The Leading Practices of Green Mobile Telecommunication Base Station Design

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ABSTRACT

The aim of this study is to identify the green mobile telecommunication base station design practices as adopted by leading cases, four cases were analyzed; Ericsson, ZTE, Huawei, and Bharti. The data were collected from the published data. This study reveals that; the design attributes could be classified to; primary and secondary design attributes. A lot of relationships are reported between the design attributes. This study helps the academics in understanding the relationship between design attributes and actions, so they can use the reported model of this study for teaching purposes or for further extended survey study. The base stations developer and mobile communication services providers have a good insight about the sustainable design alternatives. The green operations practices are still new and the research contribution is limited, the research contribution of green mobile telecommunication base station design is very limited.

Keywords: Air Conditioning, Base Station, Bharti, Capacity, CO₂ Emissions, Coverage, Design, Energy Consumption, Ericsson, Green Design, Green Energy, Huawei, Installation Time, Maintenance Cost, Operating Cost, Telecommunication, ZTE

1. INTRODUCTION

Mobile telecommunication base stations have been a crucial telecommunication technology spread everywhere as a result of wider use of mobile phone communication. The telecommunication industry consumes a large amount of energy as reported by some telecommunication social responsibility reports, further some operators are listed as the largest energy consumption in their countries, as more and more industries introduces more ICT the situation will get worse. More local and international pressure on the telecommunication operators and equipment vendors will increase in the future (Huawei 2011), accordingly, the developers of base stations have concerned about the green initiatives; the CO₂ emissions over the product life cycle are traced and different actions have been made (Lu 2008; Jianguo et al., 2008). One of these important actions made is the green design of base stations; system developers have made a lot of actions to reduce the energy consumptions, improve the using of green energy and reduce the need air

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conditioning of base stations. The concern about the green design of base stations is reasonable since the energy consumption of radio sites usually accounts for more than 75% of the energy consumed during the telecommunication process (Huawei 2011).

The majority of green product design previous studies have concerned about the process of green product development instead of reporting the attributes and actions (e.g. Wimmer et al., 2008; Bard et al., 2011; Lamore 2011; Cagno and Trucco 2013), further, the studies of green supply chain management practices have not reported in-depth the relationship between design attributes and between design attributes and actions (e.g. Zhu et al., 2005; Zhu et al., 2010; Green et al., 2012; Perotti et al., 2012; Shi, et al., 2012; Lee et al., 2012), accordingly, this study decided to report in-depth the green mobile telecommunication base stations design attributes and actions, to realize this aim the following objectives were realized.

1. Identifying the base stations design attributes.
2. Identifying the relationship between the base station design attributes.
3. Identifying the green design actions are made to realize the base station design attributes.

This paper is organized as follows; the second section discuss the literature and represents the research contributions, the third section represents and discusses the research methodology, the next section is data analysis and findings, the fifth section is the discussion and the last section is the conclusions applications and future researches.

2. LITERATURE REVIEW

The concept of design for environment is a new concept, according to this concept the product has not a negative impact on the ecological environment, whether the product is used by customers or when the product is used and disposed, according to this concept, the product could be made from ecological components, which are disposed in the ecological environment without negative consequences, or the hazardous materials are eliminated from the product, or the product is easy to disassembly for recycled or remanufactured, the product size and weight could be reduced; further, the product consumes less energy during usage, or the product emission less greenhouse gases (Zhu et al., 2005; Zhu et al., 2010; Green Jr. et. al., 2012; Perotti et al., 2012; Shi et al., 2012; Lee et al., 2012), design for environment is a critical success factor in a green supply chain management strategy and can help firms realize economic benefits (Shi et al., 2012).

The studies have investigated the green product design focused mainly on the process of green product development; for example one of these studies decided to investigate how to develop eco-products using Eco-design approach (e.g. Wimmer et al., 2008), another study has developed a new design tool for green product development process which is called “Integrated Green and Quality Function Deployment” (IGQFD) (Cagno and Trucco 2013), moreover, another study focused on developing a methodology which guides the decision makers toward a superior balance between quality, cost, environmental issues in product design (Bard et al., 2011), also a new process of product development which combines both the market requirements and social responsibilities toward stakeholders have been developed, this process is called “Green Ocean” (Lamore 2011), another study have developed an ecodesign product and the performance of this product is evaluated by using product life cycle assessment approach (Schneider et al., 2008).
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