An Assessment of the Decision Making Units’ Efficiency in Service Systems (The Case of Cellular Telecom)

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Most tools and models on performance and quality of service management are generic and do not solve the complex technical systems, which is the most critical component on the network and where these tools should be applied. The objective of this research is to assess the cellular performance and Base Transceiver Station (BTS) efficiency by proposing a robust model that is derived from multiple Key Performance Indicators (KPIs) based on technical and financial aspects. The novelty of this research provides a comprehensive multidimensional model for tuning the BTS parameters, which can lead to a development of a standard global mobile network KPI. The model measures the efficiency of BTSs and offers a reference set for inefficient BTSs. This creates guidelines for the network optimization engineers to improve inefficient BTSs by comparing their configurations with efficient BTSs to achieve a high level of network optimization. Thus, the analysis will help the decision makers focus on the right area and identify the most critical BTSs based on best practices.

### Literature Review

#### Table 1: BTS Research Focus Summary

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### Research Methods

#### Research Goal

- To develop a comprehensive model for BTS efficiency assessment based on multiple inputs and outputs.
- Identify the reference set of efficient BTSs.
- Evaluate the cellular network performance in a complex process.

#### Literature Review

- Adoption of weight restrictions for inputs and outputs to refine the priorities.
- Real implementation in a real case of inefficient BTSs based on research.
- This research aims to address how to improve the productivity and efficiency of the new way of service delivery.

#### Conclusions and Future Work

- Due to the increase in competition, the importance of quality of service and performance evaluation to improve the provider’s customer satisfaction should be taken into consideration more than ever.
- Mobile providers measure the BTS efficiency through a variety of KPIs, but the optimization and planning engineers are struggling to balance conflicting KPIs, to assess the priority of the BTSs.
- This research aims to address how to improve the productivity and efficiency of the units in a chain and develop a decision model to enable better decision making within the operation stage by learning best practices from efficient units, and identifying the reference set to improve the efficiency of inefficient units.

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**Abstract**

Most tools and models on performance and quality of service management are generic and do not solve the complex technical systems, which is the most critical component on the network and where these tools should be applied. The objective of this research is to assess the cellular performance and Base Transceiver Station (BTS) efficiency by proposing a robust model that is derived from multiple Key Performance Indicators (KPIs) based on technical and financial aspects. The novelty of this research provides a comprehensive multidimensional model for tuning the BTS parameters, which can lead to a development of a standard global mobile network KPI. The model measures the efficiency of BTSs and offers a reference set for inefficient BTSs. This creates guidelines for the network optimization engineers to improve inefficient BTSs by comparing their configurations with efficient BTSs to achieve a high level of network optimization. Thus, the analysis will help the decision makers focus on the right area and identify the most critical BTSs based on best practices.

### Introduction

- Service science is the study of service systems, which creates a basis for systematic service innovation.
- The goal of service science is to increase the productivity and efficiency of the service industry and creates greater tools for assessing the value of investments in service systems.
- Customer satisfaction is directly related to performance and services quality.
- It is very important to adopt a right tool to measure the productivity and efficiency of the new way of service delivery.

- Many daily life services are built on the availability and quality of telecommunication mobile service (Cylar and Minard 2014; Wh @ 2011).
- The mobile telecom industry has become one of the fastest growing sectors, and developing countries have been trying to keep up with the pace of these changes (Charola 2013; Casey 2014).
- Mobile operators should adopt assessment of service quality approaches to respond to an increasingly competitive environment of customer satisfaction (Harder et al. 2009; Oronso and Dada 2012; Lee et al. 2016).

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**Data Envelopment Analysis** is a nonparametric method that measures the efficiency of a series of Decision-Making Units (DMUs) using linear programming models (Charnes, Cooper, and Rhodes 1978).

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- Identify the reference set of efficient BTSs and provide recommendations to improve these BTSs.
- Conduct a real industry problem with technology management solutions.

#### Conclusion and Future Work

- Due to the increase in competition, the importance of quality of service and performance evaluation to improve the provider’s customer satisfaction should be taken into consideration more than ever.
- Mobile providers measure the BTS efficiency through a variety of KPIs, but the optimization and planning engineers are struggling to balance conflicting KPIs, to assess the priority of the BTSs.
- This research aims to address how to improve the productivity and efficiency of the new way of service delivery.

- The nature of the problem in this research requires a method that considers a variety of factors, and builds the evaluating model using multiple inputs and outputs. Therefore, DEA is employed as the methodology because it meets this purpose and can be used to generate a composite of efficiency, productivity, performance, and benchmarking measures.

- This research aims to address how to improve the productivity and efficiency of the units in a chain and develop a decision model to enable better decision making within the operation stage by learning best practices from efficient units, and identifying the reference set to improve the efficiency of inefficient units.

- Real implementation in a real case of inefficient BTSs based on research results.

- Adopting weight restrictions for inputs and outputs to refine priorities.