The current adoption and future use of RFID tags

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The adoption of technology depends on the perceived value of the technology to the business. Radio Frequency Identification (RFID) technology, a contactless and short distance wireless communication, has been adopted across a spectrum of retailers and retail merchandise, particularly since 2003 when Wal-Mart instituted requirements to their top 100 suppliers to start using this technology (Malone, 2012). Retail merchandisers from the first introduction of item level RFID and supply chain management requirements to vendors and within stores at Wal-Mart have seen the benefits and challenges of adding RFID technology. Modern RFID sensors, specifically for retail, are made with a high memory capacity that is superior to a typical barcode. Store level RFID has improved with newer label readers for stacks of garments, improvements to identify inventory outages and mapping the stores to improve store merchandise placement (Rizzi & Volpi, 2017).

Retailers, however, have not been adopting RFID technology as fast as expected (Bhattacharya & Fosso Wamba, 2015). Early adopters of the RFID chip experienced some push back from consumer privacy concerns and, even with improvements, there continues to be privacy issues. Primary concerns included how portable readers may be scanning RFID tags on clothing, credit cards and items in homes. Newer concerns include how RFID may be transmitting information while wearing garments.

In response to these RFID privacy concerns textile industries have created special fabric for consumers to block the sensor signals. RFID is continuing to evolve and become more widely acceptable as the microscopic chips are now embedded in the yarn/thread for military contractors, healthcare industry and sportswear manufacturing (Dias, 2015). New technology can be sealed inside resin micro pods within yarns and the fabrics with embedded RFIDs can survive through washing and drying without losing their functionality. Similar to the RFID devices now used in bank cards for contactless payments, the tiny chips, one millimeter by 0.5 millimeter in size, can contain all the information which is usually communicated via barcode (Dias, 2015). The purpose of this study was to explore the current and future use of RFID tags in retail stores.

This research explored RFID use in retail stores. National retail chains, department stores, specialty stores, and discount stores were visited to examine RFID types in current use and collect information. Information found in the company reports was utilized to analyze final results. An invisible RFID manufacturer provided a RFID yarn catalog to understand the functions and clothing to inspect. A total of 100 RFID labels were collected from six retail stores. Six categories of RFID devices were divided as tags, yarn, cards, keys, chips, and stickers. All retail stores visited had at least one of five (tags, cards, keys, chips, and stickers)

categories of RFID. No yarn embedded devices were identified in any retail store. National retail chain stores and department stores were found to have standard RFID cards and chips. Specialty stores are more likely to create decorative hang tags to give RFID a more luxurious appearance. Perfumes and aroma items adopted packages with chips inside of the box. For some expensive items, there were double keys or card and key combination.

As the RFID embedded yarn is invisible, a manufacturer of luxury items was contacted and, in this discussion, it was stated that many luxury items currently use the invisible RFID technology (Chiang, 2018). This technology has been instituted to reduce theft issues and maintain a high-end appearance for the luxury items (Sabbaghi & Vaidyanathan, 2008). While we cannot ascertain exactly all the luxury brands which use this technology, in our study it was noted the lack of identifiable RFID tags on the higher end items.

This study found the adoption of RFID includes larger models types as well as smaller/micro models and from visible to invisible. RFID tags or labels are easy to find at a variety of merchants regardless of the size of the RFID device. RFID has gained the trust of retail stores and has successfully lowered inventory loss in retail stores (Chiang, 2018). However, the difference between invisible RFID clothing and non-RFID clothing cannot be detected by sight or touch. The use of RFID is one of the solutions to stop theft and counterfeit issues for luxury products. The trend for adoption of RFID has spread to many industries, such as footwear, oil industry, health care, hospital, food industry, warehouse management, textile/fabric production pipeline, and recycled textile management (LeBlanc, 2018).

The future of RFID is rapidly changing as RFID has the potential to change the retail, textile, health and sportswear industries by using it to track items throughout the sourcing chain until final disposal. This yarn/thread has the ability to be an environmentally conscious solution for the apparel industry that produces and disposes of over two billion pounds of textiles each year (LeBlanc, 2018).

RFIDS tags are also being used to allow customers to pay for their purchases by themselves using RFID sensitive tables and iPads. Dressing rooms now can identify what item is brought in and a screen in the room lets the customer know what sizes and colors are available. At Burberry, RFID tags tell the story behind their garments as their tags communicate with consumer's phones and give information where the products were produced or recommend wearing options. With this wide variety of uses, increased information and ease of shopping, retailers will develop new uses for RFID tags in the future. Knowledge of this innovative textile and uses of the RFID tags/labels and yarns are imperative for advanced research on textile, supply chain management and for disposal/recycling of textile waste. Quick and accurate information communication technology will be a major contribution in improved inventory management, payment system, traceability of order, communication with customers and employees which has key role in retailer supply chain operations. Future research is needed to apply open innovation strategies in the framework of the current study.

References

Bhattacharya, M. and Fosso Wamba, S. (2015). A Conceptual Framework of RFID Adoption in Retail Using TOE Framework. *International Journal of Technology Diffusion (IJTD)*, 5(1), 1-32. DOI: 10.4018/IJTD.2015010101

Chiang, M. (2018). Personal interview in the COMPUTEX Taipei. Researcher of Taiwan Textile Research Institute.

Dias, T. (Ed.). (2015). *Electronic textiles: Smart fabrics and wearable technology*. Woodhead Publishing: The Textile Institute.

LeBlanc, R. (2018). Textile recycling facts and figures. Retrieved from: https://www.thebalancesmb.com/textile-recycling-facts-and-figures-2878122:

Malone, M. (2012, Feb.14). Did Wal-Mart love RFID to death? Retrieved from: https://www.zdnet.com/article/did-wal-mart-love-rfid-to-death/

Sabbaghi, A., & Vaidyanathan, G. (2008). Effectiveness and efficiency of RFID technology in supply chain management: strategic values and challenges. *Journal of theoretical and applied electronic commerce research*, *3*(2), 71-81.