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RAMS IN TRANSPORTATION SYSTEMS: A HUMAN-CENTRIC APPROACH

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Summary: Reliability, Availability, Maintenance, and Safety (RAMS) is one of the most critical Key Performance Indicators (KPIs) in transportation systems. With RAMS, various transport-related challenges can be addressed, ranging from schedule optimization to fleet management. Today, new challenges have emerged in assessing public transportation systems. In the context of Industry 5.0, a human-centric approach to addressing everyday challenges is essential for innovating existing systems. With innovation as its main objective, this PhD project aims to tackle and adapt specific transport-related case studies using novel methods that incorporate RAMS within a human-centric approach. The first case study focuses on multimodal transport hubs. It addresses the Reliability and Availability of public transportation services in two Portuguese transport hubs. The impact of schedule synchronization and rescheduling on hub users is assessed at the Ermesinde (Porto) and Cais do Sodré (Lisbon) hubs. A human-centric approach is achieved by installing people-counting sensors, which gather data to identify passenger flows within the hubs and transfers between different services. Factors such as weather conditions, time periods (e.g., months and days), and disruptions like strikes are analyzed. The ultimate goal of this case study is to adapt schedule optimization models and the rescheduling decision-making process to better meet the needs of users, rather than focusing solely on operators. The second case study introduces a new Maintenance management strategy for a Bike Sharing System. This strategy emphasizes user feedback and service evaluations to better predict fault occurrences. The final stage involves defining a predictive maintenance strategy combined with personalized vehicle allocation. Users will be encouraged to use specific bicycles based on their travel patterns, thereby facilitating bicycle relocation to stations near maintenance workshops or areas with higher vehicle collection needs. The third case study addresses the critical issue of railway suicides. Historical data is analyzed to develop mitigation strategies for this serious problem. These strategies will be based on the identification of relevant profiles, high-risk locations, and seasonal patterns. This case study is conducted in close collaboration with the Portuguese National Safety Authority and other key stakeholders. The strategies developed across these three case studies represent significant improvements for both users and operators of modern transportation systems.