

Redesigning the Building of Sharq El-Nile University's Economics and Administrative Sciences Faculty in Sudan: A Smart and Sustainable Campus Design

ABSTRACT

This thesis presents a comprehensive architectural study and redesign proposal for the Faculty of Economics and Administrative Sciences at Sharq El-Nile University in Khartoum Bahri, Sudan. The research addresses the campus's existing spatial, functional, and environmental deficiencies by developing a modern, sustainable, and culturally grounded academic environment that aligns with contemporary educational requirements. Through an integrated methodology that combines theoretical exploration, contextual and climatic analyses, case study reviews, and iterative design development, the study develops a design framework that is both contextually sensitive and environmentally responsive.

The findings highlight major challenges within the existing facility, including inadequate learning spaces, weak spatial organization, limited environmental control, and the absence of a coherent campus identity. In response, the redesign emphasizes passive cooling strategies, natural ventilation, daylight optimization, and building orientation to enhance thermal comfort and reduce energy consumption. Smart systems, renewable energy integration, and flexible learning spaces further strengthen the project's alignment with global trends in intelligent campus development. Culturally, the design draws inspiration from Sudanese architectural traditions, such as shaded courtyards, colonnades, and screened façades, reinterpreted in a contemporary manner to reinforce identity and climate adaptability.

The resulting proposal delivers a functional, aesthetically balanced, and environmentally efficient academic precinct that supports learning, interaction, and sustainability. Beyond addressing immediate operational needs, the study contributes to broader discourse on sustainable campus redevelopment in resource-constrained regions. The thesis concludes with practical recommendations for phased implementation, long-term sustainable management, technological integration, and future research to guide the successful realization and continuous improvement of the redesigned faculty.

Keywords: Sharq El-Nile University; Faculty of Economics and Administrative Sciences; architectural redesign; sustainable building design; educational infrastructure; spatial planning; smart technology integration; cultural heritage preservation; Sudan higher education; sustainable development

PREFACE

This thesis, entitled **“Redesigning the Building of Sharq El-Nile University's Economics and Administrative Sciences Faculty in Sudan: A Smart and Sustainable Campus Design,”** is submitted as part of the requirements for completing my academic program in architecture. The work presented here reflects both a scholarly investigation and a practical design exploration aimed at addressing urgent infrastructural challenges facing higher education in Sudan.

The research was motivated by the recognition that universities are not only centers of teaching and research but also environments that embody innovation, culture, and sustainability. In particular, Sharq El-Nile University's Faculty of Economics and Administrative Sciences has long served as a cornerstone of knowledge in Sudan, yet its outdated infrastructure has hindered its ability to meet the demands of contemporary education. This project seeks to respond to that challenge by proposing a comprehensive redesign framework that integrates smart technologies, sustainable strategies, and cultural identity.

The preparation of this thesis required extensive study of local conditions, critical analysis of global best practices, and creative engagement with architectural design principles. It has been both a challenging and rewarding process, made possible by the guidance, encouragement, and support of many individuals and institutions. I am deeply grateful to my supervisors for their valuable insights, to my colleagues for their constructive feedback, and to my family for their unwavering encouragement throughout this journey.

I hope that this thesis will contribute not only to the academic discourse on smart and sustainable campus design but also to the practical improvement of higher education infrastructure in Sudan. More broadly, I wish for this work to inspire further efforts in creating educational environments that are functional, resilient, and reflective of cultural identity, while remaining aligned with global sustainability goals.