Business Horizons (2012) xxx, xxx—xxx

Available online at www.sciencedirect.com

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Technology designed to combat fakes in the global supply chain

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KEYWORDS
Anti-counterfeiting technology;
RFID;
IoT;
Authentication technology;
Trace and track technology;
Supply chain

Abstract With the increase of globalization in trading and online shopping, phony products are on the rise in the market. This article introduces a range of technologies that have been implemented in the supply chain to deter counterfeiters. Technology for both product authentication and tracing and tracking products in the supply chain will be discussed, along with the advantages and disadvantages of each solution. Additionally, success stories on combating counterfeits are introduced. Finally, issues related to rising anti-counterfeiting costs, collaborative efforts in fighting fakes, and a multi-pronged plan are explored.

1. Safeguarding authentic products and keeping companies from unfair competition

With the increase of globalization in trading and online shopping, the amount of counterfeit goods and fake products has skyrocketed. According to CBS News' Bob Orr, on May 4, 2012, the U.S. Justice Department shut down several websites that sold fake sportswear. The law enforcement agency also indicated that it seized $1.5 million in illegal revenue ("The Battle," 2012). In 2011, U.S. Customs officers confiscated more than $1 billion in phony handbags, sportswear, electronics items, and the like.

The monetary loss from counterfeit and piracy products is enormous. In 2009, the Chief Marketing Officer (CMO) Council conducted a survey on brand infection protection. The CMOs that responded believe that the financial impact of counterfeiting, piracy, and cyber-fraud products cost the U.S. economy alone between $200 and $250 billion per year (CMO Council survey, 2009). The estimated cost of counterfeiting for the world economy is $700 billion annually ("The Battle," 2012). Though this number sounds enormous, it does not reflect the whole story; many of the hidden costs are difficult to estimate because U.S. ports handle an average of 2.5 million import containers each year, and phony products are mixed in with legitimate cargo.

Counterfeiting is a byproduct of the growing global dynamic markets and supply chain. According to a report issued by the International Chamber of

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0007-6813/$ — see front matter
http://dx.doi.org/10.1016/j.bushor.2012.11.010

Commerce (ICC) Counterfeiting Intelligence Bureau (2005), counterfeiting is a critical issue in today's global supply chain. As markets have become more global, business competition has evolved from a firm-versus-firm race to a supply chain-against-supply chain battle and a wrestling match between lawful manufacturers and counterfeiters. For many companies around the world, fighting fraudulent products is a large and growing challenge (Berman, 2008; Chaudhry, 2006; Chaudhry, Chaudhry, Stumpf, & Sudler, 2011; Chaudhry, Zimmerman, Peters, & Cordell, 2009). Faking products has developed into an existential threat to the rights of both businesses and consumers. This threat calls for anti-counterfeiting technology to safeguard authentic products and keep companies from unfair competition.

2. Anti-counterfeiting technology: Ways genuine products beat out fakes

The purpose of applying anti-counterfeiting technology is to protect brand names, suppliers' reputations, and public safety. In general, anti-counterfeiting technologies should be easily applied but difficult to imitate. These technologies usually have four main features: (1) difficult to duplicate or forge, (2) easily identifiable visually without the need of special equipment, (3) hard to re-label or reuse, and (4) easily noticeable when tampered with. Counterfeiting devices are applied in supply chains by many industries, such as apparel, office supplies, optical lenses, mineral water, automotive parts, machinery tools, sporting goods, electrical fittings, food and drug products, home appliances, jewelry, watches, books, video, audio CDs, and others.

There are a range of anti-counterfeiting technologies available to authenticate products or packaging, as well as to trace and track products in supply chains. All these technologies aim at detecting fake products or deterring counterfeiting. Some anti-counterfeiting technologies are low cost and user friendly, while others are highly sophisticated and expensive. Table 1 categorizes currently available anti-counterfeiting technologies into two areas: technology for product authentication and technology for tracing and tracking products as they move through supply chains. Technology for product authentication is used to determine whether a product is in fact what it is declared to be, whereas technology for tracing and tracking products includes technologies like electronic product codes (EPCs) and radio frequency identification (RFID) to follow products as they move through supply chains (Li, 2011; Li, Ge, Zhou, & Valerdi, 2012; Li, Xu, Wang, & Wang, 2012; Power, 2008; Qian, Jin, & Fang, 2011; Ting & Ip, 2012; Xu, 2011a, 2011b).

2.1. Authentication technology

Anti-counterfeiting technologies can be used to identify authentic goods from phony items. At present, a range of anti-counterfeiting technologies—including watermarks, holograms, color-shifting ink, security thread, micro-printing, anti-forgery ink, barcode technology, holographic technology, physical security technology, packaging protective technology, biological anti-counterfeiting technology, and latent image decrypt anti-counterfeiting technology—exists to protect product authentication.

2.1.1. Overt technology

Under the product or packaging authentication area in Table 1, there are two types of major technologies: overt and covert (Power, 2008). Overt technology is visible, making it easy for users to authenticate products. The major advantages of overt technology include product verification by users and improved security. The possible downsides of overt technology include user training, potential imitation and reuse, and possible false assurance. Moreover, overt devices require high security commitment on the supplier side and appropriate disposal procedures on the user side to avoid unauthorized use or reuse. As such, overt technology can increase the cost of production. Additionally, genuine overt features can be faked by counterfeiters to confuse average customers.

Covert technology, on the other hand, is hidden and invisible. Covert devices enable the producer or the brand owner to identify counterfeited products. Covert technology is controlled, and only those who have administrative responsibility have access to the details. Customers are neither able to detect nor verify covert devices' presence. The advantages of covert technology include low implementation costs, no need for regulatory approval, easy upgrading or addition, and flexible implementation by either the device supplier or the manufacturer. The potential downsides of covert technology include easy imitation if widely applied, increasing cost if more security options are required, and risk of compromise if the device is solely administered by component suppliers.

Some popular overt technologies used in supply chains are holograms, color-shifting ink, security thread, watermarks, and sequential product numbering. Many of these technologies are suitable for anti-counterfeiting packaging, and some can be integrated into the product using chemical or physical markers as well. Overt holograms are not only