# IMPLEMENTATION OF ERTMS SYSTEM FOR MALAYSIAN RAIL NETWORK – AN INTRODUCTION

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**ABSTRACT:** Technology development in the railway signalling and train control systems discipline has provided many advantages to modern railways operation. This has produced better operational performances, increased services handling capacity, maintenance flexibilities and greater safety element improvements. Malaysia is a country where the rail network serves as also an economic spine for the nation which connects major cities, ports, tourism areas and places of interests which value adds from the socio-economic benefits of the rail network development itself. The Malaysian national rail network, operated by Keretapi Tanah Melayu Berhad (KTMB), spans over 1,700km across the country covering most of the east and west coast of the peninsular. The network has undergone vast upgrading via transformation from a single line non-electrified network to a double track electrified network. In order to perform better, its timely for the Malaysian Railway Network to apply European Traffic Management System (ERTMS) control management system in its services. This will surely increase the efficiency as well as the productivity of the railway network of the nation.

**Keywords:** *railway signalling, ERTMS, national rail.*

## 1. INTRODUCTION

The principal activities of KTMB are to operate railway transportation and the provision of related railway services in Peninsular Malaysia In the history of 135 years, KTMB has undergone a revolution from conventional to modern train which is from diesel locomotive to modern electric train. In 1995, the first electric train namely KTM Komuter was introduced in Klang Valley area. The Electric Train Service (ETS) was introduced in 2010 for services between Kuala Lumpur (KL) Sentral and Ipoh. In 2015, the KTM Komuter was introduced in the Northern sector from Ipoh to Padang Besar and Southern sector from Seremban to Gemas. ETS Services has been extended up to Padang Besar after the completion of electrified double-track Ipoh – Padang Besar in 2014. ETS service is expected to be extended to the South upon completion of the Electrified Double Tracking Project from Gemas to Johor Bahru targeted in 2024. This milestone indicates a major point in KTMB history as the complete infrastructure for the electric train service will be available from North to South of the peninsular Malaysia.

To accommodate the continued increase in demand, additional capacity in the railway is required, which would mean that there will be an increase in the capacity of the system [1]. This necessitates the railway sector making the best possible use of available capacity, often by running extra trains on current infrastructure, while attempting to maintain acceptable standards of performance, such as punctuality and, most importantly, safety [2]. Conventional ways of delivering the expected network service demand through the construction of new railway infrastructure in future will be highly disruptive, very costly, and possibly unachievable. As has been shown elsewhere internationally, the introduction of emerging technology, along with targeted traditional initiatives, is a cost-effective way of releasing substantial additional capacity into the current network.

## 2. METHODOLOGY

This research uses a combination of mixed-method using convergent design to answer the feasibility of ERTMS implementation in the Malaysian railway network. The triangulation framework used for this research is as illustrated in Figure 1 below.

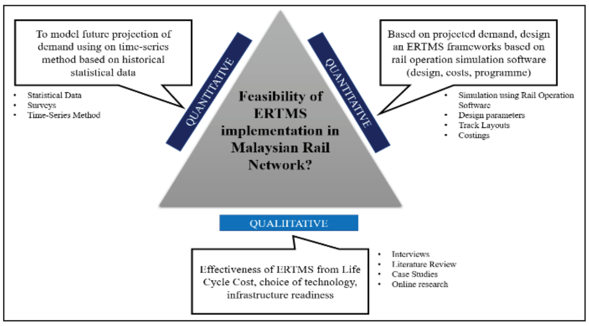


Figure 1: Convergent Research Method Design

The convergent design in a mixed-method study uses both quantitative and qualitative methods to verify or answer the research question.

### 2.1 Demand Forecasting using Auto-Regressive Integrated Moving Average (ARIMA)

Accurate prediction of the future demand is an critical element to frame the intelligent transportation systems [3]. For this research, statistical data from KTMB's past ridership and demand will be used to model the future demand projection using the Auto Regressive Integrated Moving Average (ARIMA) method. The AR section of ARIMA model expresses that the evolving variable is regressed on its own prior values [4]. ARIMA is a time-series forecasting method that produce forecasts based on solely historical values.

**2.2 Railway Operation Simulation**

The simulation platform is a cutting-edge contemporary experimental methodology that can assist dynamic infrastructure design systems and all operations associated with them [5]. The simulation framework will be created to allow for comprehensive infrastructure, schedule, and vehicle usage planning for a variety of variants and alternatives using the ERTMS architecture for KTMB network. Simulation modeling is one of the tools for assessing capacity (throughput performance), traffic efficiency, and reliability on railway lines [6]. The advantage of simulation is that the model can fully include all specific operating intervals for each variant of the possible routes of all trains.

**2.3 Expert Judgement and Interviews on effectiveness of ERTMS and Life-Cycle Costs**

The literature review and interviews with technical experts on the subject will identify the minimum requirement of technical infrastructure required for the ERTMS implementations, the level of systems capacity handling, the effectiveness of the ERTMS system from the life cycle cost (LCC) perspective, and choice of technology. The data analysis from all the qualitative and quantitative data gathered will assist in the result of the study.

**3. Expected Results**

(i) ERTMS implementation in the Malaysian railway network will provide an advantage in terms of increased network capacity, digital railway environment for efficient O&M activities, and safer travel. It is expected that significant improvement in capacity will be achieved using the ERTMS / ETCS Level 2, as illustrated in Figure 2 below.

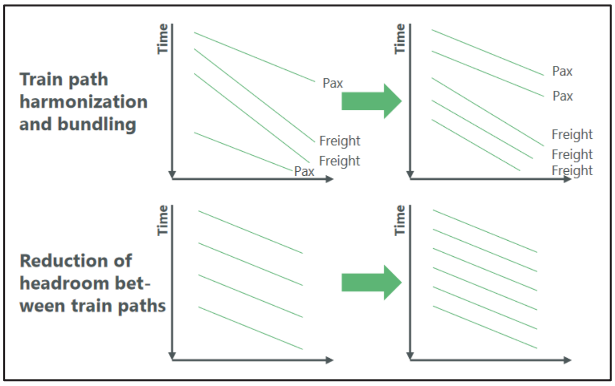


**Figure 2: Sample Expected Increase Capacity and Improved Headway Result**

(ii) ERTMS implementation will result in lower OPEX for the Life Cycle Cost of the signalling system. Lesser number of trackside components leads in cost savings, particularly with ERTMS Level 2 (since lineside signals are no longer necessary)

(iii) Will provide future references on the Costing database, layouts, migration plan and master programme proposals for the implementation of the ERTMS Level 2 for KTMB network from Padang Besar to Johor Bahru Line.

**4. CONCLUSION**

The research is focused on evaluating the feasibility of the ERTMS implementation in Malaysia rail network. Based on the expected findings, proven case studies and practical implementation in other global railways outside Malaysia, ERTMS solution could provide multiple benefits for the operation of the railway locally here in Malaysia. Benefits from economical appraisals, safety and improvisation in capacity could result the railway in a more business sustainable status and would be able to provide better services to the passenger and freight services.

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