

Final Project 2

Assignment 2-Research Methodology

To

Faculty of Management
Midocean University

Project title

**Applying Cloud Computing and Solar PV to Improve
Energy Efficiency and Reduce Costs in University IT
Infrastructure**

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Chapter 3: Research Methodology

1. Introduction

1.1 General Overview

Global concerns over energy sustainability have prompted research into alternative, renewable energy sources like solar power. Similarly, the rise of information technology, coupled with escalating energy costs, underscores the need for energy-efficient solutions such as cloud computing. This study explores the convergence of these technologies to optimize energy consumption and operational costs at Al-Zaytoonah University.

1.2 Overview of Cloud Computing

Cloud computing offers scalable, on-demand access to computing resources, reducing the need for extensive on-site infrastructure and operational costs. This paradigm shift in IT management is crucial for institutions aiming to streamline operations while minimizing environmental impact.

1.3 Objective of the Present Work

The primary objective is to replace conventional power sources with a solar PV hybrid system and transition from traditional servers to energy-efficient cloud servers at the university's computer center. This approach aims to mitigate rising energy costs and enhance sustainability.

2. Operational Definitions for Research Variables

Operational definitions include:

- **Solar PV Hybrid System:** A combination of solar photovoltaic panels and the national grid, leveraging net metering for optimal energy use.
- **Cloud Computing:** Utilization of remote servers hosted on the internet to store, manage, and process data, reducing the need for local infrastructure.

3. Research Design (Research Onion)

The research design employs a structured approach:

- **Core Objectives:** Minimize energy costs and enhance sustainability.
- **Methodology:** Integration of solar PV systems and cloud computing.
- **Data Collection:** Quantitative analysis of energy consumption and cost savings.
- **Analysis:** Statistical evaluation of economic feasibility and environmental impact.

4. Research Population & Sampling Methods and Technique

The research focuses on the computer center at Al-Zaytoonah University:

- **Population:** Devices contributing to energy consumption.
- **Sampling:** Annual energy consumption data collected from devices to assess total power requirements.

5. Data Collection Method

Data was collected through:

- **Measurement:** Annual energy consumption of devices.
- **Cost Analysis:** Financial implications of current energy usage versus proposed solar PV and cloud computing solutions.

6. Types of Data

Data types include:

- **Quantitative:** Energy consumption metrics, financial costs.
 - **Qualitative:** Operational benefits of cloud computing versus traditional servers.
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7. Statistical Analysis Procedures

Statistical procedures involved:

- **Regression Analysis:** Predicting energy savings and payback periods.
- **Cost-Benefit Analysis:** Evaluating economic viability.
- **Comparative Analysis:** Contrasting conventional versus cloud server costs and benefits.

8. Conclusion

This study highlights the feasibility and economic benefits of integrating solar PV energy and cloud computing at Al-Zaytoonah University's computer center. By replacing conventional servers with cloud-based solutions and augmenting energy supply with solar PV systems, significant cost savings and environmental benefits can be achieved. The recommended hybrid system, combining solar PV and cloud computing, offers a payback period of 1.95 years, making it a sustainable and economically viable solution for the university.