

Cost estimation methods for internet infrastructure deployment in Rural Sarawak: a review

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ABSTRACT

In rural Sarawak, the internet accessibility is low due to unreliable power grids to support telecommunication network and large geographical area. The risk for network infrastructure implementation is high for Internet Service Provider (ISP), thus more practical and accurate cost estimation methods should be used. This paper reviews different types of cost estimation methods and the accuracy and feasibility of each methods are discussed and compared for network infrastructure implementation in rural Sarawak. The unique characteristics of rural Sarawak are considered in this work, including the topography, development of rural areas and acceptance of new technologies. Different cost estimation methods are identified for different scenarios and availability of data.

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1. INTRODUCTION

The Malaysia government promised to improve the internet penetration rate in the country surpasses 90% in 2020 [1]. The leading telecommunication infrastructure company in Sarawak will construct 600 telecommunication towers in 2019 to improve the network penetration in Sarawak [2]. This will be the first phase of 5000 telecommunication towers that Sarawak government intends to build in Sarawak. Sarawak government also inked Memorandum of Understanding (MoU) with a few global companies to strength the digital transformation of Sarawak. With fast improving internet technologies, the digital divide between rural area and urban area is still a critical issue all around the world. With current high-speed internet connection, rural area seems disconnected from our society and unable to enjoy the benefits from high-speed internet.

The main factors that hinders internet connectivity in rural areas are the high installation and maintenance cost, low population density, urbanization, lack of resources and challenges in transportation [3]. With current internet technologies, rural can have potential to obtain some benefits including promoting literacy, improving health care, reducing market inefficiencies, increase government transparency and enabling environmental monitoring. There are some wireless technologies such as Wi-Fi, WiMax, LoraWan and TV White Space. The maximum range of outdoor transmission for Wi-Fi is low and only can be enhanced by using stronger directional antennas. This will indirectly affect the infrastructure cost of the network implementation. The WiMax technology requires high amount of sub-towers to extend the network coverage which result in high implementation cost. LoraWan that utilizes the license-free ISM band for rural connectivity but they have slower data transfer rate and requires stronger line-of-sight link [4]. TV White Space technology utilizes the unused TV band for data transmission. The TV White Space technology has high range of transmission with limited bandwidth.