all *i j k*. In practical, this could not be the case, and it is expected to find inconsistency specially with such complexity and high number of attributes. On the other hand, reaching a perfect consistency may also not be desirable, since the AHP mainly depends on the experts' knowledge and subjective judgements based on the natural thinking of the people [41]; forcing the consistency in the process may lead to overestimation of some alternatives and criteria among others.

Because of that, a consistency index will be used to measure the deviation from the consistency for each matrix, and compare it with the random index to derive the consistency ratio [39],[40],[41].

3.5.1 Calculating the consistency index. As per the built decision matrices and the calculated weights and priority vectors, the consistency index for each matrix will be calculated as follows:

$$CI = \frac{(\lambda_{max} - n)}{(n-1)} \quad (11)$$

Where λ_{max} is the maximum Eigen Value of the decision matrix and *n* is the number of the compared criteria. For the main criteria at level 2 and sub-criteria (attributes) at level 3, the CI will be calculated for all decision matrices to find the consistency ratio, which will be shown in the next step. To calculate the Eigen Value, several methods can be used [51][52]. For our model, and since we have many decision matrices as square matrices of different order n(s), the eigen values will be calculated by using the product of multiplying the original decision matrices with the obtained priority vectors matrices, and then divide the results by their priority vectors values. The average of the obtained values will be used as the approximate value for λ_{max} , which will be used to calculate the consistency index. For the sake of calculation, an Excel Template will be developed to apply the product of the matrices and to check the consistency indices.

3.5.2 Calculating the consistency ratio. In order to calculate the Consistency Ratio, the CI found in the previous step will be divided by random matrix, RI, as follow;

$$CR = \frac{CI}{RI} \quad (12)$$

The consistency ratio will be derived based on the scale of the random indices as shown in Table 3.4.

Table 3.4: Scale of Random Indices (RI), Saaty [40]

n	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45

Where *n* is the number of the compared alternatives, and *RI* is the corresponding Random Index for the selected *n*.

As suggested by Saaty [39],[41], the consistency ratio should not be more than 0.1 (10%). In case that the consistency ratio found to be more than 0.1 (10%), further study is required and the pairwise comparison need to be re-evaluated.

For the proposed model, consistency will be evaluated first for the Level 2 main criteria and then to be followed for Level 3 sub-criteria. This will be done to avoid re-calculation of the weights of the main criteria and their attributes in case any inconsistency was found during the experimental setup of the model.

Due to the use of the pairwise comparison, and as per the Excel Template which been developed for the model, checking consistency will be done during the brainstorming session, in order to avoid any re-evaluating, and also to ensure that the participants are aware and consistent with their judgements through the ranking of the criteria.

3.6. Using Measurements for each Alternative for Evaluating the Government Performance in Public Sector.

The proposed model for Government Performance aims to evaluate the performance of public services as one unified index for each entity. This index is designed to indicate the level of service performance, considering different aspects and pillars which have different dimensions and attributes, and at the same time comparing the achieved results with the desired goals and planned targets. Looking at the measurements gathered and data collected from the selected attributes on the service levels, it is noticed that different units and dimensions are found. Furthermore, different measurements for the same attribute could be found for each alternative, since there are more services selected for each government entity.

On the other hand, looking at the alternative levels, different targets are assigned for different pillars, which need to be considered also in our model. The same is also noticed for the same pillar among different government entities, where we could also find different targets assigned for the same pillar through different alternatives.

3.6.1. Finding measurement to target ratio for all attributes. For each pillar, it is noticed that different attributes with different units could be found. Some of those attributes are measured as percentages or ratios; and sometime are measured as specific units such as cost in AED or transactions per employee. In order to overcome this challenge, all the attributes measurements will be converted into ratios, by dividing them by the planned target for that attribute;

$$\text{Ratio} = R_{ij} = \frac{\text{Attribute Actual Measurement}}{\text{Attribute Planned Target}} \quad (13)$$

The main reason of using this approach is to overcome the challenge of having different units and dimensions of the measured attributes. Since one of the objective of our evaluation model is to be aligned with general framework of the performance management, this approach will build the link between the desired goals and planned targets identified in the first phase of the cycle “planning phase” with the monitoring phase and measured results of the attributes. In addition to that, for the same attributes, different targets could be set among different government entities. Accordingly, comparing the result over target will lead to more accurate comparison for the same attribute among different entities.

3.6.2. Multiplying the attribute’s ratio of each alternative by the weights of attributes. After calculating the measurement to target ratio for each alternative, the result will be multiplied by the weight of that attribute, and summed up the results for all attributes under the main criteria in order to calculate the value of the service performance index for the government entity, as follows:

$$SPI_{ENT} = \sum_{i=1}^{N} \sum_{j=1}^{N} R_{ij}\, a_{ij} \quad (14)$$

Where SPI_{ENT} is the service performance index for the Government Entity, R_{ij} is the ratio of the attribute j in the main criteria i measurement to its target, a_{ij} is the overall weight or priority vector value of attribute j in the main criteria i which is calculated using the AHP technique, as shown previously.

The Service Performance Index Value represents the performance of the government entity in the public services, based on 5 different criteria, taking into consideration the importance of the attributes and the planned target for each attribute. In other words, if the government entity A scored a value of 85.00 out of 100.00 in the service performance index, means the entity A is achieving 85% of their planned prioritized outcomes of their services, based on 5 aspects of their performance; Customer Satisfaction, their Internal Service Indicators, their Service Standards, Level of Satisfaction of their employees and the Innovation level in their services.

In this thesis, and since we are selecting 5 different government entities which have similar specifications, the service performance index for the whole government can be calculated by averaging the results of the indices for the selected entities;

$$SPI_{(Government)} = W_A\, SPI_A + W_B\, SPI_B + + W_C\, SPI_C + W_D\, SPI_D + W_E\, SPI_E \quad (15)$$

Where $W_{A,B,C,D \text{ and } E}$ is assumed to be 0.2 for the selected entities since they have similar specifications, as shown and discussed previously.

The same is also applicable for the services measurements, since we selected similar services from customer service type, the average of the measurements of attributes was used to evaluate the performance of the government entity.

In case we have different entities, which differ in the specifications or could have more weight in the contribution of the whole government performance, the weights/ importance factors of the entities should be considered in the calculation of service performance index for the whole government;

$$SPI_{Gov}\,(Government) = W_A\, SPI_A + W_B\, SPI_B + \ldots + W_N\, SPI_N \quad (16)$$

where W_N is the weight or contribution of the government entity in the overall performance of the whole government. The same is also applicable for the services measurements, in case that we selected services from different types, the weight or importance factor of each service should be calculated and considered the in the value of the service performance index of the government entity.

In order to find the weight or importance of the contribution of the government entity in the overall performance of the government, or the weight of a specific service for the entity, many criteria and factors need to be considered from different aspects such as economic, political and impacts on the public or society.

For example, different factors like contribution in GDP of the country, budget and revenue, sector/ industry and type of services provided, and customer base, political power and impacts, and many other factors. For such case, AHP could not be the best approach to determine the weights of the government entities, and other approaches could be used such as ANP, or any other techniques that could help to determine the weights.

3.7. Proposed Model for Government Service Performance Evaluation: Performance Management Cycle and Flowchart for Calculating Service Performance Index

For our model, the measurements used and the criteria selected for developing the evaluation model were gathered and determined based on existing and available data. Although this could work for the current selected services and attributes, other criteria may be added or changed. The same is also applicable for the weights, which also could be changed since the priorities and the focus of the entities could be changed based on the changes in the strategies or directions.

Because of that, the framework of the proposed evaluation model for the government service performance in our thesis consist of the following phases:

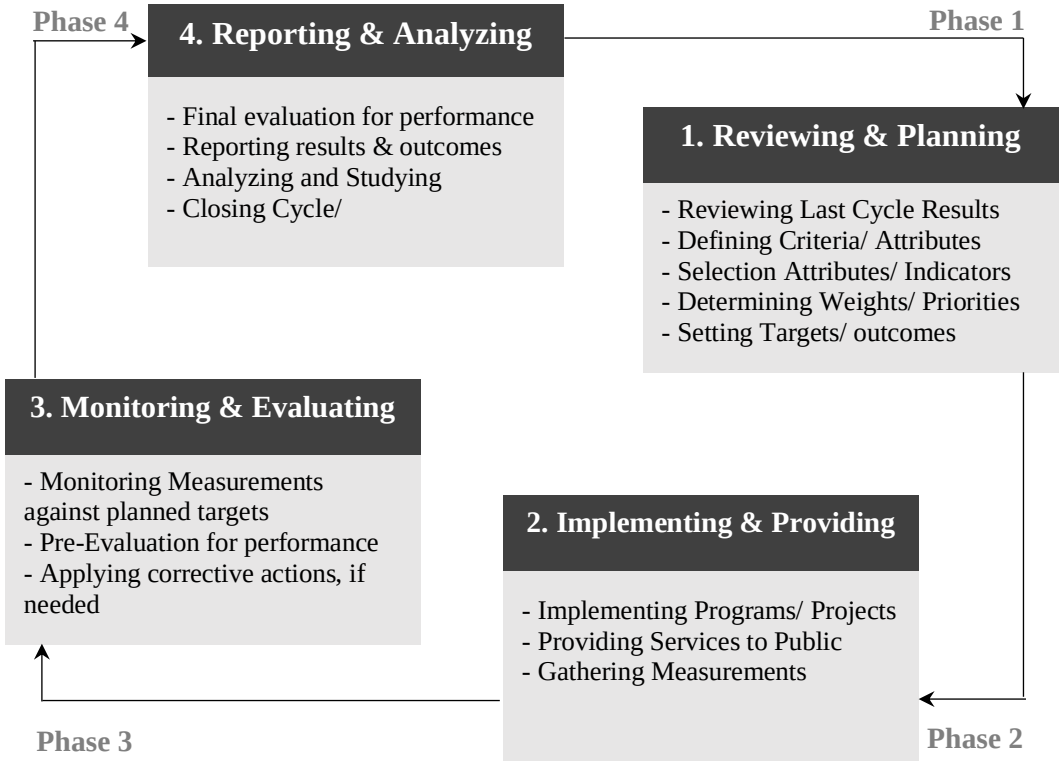


Figure 3.3: Phases of Government Services Performance Evaluation Model Framework

In the first phase, Reviewing and Planning Phase, the government entity will review the results of the last cycle, which could be every year or for other sufficient durations. At the beginning of the cycle, the criteria of evaluation and attributes along with the weights will be determined by the entity, together with setting targets to be achieved.

In the second phase, “Implementing and Providing”, the government entity will start implementing the programs and projects for the public sector, and provide services. During this phase, the measurements and service outputs will be generated.

Following that, government entity will start monitoring the outputs and service performance indicators against their targets in the Monitoring and Evaluating Phase. Also, pre-evaluation for the performance could be conducted in this phase, together with monitoring any trigger that may requires taking corrective actions or applying improvement.

In last phase of the cycle, Reporting and Analysing Phase, final evaluation for the performance based on the service measurements and output results will be done. This could also include reporting the results of evaluation or specific indicator or an outcome, and doing the analysis part if required to tackle the opportunities for improvement and other findings, and then closing off the cycle.

Along with the framework of the proposed model, and in order to calculate the service performance index based on the discussed phases, the steps are presented below;

Step 1: Select Main Pillars and Attributes to be evaluated for Government Performance

The Government Entity will select main criteria and their attributes that will be used to evaluate the performance. This could be aligned with GE scope, strategy or upper management direction

Step 2: Determine the weights/ Priorities of selected criteria and attributes

Through AHP approach and pairwise comparison using Delphi Method, different workshops will be conducted internally by each government entity to determine the priority vectors or weights of criteria and attributes. This need to be aligned with GE scope, strategy or upper management direction

Step 3: Set targets/ Planned outcomes to be achieved based on prioritized criteria and attributes

Based on the priority of the criteria and attributes, each attribute should to be assigned with specific target. Planned outcomes could be also linked with group or criteria or attributes

Step 4: Measure service’s outputs and gather related information, measurements and indicators

All outputs and measurements related to selected attributes need to be measured and validated during the implementation and monitoring phases until the end of the cycle. This can be done quarterly

Step 5: Calculate SPI based on the selected attributes, weights, assigned targets & measurements

The SPI will be the sum of multiplication ratio (measurements result/target) by attributes weights

Figure 3.4: Steps for Calculating Service Performance Index

Chapter 4. Experimental Setup

In this chapter, the proposed model used for evaluating the performance of government services was built, using AHP technique. The decision matrices and the weights of criteria and their attributes were calculated based on the experts' judgements through brainstorming sessions and workshops, using Delphi Method [42]. A template was developed for the model in Excel, which used to apply the pairwise comparisons and find the performance index of each government entity based on the gathered measurements and selected attributes.

4.1. Hierarchic Structure of the Evaluation Model

This hierarchic is proposed for evaluating the government services performance based on main pillars as criteria and sub-criteria. In this structure, one of the main objectives of our model is having a unified index for the government performance in public sector, as previously presented in Chapter 3. The levels of judgement are the main criteria and sub-criteria of evaluation, on the basis of which the alternatives "government entities" will be evaluated.

As discussed previously, the above hierarchy has been developed based on the main criteria and selected attributes that contribute to the government performance.

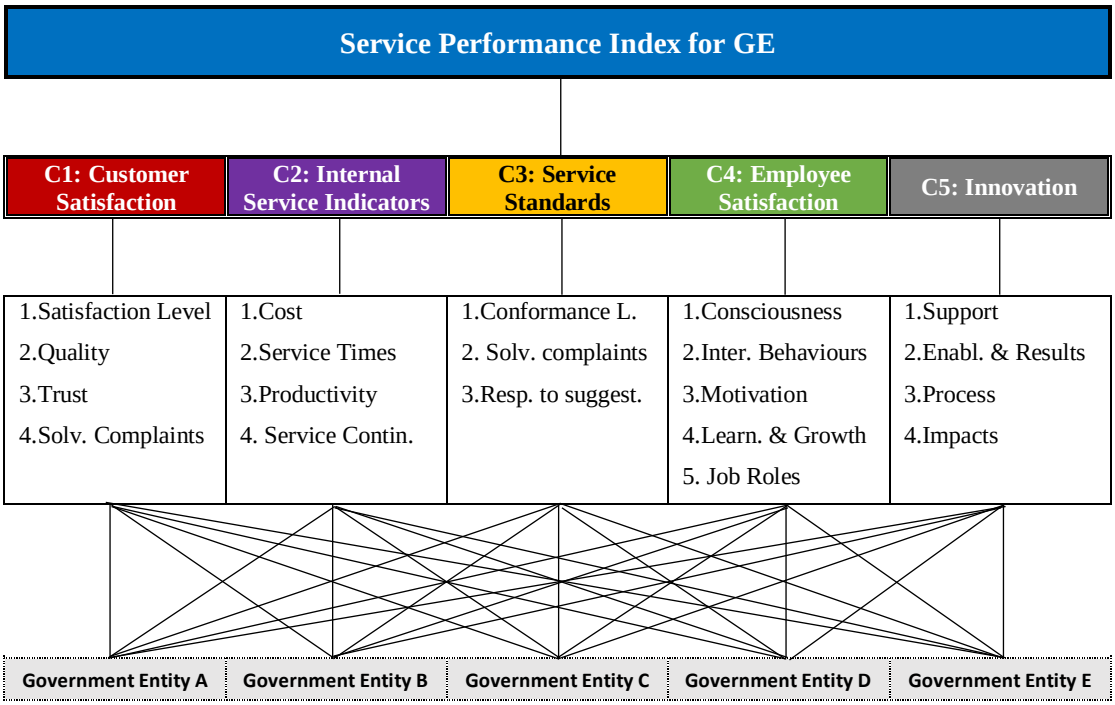


Figure 4.1: Hierarchy of the Evaluation Model to find Service Performance Index

4.2. Decision Matrix and Priority Vector values for Main Criteria

Based on the conducted comparison for the main criteria, experts' judgements and feedback from Higher Management level were used to rank the importance of each criteria, with comparison to each other. The participants list and designations are attached in the Appendix, and 2 workshops were conducted in order to build the decision matrix; one for the main criteria, and the other one for the attributes under each criteria, as discussed before in Chapter 3.

4.2.1. Building decision matrix based on pairwise comparison. A brainstorming workshop was conducted for the participants from Higher Management Level, and the discussion was held in order to reach to a common agreement on the ranking of the criteria. The matrix which been constructed is shown below;

C1 : Customer Satisfaction
C2: Internal Service Indicators
C3: Service Standards
C4: Employee Satisfaction
C5: Innovation

$$\begin{array}{c} \\ C1 \\ C2 \\ C3 \\ C4 \\ C5 \end{array} \begin{array}{c} \begin{array}{ccccc} C1 & C2 & C3 & C4 & C5 \end{array} \\ \begin{bmatrix} 1 & 3 & 1 & 5 & 3 \\ \frac{1}{3} & 1 & \frac{1}{5} & 1 & 3 \\ 1 & 5 & 1 & 4 & 3 \\ \frac{1}{5} & 1 & \frac{1}{4} & 1 & 3 \\ \frac{1}{3} & \frac{1}{3} & \frac{1}{3} & \frac{1}{3} & 1 \end{bmatrix} \end{array} \tag{17}$$

For the sake of comparison, the same scales suggested by Saaty [40] were used. As shown in the table, the ranking of the criteria was based on the contribution of each criteria to the overall government performance. Noting that the exercise was done individually first, in order to let the participants to get used on the method. Excel template was used to conduct the pairwise comparison and gather the inputs from the experts.

Looking to the obtained decision matrix for the main criteria, and based on the judgements of the participated experts in the workshop, the importance of criteria C1: Customer Satisfaction was considered marginally strong, to the contribution in the government performance, compared to C2: Internal Service Indicators. On the other side, the same criteria C1: Customer Satisfaction was considered having equal importance to C3: Service Standards criteria in terms of the contribution in the government services performance.

4.2.2. Calculating the weights/ priority vectors. In this part, and as per the steps showed in Chapter 3, the weights of the main criteria were found based on the average row entries in the normalized matrix. The same excel template was used to calculate the weights and the results are shown in Chapter 5.

4.2.3. Checking consistency. During the brainstorming session, the consistency index and ratio were checked instantaneously, through the excel template. The re-evaluation was required several times, and the comparison was repeated 3 times in order not to exceed the 10% limit and also to agree on the results of the priority vectors. The results of the consistency index and consistency ratio are discussed and shown in the next sections in Chapter 5.

4.3. Decision Matrix and Priority Vector values for the Sub-Criteria

Similar to the previous step for the main criteria, and based on the conducted comparison for the attributes under each criteria, experts' judgements and feedback from Middle Management and Functional Managers level were used to rank the importance of each attribute, with comparison to each other. The participants list and designations are attached in the Appendix. Five workshops were conducted in order to build the decision matrices; one for each main criteria, as discussed previously.

4.3.1. Building decision matrix based on pairwise comparison. For each main criteria, a brainstorming workshop was conducted for the participants from Middle Management Level; and the discussion was held in order to reach a common agreement on the ranking of the attributes which belong to this criteria. The matrices which been constructed is shown below:

- Customer Satisfaction Decision Matrix

$$
\begin{array}{l}
\\
a_{11}\text{: Overall Service Quality Level} \\
a_{12}\text{: Customer Satisfaction Level} \\
a_{13}\text{: Level of Trust} \\
a_{14}\text{: Satisfaction for Solving Complaints}
\end{array}
\begin{array}{c}
\begin{array}{cccc} a_{11} & a_{12} & a_{13} & a_{14} \end{array} \\
\begin{bmatrix}
1 & 1 & 2 & 3 \\
1 & 1 & 3 & 2 \\
\frac{1}{2} & \frac{1}{3} & 1 & 4 \\
\frac{1}{3} & \frac{1}{2} & \frac{1}{4} & 1
\end{bmatrix}
\end{array}
\begin{array}{l}
\begin{array}{c} a_{11} \\ a_{12} \\ a_{13} \\ a_{14} \end{array}
\end{array}
\qquad (18)
$$

If we look to the obtained matrix, the overall service quality for the public service was considered to have equal importance compared to Customer Satisfaction Level.

On the other hand, the experts considered both attributes a_{11} and a_{12} are stronger than Level of Trust and Satisfaction for Solving Complaints in terms of importance for the government services performance, on different scales.

- Internal Service Indicators Decision Matrix

a_{21}: Service Cost
a_{22}: Service Times
a_{23}: Productivity
a_{24}: Service Continuity

$$\begin{array}{c} \\ a_{21} \\ a_{22} \\ a_{23} \\ a_{24} \end{array} \begin{array}{c} \begin{array}{cccc} a_{21} & a_{22} & a_{23} & a_{24} \end{array} \\ \begin{bmatrix} 1 & 5 & 3 & \frac{1}{2} \\ \frac{1}{5} & 1 & \frac{1}{3} & \frac{1}{5} \\ \frac{1}{3} & 3 & 1 & \frac{1}{5} \\ 2 & 5 & 5 & 1 \end{bmatrix} \end{array} \quad (19)$$

By looking to the decision matrix for the internal service indicators, Service Continuity and Service Cost attributes considered more important than other attributes under the same main criteria.

- Service Standards Decision Matrix

a_{31}: Conformance to Standards
a_{32}: Solving complaints w/ Standards
a_{33}: Respond to suggestions w/ Standards

$$\begin{array}{c} \\ a_{31} \\ a_{32} \\ a_{33} \end{array} \begin{array}{c} \begin{array}{ccc} a_{31} & a_{32} & a_{33} \end{array} \\ \begin{bmatrix} 1 & 3 & 7 \\ \frac{1}{3} & 1 & 5 \\ \frac{1}{7} & \frac{1}{5} & 1 \end{bmatrix} \end{array} \quad (20)$$

For the Service Standards, the experts from middle management level considered the first attribute a_{31}: Conformance to Standards is marginally strong and very strong compared to other attributes; a_{32} and a_{33} respectively.

- Employee Satisfaction Decision Matrix

a_{41}: Consciousness
a_{42}: Internal Behaviors
a_{43}: Motivation
a_{44}: Learning and Growth
a_{45}: Job Roles

$$\begin{array}{c} \\ a_{41} \\ a_{42} \\ a_{43} \\ a_{44} \\ a_{45} \end{array} \begin{array}{c} \begin{array}{ccccc} a_{41} & a_{42} & a_{43} & a_{44} & a_{45} \end{array} \\ \begin{bmatrix} 1 & \frac{1}{7} & \frac{1}{9} & \frac{1}{5} & 1 \\ 7 & 1 & \frac{1}{5} & 2 & 3 \\ 9 & 5 & 1 & 3 & 5 \\ 5 & \frac{1}{2} & \frac{1}{3} & 1 & 2 \\ 1 & \frac{1}{3} & \frac{1}{5} & \frac{1}{2} & 1 \end{bmatrix} \end{array} \quad (21)$$

Based on the Employee Satisfaction Decision Matrix, the attribute a_{43}: Motivation considered to be the strongest among the compared attributes, in term of importance to the contribution in the government services performance, as per the feedback and ranking decided by the participated experts.

- Innovation Decision Matrix

$$
\begin{array}{lc}
 & \begin{array}{cccc} a_{51} & a_{52} & a_{53} & a_{54} \end{array} \\
\begin{array}{l} a_{51}\text{: Support} \\ a_{52}\text{: Enablers \& Results} \\ a_{53}\text{: Process} \\ a_{54}\text{: Impacts} \end{array} & \begin{array}{c} a_{51} \\ a_{52} \\ a_{53} \\ a_{54} \end{array} \begin{bmatrix} 1 & 1 & \frac{1}{4} & \frac{1}{5} \\ 1 & 1 & \frac{1}{4} & \frac{1}{2} \\ 4 & 3 & 1 & 3 \\ 5 & 2 & \frac{1}{3} & 1 \end{bmatrix}
\end{array} \qquad (22)
$$

Looking to the decision matrix of the Innovation Criteria, Process and Impacts attributes were considered more important than the Support and Enablers & Results attributes under the same main criteria in terms of the contribution in the public services performance.

For the sake of comparison, the same scales suggested by Saaty and shown previously were used. Noting that the exercise was done using Delphi Method, and Excel template was used to gather the inputs from the experts and conduct the pairwise comparison.

4.3.2. Calculating the weights/ priority vectors. In this part, and similar to what has been done for the main criteria, the weights of the attributes under each main criteria were obtained based on the average row entries in the normalized matrix. The same excel template was used to calculate the weights and the results are shown in Chapter 5.

4.3.3. Checking consistency. During the brainstorming session, the consistency index and ratio were checked instantaneously, through the excel template. The re-evaluation was required several times, and the comparison was repeated 3 times in order not to exceed the 10% limit. The results of the consistency index and consistency ratio are discussed and shown in Chapter 5.

4.4. Modified Measurements and Related Indicators

For our model, many measurements and data gathered from the public sector, for the customer services from 5 different government entities. The criteria for selection of those entities and the services were discussed in the Methodology, as well as the rules for the gathered measurements and service indicators. In Table 4.1, the service measurements for the government entities are summarized; which will be used to evaluate the government performance in our model, noting that all measurements showed as relative ratios to the targets.

Table 4.1: Modified Measurements and Related Indicators of the selected entities

			Government Entity				
Main Criteria	Attribute	Unit	A	B	C	D	E
Customer Satisfaction	*Service Quality*	%	87.32%	97.11%	92.47%	82.10%	90.10%
	Satisfaction Level	%	90.15%	96.40%	87.67%	76.70%	89.80%
	Level of Trust	%	92.47%	94.70%	91.20%	84.30%	90.60%
	Satisfaction for Solving Complaints	%	83.74%	80.19%	82.71%	95.70%	76.30%
Internal Service Indicators	*Cost*	AED	81.73%	87.14%	64.21%	31.40%	87.10%
	Service Times	Minutes	67.14%	81.13%	74.32%	71.40%	91.20%
	Productivity	Differs	98.86%	75.18%	71.30%	86.10%	87.15%
	Service Continuity	%	99.84%	97.46%	94.31%	98.80%	98.47%
Service Standards	*Conformance to standards*	%	97.61%	96.61%	71.56%	78.60%	79.20%
	Solving complaints within Standard	%	85.12%	82.10%	64.34%	82.40%	74.90%
	Respond to suggestions within Standard	%	64.52%	42.03%	30.47%	73.20%	53.90%
Employees Satisfaction	*Consciousness*	%	90.00%	85.00%	84.00%	82.00%	80.00%
	Internal Behaviours	%	91.00%	81.00%	61.00%	51.00%	68.00%
	Motivation	%	95.00%	79.00%	68.00%	56.00%	50.00%
	Learning and Growth	%	93.00%	72.00%	80.00%	57.00%	57.00%
	Job Roles	%	96.00%	74.00%	91.00%	81.00%	71.00%
Innovation	*Support*	%	82.86%	75.14%	68.57%	88.57%	91.43%
	Enablers & Results	%	77.14%	42.86%	48.57%	71.43%	94.29%
	Process	%	84.00%	52.00%	56.00%	72.00%	96.00%
	Impacts	%	84.00%	56.00%	48.00%	76.00%	96.00%

As discussed previously, the above measurements were gathered from systems, survey results, assessments and audits, and adjusted by ± 5% as random noise. The period of measurements is the same for all measurements, which was a period of 1 year, starting from 1st of January 2016 to 31st of December 2016.

Based on the nature of the sector in the results of the measurement of the

government entities, a few findings could be reached for some of the attributes measurements which could be influenced by the nature of the sector.

Starting with measurements of **Government Entity A**, which belongs to the Justice Sector, it is obvious that the level of trust was the highest compared to other attributes under customer satisfaction criteria. This is logical since the nature of the services in this sector needs high level of trust among people and the public. The same is also noticeable for Service Continuity and Conformance to Service Standards, which are also critical attributes to this sector.

Moving to the measurements for **Government Entity B** and **Government Entity C** which are both from the healthcare sector, Service Quality level attribute has the highest measurement in the Customer Satisfaction, which is aligned with the nature and requirement to provide high quality service. As for the Employee Satisfaction criteria, the attribute Job Rules shows high results, which indicates that high awareness about their job rules is more important to the performance of their services.

For the **Government Entity D** which is from the society sector, the measurement for the Satisfaction for solving the Complaints Attribute was the highest, and the result range was far from other attributes. This result is also consistent with Solving Complaints within Standards attribute measurement, which was in the 80s', while other standards were less than that.

Finally, after reviewing the evaluation for the performance of **Government Entity E**, it can easily be concluded that Service Times and Cost attributes measurement were high compared to other entities. This is probably due to the fact that such kind of services in the infrastructure sector focus more on those attributes. A close look at the attributes under the Innovation criteria shows that the results were higher, because of the nature of this sector which needs more emphasis on applying innovative ideas and technologies to enhance the level of service delivery.

Chapter 5. Results and Analysis

This chapter is devoted to the results of the main criteria and the weights of their attributes achieved for the implemented AHP method. It also evaluates the performance of government entities services, based on the modified measurements and service indicators showed previously. Along with that, a comparison will be also conducted for the result of the service performance index, with the result of average measurements of each government entity, to study the impacts of considering the weights of the criteria and the attributes in the evaluation of the government services performance.

5.1. Priority Vector Values for Main Criteria and Attributes Results.

After building the decision matrices using pairwise comparison approach, the weights the main criteria and attributes under each criteria were calculated.

Starting with the main criteria which are in Level 2, the priority vectors were calculated based on the matrix and found to be

C1 : Customer Satisfaction

C2: Internal Service Indicators

C3: Service Standards

C4: Employee Satisfaction

C5: Innovation

$$\text{Criteria (Weights)} = \begin{bmatrix} C1 \\ C2 \\ C3 \\ C4 \\ C5 \end{bmatrix} = \begin{bmatrix} 0.3341 \\ 0.1208 \\ 0.3551 \\ 0.1151 \\ 0.0749 \end{bmatrix} \quad (23)$$

The found consistency ratio was 0.085 (8.5%) which was less than 10% suggested by Saaty. As per the above results, the compliance with Service Standards, got the highest weight (35.51%) in contribution to the government performance, and also the Customer Satisfaction measurements has around almost similar weight (33.41%) of the contribution to the performance of the government entity.

As noticed, Customer Satisfaction and Service Standards pillars has almost 70% weight in contribution to the evaluation of the government performance. Although the combined weights of other criteria (Internal Service Standards, Employee Satisfaction and Innovation) are 30%, still those criteria could be considered as ‘enablers’ to the top two pillars, and are also important to be focused on.

Moving to the attributes under each main criteria, the priority vectors were also calculated based on decision matrices.

For the Customer Satisfaction;

a_{11}: Overall Service Quality Level

a_{12}: Customer Satisfaction Level

a_{13}: Level of Trust

a_{14}: Satisfaction for Solving Complaints

$$\text{Attributes (Weights)} = \begin{bmatrix} a_{11} \\ a_{12} \\ a_{13} \\ a_{14} \end{bmatrix} = \begin{bmatrix} 0.3315 \\ 0.3465 \\ 0.2135 \\ 0.1085 \end{bmatrix} \quad (24)$$

The found consistency ratio was 0.084 (8.4%) which was less than 10% suggested by Saaty. As noticed, Attribute 11 and Attribute 12 got the highest weights, which represent around 68%. The meaning of these results is that the overall service quality and customer satisfaction are the main attributes in the Customer Satisfaction in order to enhance the performance of the government services.

For the Internal Service Indicators;

a_{21}: Service Cost

a_{22}: Service Times

a_{23}: Productivity

a_{24}: Service Continuity

$$\text{Attributes (Weights)} = \begin{bmatrix} a_{21} \\ a_{22} \\ a_{23} \\ a_{24} \end{bmatrix} = \begin{bmatrix} 0.3062 \\ 0.0673 \\ 0.1303 \\ 0.4963 \end{bmatrix} \quad (25)$$

The found consistency ratio was 0.05 (5%) which was less than 10% suggested by Saaty.

Looking to the results, Service Continuity Attribute weight is almost representing 50% of the importance or the weight of the service standards. Also, the cost got a priority vector of 30%, whereas the other 2 attributes combined results are 20%. Based on those results, we can conclude that ensuring the continuity of the service, along with its cost, are representing around 80% of the importance to the government services performance.

For the Service Standards;

a_{31}: *Conformance to Standards*

a_{32}: *Solving complaints within Standards*

a_{33}: *Respond to suggestions within Standards*

$$\text{Attributes (Weights)} = \begin{bmatrix} a_{31} \\ a_{32} \\ a_{33} \end{bmatrix} = \begin{bmatrix} 0.6434 \\ 0.2828 \\ 0.0738 \end{bmatrix} \quad (26)$$

The found consistency ratio was 0.056 (5.6%) which was less than the 10% suggested by Saaty. Reviewing the above results, one can notice that conformance to standards attribute is the most important attribute in terms of service standard criteria, followed by the compliance to solving complaints. Based on those results, more than 90% of the importance to the government services performance is based on conformance to service standards, along with solving the complaints within the targets.

For the Employee Satisfaction;

a_{41}: *Consciousness*

a_{42}: *Internal Behaviors*

a_{43}: *Motivation*

a_{44}: *Learning and Growth*

a_{45}: *Job Roles*

$$\text{Attributes (Weights)} = \begin{bmatrix} a_{41} \\ a_{42} \\ a_{43} \\ a_{44} \\ a_{45} \end{bmatrix} = \begin{bmatrix} 0.0475 \\ 0.2209 \\ 0.5029 \\ 0.1571 \\ 0.0715 \end{bmatrix} \quad (27)$$

The obtained consistency ratio was 0.065 (6.5%) which was less than the 10% suggested by Saaty. As noticed, the motivation of employees is representing 50% of the importance when it comes the government services performance.

For the Innovation;

a_{51}: *Support*

a_{52}: *Enablers & Results*

a_{53}: *Process*

a_{54}: *Impacts*

$$\text{Attributes (Weights)} = \begin{bmatrix} a_{51} \\ a_{52} \\ a_{53} \\ a_{54} \end{bmatrix} = \begin{bmatrix} 0.0987 \\ 0.1147 \\ 0.5118 \\ 0.2748 \end{bmatrix} \quad (28)$$

The results reveal that the innovation process and its impacts represent around 80% of the importance in the innovation criteria when it comes to the government services performance evaluation.

Based on the priority vectors founded for all attributes, the overall weight of each attribute was found relative to the main criteria, as shown in Table 5.1

Table 5.1: Results for the Calculated Weights of Main Criteria and Attribute derived from AHP

Main Criteria	Weight	Attribute	Local Weight	Overall Weight
Customer Satisfaction	**0.3341**	*Overall Service Quality Level*	0.3315	**0.1108**
		Customer Satisfaction Level	0.3465	**0.1158**
		Level of Trust	0.2135	**0.0713**
		Satisfaction for Solving Complaints	0.1085	**0.0362**
Service Indicators	**0.1208**	*Cost*	0.3062	**0.0370**
		Service times	0.0673	**0.0081**
		Productivity	0.1303	**0.0157**
		Service Continuity	0.4963	**0.0600**
Service Standards	**0.3551**	*Conformance to Service Standard*	0.6434	**0.2285**
		Solving complaints within Standard	0.2828	**0.1004**
		Respond to suggestions within Standard	0.0738	**0.0262**
Employees Satisfaction	**0.1151**	*Consciousness*	0.0475	**0.0055**
		Internal Behaviors	0.2209	**0.0254**
		Motivation	0.5029	**0.0579**
		Learning and Growth	0.1571	**0.0181**
		Job Roles	0.0715	**0.0082**
Innovation	**0.0749**	*Support*	0.0987	**0.0074**
		Enablers & Results	0.1147	**0.0086**
		Process	0.5118	**0.0383**
		Impacts	0.2748	**0.0206**

For each main criteria, the local priorities (weights) of all attributes under it were found using the AHP method. In order to find the overall (global) weight of each attribute, the local weight of that attribute was multiplied by the weight of the relative main criteria considered for evaluating the government services performance, as shown in the example in the next page.

Example: Level of Trust (overall weight)

= Customer Satisfaction (weight) x Level of Trust (local weight)

= (0.3341) (0.2135) = 0.0713

Looking to the overall weights of all selected attributes for our evaluation model;

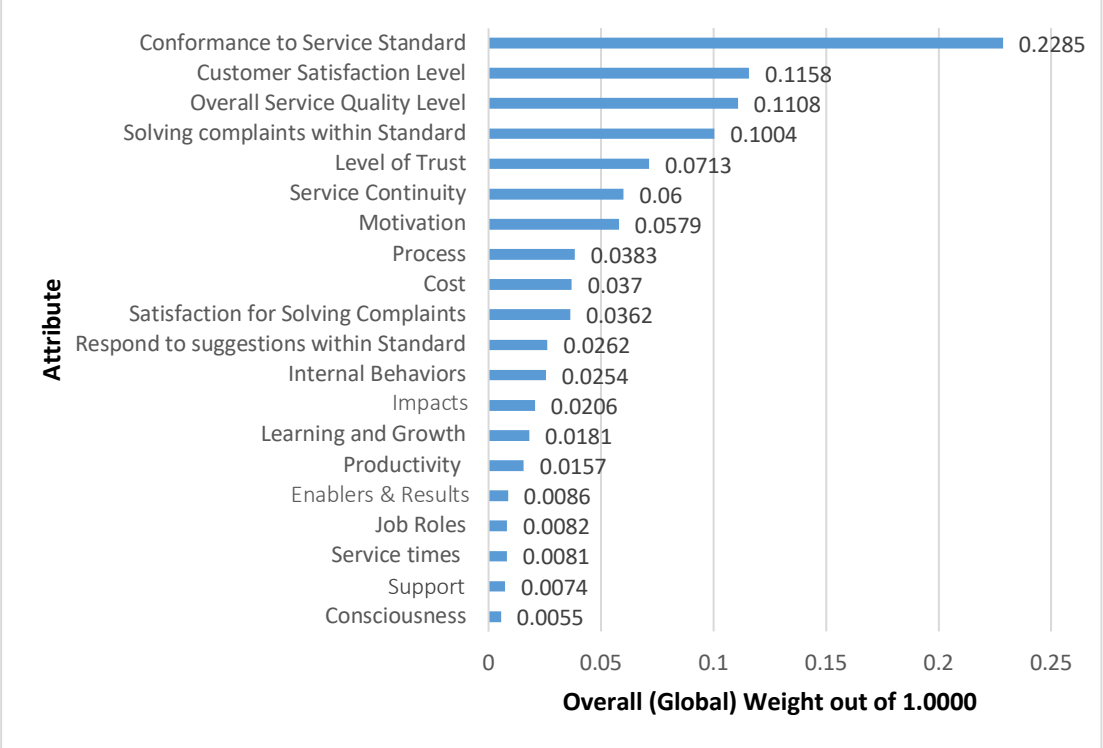


Figure 5.1: Overall Weights of the Selected Attribute

From Figure 5.1, we can conclude that based on resutls of the AHP approach and experts judgments for the selected criteria and attributes, the importance of Conformance to Service Standard attribute to the evaluation of government performance is around 23%. The combined weights of customer satisfcation and service quality levels are also around 23% of the importance in the evaluation, and 10% is priority vector for solving the complaints within standards.

Although there are some other attributes which are important to the evaluation of the government performance, but the top four attributes in the weights are having more than 60% of the importance for the performance. In other words,more than 60% of the Service Performance Index value will be contributed by the results of the following attributes; Conformance to Service Standards, Customer Satisfaction Level, Overall Service Quality Level and Solving Customers' Complaints within standards.

5.2. Performance Index Results for Government Entities

Based on the measurements ratios (to the targets as shown before in Table 4.1), the results will be multiplied by the overall weight of that attribute (as shown in Table 5.1), and summed up the results in order to calculate the value of the service performance index for the government entity, using the following equation

$$SPI_i = \sum_{i=1}^{N} \sum_{j=1}^{N} R_{ij}\, a_{ij} \quad (29)$$

Based on the results of the Service Performance Index for the government entities, the values of all entities showed a deviation from the average results of the measurements, starting from around 1% up to 12% for one of the entity. Although the current gathered measurement and information for the government entities could not justify these differences, many reasons could lead to this deviation, which could be sector-wise: the government entity to which sector belongs, or the assigned targets per entity. In addition, the inconsistency of the measurements between different pillars could be a reason for the deviation: for instance, some entities show high results of the measurements under some criteria, whereas other criteria showed low results.

On the other hand, and by looking to the final ranking of the government entities based on the SPI in Figure 5.2, the performance of Government Entity A based on its measurements is evaluated to be the highest (90.30 out of 100.00). On the other hand, government entity C got the lowest value of performance evaluation, which was (75.5 out of 100.0).

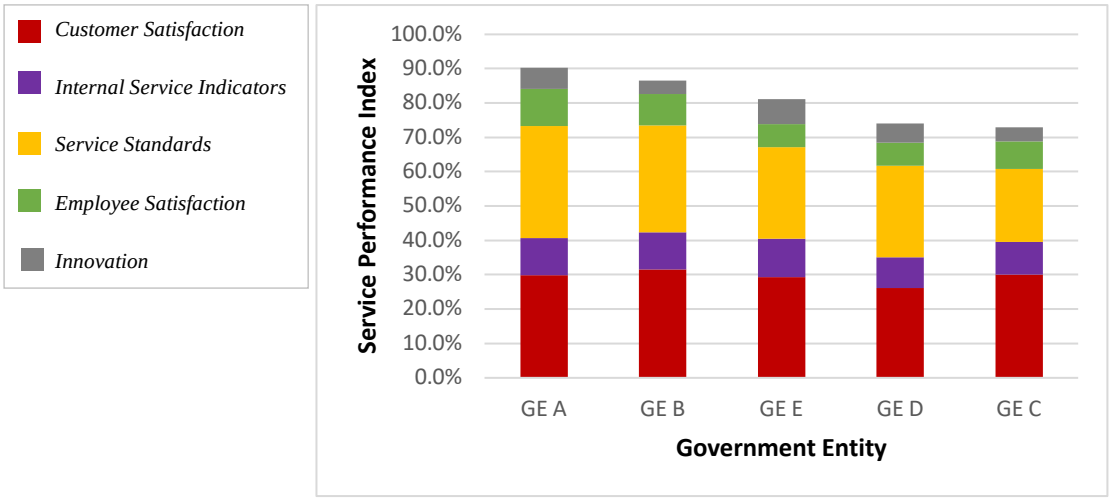


Figure 5.2: Ranking of SPI values for the selected Entities

If we look to the ranking of government entities based on the average results of the measurements, we can notice that the ranking has been changed a bit, as shown in Figure 5.3:

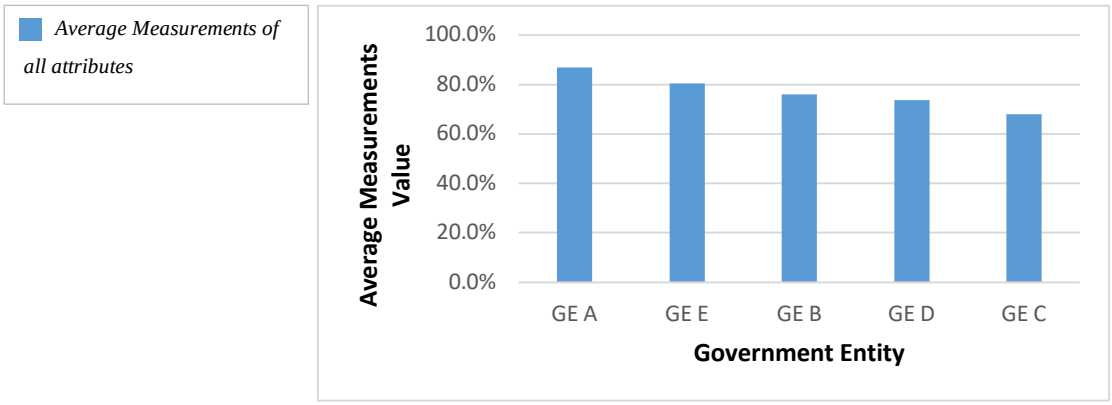


Figure 5.3: Ranking of average of the measurements for the selected Entities

As noticed, the ranking of the Government Entity A and C are still 1st and 5th, whereas the ranking of the entities between changed. As per the SPI, Government Entity B index value was 87.0 out of 100.0, higher than that of the Government Entity E which was (81.7) but the average was 77.4 for government entity B, which was lower than the average of government entity E (81.1 out of 100.0) as shown in Figure 5.4.

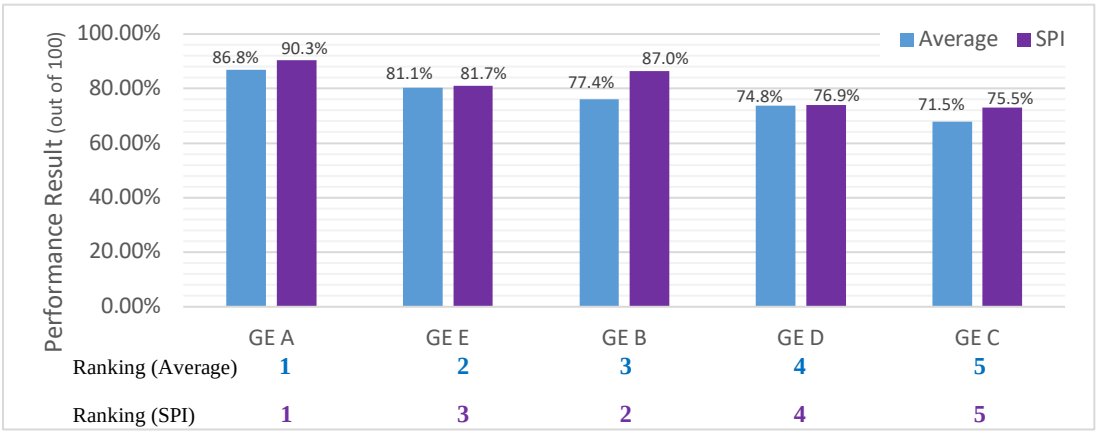


Figure 5.4: Results for Average Measurements & SPI values for the selected Entities

The initial conclusion that could be reached for the 5 selected entities based on this analysis is that the ranking of the high and low performing entities have not been affected by considering the weights of the attributes. Although this situation might not be obtained if more entities were selected and more attributes were included in the evaluation. Therefore, one can conclude that the consistent level of performance (either low or high) between different pillars and criteria for the same entity could indicate an initial perception for the evaluation of the performance for the same entity.

Looking to results of SPI for the selected entities in Table 5.2, this type of results is beneficial in monitoring the overall government services performance, either;

- Individual Entity's Level, to evaluate the performance over period of time or every year, which will help in studying the improvement of the overall performance of the public services, Or
- Group of Entities' Level, to evaluate and compare the overall service performance of different entities with respect to each others. This could be done between group of entities from the same sector, or different entities from different sectors.

Table 5.2: Results for Average Measurements and SPI values for Government Entities

Main Criteria	Attribute	Overall weight a_{ij}	Entity A (Justice Sector)	Entity B (Healthcare Sector)	Entity C (Healthcare Sector)	Entity D (Society Sector)	Entity E (Infrastruct. Sector)
			R_{ij}	R_{ij}	R_{ij}	R_{ij}	R_{ij}
Customer Satisfaction	*Service Quality*	**0.1108**	87.32%	97.11%	92.40%	82.10%	90.10%
	Satisfaction Level	**0.1158**	90.15%	96.40%	90.90%	73.00%	90.50%
	Level of Trust	**0.0713**	92.47%	94.70%	90.50%	80.00%	91.30%
	Satisfaction Solv. Compl.	**0.0362**	83.74%	80.19%	83.40%	97.40%	67.10%
Internal Service Indicators	*Cost*	**0.0370**	81.73%	87.14%	64.21%	31.40%	87.10%
	Service Times	**0.0081**	67.14%	81.13%	74.32%	71.40%	91.20%
	Productivity	**0.0157**	100.0%	75.18%	71.30%	86.10%	87.15%
	Service Continuity	**0.0600**	99.84%	97.46%	94.31%	98.80%	98.47%
Service Standards	*Conformance | standards*	**0.2285**	97.61%	96.61%	71.56%	78.60%	79.20%
	Solving compl. w/ Standard	**0.1004**	85.12%	82.10%	64.34%	82.40%	74.90%
	Respond to suggestions	**0.0262**	64.52%	42.03%	30.47%	73.20%	53.90%
Employees Satisfaction	*Consciousnes*	**0.0055**	90.00%	85.00%	84.00%	82.00%	80.00%
	Internal Behaviours	**0.0254**	91.00%	81.00%	61.00%	51.00%	68.00%
	Motivation	**0.0579**	95.00%	79.00%	68.00%	56.00%	50.00%
	Learning & Growth	**0.0181**	93.00%	72.00%	80.00%	57.00%	57.00%
	Job Roles	**0.0082**	96.00%	74.00%	91.00%	81.00%	71.00%
Innovation	*Support*	**0.0074**	82.86%	75.14%	68.57%	88.57%	91.43%
	Enablers & Results	**0.0086**	77.14%	42.86%	48.57%	71.43%	94.29%
	Innovation Process	**0.0383**	84.00%	52.00%	56.00%	72.00%	96.00%
	Impacts	**0.0206**	84.00%	56.00%	48.00%	76.00%	96.00%
Results							
Based on the Average of R_{ij}			**86.8%**	**77.4%**	**71.5%**	**74.8%**	**81.1%**
Based on the Model, SPI = Sum of (Rij*aij)			**90.3%**	**87.0%**	**75.5%**	**76.9%**	**81.7%**
Difference							
Difference between the results			**+ 4.0%**	**+ 12.4%**	**+ 5.6%**	**+ 2.8%**	**+ 0.7%**

Chapter 6. Conclusion and Future Work

In this thesis, Government Performance Management in the public sector was the focus of our study; the main objective was to develop an evaluation model for service performance considering different pillars and criteria. Another objective was to design an index for the level of service performance in the public sector, in order to overcome the issue of having many measurements and outputs for each service. The framework of the government performance management and the concept of measuring the performance were discussed and studied deeply in the literature review, along with looking to some approaches and practical models used to evaluate the performance based on quality, efficiency, statistical methods and other decision-making methods such as AHP and ANP.

There are many issues and challenges associated with the current models used to evaluate and measure the government performance. One of the common issues found in many models is that the framework of the model itself is not aligned with government performance management framework. Another issue is also related to the number of measurements and indicators generated based on the current model, which may dissolve the focus on specific area of improvement. Along with that, most of the models focus only on one aspect of performance, such as quality, efficiency, customer perception or the spending and budgeting. Focusing only on one aspect may lead to inaccurate evaluation results when it comes to government performance

The proposed evaluation model investigated in this research is aligned with the general framework of government performance management. The cycle used for evaluation will start with planning and reviewing phase. It is followed by implementing programs and providing services where the service outputs will be gathered and measured, and ending up with the evaluation and reporting phase. The developed model could also be integrated with some of the current models and approaches used to measure and evaluate government performance, since the collected measurements and attributes gathered from quality, customer perception, financial and non-financial indicators with different dimensions and units can be used in our model.

For the Service Performance Index which was designed based on our evaluation model, AHP method was used to develop a hierarchy for the evaluation index, and using

Delphi Method to collect inputs for the pairwise comparison of the criteria of evaluation and their attributes through the conducted brainstorming sessions with the experts from different levels in the government. The AHP approach was also used to calculate the weight and importance of each criteria based on the experts' ranking, and on the government performance evaluation, which was used after that to calculate the SPI for each government entity based on the available measurements and the assigned target of each attribute. The designed index of our evaluation model can now be used to compare between different government entities, and the performance of same entity over period of time.

Based on the results and findings of the experimental setup of the evaluation model, the selected criteria and attributes used to evaluate the government performance seem to have different weights and importance; and this needs to be considered during the evaluation. For the proposed model, five main criteria were selected to evaluate government service performance: 'Customer Satisfaction, Internal Service Indicators, Service Standards, Employees Satisfaction and Innovation'. The combined weights for 'Customer Satisfaction and Service Standards' have almost 70% in contribution to the evaluation of government performance. This finding is also consistent with the weights of attributes; it was found that out of 20 attributes used to develop the evaluation model, 4 attributes mainly 'Conformance to Service Standards, Customer Satisfaction Level, Overall Service Quality Level and Solving Customers' Complaints within standards' attributes represent around 65% of the importance when it comes to the evaluation of service performance in each entity.

Moving to the results of the SPI based on the measurements of each entity, a deviation from the average results of the measurements was found for all selected entities, starting from around 1% up to 12%. The current gathered measurement and the information related to government entities could not justify these differences. Another clear finding was that the ranking of the high and low performing entities has not been affected by considering the weights of the attributes. Finally, the behaviour of some attributes measurements for some entities was also noticed with respect to sector, but it cannot be confirmed since only five government entities were selected, together with and specific attributes and measurements.

As far as future work is concerned, based on the limitations of this thesis and feedback received from experts who participated in the pairwise comparison workshops, it is assumed that further research is necessary to test if considering other criteria such as technical indicators and specific criteria per sector or entity could be more practical and could help in focusing on improvement. Another point also raised during the discussion that some attributes and criteria could be linked or have impacts on other criteria, and these dependencies should be considered during the evaluation of the government performance. In addition to that, different researches are still needed to see if other approaches and techniques related to Structural Equation Modelling, Big Data and Artificial Intelligence in public sector, could also be integrated in the evaluation model using a huge number of input and output measurements in order to evaluate government performance, rather than rely only on performance indicators.

Along with that, other pillars related to the government performance such as operational performance, programs and projects outcomes, and employees' performance could be studied and covered in the evaluation of the government entity performance, which was not covered in this research due to the time limitation and availability of information. Also, expansion the scope of this study to include more than five government entities and including more services from each entity, will lead to have a better understanding about public services performance management. Finally, due to the limitation of research duration, longer period of time is needed to investigate and test the results and the assumption used to develop the proposed model in this research. The practicality and stability of the proposed model for evaluating the government performance, along with the opportunities of integrating it with the other current performance models used by the government entities, could be a great area of research for future works and studies. Keeping in mind that the results of such studies require from three to five years duration of researches, in order to give sufficient time to the results' analysis and improved outcomes to appear and measured.

It is recommended that researcher try to consider an ANP approach by including more criteria for the evaluation and for studying the dependencies between different criteria and different attributes. Additionally, there is need for including more government entities in the pairwise comparison workshops, and for conducting several sessions in parallel in order to reach consistent results for the weights of criteria and

attributes. Finally, the automation of the data measurement processes and the quality of the information gathered are very crucial for the evaluation, since most of the evaluation models for government performance rely mainly on measurements, which could sometimes have human or systems errors. Accordingly, having a well-reliable information system for measuring and gathering service outputs and measurements in the public sector, could be the first step to ensure the accuracy and validity of the evaluation results for government performance.

References

[1] ADAA Brorochure, Federal Government Performance Management System "Adaa 2.0", Ministry of Cabinet Affairs and the Future, United Arab Emirates, 2013. [Online]. Available: https://www.mocaf.gov.ae/docs/default-source/default-document-library/adaa-brochure-en.pdf?sfvrsn=0 [Accessed: Mar. 20,2018].

[2] M. Mucha, "A Performance Management Framework", *Government Finance Review*, Chicago, GFOA, vol. 25, no. 5, pp 51–54, October 2009.

[3] I. Crawford, A. Klemm, H. Simpson, “Measuring public sector efficiency”, *The IFS Green Budget*, vol. 2, pp. 105–111, January 2003.

[4] T. Curristine, "Government Performance: Lessons and Challenges", *OECD Journal on Budgeting*, vol. 5, no. 1, pp. 127–150, ISSN 1608-7143, July 2006.

[5] A Performance Management Framework for State and Local Government: *From Measurement and Reporting to Management and Improving*, National Performance Management Advisory Commission, 2010.

[6] D. Hauner, A. Kyobe, "Determinants of Government Efficiency", IMF Working Paper, Fiscal Affairs Department, International Monetary Fund, WP/08/228, September 2008.

[7] P. Ramseook-Munhurrun, "Service Quality in the Public Service", *International Journal of Management and Marketing Research*, vol. 3, no. 1, pp. 37–46, 2010.

[8] B. Hoffman, "Assessing the Quality of Local Government in South Africa", Center on Democracy, Development, and the Rule of Law, Stanford University, 2005.

[9] M. Sarfraz, J. Ran, I. Soliev, "Restructuring and Performance Evaluation of Chinese Local Government: Problem, Reason, and Options of Change", *Journal of Management Policies and Practices*, vol. 2, no. 1, pp. 01–15, March 2014.

[10] H. Shanga, C. Wangb, "Realizing the Government Performance Evaluation Index Additivity in China: A Probe into the Aggregate Degree and Additivity of Evaluation Index", University of Nis, Serbia, 2016.

[11] D. Markić, "A Review on the Use of Performance Indicators in the Public Sector", *TEM Journal*, vol. 3, no. 1, pp. 22–27, 2014.

[12] C. Talbot, "Performance in Government: The Evolving System of Performamnce and Evaluation Measurement, Monitoring and Management in the United Kingdom", The World Bank, Washington, DC, November 2010.

[13] On efficiency and effectiveness: *Some Definitions*, Productivity Commission, Staff Research Note, Canberra, Australian Government, May 2013.

[14] D. Mihaiu, A. Opreana, M. Cristescu, "Efficiency, Effectiveness and Performance of the Public Sector", *Romanian Journal of Economic Forecasting*, vol. 4, no.1, pp. 132–147, April 2010.

[15] M. Castro, "Defining and Using Performance Indicators and Targets in Government M&E Systems", The World Bank, Series no. 12, July 2011.

[16] B. Heinrichs, S. Lafleur, "Local Government Performance Index", in *The Frontier Center For Public Policy Publication*, 8th Edition, ISSN # 1491-78 2015, pp. 5–11.

[17] Guide to the Performance Management Framework, Published by The Australian Capital Territory, November 2012. [Online]. Available: https://apps.treasury.act.gov.au/__data/assets/pdf_file/0003/617916/Performance-Management-Framework-Guide-November-2012.pdf [Accessed: Mar. 20,2018].

[18] E. Yarimoglu, "A Review on Dimensions of Service Quality Models", *Journal of Marketing Management*, vol. 2, no. 2, pp. 79–93, June 2014.

[19] A. Shahin, "SERVQUAL and Model of Service Quality Gaps: A Framework for Determining and Prioritizing Critical Factors in Delivering Quality Services", University of Isfahan, Iran, 2004. [Online]. Available: http://www.proserv.nu/b/Docs/Servqual.pdf [Accessed: Mar. 20,2018].

[20] G. Akinyi, C. Moturi, "Application of IS-Balanced Scorecard in Performance Measurement of e-Government Services in Kenya", *American Journal of Information Systems*, vol. 3, no. 1, pp. 1-14, 2015.

[21] F. Fechete, A. Nedelcu, "Analysis of the Economic Performance of an Organization Using Multiple Regression", presented at International Conference of Scientific Paper Afases, Brasov, Romania, May 2014.

[22] C. Pérez, V. Montequín, F. Fernández and J. Balsera, "Integrating Analytic Hierarchy Process (AHP) and Balanced Scorecard (BSC) Framework for Sustainable Business in a Software Factory in the Financial Sector", University of Oviedo, Spain, March 2017.

[23] R. Islama, S. Rasad, "Employee Performance Evaluation by the AHP", *Asia Pacific Management Review*, Kuala Lumpur, Malaysia, vol. 11, no. 3, pp. 163–176, June 2006.

[24] N. Kadoić, N. Ređep, B. Divjak, "Decision Making with the Analytic Network Process, Faculty of Organisation and Informatics", Pavlinska 2, Varaždin, Croatia, IP-2014-09-7854, 2014.

[25] S. Yellepeddi, "An Analytical Network Process (ANP) approach for the development of a reverse supply chain performance index in consumer

electronics industry", Ph.D. dissertation, The University of Texas at Arlington, Texas, USA, 2006.

[26] M. Amiri, A. Amiri, and M. Amiri, "An Analytical Network Processapproach for banking performance evaluation based on Balanced Scorecard", *Trends in Applied Sciences Research*, vol. 7, no. 6, pp. 456–466, 2012.

[27] V. Domanović, M. Jakšić, P. Mimović, "Balanced scorecard and analytic network process in performance measurement and strategy evaluation: a case study", University of Kragujevac, Kragujevac, 2014.

[28] Ministry of Cabinet Affairs and the Future Offical Website, United Arab Emirates, 2017. [Online]. Available: https://www.mocaf.gov.ae/en/area-of-focus/government-performance [Accessed: Mar. 20,2018].

[29] "Mohammed launches world's most advanced government performance management system", *Emirates24|7 Newspaper*, (November 24, 2013). [Online]. Available: https://www.emirates247.com/news/emirates/mohammed-launches-world-s-most-advanced-government-performance-management-system-2013-11-24-1.529006 [Accessed: Mar. 20,2018].

[30] Dubai Model for Government Services: *The Main Document*, 1st Edition, Issued by The General Secretary of Executive Council, Dubai, 2011, pp. 22–31.

[31] C. Brass, "Changes to the Government Performance and Results Act (GPRA): Overview of the New Framework of Products and Processes", Congressional Research Service, 2012.

[32] "How government works", The United Kingdom Government Offical Website, UK, 2018. [Online]. Available: https://www.gov.uk/government/how-government-works [Accessed: Mar. 20,2018].

[33] W. Ko, "Performance Management In Government, A Comparative Study of the UK and KOREA", Ph.D. dissertation, University of Exeter, May 2008.

[34] C. Pollitt, "Performance Management In Practive: A Comparative Study of Executive Agencies", Paper for the Scancor Worskshop, Stanford University, California, 1-2 April 2005.

[35] Results Based Management (RBM) in Finland's Development Cooperation: *Concepts and Guiding Principles*, Unit for Development Communications, Ministry for Foreign Affairs, Government of Finland, 2015.

[36] M. Matsuura, J. Watkins, W. Dorotinsky, "Overview of Public Sector Performance Assessment Processes in Japan", Global Expert Team, The World Bank, August 2010.

[37] M. Moon, Class Lecture, Topic: "Governement Performance Management", Department of Public Administration, Yonsei University, Seoul, South Korea.

[Online],Available:http://unpan1.un.org/intradoc/groups/public/documents/ungc/unpan039882.pdf [Accessed: Mar. 20,2018].

[38] Performance Management in Government, Department of Administrative Reforms & Public Grievances, Centre for Good Governance, Government of India, April 2009.

[39] T. Saaty, "Decision making with the analytic hierarchy process", Katz Graduate School of Business, University of Pittsburgh, Pittsburgh, PA 15260, USA, Int. J. Services Sciences, vol. 1, no. 1, pp. 83–97, 2008.

[40] N. Bhushan, K. Rai, *Strategic Decision-Making: Applying The Analytic Hierarchy Process*, 1st Edition, ISSN 978-1-85233-756-8, Springer Publications, 2004, pp. 11–20.

[41] T. Saaty, "How to Make a Decision: The Analytic Hierarchy Process", The Institute of Management Science, vol. 24, no. 6, pp. 19–43, 1994.

[42] W. Ciptono, "Application of Analytic Hierarchy Process in Prioritization of Critical Success Factors of TQM", Ph.D. dissertation, Faculty of Business and Accountancy University of Malaya Kuala Lumpur, Malaysia, 2005.

[43] J. Pérez, J. Jimeno, E. Mokotoff, "Another Potential Strong Shortcoming of AHP", *Sociedad de Estadistica e Investigacion Operativa*, Departamento de Fundamentos de Economía e Historia Económica, vol. 14, no. 1, pp. 99–111, 2006.

[44] A. Bester, "Efficiency in the Public Sector: An Analysis of Performance Measurements Employed by the Western Cape Provincial Treasury", Master in Public Administration Thesis, University of Stellenbosh, March 2007.

[45] L. Di Matteo, "Measuring Government in the Twenty-first Century: An International Overview of the Size and Efficiency of Public Spending", Fraser Institute, Canada, December 2013. [Online], Available: https://www.fraserinstitute.org/sites/default/files/measuring-government-in-the-21st-century.pdf [Accessed: Mar. 20,2018].

[46] T. Hunjak, D. Jakovčević, "AHP Based Model for Bank Performance Evaluation and Rating", Faculty of organization and informatics, University of Zagreb, Pavlinska 2, Varaždin – Croatia, Berne, Switzerland, August, 2001.

[47] P.D.D. Dominic, H. Jati, "Performance evaluation on quality of Asian e-government websites – an AHP approach", Department of Computer and Information Science, Universiti Teknologi Petronas, Tronoh, Perak, Malaysia, Int. J. Business Information Systems, vol. 6, no. 2, pp. 219–237, 2010.

[48] Introduction to the Balanced Scorecard for the Public Sector, Stellar Leadership Ltd, City East, Newtownards Rd, Belfast, United Kingdom, 2010. [Online], Available: http://stellarleadership.com/docs/ [Accessed: Mar. 20,2018].

[49] G. Fogarty, R. Catts, C. Forlin, "Identifying shortcomings in the measurement of service quality", *Journal of Outcome Measurement*, University of Southern Queensland, vol. 4, no. 1, pp. 425–447, 2000.

[50] M. Adil, Dr. O. AlGhaswyneh, A. Albkour, "SERVQUAL and SERVPERF: A Review of Measures in Services Marketing Research", Published under *Global Journal of Management and Business Research Marketing*, vol. 13, no. 6, pp. 65–72, 2013.

[51] Class Lecture, Topic: "Eigenvalues and Eigenvectors", Linear Algebra, MIT OpenCourseWare. [Online]. Available: http://ocw.mit.edu, Fall 2011 [Accessed: Mar. 20,2018].

[52] E. Eriksen, Class Lecture, Topic: "Eigenvalues and Eigenvectors", Department of Economics, BI Norwegian School of Management, September 10, 2010. [Online]. Available: http://www.dr-eriksen.no/teaching/GRA6035/2010/lecture3-hand.pdf [Accessed: Mar. 20,2018].

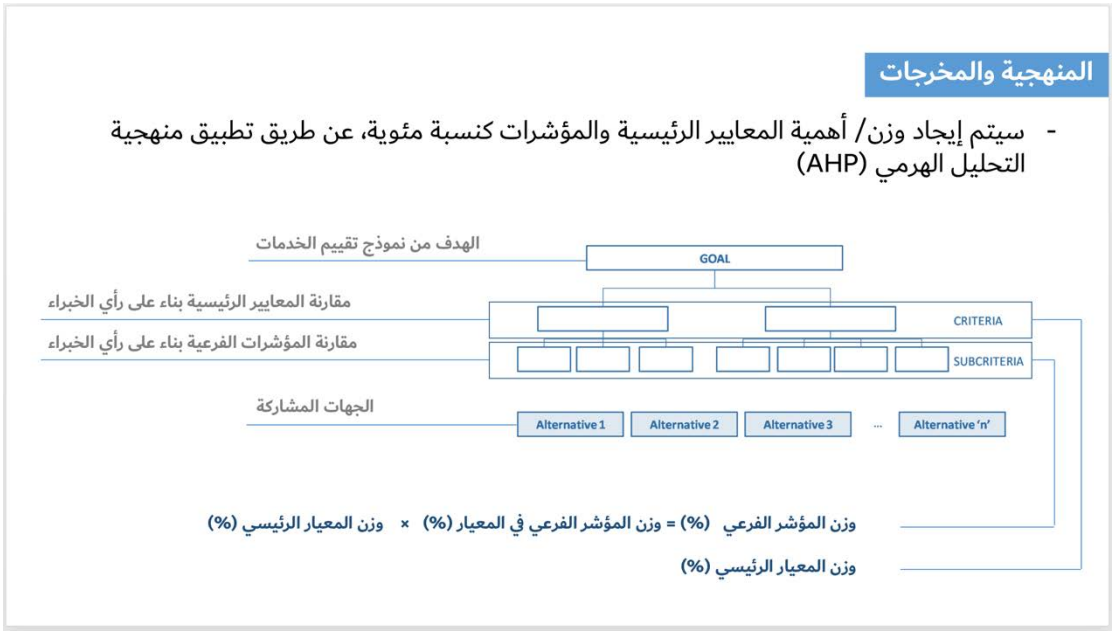
[53] R. Fandaru, " New Design of Raskin Program: Analysis Implementation RASDA in Kulonprogo Regency", *Jurnal Kebijakan dan Administrasi Publik*, vol. 20, no. 1, pp. 68–83, May 2016. [Online]. Available: https://www.researchgate.net/figure/Logical-framework-performance-measurement-of-the-policy-implementation_fig1_312163242 [Accessed: Mar. 20,2018].

[54] S. Han, S. Hong, "Effects of Service Quality on Customer Retention and Word-Of-Mouth in a Retail Setting: Comparative Study of Different Scales", Asia Pacific Advances in Consumer Research, Hanyang University, Korea, vol. 6, pp. 316–321, 2005.
[Online]. Available: http://www.acrwebsite.org/volumes/ap06/06318f02.gif [Accessed: Mar. 20,2018].

Appendix

In this section, the agenda of the conducted workshops and the list of participants are included, along with screenshots of the developed Excel Template which been used during the workshops.

1. Agenda for AHP workshops conducted for the thesis (in Arabic)



ورشة عصف ذهني – وزن المؤشرات ومساهمتها في أداء الخدمات الحكومية

تهدف الورشة إلى جمع آراء الخبراء من عدة مستويات وظيفية من مؤسسات مختلفة حول أهمية المعايير الرئيسية والمؤشرات الفرعية للجهات ومساهمتها في أداء الخدمات، عن طريق تطبيق منهجية التحليل الهرمي (AHP)

- **الوقت:** 09:00 – 11:30 صباحاً (ساعتان ونصف) - **المكان:** (سيتم تحديده)
- **اليوم والتاريخ:** الثلاثاء والأربعاء 21-2018/03/20م - **عدد المشاركين المتوقع:** 15 شخص

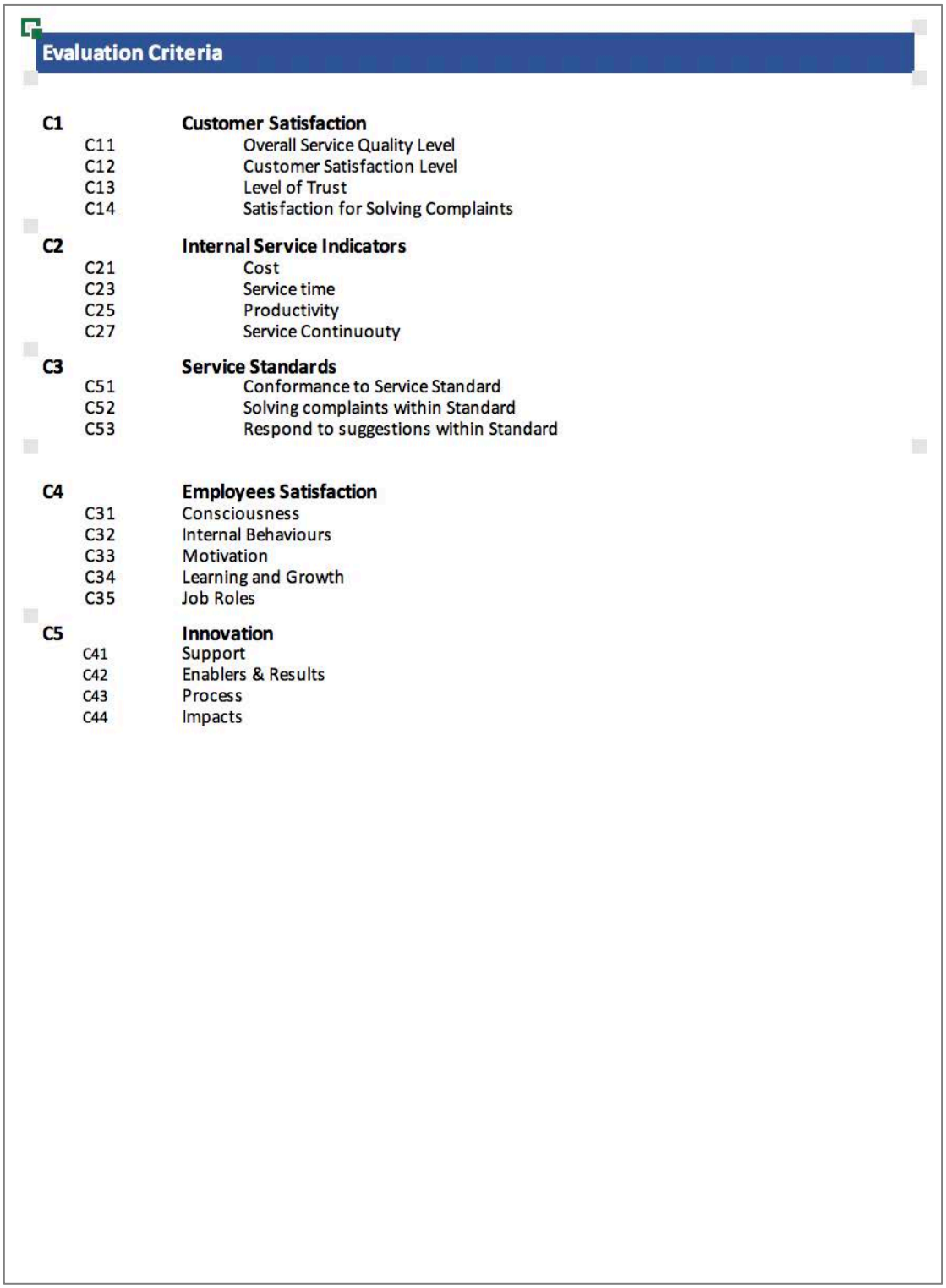
الوقت	الفقرة	الهدف	ملاحظات
09:05 – 09:00	مقدمة	الترحيب بالمشاركين ونبذة عن هدف الورشة	
09:10 – 09:05	التعريف بالأداة المستخدمة	عرض الأداة المستخدمة لجمع الآراء ولعمل المقارنات باستخدام AHP ومصفوفة القرار	
09:30 – 09:10	تجربة لمقارنة مبدئية	الطلب من الجهات عمل مقارنة مبدئية على مستوى كل جهة بشكل مبدئي	توزيع نماذج/ جمع النتائج
11:15 – 09:30	مقارنة المعايير الرئيسية (اليوم الأول)	تطبيق منهجية التحليل الهرمي (AHP) للمعايير الرئيسية على مستوى الجهات	الخبراء – مستويات وظيفية عليا وإشرافية
11:15 – 09:30	مقارنة المؤشرات الفرعية (اليوم الثاني)	تطبيق منهجية التحليل الهرمي (AHP) للمؤشرات الفرعية على مستوى الجهات	الخبراء – مستويات وظيفية متوسطة وإشرافية
11:30 – 11:15	النتائج وختام الورشة	عرض النتائج المبدئية للمشاركين وشكرهم	

2. List of Experts participated in the conducted AHP workshops for the thesis (not all designations are included)

Designation	Field/ Experience/ Background	Level	Remarks
- Director	Engineering	Higher Management	Participated partially
- Head	Organizational Performance	Higher Management	
- Advisor	Customer Service & Quality	Higher Management	
- Consultant	Public Services	Higher Management	
- Manager	Quality & Strategy	Middle Management	
- Manager	Service Design	Middle Management	
- Manager	Service Design	Middle Management	
- Manager	Customer Service	Middle Management	
- Associate Manager	Public Services	Middle Management	
- Expert	Performance Management	-	Provided feedback
- Expert	Public Services	-	Provided feedback

3. Developed Excel Template used to conduct the pairwise comparison and calculate priority vectors of main criteria and attributes

- Main Criteria and Sub-Criteria (Attributes) Worksheet

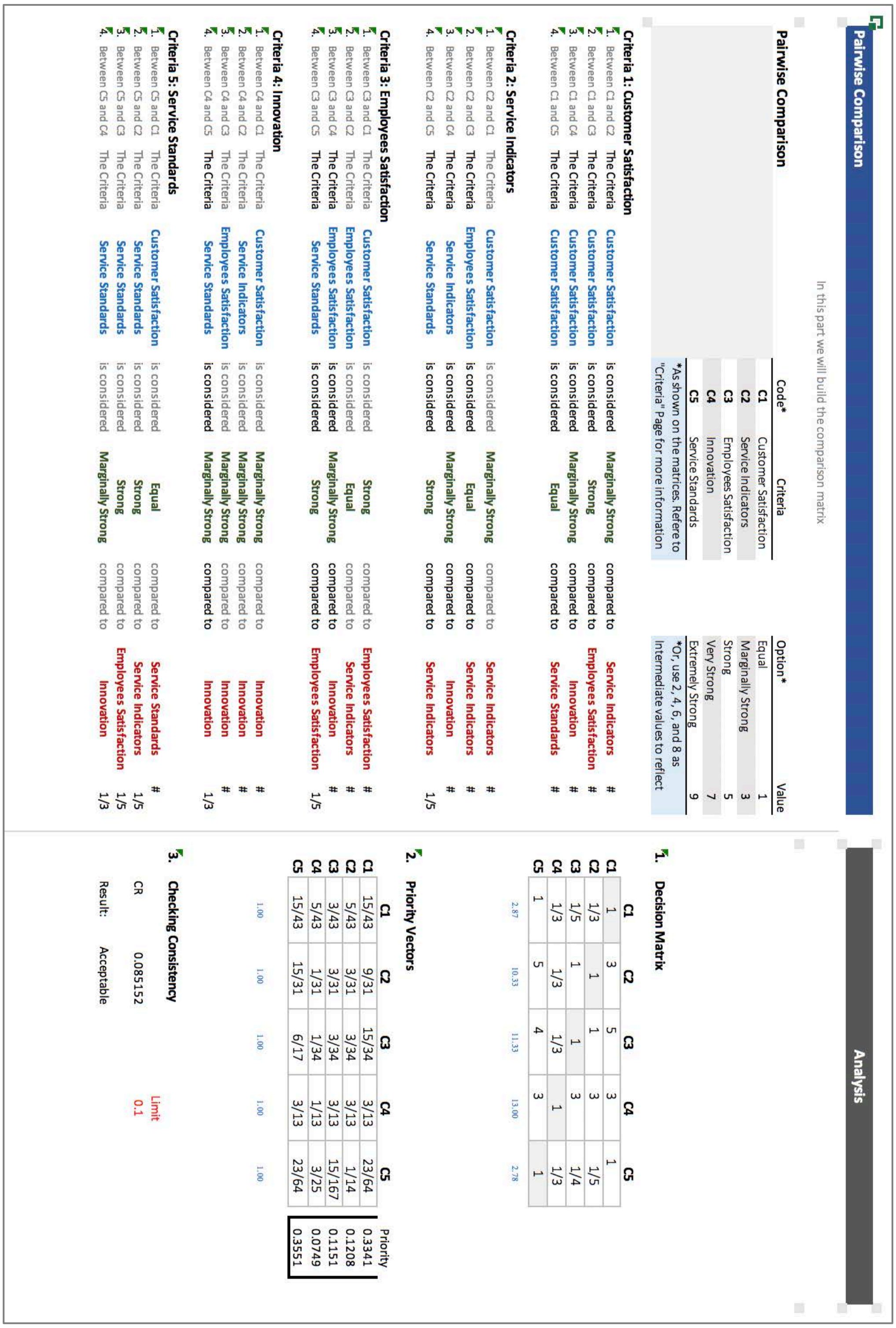


Evaluation Criteria

C1		**Customer Satisfaction**
	C11	Overall Service Quality Level
	C12	Customer Satisfaction Level
	C13	Level of Trust
	C14	Satisfaction for Solving Complaints
C2		**Internal Service Indicators**
	C21	Cost
	C23	Service time
	C25	Productivity
	C27	Service Continuouty
C3		**Service Standards**
	C51	Conformance to Service Standard
	C52	Solving complaints within Standard
	C53	Respond to suggestions within Standard
C4		**Employees Satisfaction**
	C31	Consciousness
	C32	Internal Behaviours
	C33	Motivation
	C34	Learning and Growth
	C35	Job Roles
C5		**Innovation**
	C41	Support
	C42	Enablers & Results
	C43	Process
	C44	Impacts

3. Developed Excel Template used to conduct the pairwise comparison and calculate priority vectors of main criteria and attributes

- Pairwise Comparison (Main Criteria) Worksheet



Pairwise Comparison

In this part we will build the comparison matrix

Pairwise Comparison

Code*	Criteria
C1	Customer Satisfaction
C2	Service Indicators
C3	Employees Satisfaction
C4	Innovation
C5	Service Standards

*As shown on the matrices. Refere to "Criteria" Page for more information

Option*	Value
Equal	1
Marginally Strong	3
Strong	5
Very Strong	7
Extremely Strong	9

*Or, use 2, 4, 6, and 8 as Intermediate values to reflect

Criteria 1: Customer Satisfaction

1. Between C1 and C2	The Criteria	Customer Satisfaction	is considered	Marginally Strong	compared to	Service Indicators	#
2. Between C1 and C3	The Criteria	Customer Satisfaction	is considered	Strong	compared to	Employees Satisfaction	#
3. Between C1 and C4	The Criteria	Customer Satisfaction	is considered	Marginally Strong	compared to	Innovation	#
4. Between C1 and C5	The Criteria	Customer Satisfaction	is considered	Equal	compared to	Service Standards	#

Criteria 2: Service Indicators

1. Between C2 and C1	The Criteria	Customer Satisfaction	is considered	Marginally Strong	compared to	Service Indicators	#
2. Between C2 and C3	The Criteria	Employees Satisfaction	is considered	Equal	compared to	Service Indicators	#
3. Between C2 and C4	The Criteria	Service Indicators	is considered	Marginally Strong	compared to	Innovation	#
4. Between C2 and C5	The Criteria	Service Standards	is considered	Strong	compared to	Service Indicators	1/5

Criteria 3: Employees Satisfaction

1. Between C3 and C1	The Criteria	Customer Satisfaction	is considered	Strong	compared to	Employees Satisfaction	#
2. Between C3 and C2	The Criteria	Employees Satisfaction	is considered	Equal	compared to	Service Indicators	#
3. Between C3 and C4	The Criteria	Employees Satisfaction	is considered	Marginally Strong	compared to	Innovation	#
4. Between C3 and C5	The Criteria	Service Standards	is considered	Strong	compared to	Employees Satisfaction	1/5

Criteria 4: Innovation

1. Between C4 and C1	The Criteria	Customer Satisfaction	is considered	Marginally Strong	compared to	Innovation	#
2. Between C4 and C2	The Criteria	Service Indicators	is considered	Marginally Strong	compared to	Innovation	#
3. Between C4 and C3	The Criteria	Employees Satisfaction	is considered	Marginally Strong	compared to	Innovation	#
4. Between C4 and C5	The Criteria	Service Standards	is considered	Marginally Strong	compared to	Innovation	1/3

Criteria 5: Service Standards

1. Between C5 and C1	The Criteria	Customer Satisfaction	is considered	Equal	compared to	Service Standards	#
2. Between C5 and C2	The Criteria	Service Standards	is considered	Strong	compared to	Service Indicators	1/5
3. Between C5 and C3	The Criteria	Service Standards	is considered	Strong	compared to	Employees Satisfaction	1/5
4. Between C5 and C4	The Criteria	Service Standards	is considered	Marginally Strong	compared to	Innovation	1/3

Analysis

1. Decision Matrix

	C1	C2	C3	C4	C5
C1	1	3	5	3	1
C2	1/3	1	1	3	1/5
C3	1/5	1	1	3	1/4
C4	1/3	1/3	1/3	1	1/3
C5	1	5	4	3	1
	2.87	10.33	11.33	13.00	2.78

2. Priority Vectors

	C1	C2	C3	C4	C5	Priority
C1	15/43	9/31	15/34	3/13	23/64	0.3341
C2	5/43	3/31	3/34	3/13	1/14	0.1208
C3	3/43	3/31	3/34	3/13	15/167	0.1151
C4	5/43	1/31	1/34	1/13	3/25	0.0749
C5	15/43	15/31	6/17	3/13	23/64	0.3551
	1.00	1.00	1.00	1.00	1.00	

3. Checking Consistency

		Limit
CR	0.085152	0.1
Result:	Acceptable	

3. Developed Excel Template used to conduct the pairwise comparison and calculate priority vectors of main criteria and attributes

- Pairwise Comparison (Customer Satisfaction Attributes) Worksheet

Pairwise Comparison Criteria 1 Customer Satisfaction

In this part we will build the comparison matrix

Pairwise Comparison

Code*	Sub-Criteria
C11	Overall Service Quality Level
C12	Customer Satisfaction Level
C13	Level of Trust
C14	Satisfaction for Solving Complaints

*As shown on the matrices. Refere to "Criteria" Page for more information

Option*	Value
Equal	1
Marginally Strong	3
Strong	5
Very Strong	7
Extremely Strong	9

*Or, use 2, 4, 6, and 8 as Intermediate values to reflect

Sub-Criteria 1: Overall Service Quality Level

1. Between C11 and C12 The Criteria Customer Satisfaction Leve 2 is considered Equal 1 compared to Overall Service Quality Leve #
2. Between C11 and C13 The Criteria Overall Service Quality Leve 1 is considered Marginally Strong 3 compared to Level of Trust #
3. Between C11 and C14 The Criteria Overall Service Quality Leve 1 is considered Marginally Strong 3 compared to sfaction for Solving Compla #

Sub-Criteria 2: Customer Satisfaction Level

1. Between C12 and C11 The Criteria Customer Satisfaction Leve 2 is considered Equal 1 compared to Overall Service Quality Leve #
2. Between C12 and C13 The Criteria Customer Satisfaction Leve 1 is considered Marginally Strong 3 compared to Level of Trust #
3. Between C12 and C14 The Criteria Customer Satisfaction Leve 1 is considered Marginally Strong 3 compared to sfaction for Solving Compla #

Sub-Criteria 3: Level of Trust

1. Between C13 and C11 The Criteria Overall Service Quality Leve 2 is considered Marginally Strong 3 compared to Level of Trust #
2. Between C13 and C12 The Criteria Customer Satisfaction Leve 1 is considered Marginally Strong 3 compared to Level of Trust #
3. Between C13 and C14 The Criteria Level of Trust 1 is considered Very Strong 7 compared to sfaction for Solving Compla #

Sub-Criteria 4: Satisfaction for Solving Complaints

1. Between C11 and C12 The Criteria Overall Service Quality Leve 2 is considered Marginally Strong 3 compared to sfaction for Solving Compla #
2. Between C11 and C13 The Criteria Customer Satisfaction Level is considered Marginally Strong 3 compared to sfaction for Solving Compla #
3. Between C11 and C14 The Criteria Level of Trust is considered Very Strong 7 compared to sfaction for Solving Compla #

Analysis

1. Decision Matrix

	C11	C12	C13	C4	mult
C11	1	1	2	3	1.43059
C12	1	1	3	2	1.53559
C13	1/2	1/3	1	4	0.92887
C14	1/3	1/2	1/4	1	0.44564
	2.83	2.83	6.25	10.00	

2. Priority Vectors

	C1	C2	C3	C4		Priority
C1	6/17	6/17	8/25	3/10	1 29/89	0.3315
C2	6/17	6/17	12/25	1/5	1 22/57	0.3465
C3	3/17	2/17	4/25	2/5	41/48	0.2135
C4	2/17	3/17	1/25	1/10	33/76	0.1085
	1.00	1.00	1.00	1.00	4.316	
					4.432	
					4.350	
					4.106	

3. Checking Consistency

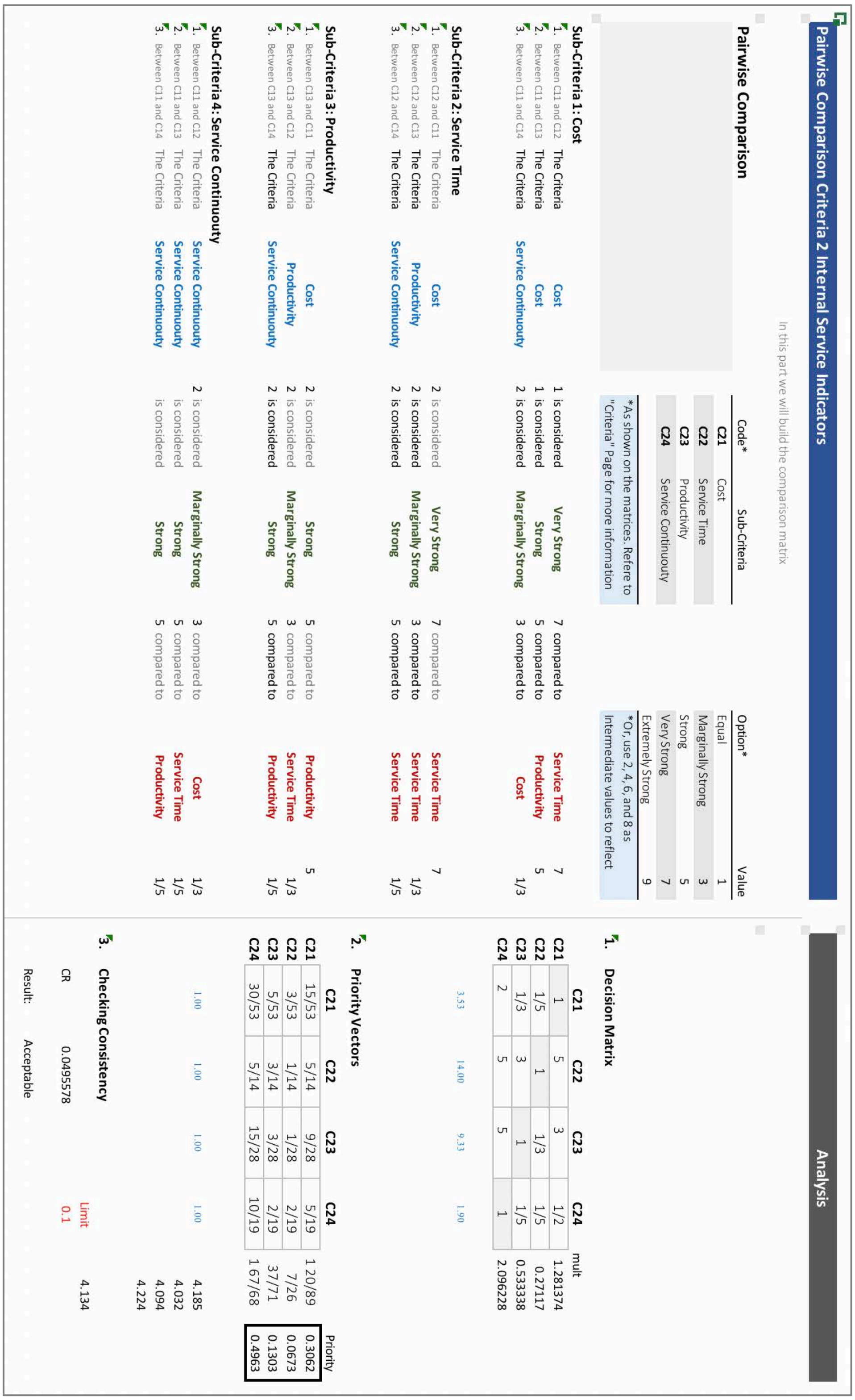
Limit 4.301

CR 0.083625 0.1

Result: Acceptable

3. Developed Excel Template used to conduct the pairwise comparison and calculate priority vectors of main criteria and attributes

- Pairwise Comparison (Internal Service Indicators Attributes) Worksheet



Pairwise Comparison Criteria 2 Internal Service Indicators

In this part we will build the comparison matrix

Pairwise Comparison

Code*	Sub-Criteria
C21	Cost
C22	Service Time
C23	Productivity
C24	Service Continuouty

*As shown on the matrices. Refere to "Criteria" Page for more information

Option*	Value
Equal	1
Marginally Strong	3
Strong	5
Very Strong	7
Extremely Strong	9

*Or, use 2, 4, 6, and 8 as Intermediate values to reflect

Sub-Criteria 1: Cost

1.	Between C11 and C12	The Criteria	Cost	1	is considered	Very Strong	7	compared to	Service Time	7
2.	Between C11 and C13	The Criteria	Cost	1	is considered	Strong	5	compared to	Productivity	5
3.	Between C11 and C14	The Criteria	Service Continuouty	2	is considered	Marginally Strong	3	compared to	Cost	1/3

Sub-Criteria 2: Service Time

1.	Between C12 and C11	The Criteria	Cost	2	is considered	Very Strong	7	compared to	Service Time	7
2.	Between C12 and C13	The Criteria	Productivity	2	is considered	Marginally Strong	3	compared to	Service Time	1/3
3.	Between C12 and C14	The Criteria	Service Continuouty	2	is considered	Strong	5	compared to	Service Time	1/5

Sub-Criteria 3: Productivity

1.	Between C13 and C11	The Criteria	Cost	2	is considered	Strong	5	compared to	Productivity	5
2.	Between C13 and C12	The Criteria	Productivity	2	is considered	Marginally Strong	3	compared to	Service Time	1/3
3.	Between C13 and C14	The Criteria	Service Continuouty	2	is considered	Strong	5	compared to	Productivity	1/5

Sub-Criteria 4: Service Continuouty

1.	Between C11 and C12	The Criteria	Service Continuouty	2	is considered	Marginally Strong	3	compared to	Cost	1/3
2.	Between C11 and C13	The Criteria	Service Continuouty		is considered	Strong	5	compared to	Service Time	1/5
3.	Between C11 and C14	The Criteria	Service Continuouty		is considered	Strong	5	compared to	Productivity	1/5

Analysis

1. Decision Matrix

	C21	C22	C23	C24	mult
C21	1	5	3	1/2	1.281374
C22	1/5	1	1/3	1/5	0.27117
C23	1/3	3	1	1/5	0.533338
C24	2	5	5	1	2.096228
	3.53	14.00	9.33	1.90	

2. Priority Vectors

	C21	C22	C23	C24		Priority
C21	15/53	5/14	9/28	5/19	1 20/89	0.3062
C22	3/53	1/14	1/28	2/19	7/26	0.0673
C23	5/53	3/14	3/28	2/19	37/71	0.1303
C24	30/53	5/14	15/28	10/19	1 67/68	0.4963
	1.00	1.00	1.00	1.00	4.185	
					4.032	
					4.094	
					4.224	

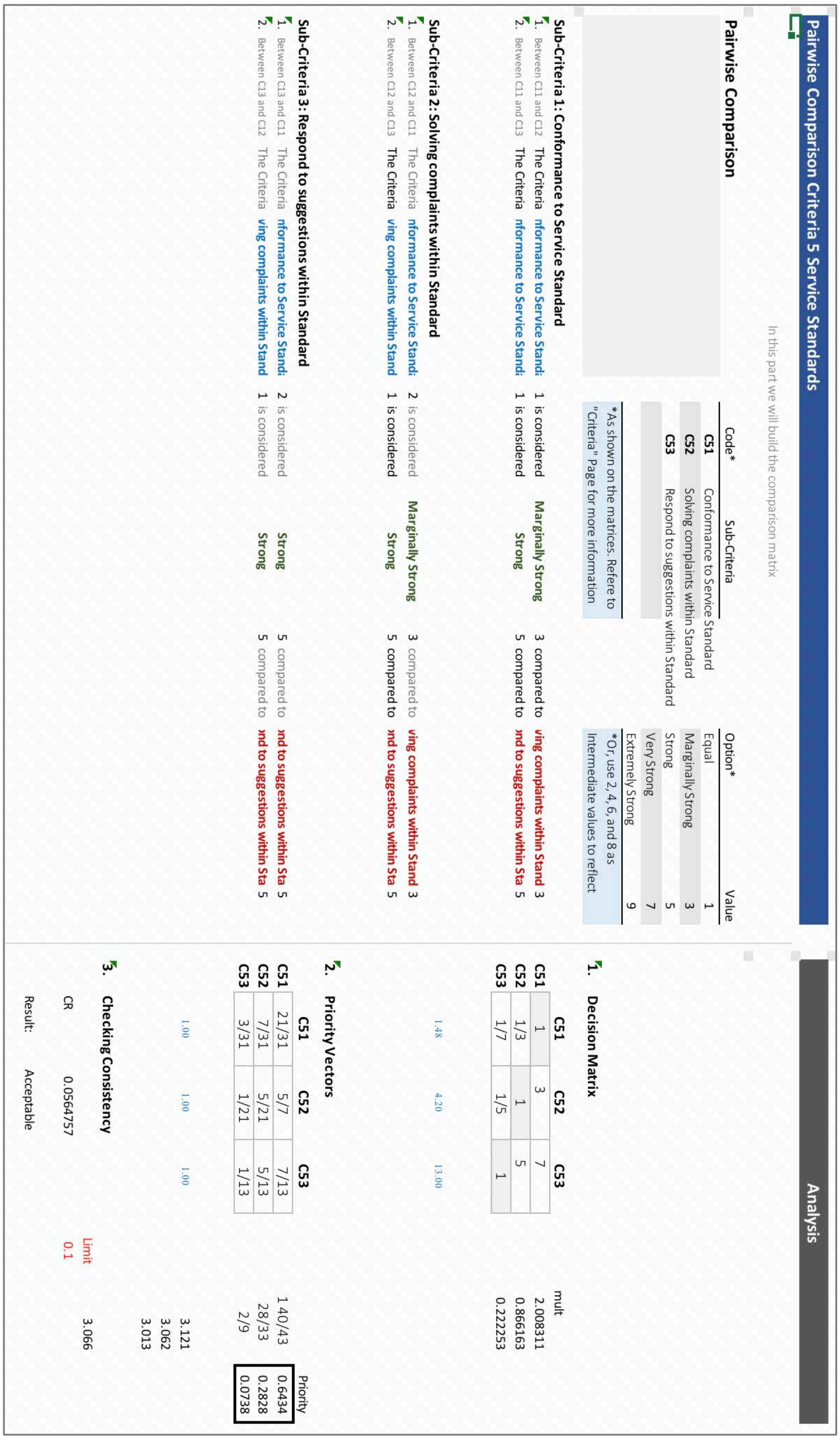
3. Checking Consistency

		Limit	4.134
CR	0.0495578	0.1	

Result: Acceptable

3. Developed Excel Template used to conduct the pairwise comparison and calculate priority vectors of main criteria and attributes

- Pairwise Comparison (Service Standards Attributes) Worksheet



Pairwise Comparison Criteria 5 Service Standards

In this part we will build the comparison matrix

Pairwise Comparison

Code*	Sub-Criteria
C51	Conformance to Service Standard
C52	Solving complaints within Standard
C53	Respond to suggestions within Standard

*As shown on the matrices. Refere to "Criteria" Page for more information

Option*	Value
Equal	1
Marginally Strong	3
Strong	5
Very Strong	7
Extremely Strong	9

*Or, use 2, 4, 6, and 8 as Intermediate values to reflect

Sub-Criteria 1: Conformance to Service Standard

1.	Between C11 and C12	The Criteria	nformance to Service Standa	1	is considered	Marginally Strong	3	compared to	ving complaints within Stand 3
2.	Between C11 and C13	The Criteria	nformance to Service Standa	1	is considered	Strong	5	compared to	ond to suggestions within Sta 5

Sub-Criteria 2: Solving complaints within Standard

1.	Between C12 and C11	The Criteria	nformance to Service Standa	2	is considered	Marginally Strong	3	compared to	ving complaints within Stand 3
2.	Between C12 and C13	The Criteria	ving complaints within Stand	1	is considered	Strong	5	compared to	ond to suggestions within Sta 5

Sub-Criteria 3: Respond to suggestions within Standard

1.	Between C13 and C11	The Criteria	nformance to Service Standa	2	is considered	Strong	5	compared to	ond to suggestions within Sta 5
2.	Between C13 and C12	The Criteria	ving complaints within Stand	1	is considered	Strong	5	compared to	ond to suggestions within Sta 5

Analysis

1. Decision Matrix

	C51	C52	C53	mult
C51	1	3	7	2.008311
C52	1/3	1	5	0.866163
C53	1/7	1/5	1	0.222253
	1.48	4.20	13.00	

2. Priority Vectors

	C51	C52	C53		Priority
C51	21/31	5/7	7/13	1 40/43	0.6434
C52	7/31	5/21	5/13	28/33	0.2828
C53	3/31	1/21	1/13	2/9	0.0738
	1.00	1.00	1.00		

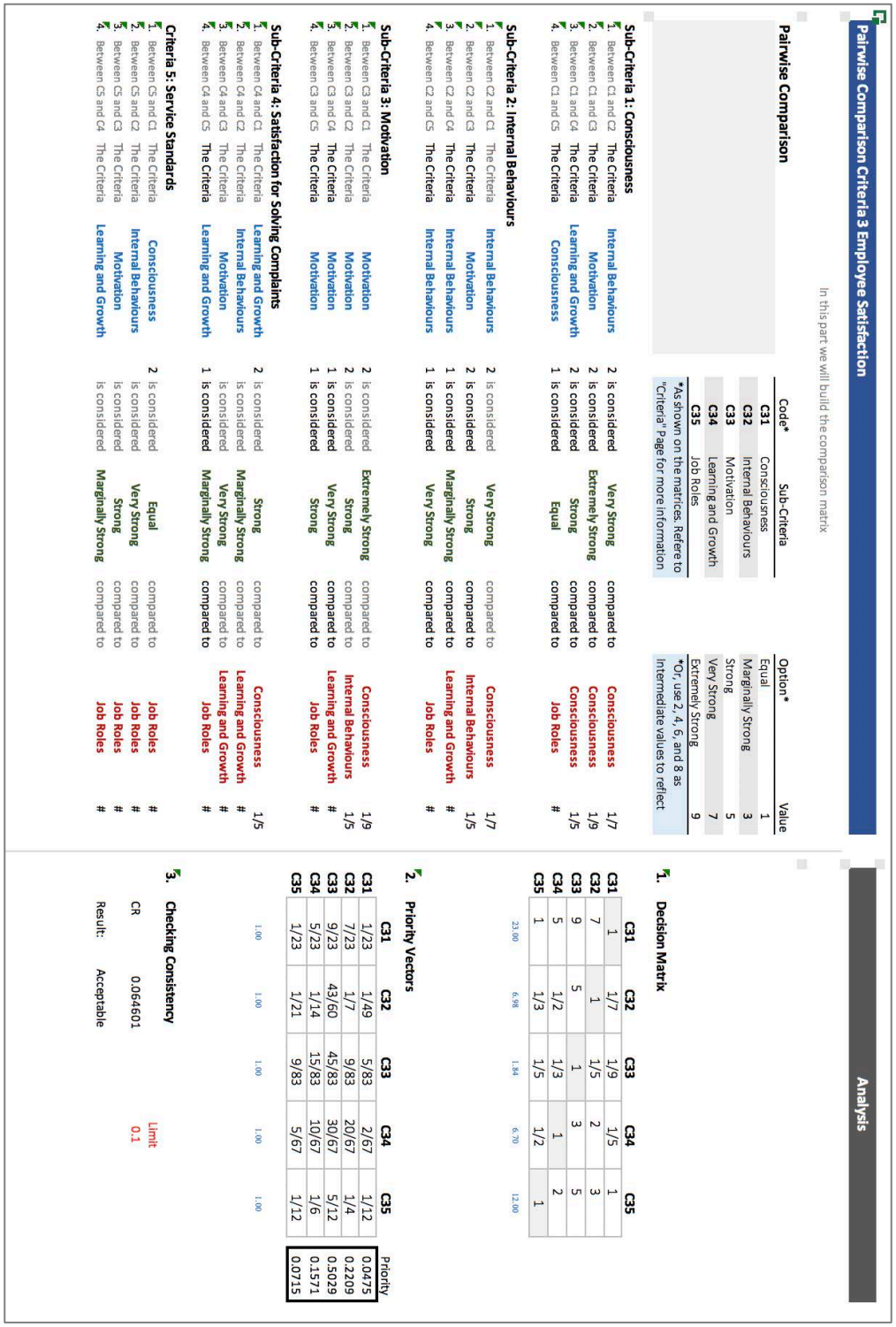
3.121
3.062
3.013

3. Checking Consistency

		Limit	
			3.066
CR	0.0564757	0.1	
Result:	Acceptable		

3.Excel Template used to conduct the pairwise comparison and calculate priority vectors of main criteria and attributes

- Pairwise Comparison (Employee Satisfaction Attributes) Worksheet



Pairwise Comparison Criteria 3 Employee Satisfaction

In this part we will build the comparison matrix

Pairwise Comparison

Code*	Sub-Criteria
C31	Consciousness
C32	Internal Behaviours
C33	Motivation
C34	Learning and Growth
C35	Job Roles

*As shown on the matrices. Refere to "Criteria" Page for more information

Option*	Value
Equal	1
Marginally Strong	3
Strong	5
Very Strong	7
Extremely Strong	9

*Or, use 2, 4, 6, and 8 as Intermediate values to reflect

Sub-Criteria 1: Consciousness

1.	Between C1 and C2	The Criteria	Internal Behaviours	2	is considered	Very Strong	compared to	Consciousness 1/7
2.	Between C1 and C3	The Criteria	Motivation	2	is considered	Extremely Strong	compared to	Consciousness 1/9
3.	Between C1 and C4	The Criteria	Learning and Growth	2	is considered	Strong	compared to	Consciousness 1/5
4.	Between C1 and C5	The Criteria	Consciousness	1	is considered	Equal	compared to	Job Roles #

Sub-Criteria 2: Internal Behaviours

1.	Between C2 and C1	The Criteria	Internal Behaviours	2	is considered	Very Strong	compared to	Consciousness 1/7
2.	Between C2 and C3	The Criteria	Motivation	2	is considered	Strong	compared to	Internal Behaviours 1/5
3.	Between C2 and C4	The Criteria	Internal Behaviours	1	is considered	Marginally Strong	compared to	Learning and Growth #
4.	Between C2 and C5	The Criteria	Internal Behaviours	1	is considered	Very Strong	compared to	Job Roles #

Sub-Criteria 3: Motivation

1.	Between C3 and C1	The Criteria	Motivation	2	is considered	Extremely Strong	compared to	Consciousness 1/9
2.	Between C3 and C2	The Criteria	Motivation	2	is considered	Strong	compared to	Internal Behaviours 1/5
3.	Between C3 and C4	The Criteria	Motivation	1	is considered	Very Strong	compared to	Learning and Growth #
4.	Between C3 and C5	The Criteria	Motivation	1	is considered	Strong	compared to	Job Roles #

Sub-Criteria 4: Satisfaction for Solving Complaints

1.	Between C4 and C1	The Criteria	Learning and Growth	2	is considered	Strong	compared to	Consciousness 1/5
2.	Between C4 and C2	The Criteria	Internal Behaviours		is considered	Marginally Strong	compared to	Learning and Growth #
3.	Between C4 and C3	The Criteria	Motivation		is considered	Very Strong	compared to	Learning and Growth #
4.	Between C4 and C5	The Criteria	Learning and Growth	1	is considered	Marginally Strong	compared to	Job Roles #

Criteria 5: Service Standards

1.	Between C5 and C1	The Criteria	Consciousness	2	is considered	Equal	compared to	Job Roles #
2.	Between C5 and C2	The Criteria	Internal Behaviours		is considered	Very Strong	compared to	Job Roles #
3.	Between C5 and C3	The Criteria	Motivation		is considered	Strong	compared to	Job Roles #
4.	Between C5 and C4	The Criteria	Learning and Growth		is considered	Marginally Strong	compared to	Job Roles #

Analysis

1. Decision Matrix

	C31	C32	C33	C34	C35
C31	1	1/7	1/9	1/5	1
C32	7	1	1/5	2	3
C33	9	5	1	3	5
C34	5	1/2	1/3	1	2
C35	1	1/3	1/5	1/2	1
	23.00	6.98	1.84	6.70	12.00

2. Priority Vectors

	C31	C32	C33	C34	C35	Priority
C31	1/23	1/49	5/83	2/67	1/12	0.0475
C32	7/23	1/7	9/83	20/67	1/4	0.2209
C33	9/23	43/60	45/83	30/67	5/12	0.5029
C34	5/23	1/14	15/83	10/67	1/6	0.1571
C35	1/23	1/21	9/83	5/67	1/12	0.0715
	1.00	1.00	1.00	1.00	1.00	

3. Checking Consistency

		Limit
CR	0.064601	0.1
Result:	Acceptable	

3.Excel Template used to conduct the pairwise comparison and calculate priority vectors of main criteria and attributes

- Pairwise Comparison (Innovation Attributes) Worksheet

Pairwise Comparison Criteria 4 Innovation

In this part we will build the comparison matrix

Pairwise Comparison

Code*	Sub-Criteria
C41	Support
C42	Enablers and Results
C43	Process
C44	Impacts

*As shown on the matrices. Refere to "Criteria" Page for more information

Option*	Value
Equal	1
Marginally Strong	3
Strong	5
Very Strong	7
Extremely Strong	9

*Or, use 2, 4, 6, and 8 as Intermediate values to reflect

Sub-Criteria 1: Support

1.	Between C11 and C12	The Criteria	Enablers and Results	2	is considered	Equal	1	compared to	Support	#
2.	Between C11 and C13	The Criteria	Process	2	is considered	Strong	5	compared to	Support	1/5
3.	Between C11 and C14	The Criteria	Impacts	2	is considered	Strong	5	compared to	Support	1/5

Sub-Criteria 2: Enablers and Results

1.	Between C12 and C11	The Criteria	Enablers and Results	2	is considered	Equal	1	compared to	Support	#
2.	Between C12 and C13	The Criteria	Process	2	is considered	Marginally Strong	3	compared to	Enablers and Results	1/3
3.	Between C12 and C14	The Criteria	Impacts	2	is considered	Marginally Strong	3	compared to	Enablers and Results	1/3

Sub-Criteria 3: Process

1.	Between C13 and C11	The Criteria	Process	2	is considered	Strong	5	compared to	Support	1/5
2.	Between C13 and C12	The Criteria	Process	2	is considered	Marginally Strong	3	compared to	Enablers and Results	1/3
3.	Between C13 and C14	The Criteria	Process	1	is considered	Strong	5	compared to	Impacts	#

Sub-Criteria 4: Impacts

1.	Between C11 and C12	The Criteria	Impacts	2	is considered	Strong	5	compared to	Support	1/5
2.	Between C11 and C13	The Criteria	Impacts		is considered	Marginally Strong	3	compared to	Enablers and Results	1/3
3.	Between C11 and C14	The Criteria	Process		is considered	Strong	5	compared to	Impacts	#

Analysis

1. Decision Matrix

	C41	C42	C43	C44	mult
C41	1	1	1/4	1/5	0.39629
C42	1	1	1/4	1/2	0.47872
C43	4	4	1	3	2.18968
C44	5	2	1/3	1	1.16826
	11.00	8.00	1.83	4.70	

2. Priority Vectors

	C41	C42	C43	C44		Priority
C41	1/11	1/8	3/22	2/47	15/38	0.0987
C42	1/11	1/8	3/22	5/47	11/24	0.1147
C43	4/11	1/2	6/11	30/47	2 1/21	0.5118
C44	5/11	1/4	2/11	10/47	1 1/10	0.2748
	1.00	1.00	1.00	1.00	4.015	
					4.175	
					4.278	
					4.252	

3. Checking Consistency

		Limit	4.180
CR	0.066611	0.1	
Result:	Acceptable		

Vita

Ahmed Ali Al Ameemi was born in 1989, in Um Al Quwain, United Arab Emirates. He received his primary and secondary education in Al Dhaid – Sharjah, UAE. He received his B.Sc. degree in Civil and Environmental Engineering from the United Arab Emirates University in 2012. In 2017, he joined Government of Dubai, as Project Manager. In September 2015, he joined the Engineering Systems Management master's program in the American University of Sharjah.