

Abstract

Effective maintenance management is critical for laboratories in the field of education, where equipment reliability directly impacts educational quality, research output, and operational safety. This project aimed to analyze and develop an improved Maintenance Management System (MMS) for the Applied Engineering Laboratories at An Najah National University. The methodology involved data collection from multiple sources to support the analysis: semi-structured interviews with 5 key MMS roles, on-site observations and semi-structured questionnaire that was completed by all 18 laboratory technicians, representing the full population of direct and frequent users. Data were analyzed via SPSS and are presented in this report. The analysis revealed significant gaps. The lowest average score (3.06 on 5-point Likert scale) was recorded for the item questioning whether technicians receive sufficient training to operate machines and equipment. Furthermore, the second lowest average (3.11) was recorded for the item asking whether there are clear preventive maintenance (PM) plans, confirming a predominantly reactive maintenance culture. To address these gaps, we recommend centralizing maintenance operations and implementing a Computerized Maintenance Management System (CMMS). A pilot was conducted, with three Industrial Engineering laboratories under Program was chose and fully deployed into Smart CMMS, enabling tracking, scheduling PM plans and generating analytical reports on equipment downtime and maintenance costs, providing crucial data for budget justification and strategic planning. Proper use of the equipment prolongs equipment life, and increases efficiency. We also propose using EON-XR platform to offer standardized, immersive, and archived training for staff. Together, these solutions are designed to improve technician competence, transition maintenance to a proactive model, and increase longevity and efficiency.