



Building **R**adio frequency **I**Dentification for the **G**lobal
Environment

Problem-Analysis Report on Counterfeiting and Illicit Trade

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BRIDGE (**B**uilding **R**adio frequency **I**dentification for the **G**lobal **E**nvironment) is a 13 million Euro RFID project running over 3 years and partly funded (€7,5 million) by the European Union. The objective of the BRIDGE project is to research, develop and implement tools to enable the deployment of EPCglobal applications in Europe. Thirty interdisciplinary partners from 12 countries (Europe and Asia) are working together on : Hardware development, Serial Look-up Service, Serial-Level Supply Chain Control, Security; Anti-counterfeiting, Drug Pedigree, Supply Chain Management, Manufacturing Process, Reusable Asset Management, Products in Service, Item Level Tagging for non-food items as well as Dissemination tools, Education material and Policy recommendations.

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This document:

This report will provide a problem analysis of product counterfeiting and illicit trade as a first step towards making use of the potential of networked RFID technology to counter the problem of illicit trade.

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1 Introduction

Counterfeiting and product piracy constitute a serious and ever growing problem against legally run businesses and owners of intellectual property rights. Counterfeiting is not specific to any industry but it affects a large number of sectors such as the music, software, and luxury goods industries, and also pharmaceutical industry, automobile industry, fast moving consumer goods industry, and toys. According to the International Chamber of Commerce, “[c]ounterfeiting and piracy are growing exponentially in terms of volume, sophistication, range of goods, and countries affected - this has significant negative economic and social impact for governments, consumers and businesses [...]”

Product counterfeiting has many victims: Different kinds of counterfeit products threaten the health and safety of end-users and consumers, sometimes with the most serious consequences. Legally run businesses and governments are affected by a number of direct and indirect economic losses which decreases the welfare of affected societies. By understanding and continuously surveying the problem and available countermeasures, however, companies can protect their products and mitigate the negative impacts and ensure the safety of consumers. In addition, alongside with the development of technologies that enable counterfeiting on an industry scale, technology also allows for novel countermeasures. Most importantly, mass-serialization is changing the way product information is managed by giving unique identities to individual items. One implication of this higher level of information granularity is that the physical security of products can be improved in terms of novel anti-counterfeiting techniques, as well as with the detection of illicit trade activities.

The potential of RFID and the EPCnetwork in enabling these novel anti-counterfeiting and anti-fraud techniques is well recognized. Even though it seems that there will never be one silver bullet solution against illicit trade, industries and academia see mass-serialization among the most promising single countermeasures. There are two major reasons for using EPCnetwork technology in anti-counterfeiting: First, RFID allows for new, automated and secure ways to efficiently authenticate physical items. Secondly, as many companies invest in networked RFID technology for varying supply chain applications, the item-level data will be gathered in any case – so why not using it to find counterfeit products? This report will provide a problem analysis of product counterfeiting and illicit trade as a first step towards making use of the potential of networked RFID technology to counter the problem of illicit trade.

1.1 Motivation and goals of this report

Different sides of the problem of illicit trade are partially addressed in existing literature, but complete industry and problem wide analysis that systematically takes into account all aspects of the problem and different industry branches does not exist. This report will first of all support research and development of counter measures within the BRIDGE project, but also practitioners and academics working in the field in general. The goals of this report are to give an overview of different aspects of the problem of illicit trade, to present the dangers of counterfeit goods, to define terminology so that the problem can be formally addressed, to

present the drivers and enablers behind counterfeit trade, and to study the structure and extent of the problem. This report will also present counterfeiting scenarios in different industry branches to provide valuable input for the design of industry specific countermeasures. Finally, understanding the trade with counterfeit goods will serve as input for the development of models quantifying the economic impact of various aspects of illicit trade, which will be covered in greater details in the adjacent research project SToP.

1.2 Methodology

To achieve the abovementioned goals, the following methodology was adopted: The first stage was to review available literature that covers the topic. As a second stage, we conducted in-depth interviews with experts from different companies in order to acquire industry specific information, as well as to validate information from the literature. These interviews were semi-structured and the used interview guideline can be found in the appendixes of this report. The interviews were conducted either face-to-face or over the telephone. The interviewed companies were chosen from the following six industry segments: IT, automotive, life sciences and pharmaceutical, aerospace, luxury goods, and consumer goods and retail industry.

1.3 Structure of this report

This report is organized as follows. Section 2 provides an overview to the various problems of illicit trade and defines the used terminology. We evaluate the structure and dimensions of counterfeiting, its drivers and enablers, roles of different actors in counterfeit trade, and present what dangers counterfeit goods present to consumers and end-users. Also the distribution channels and grey market are discussed. Section 3 provides the industry-specific part of the analysis. It presents counterfeiting scenarios in the chosen industry segments and is based on industry-specific literature and expert interviews. Section 4 presents a qualitative analysis of the impact of illicit trade on companies, societies and consumers. Section 5 concludes this report.

2 Aspects of counterfeiting and illicit trade

This section provides an overview to counterfeiting and illicit trade. First we define the used terminology in subsection 2.1. In subsection 2.2 we present the background on counterfeiting. We present estimates on its extent, describe its drivers and enablers as well as the roles of different actors, and expose the dangers of counterfeit goods. After giving an overview of existing approaches to anti-counterfeiting in subsection 2.3, we describe the distribution channels of counterfeit goods and the grey market in subsection 2.4. Concerning distribution channels and grey market, the focus is on analyzing enablers and the roles of different actors in order to find general mechanisms. The section ends with a summary of findings.

2.1 Terminology and scope

Throughout this study we define a counterfeit product as follows:

A counterfeit product is any good that bears without authorization a trademark which is identical to a validly registered trademark or which cannot be distinguished from such a trademark.

This definition is in accordance with the TRIPs Agreement¹ (Agreement on Trade-related Aspects of Intellectual Property Rights), which states that:

- “Counterfeit trademark² goods” shall mean any goods, including packaging, bearing without authorization a trademark which is identical to the trademark validly registered in respect of such goods, or which cannot be distinguished in its essential aspects from such a trademark, and which thereby infringes the rights of the owner of the trademark in question under the law of the country of importation.
- “Pirated copyright³ goods” shall mean any goods which are copies made without the consent of the right holder or person duly authorized by the right holder in the country of production and which are made directly or indirectly from an article where the making of that copy would have constituted an infringement of a copyright or a related right under the law of the country of importation.

We define **illicit trade** as the generic term to refer to all problems, crimes, and contract breaches, which will be presented in this subsection. It comprises manufacturing of and trade with counterfeit and pirate goods, as well as grey and black market activities. Such general term is useful to include all the aspects of the problem. In many reports and trade statistics,

¹ www.wto.org/english/tratop_e/trips_e/trips_e.htm

² **Trademark** protection can apply to brands, names, signs, symbols, and, within a defined application area, even to colors, smells, sounds and shapes. Almost any distinctive feature attached to a product can be protected as a trademark. In most countries, a trademark has to be registered for use with specific goods or services in order to be protected. Several international agreements on trademark protection exist. The most important are the Paris Convention for the Protection of Industrial Property (1883, www.wipo.org/treaties/en/ip/paris/), the Trademark Law Treaty (1994, www.wipo.org/treaties/en/ip/tlt/), and the Agreement on Trade-related Aspects of Intellectual Property Rights (the TRIPs Agreement) (1994, www.wto.org/english/tratop_e/trips_e/trips_e.htm).

³ **Copyrights** exist to encourage the production of original artistic, literary, and musical creations from books and paintings to movies, recordings and software. Copyright law allows the copyright holder to control certain uses of his work. These uses typically include reproducing, distributing, renting, broadcasting, and translating or adapting the work. Several international agreements on copyright protection exist. The TRIPs Agreement (1994) is the first multilateral trade-related intellectual property agreement.

no clear-cut definition of product counterfeiting, piracy, or illicit trade is given or applied. In this report we define the terminology in order to separate product counterfeiting from – partly legal – grey market activities.

Even though technically and throughout this study the English term “counterfeiting” only refers to specific cases of trademark infringement as explained above, in practice the term often encompasses any manufacture of a product that so closely imitates the appearance of another so as to mislead a consumer. Hence, it may in some cases also include the unauthorized production and distribution of a product that is protected by other intellectual property rights, such as copyright and related rights. Also the term “fake” is often used in practice when refer to different kinds of intellectual property rights (IPR) infringements and imitation of original products to mislead a consumer. Even though we avoid the use of term “fake” in this report to avoid impreciseness, is used in many references and relating literature.

It is important to note that products that are manufactured as **factory overruns**, that is when an outsourced manufacturer exceeds the production quantity allowed by the licence with the right holder, are legally considered counterfeits because they bear the trademark without permission of the right holder. In other words, in this particular case, a counterfeit product can be of same quality as the original, genuine product. This emphasizes the fact that counterfeiting is above all an infringement of intellectual property rights which is a criminal act as such. Moreover, different types of IPR infringements often overlap. Music piracy, for example, infringes copyright as well as trademark protection. Counterfeit toys are often sold under a different name but infringe the design protection of the toy. Even in cases where there is no trademark infringement, the evolving factual problems and subsequent legal issues often bear a close resemblance to cases of counterfeiting.

When discussing the consumer’s behaviour, it is important to differentiate between **perceptive** (often referred to as non-deceptive) and **non-perceptive** (also referred to as deceptive) counterfeits. Perceptive counterfeits are defined as the knowing consumption of counterfeit products by consumers, whereas non-perceptive counterfeits are cases where consumers purchase these goods unintentionally.

It is also important to differentiate between **high-quality counterfeits** and **low-quality counterfeits**. We refer to high-quality counterfeits as counterfeit products whose quality is close or identical to the original products and that can fool even trained personnel. Low-quality counterfeits are poor imitations that can be recognized as counterfeit at first sight by a person who knows the original brand, trademark or design.

Because counterfeit products are bought both perceptively and non-perceptively, it is important to make difference between different distribution channels of counterfeit products. From a brand owner’s perspective, distribution channels can be divided into licit supply chain or the white market, the illegal black market and the grey market. Counterfeit products can be found on each these markets, to different extents. We describe these three distribution channels below.

Licit Supply Chain: The “White Market”: Products’ ways to the market and to the consumer vary. Brand owners may choose to sell their products directly to authorized retailers. Or they may choose to sell through intermediaries, that is, through one or multiple wholesalers [1]. In the white market, the supply chains are typically secured and controlled. Retailers are authorized and certified by the brand owners and in some cases even sell exclusively for one brand. In this report we refer to this market as the licit supply chain, or the intended supply chain.

Illicit Market: The “Black Market”: The black market (also referred to as the underground market) involves all illegal dealings, typically the buying and selling of merchandise or services illegally. The goods themselves may be illegal to sell (e.g., weapons and illegal drugs); the merchandise may be stolen; the merchandise may be sold through illegal channels to avoid tax payments or licensing requirements, for example cigarettes or unregistered firearms. The notation of this market originates from the fact that "black economy" or "black market" affairs are conducted outside the law, and so are necessarily conducted "in the dark", out of the sight of the law. Black markets develop when the state places restrictions on the production or provision of goods and services. These markets prosper when state restrictions are heavy, such as during a period of prohibition, price controls and/or rationing. Black markets are currently present in any known economy.

The “Grey Market”: Grey market is a term put forth by brand owners. It refers to sale of original, authorized and branded products through distribution channels that are not authorized by the manufacturer or brand owner [2] – usually bargain/discount outlets that provide less customer service than the authorized channels do [1]. Grey market activities are not illegal but they can constitute contract breaches between distributors and the brand owner. Grey markets turn black and illegal only when the sold products are stolen or illegal. Due to dubious product sources, it is often difficult to draw an exact line between grey and black markets. Grey market can take place on flea markets, internet auctions (eBay etc.), shopping sites that can open and disappear within days, shopping booths in cities, or even dedicated markets, for example in holiday resorts. Brand owners usually try to fight grey markets to manage and control distribution of their goods.

The most important way how original products enter the grey market is **parallel trade**. Parallel trading refers to situations where products are legitimately bought in one territory and diverted for sale to another territory without the consent of the right holder in the receiving territory. If the distribution occurs across national borders it is frequently referred to as parallel importing [3]. Typically, parallel imports occur most often in industries where there is a wide price differential between domestic goods and foreign goods [4]. For example, a European pharmaceutical manufacturer sells drugs that are intended to be distributed outside Europe with a lower selling price to a wholesaler, but the wholesaler does not distribute the drugs outside Europe, and diverts them to European market instead. Parallel trading is mostly legal and legal stands of different countries for parallel trading will be addressed in the subsection 2.4.4. Additionally, there is a field of tension between companies that try to perform perfect price discrimination and states that facilitate parallel trading, for example in the pharmaceutical industry.

Similarly, the most important way how original products enter the black market is **theft**. In this case, products are stolen from shipments, factories, or warehouses, and distributed in the black market.

2.2 Counterfeiting

Counterfeiting refers to manufacturing and distribution of counterfeit products. This subsection gives a general overview to the extent of counterfeiting, drivers and enablers of counterfeiting, roles of different actors, as well as dangers of counterfeit goods.

2.2.1 General extent of counterfeiting

A large number of scientific and management oriented articles discuss the qualitative impact of counterfeiting and product piracy. However, the underlying estimates quantifying the extent of counterfeiting and piracy have severe shortcomings, as the underlying data is often not supported by substantial, trustworthy investigations. Moreover, no methodology has been published to date showing how to estimate the volume of counterfeit goods in specific product categories or for specific brands. Though a throughout estimation of the extent will be addressed in a project called SToP (more specifically, in deliverable D2.1 – Description of the impact of the main drivers and mechanisms fostering illicit trade), we will provide a short summary of the extent in this section.

Referring to the Organization of Economic Co-operation and Development (OECD), the overall costs of counterfeiting in the world today are estimated to constitute between 5 and 7 percent of world trade [5]. As stated in the original source – but not in most of the succeeding citations – there is no substantial aggregated data to support the high numbers. However, the figures are now widely accepted and used to illustrate the extent of the counterfeiting problem, but are not sufficient to serve as a basis for managerial decisions.

Many agencies have used these numbers in order to support their arguments. As an example, the International Chamber of Commerce (ICC) used the OECD estimations for 2004 – without stating the careful restriction concerning the credibility of the data - and concluded that counterfeit goods constitute a market volume of 500 billion US dollars [6]. Apart from the use of unconfirmed data, expressing the share of counterfeit goods in monetary units is questionable as it leaves considerable freedom to the editor of the statistics by allowing him or her to set the value per counterfeit item. In most cases, the price of an original product is used as the market price of a counterfeit, leading to very high numbers. Anti-counterfeiting advocates may tend to exaggerate the estimates to emphasize the significance of the problem. Unpublished results based on customs statistics from a study at the University of St. Gallen indicate that the overall cost of counterfeiting in the world is much less than the 5 to 7 percent stated by the OECD, but nevertheless significant enough to call for countermeasures.

Nevertheless, comprehensive statistics provided by customs support that the problem is growing fast and is not specific to particular products or markets. Alongside the music, software, and luxury goods industries, counterfeit products are increasingly finding their way into other sectors, such as pharmaceuticals, automobile spare parts or toys. Regarding the

European Union, commissioner László Kovács points out that in 2003 alone, EU Customs seized about 100 million faked items - which represents a 900 percent increase within four years; and even though these seizures are considered to correspond to more than 1 billion Euros - they are only the tip of the world's "fake iceberg" [7]. The majority of counterfeit products in the Western countries are imports. Customs statistics indicate that the primary source of counterfeits is Asia, with more than 50% of counterfeits stopped at the European borders originating from China [8]. The most important means of transport of counterfeit products is by sea, being responsible of 70% of stopped counterfeit and pirate products in Europe [8].

Recent increase in the extent of illicit trade has been indicated in many sources. The U.S. Food and Drug Administration (FDA) counterfeit-drug investigations have increased to over 20 per year since 2000, after averaging only 5 per cent through the late 1990's [9]. The Swiss Federal Institute of Intellectual Property found clear indications that the extent of counterfeiting is increasing within the Swiss luxury-goods industry [10]. The development of the trade in counterfeit goods, as stated by the World Trade Organization and the International Chamber of Commerce, compared to worldwide merchandise trade is illustrated in Figure 1. These estimates indicate that the trade with counterfeit goods is growing much faster than the world trade in average.

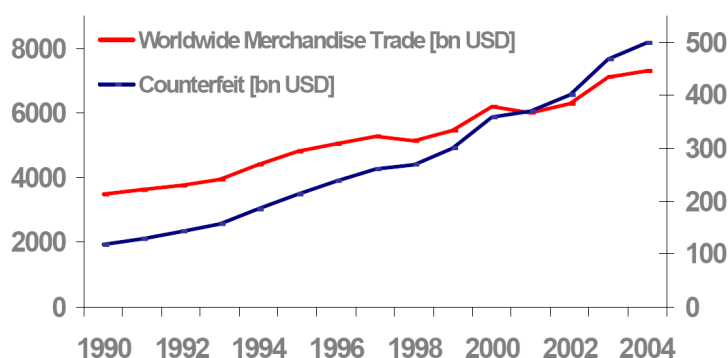


Figure 1. Development of Trade in Counterfeit Goods [6, 11]

2.2.2 Industry specific extent of counterfeiting

Counterfeiting is a recognized problem across virtually all industries [12] but the extent of counterfeiting is highly sector specific. To illustrate the extent of counterfeiting in different industries, we present the estimates of the European Brands Association (AIM) about the value of counterfeits in relation to the total turnover in different industries [13]. These results are presented below in Table 1.

Table 1. Estimates of value of counterfeits in different industries [13]

Value of counterfeits in relation to total turnover	
Computer software	35%
Audio-video	25%
Textiles and clothing	22%
Toys	12%
Perfumes	10%
Pharmaceuticals	6%
Watches	5%

Other estimates of the scale of counterfeiting in different industries are stated below:

- In the Copyright Industry, almost half of all motion picture videos, more than 40 percent of all business software, and a third of all music recordings were pirated copies [5].
- About 10 percent of clothing, fashion, and sports wear are counterfeits. Referring to estimates by the Counterfeiting Intelligence Bureau of the International Chamber of Commerce, online sales of faked luxury goods are worth 25 billion USD per year.
- In the automotive industry, 5 to 10 percent of all spare parts are fakes. This includes factory overruns, recycled items, copy parts, and stolen goods [11]. Although very stringent controls exist for the supply of spare aircraft parts, the number of counterfeit or suspected unapproved components installed worldwide is rising every year.
- Between 5 and 8 percent of the 500 billion USD worth of medicines sold worldwide are counterfeits, as estimated by the World Health Organization (WHO) [14]. In some developing countries, the counterfeiting of drugs is endemic, with patients having a better chance of receiving a medicine than a real one. Counterfeit drugs have far-reaching health implications, attracting considerable attention from public bodies such as the WHO or the U.S. Food and Drug Administration (FDA). [9]

It should be noted that estimates of the extent of counterfeiting should be treated with caution since they were mainly provided by interest groups and thus may be biased. Many reporting agencies do not apply a precise definition of the problem and include grey market activities in the statistics for counterfeits, for example. Inaccurate data is an important problem in counterfeiting and the presented numbers should always be treated as estimates. A detailed estimation of extent based on customs statistics will be investigated in the SToP Project (in deliverable D2.1 – Description of the impact of the main drivers and mechanisms fostering illicit trade).

2.2.3 Drivers and enablers of counterfeiting

This subsection outlines the drivers and enablers of counterfeiting. A more thorough study will be provided in SToP Project (in deliverable D1.1 – Description of main drivers and mechanisms of illicit trade). Many different factors have contributed to the growth of product counterfeiting within the last years. OECD partly explains the development as being a side-effect of a number of worldwide trends [5]. These trends act as drivers and enablers for counterfeiting and they are listed below:

- **Advances in technology:** Emerging technologies have not only benefited licit manufacturers, but also counterfeiters. New techniques have enabled counterfeiting of what were normally considered as “high-tech” products. With advanced production processes, counterfeiters can manufacture with higher quality and thus demand a higher price. Since both price and quality are considered very important indicators for counterfeited products, the chance of seizing counterfeits is reduced, leading to higher profits of the illicit actors.
- **Increased international trade:** In view of the world-wide growth of regional economic integration (e.g., the European Union and the North American Free Trade Agreement), the effects of any expansion in border measures to combat counterfeiting have been offset by a general trend in favour of dismantling border controls to ease the flow of international trade.
- **Emerging markets:** A number of centrally planned economies are being transformed into free markets. These markets are – partly due to missing Intellectual Property Rights and the attitude of their consumers – now emerging as both large producers and consumers of counterfeit products. East Asia is still regarded as the main source of counterfeits. This region has increased its share of world trade, implying increased production of counterfeits along with genuine products.

The abovementioned drivers and enablers are out of the control of individual companies and governments, and even mitigating their effects to discourage illicit trade seems unrealistic. Also the Commission of the European Communities has identified factors which contribute to the increase of trade with counterfeit products [15]. These drivers and enablers include:

- **Growing demand for branded products** and luxury goods. Counterfeiters often target these products due to high profit margins.
- **More complex supply chains** alongside the growing importance of outsourcing activities. Especially such activities in East Asia make it difficult to control the growing number of suppliers and subcontractors.
- **Internet** has a growing importance as a distribution channel, which is especially difficult for authorities and licit manufacturers to control, but easy for illicit actors to use.
- **Low risk and high profits** resulting from producing and selling counterfeit products in many countries in comparison to the expected returns. Though some sample cases exist where severe penalties have been applied to manufacturers of counterfeit products, profit margins for counterfeit goods are often higher than those for drug trafficking, while the risks are much lower. This is illustrated by estimation of European Taxation and Customs Union that a kilo of cannabis leaf will fetch 2000€ in Europe, whilst a kilo of pirate or counterfeit CDs will fetch 3000€ [16]. The risk of counterfeiting is further reduced by the fact that it is not really easy to prove the counterfeiting in a court of law. Detailed discussion about legal aspects of counterfeiting is out of the scope of this report, more details about the legal side of the problem can be found from [17].
- **Growing professionalism** of the illicit actors is another important factor that contributes to the growth of product counterfeiting. Counterfeiters frequently use modern equipment

to produce and elaborate strategies to deliver counterfeit goods. In particular, the networks of counterfeit players are well organized [13].

- **Low political will to help** has also contributed to the increase of trade with counterfeit products. Brand owners feel that they don't get enough support from official enforcement bodies and legal systems to protect their intellectual property rights and. Even in cases where the laws for IPR protection exist, they might not be executed in practice to have a real effect. In particular, the European Brand Association (AIM) has expressed its concern about inadequate enforcement and inadequate legislation [13].

Most of the abovementioned factors cannot be controlled by individual brand owners. However, individual enterprises can mitigate some of them by making use of efficient organizational, legal and technical countermeasures if they have a thorough understanding of the problem. An efficient anti-counterfeiting solution should address at least some of the listed factors. For example, the risk-profit ratio of counterfeiters can be increased by more efficient ways to find counterfeit products and by collaborating with for example customs. Growing professionalism and networking of illicit actors calls for more professional and networked anti-counterfeiting efforts. One of the potentials of RFID technology and EPCnetwork in anti-counterfeiting is that they can contribute in achieving these goals. Accordingly, this analysis provides the basis for justification of forthcoming countermeasures based on the solutions to be developed within the BRIDGE project (Task 5.4 – Development of Trial Infrastructure).

2.2.4 Roles of different actors

This subsection addresses the roles of different actors in counterfeit trade. The different actors and their relations are illustrated in Figure 2.

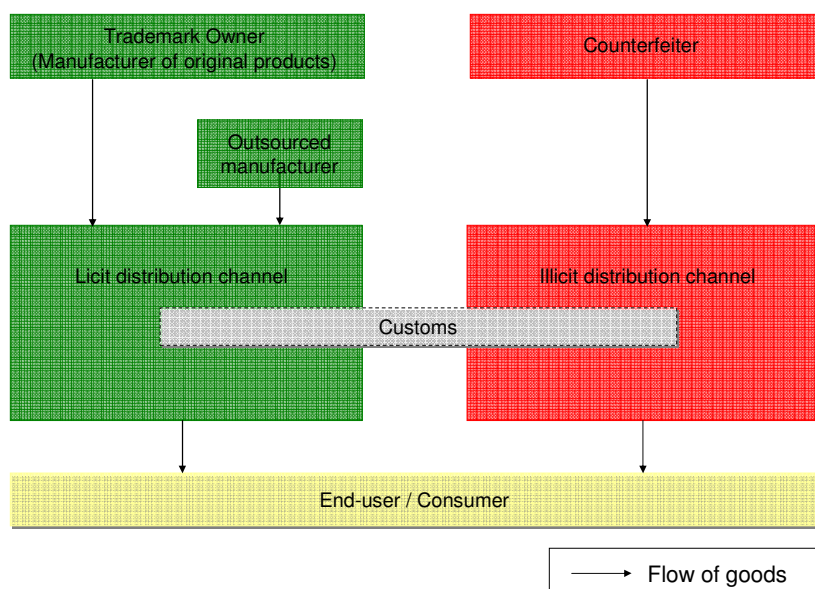


Figure 2. Illustration of different actors in trade with counterfeit products

The trademark owner carries most of the resulting negative effects of counterfeiting (see Section 4 below). To mitigate these negative effects, it is in the interest for the trademark

owner to be engaged in anti-counterfeiting activities. The anti-counterfeiting activities of the trademark owner are indeed important for the success of any kinds of counter measures. Most often trademark owners are only aware of whether they have a problem with counterfeits, but the actual extend of the problem remains unknown. Often trademark owners do not want to discuss the problem in public and with their competitors. We assume that the reason for this is that companies consider the risk of negative publicity to be higher than possible benefits from public awareness.

Manufacturers of counterfeit products seek ways to increase their profits illegally by forging or copying the trademark of the brand owner. Protecting the original goods by different methods of product individualisation and security labels is a *war of escalation* and the counterfeit manufacturers respond by making changes in their manufacturing processes and distribution channels; for example in the pharmaceutical industry, the counterfeiters adapt rapidly to any particular counter measure [9].

Outsourced manufacturers working under licenses of trademark owners expose the brand to the risk of counterfeiting in a larger extent than the trademark owner's own manufacturers. This is because typically the transfer of knowledge, work force, and machinery to counterfeit manufacturers is easier from outsourced manufacturer than from the original manufacturer, which can be controlled more tightly by the trademark owner. In addition, once the outsourced manufacturer has the ability to produce original products, in is relatively easy for them to continue producing branded products after the licence is due, turning themselves into counterfeit manufacturers. In these cases the counterfeit products are manufactured close to original quality, according to the latest design the outsourced manufacturer had. One counter measure against this threat, which is in the disposal of the trademark owner, is to update the design (for example, by changing markings in secondary packaging or a label) to distinguish outdated versions of the product.

The licit distribution channel consists of entities that distribute the original products and also have permission to do so. There are many cases where licit and illicit distribution channels cross and it can be hard to draw a line between them; for example, counterfeit and original products can travel in the same consignment in different containers. The risk of having counterfeit products in licit distribution channels is still low in western countries, but at the same time the most alarming cases of counterfeiting deal with fakes bought among original ones in the licit channel; example cases can be found throughout Section 3. Therefore, the licit distribution channel needs to be committed to guarantee the safety of its products. The players within the licit distribution channel will play an important role in anti-counterfeiting approaches across the supply chain, which are enabled by automatic identification technologies.

The illicit distribution channel consists of different players who try to make sure that the counterfeit products find their way to the end consumers. We define this channel as the chain of entities that, almost always knowingly, distribute the counterfeit products and do not have authorization to distribute originals from the brand owner. Illicit distribution channels include many steps from different kinds of logistics operations to the actual retailer, which can be a market, bazaar, or a store that sells counterfeit products. The main motivation for players in

the illicit distribution channel is higher profit through cheaper products. Most effective seizures of counterfeit products take place while the products are being distributed and the illicit distribution channel has to hide the counterfeits, use small lot sizes, transport semi-finished goods instead of fully assembled ones, mix counterfeits with original products, avoid certain routes that pose them higher risks, etc. This increases the cost of distribution of counterfeits. Logistics is an important cost factor for the counterfeit products, but also the core competence of counterfeit players.

Customs is a very important organization in the fight against illicit trade and responsible of 70 percent of seizures made worldwide [18]. One of the goals of customs is to detect and seize counterfeit products as they pass through borders. Customs provide brand owners with ways to protect the trademarks through collaboration, but have limited means if the brand owner itself is not actively committed to trademark protection. Another goal of customs is to facilitate the international trade, which sometimes conflicts with anti-counterfeiting because it calls for checking fewer products. As a consequence, the resources that customs has for finding counterfeit products are very limited.

The end-user / consumer has a twofold role in trade with counterfeit products. On the one hand, consumers buy some fakes perceptively, creating the demand for counterfeit goods (see subsection 3.5). This is often the case in the luxury goods industry [19]. Here consumers typically benefit from low prices of counterfeit goods and consider the fakes good bargains, despite their unknown origin and possibly lower quality. On the other hand, there are cases where the end-users and consumers have to be protected from buying counterfeits non-perceptively, as the fakes can threaten their health, safety, or security. In these cases it is in the consumers' interest to guarantee the authentic origins of products. A more detailed description of possible dangers of counterfeit goods can be found in subsection 2.2.5, below.

2.2.5 Dangers of counterfeit goods

The quality of counterfeit goods is generally lower than that of original goods⁴. This typically results from substandard manufacturing processes and the use of poor materials, as the goal of counterfeiters is to produce goods that only appear to be originals. Manufacturers of counterfeit goods (as opposed to legal brand owners) do not take liability of the dangers and do not care about customer dissatisfaction as a result of poor product quality. As a result, manufacturers of counterfeit products can use even ruthless ways to deceive customers while seeking for bigger profits, posing threats to health, safety, and security of consumers. It's important to note, however, that many counterfeit products such as some fake luxury goods, are bought perceptively and without any of the abovementioned risks.

The Commission of the European Communities states, “[o]ne of the most alarming dimensions of this phenomenon is the increased risk faced by EU citizens as a result of the growth in dangerous fake goods such as medicines, car parts and foodstuffs.” [20]. The actual dangers of counterfeit products vary between industries; counterfeit medicines may

⁴ In some exotic cases counterfeit products can offer more functionalities than the original one. This is the case with counterfeit Sony PlayStation that contains a mobile phone.
<http://www.spiegel.de/netzwelt/mobil/0,1518,451300,00.html>

not contain active ingredients at all, or the amount of active ingredients may be far greater or smaller than indicated, or the drug can even contain other, dangerous ingredients that cause severe side effects. Counterfeit car and airplane spare parts have shorter life times than original parts and they can break under normal use. Counterfeit food, beverages, health-care products, and toys may not conform to health and safety regulations. Even such seemingly harmless fake products as counterfeit designer sunglasses can prove unsafe if they fail to provide the UV protection advertised on their labels.

The international anti-counterfeiting coalition (IACC) has achieved and published a number of cases of health and safety concerns of different kinds of counterfeit products. To illustrate what kind of dangers counterfeit goods in different product categories can pose, we list example cases that are published by IACC [21]. (Original references marked)

- According to the Shenzhen Evening News (a government owned newspaper), approximately 192,000 people died in China in 2001 because of fake drugs. *China's killer Headache: Fake Pharmaceuticals*, Washington Post, August 30, 2002.
- Seventeen people in the US died between May 1999 and January 2000 after taking a powerful, but counterfeit, antibiotic. The Engineer, *Fighting the Fakers*, at 16 (April 26, 2002).
- Over 100 children died in Nigeria in 1990 after raking cough syrup that was actually antifreeze. Philippe Broussard, *Dangerous Fakes*, World Press Review, v44, N1, p36 (1) (January 1999).
- "...[c]ounterfeit drug cases include a meningitis vaccine made of tap water, birth control pills made of wheat flour, and paracetamol syrup made of industrial solvents." The Engineer, *Fighting the Fakers*, April 26, 2006, at 16; House Report of the Committee on Energy and Commerce, Subcommittee on Oversight and Investigations, *Prescription Drug Diversion and Counterfeiting*, July 10, 1985, at 23.
- In 2001, illicit vodka containing methyl alcohol killed 60 people in Estonia. The Engineer, *Fighting the Fakes*, at 16 (April 26, 2002).
- A Norwegian plane crash in 1989 that killed 55 people resulted, in part, from substandard shear bolts and sleeves of an unknown origin. *55 killed in Crash of Norwegian Plane, None Abound Survive as Craft Plunges into Sea Near Denmark*, L.A: Times, September 9, 1989, at 4 (cited and discussed in Robert W. Luedeman, *Flying Underground: The Trade in Bootleg Aircraft Parts*, 62 J. Air L. & Comm. 9396-100 (August/September 1996)).
- Counterfeit parts have been discovered in helicopters sold to NATO, in jet engines, bridge joints, and fasteners in areas of nuclear facilities responsible for preventing the meltdown of the reactor itself. H.R. Rep. 104-556 (1996).
- In addition, in 1987, seven children died when the bus they were riding in flipped over. The brakes that were just installed on the bus were bore a well-known trademark. Further examination, however, showed they were made of sawdust. George W. Abbott, Jr. and Lee S. Sporn, *Trademark Counterfeiting* (2002) [22].

The examples above illustrate that counterfeit products pose threats to consumer health, safety, and security. In addition to these direct dangers of counterfeit goods, many examples

show that counterfeiting is associated with organized crime and terrorism [22]. Counterfeit products are sold to fund terrorist operations and to launder money from drug trafficking. As a conclusion, even though consumers might buy fake products without bad intentions, this ground of evidence suggests that counterfeiting is not a harmless crime.

2.3 Overview of existing anti-counterfeiting approaches

Even though the scope of this report is a pure problem-analysis of illicit trade, we present a brief overview on currently existing anti-counterfeiting approaches. There are four principal ways to fight counterfeit trade. These are: (1) legal actions against the illicit players, (2) private investigations and cooperation with enforcement agencies, (3) consumer information and education, and (4) countermeasures based on technology. While consumer information and education as well as countermeasures based on technology are preventive measures, collaboration with private investigators and cooperation with enforcement agencies as well as legal actions are rather taken into account when counterfeits are already available on the market.

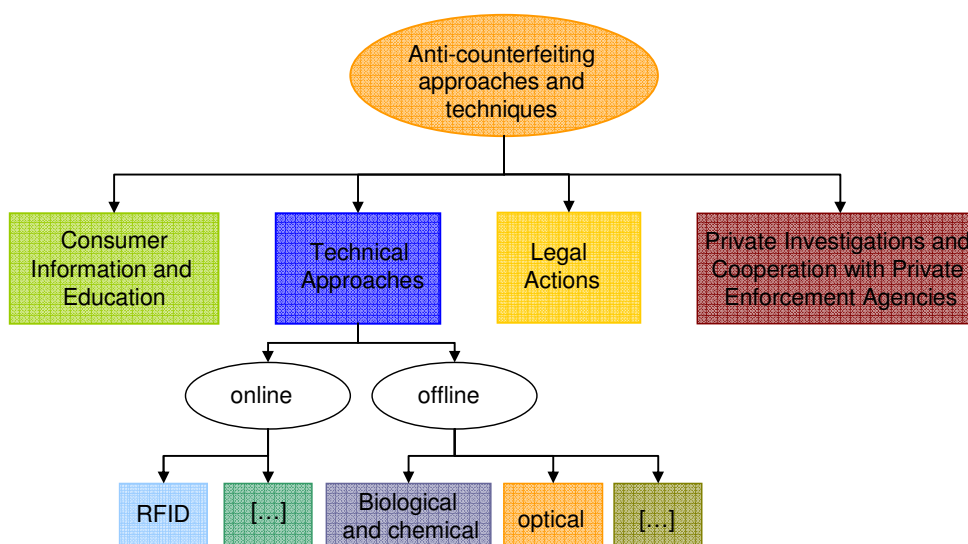


Figure 3. Overview of existing anti-counterfeiting approaches and techniques

Figure 3 presents an overview of possible anti-counterfeiting approaches. The common understanding within the industries is that successful anti-counterfeiting is not possible by applying anti-counterfeiting technologies or legal actions alone. Rather, combined approaches are needed. Technical approaches make cloning of products harder and they can be used to distinguish original products from fakes. Secure product authentication is usually based on inserting a *security label* on products and authenticating this label. A security label provides an identity for the product and makes it harder to be copied or cloned. Security labels can be implemented using various technologies. An overview of product-authentication approaches is out of the scope of this study but will be addressed in EU project SToP (e.g., in deliverable D3.1 – Report on relevant state-of-the-art research). Furthermore, a list of different anti-counterfeiting and trademark protection organizations that work actively to fight illicit trade can be found from Appendix B.

2.4 Distribution channels and parallel trade

Counterfeit products are distributed through various channels that are sometimes linked to grey or black market activities. As explained in subsection 2.1, parallel trading is not legal and it deals with original, non counterfeit products. However, in some cases it can also open a door for distribution of counterfeit products. This subsection presents the structure and dimensions of parallel trading, its drivers and enablers, and roles of different actors. To illustrate the regional dimension of the problem, an overview on legal stances of different countries regarding parallel trade is given. Legal aspects are important in order to explain the different size and extent of parallel trading in different countries.

2.4.1 Structure and dimensions of parallel trade

Distribution channels for parallel traded goods can be regarded as established, professional, and trusted market, and in particular not black markets where stolen goods are traded. They are trusted but not secure. People buying from these distribution channels usually know that the products were destined for another market but were diverted to this market. As long as these products are original, the consumers do not care about the products origin or destination market. Consumers typically receive warranty and other after-sales services for the purchased goods, though they may differ from the service offered in the country of purchase. This happens quite often when customers, such as small distributors and solution provider from the IT market, use parallel traded products as they are cheaper channel than the official sales to acquire products [23].

2.4.2 Drivers and enablers of parallel trade

Probably the most important driver for parallel trading is the price difference between different countries due to different pricing. Traders in this market are called “arbitrarians” and their profits represent the so-called arbitrages. They buy goods from markets worldwide, import them to countries where they can obtain higher prices for their goods, and resell them with a margin that varies from 10-30%. Consumers with a high price consciousness prefer parallel traded goods and thus represent another important driver of the parallel traded distribution channels. Some suppliers and manufacturers are in favour of parallel trading, as they can sell their products in different, not yet addressed markets, without any additional efforts. The significance of this mechanism is however still unknown.

Legal aspects are in favour of parallel trading, as they are only illegal if parallel traded goods violate either product regulations, for example, for pharmaceutical products, or a licensing contract for the trademark’s use, or when the trademark owner is based in the destination country of parallel imports [3] or like in the United States. Federations like the European Union thus do not join brand owner’s efforts to change legislation and to interdict parallel imports. On the contrary, worldwide liberalization efforts are a key driver for parallel imports. The phenomenon can therefore be seen from the standpoint of those aiming at protecting intellectual property rights, leading to a higher degree of protectionism, but also from the perspective of liberalization of trade in goods and services.

2.4.3 Roles of different actors in parallel trade

Important actors and stakeholders in parallel trading are the arbiters, the official distributors, the consumers, the distributors, the brand owner and the national legislation. The parallel trade activities are illustrated in Figure 4 and the roles of different actors (from the parts that differ from roles of different actors in counterfeiting, subsection 2.2.4) are explained below.

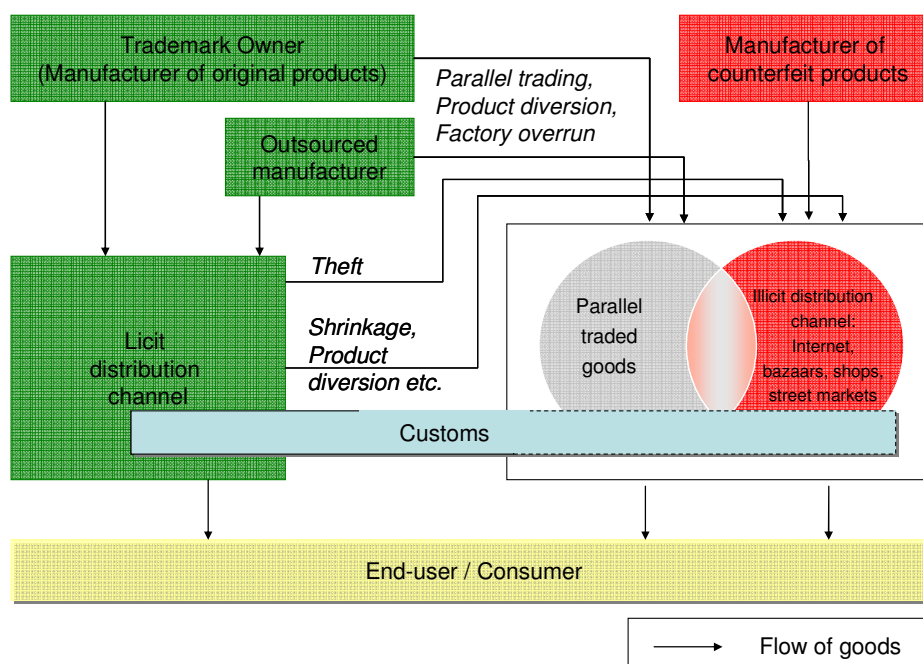


Figure 4. Illustration of parallel trade and relating activities

The brand owner / manufacturer has twofold role concerning parallel trading. First, brand owners and manufacturers might not care about parallel trading as they are selling their products in either case. Following this logic, parallel imports would just harm official and certified distributors, as mentioned above. Under certain circumstances, parallel imports may even have beneficial effects for brand owners: This is the case when i) parallel imported goods reach markets which cannot or should not be accessed via the established distribution system ii) when the existence of the parallel market does not affect the perception of the primary consumers and iii) when the relationship with the authorized distribution partners does not suffer from parallel trade, which is very rarely the case. Parallel export channels may also be helpful to develop new markets, as they enable the manufacture to test demand without the need to accept obligations with distributors. In this case, these activities can be regarded as a market intelligence tool.⁵ Second, however, brand owners might also suffer from parallel trading activities for example in terms of not having control over their distribution channel. Brand owners are trying to find ways to shut down or to reduce parallel trade without legal help (by labelling goods with “just for sale in [...]”, or by forbidding retailers

⁵ However, not all brand owners support this view.

and distributors to export products or to sell them in other countries etc.). However, parallel trading can still be a vehicle for counterfeit goods.

The arbitrary, as mentioned above, tries to maximize its profits by importing products that are sold at a lower price from another country and selling them in countries, where the price of the product is higher. Depending on the size, arbitraries can even take over warranty services and support for the products. In the figure illustrated above, he can be found under “parallel trading” and “product diversion”.

The official distributors are affected most by parallel trading activities from a financial point of view. They provide the original product, destined for the market, with usually higher warranty standards and have to stick to the predetermined price of the brand owner. They cannot reduce their prices to respond to the price attacks on the market. People buying from parallel trading distribution channels sometimes even try to claim warranty issues against the distributors. These claims are sometimes fulfilled due to image reasons.

The end-users / consumers create the demand for parallel traded products by buying from the corresponding distribution channels because of lower prices. They trust the parallel traded goods distribution channels and consider the goods to be original but diverted from various countries [24]. According to AGMA [3] and a study from 2004 [25], parallel trading activities will raise in the next years and an important driver will be the consumer, which is most probably unaware of the potential parallel trading goods risks. “It is [especially] because of their lower prices that many consumers prefer parallel traded goods to those sold by (through brand owners) authorized distributors.” [4].

The countries and governments have an important role in parallel trading in terms of providing and executing rules and legislation. In particular, parallel trade which is legal in the European Union. The World Trade Organization (WTO) favours worldwide free trade. Different regions and countries have different legal stances on parallel trade. We give some important examples in the following subsection.

2.4.4 Legal status of parallel trading in different countries

European Union: The European “[...] Court of Justice has ruled that parallel imports should not be blocked, irrespective of the factors that determine price differences” [26]. Free movement of goods within EU/EEA is one of the main principles of the “Common Market” and they are thoroughly regulated in the Treaty Establishing the European Community – specifically in Art. 28-30 of that Treaty. With putting a product on a market within EEA by the trademark owner or with its consent – the owner are exhausted (the so called “Community exhaustion of trademarks”). The products can then be freely circulated within the 28 European countries. Commission Communication of 30.12.2003 (Com(2003)839) is the latest compendium of legal provisions for parallel trade including latest rulings of the ECJ in the matter of pharmaceuticals traded freely across EU/EEA borders.

Switzerland: Bans on parallel import exist in Switzerland for many consumer products, including drugs and photographic films. In 2002, the Swiss parliament voted to give the

Competition Commission greater powers to fine companies found guilty of price fixing. New changes concerning this law are pending [27].

Australia (without Oceania): Parallel trade is not generally prohibited in Australia. On the contrary, legislation has been changed in the past years in favour of parallel trade. The biggest changes in this gradual process have been in 1991, 1998 and 2003 where new laws allowed more and more groups of products to be traded parallel across countries. Once a brand owner places his goods onto the market, the “owner’s ability to control subsequent dealings with the goods or services is exhausted“. However, Australian law does include measures to combat illegal imports [4].

China: China’s major laws are silent on the issue of parallel imports. However, parallel imports of audio-video recordings are banned for policy reasons set out by the Ministry of Culture. Although parallel imports of audio-video recordings are clearly forbidden in China, there is no blanket-ban for all copyright works. In addition, there does not seem to be any indication of concrete legislative changes on parallel imports in the pipeline [4], so the legislative situation can be expected to remain as it is in the near future.

Japan: “In principle, importing products bearing a registered trade mark into Japan without the permission of the trade mark owner constitutes trade mark infringement (Article 2(3) of the Trademark Law). However, the parallel import of genuine goods (parallel imports) has so far been supported by a number of lower-court decisions. In 2005, the Supreme Court [...] established a test to determine whether parallel imports are lawful [...]” [4]

Korea: Parallel trade in Korea is forbidden when the parallel importer infringes the trade mark of the trade mark owner. If customs find these products, they will notify the trade mark owner. However, the Korean Trademark Act and the Korean Copyright Act do not specifically designate what types of parallel imports are allowed. Currently, there are no legislative changes planned [4].

Singapore: The Singapore government maintains a policy of allowing parallel imports. Both copyright and trade mark goods may be lawfully parallel imported into Singapore (Singapore Copyright Act). In Singapore, the automotive and the music distribution industry are significantly affected by the government’s decision to allow parallel imports into Singapore. As it is difficult to legally combat the problem, the automotive industry offers incentives (longer warranty, better service etc.) to customers buying from the official distribution channel. In Singapore, no legislative changes are anticipated [4].

Thailand: Thai law allows the parallel import of trade marked and copyright products. Neither the Copyright Act nor the Trademark Act empowers right owners or the authorities to prohibit the import and distribution of genuine products. At present, there are no legislative changes [4].

United States of America: Parallel trade is prohibited in the United States of America. A law called “Stop” (also referred to as “anti-counterfeiting act”), has recently been approved.

Parallel trading is legal in the majority of countries. We can see from the examples stated above, that the trend is going into the direction, that countries where parallel trading was not legal in the past, have recently changed jurisdiction in favour of parallel trading.

2.5 Findings of this section

Counterfeiting is neither restricted to exclusive watches or luxury goods; it has become a problem across virtually all industries. Nor can the fake products always be distinguished from genuine goods. Experts from different industries confirm that the quality of counterfeited goods has risen with the technological improvements that are available to counterfeiters. Also the number of counterfeit goods that are found is constantly rising, which may be attributed partly to more efficient inspections, but also indicates an increasing number of fake products. The true extent of illicit trade, however, is very difficult to estimate. In this section we have found that estimates of the extent of illicit trade have large error margins and seem to be overestimated. Nonetheless, different indicators state that the overall extent of counterfeiting is increasing faster than the world trade in average. In addition, we have shown that the extent of counterfeiting is industry specific. Since counterfeiting is infringement of intellectual right properties, the problem has to be approached from a legal point of view. Besides definitions of different kinds of infringements presented in this section and legality of parallel trade, however, the legal aspects of counterfeiting are out of the scope of this report. For more details about the legal aspects of counterfeiting, the readers are guided to refer to [17].

Illicit trade is partly driven by global trends that are out of reach for single companies, but we have reported several factors enabling counterfeiting that should be targeted in countermeasures. In particular, an anti-counterfeiting solution should increase the risk-profit ratio of counterfeit players, which also OECD has identified as the most important principle in anti-counterfeiting [5], and the professionalism of criminals should be addressed with professional countermeasures. Customs statistics reveal that the most common source of counterfeit products in Europe is sea cargo from China, and overall Asia presents the source for about 70% of seized counterfeit products. Analysis of the roles of different actors reveals that fighting illicit trade should not be the sole responsibility of the holder of intellectual property rights, but rather a mutual goal for the licit distribution channel as counterfeit and pirate products harm legal businesses.

Analysis of dangers that counterfeit goods pose to consumers reveals that counterfeits from different product categories repeatedly endanger the health and safety of end-users as counterfeit players are capable of distributing dangerous products when maximizing their illegal profits. In addition, industry associations such as the international anti-counterfeiting coalition (IACC) has linked counterfeiting to other organized crime and even terrorism, most importantly as a way to fund illegal activities [22]. This ground of evidence suggests that counterfeiting is not a harmless crime.

3 Counterfeiting and illicit trade in different industries

This section deepens the industry specific part of the problem analysis by presenting counterfeiting scenarios in different industry branches. For all six industries under study we first provide a general description of relevant characteristics and then analyze the general aspects of illicit trade. The goal of this section is to illustrate how the counterfeiting scenarios vary between different industries and to provide necessary background information for designing industry specific anti-counterfeiting approaches.

3.1 Information technology industry

The IT or ICT industry (Information and Communication Technology) is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them. The IT industry is roughly a \$1.3 trillion industry. It employs about 23 million people around the world and its market capitalization is about \$2.7 trillion [28]. The use of IT technology is increasing with a small percentage, but the trend is stable [28]. The ICT industry is expected to grow by 6% in 2006 and, looking ahead, highest growth will be driven by Internet-related investments, Linux servers, digital storage, personal digital assistants and new portable consumer products [29]. The biggest players in hardware are HP, IBM, and Dell and the biggest player in software is clearly Microsoft. Considering revenues, HP is currently the biggest company amongst all in the IT industry. The highest investments in IT worldwide are made in the US, Europe. Considering IT production, China has overtaken the United States in 2004 as the world's leading ICT exporter [29].

The IT industry is not immune against counterfeit products. One of the first reported cases of counterfeit products in the IT industry were Intel's Pentium II Processors in 1998. The processors were relabelled from 233 MHz to 266 MHz and thus sold at higher prices. Warranty questions due to a shorter life-time as a result of over-clocking arose [30]. Today, counterfeit computer chips are still an important issue and Intel's concurrent AMD is not stay unscathed by counterfeits [30]. Counterfeit electronic devices such as cell phones or MP3-players, contain fake or modified chips; counterfeit versions of high-value parts like FPGAs (Field-Programmable Gate Arrays) or microprocessors may turn out to be inoperable, cheaper parts that have had the original package marking removed and replaced with markings from a high-value device [31]. Still, small differences in layout can reveal a copied design as each foundry has unique processes and methods of manufacture that leave "signatures" in the finished product [31].

Counterfeiting in IT does not merely affect computer chips. Nokia has faced and is still facing problems with batteries and mobile phone equipment and has estimated the number of counterfeits about 5 million pieces a year [32], Maxtor has seen problems with counterfeit devices like hard disks [33], Cisco is facing problems with counterfeit switches and inadequate distribution channels [23], Adaptec controller cards aren't spared neither, as in October 2000, 5000 fake Adaptec AHA-2940 and AHA-3940 host bus adapters, infringing software and documentation were found [34] and even Nintendo Game Boy Advance

packaging, manufacturing components and counterfeit versions of games have been discovered [35].

The major problem in IT industry is also, that even distributors of counterfeit devices will typically be unaware that the devices were not genuine [31]. One case of Hewlett Packard may show the trickiness of counterfeiters, as they replace memory chips from Laptops or Home Computers and install copied, non-branded parts instead, selling the replaced ones as original parts [36]. Another problem is the requirements in distribution channels. Small solution providers simply cannot source parts directly from the manufacturer or big wholesalers, as the number of ordered parts is too small. Accordingly, these customers forced to buy their parts from other sources such as from inadequate distribution channels [23].

The above mentioned cases show that even information technology industry is not immune against counterfeit products and parts. This is especially true for software, as this represents a big part of infringing products in IT industry and is normally protected by copyrights.

3.2 Automotive industry

The global automotive industry, also known as motor vehicle industry, manufactures and distributes vehicles, including passenger cars, trucks and motorcycles. It produces 54 million vehicles a year and generates sales of \$3 trillion and in some parts of the world, the United States and Germany for instance, supplies a living for one in every seven people [37]. The biggest manufacturers of motor vehicles are Western Europe (driven by Germany and France), USA and Japan. Worldwide production numbers of motor vehicles in 2004 are presented in Figure 5.

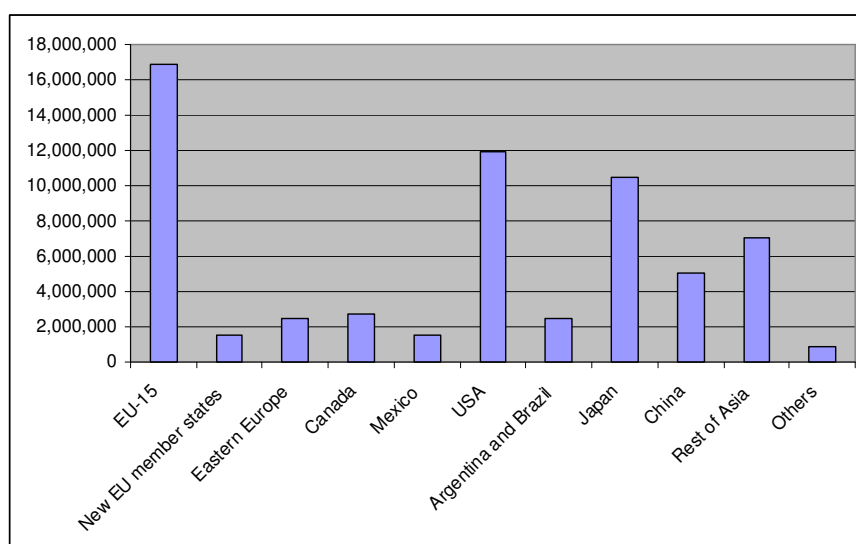


Figure 5. Worldwide production of motor vehicles in 2004 [38]. Of all the motor vehicles, ratio of passenger vehicles was 84% and commercial vehicles 16%.

The manufacturing side of automotive industry is dominated by the so called *big three*, General Motors, Ford, and DaimlerChrysler, which generate together more than \$550 billion

sales and revenues. The dominating regional car market is USA – of the 800 million cars and light trucks that are in use, 240 million operate in the USA [39]. The regional dominance of the US market can be also seen in the geographical distribution of revenues of the big three car manufacturers, as illustrated in Figure 6 below.

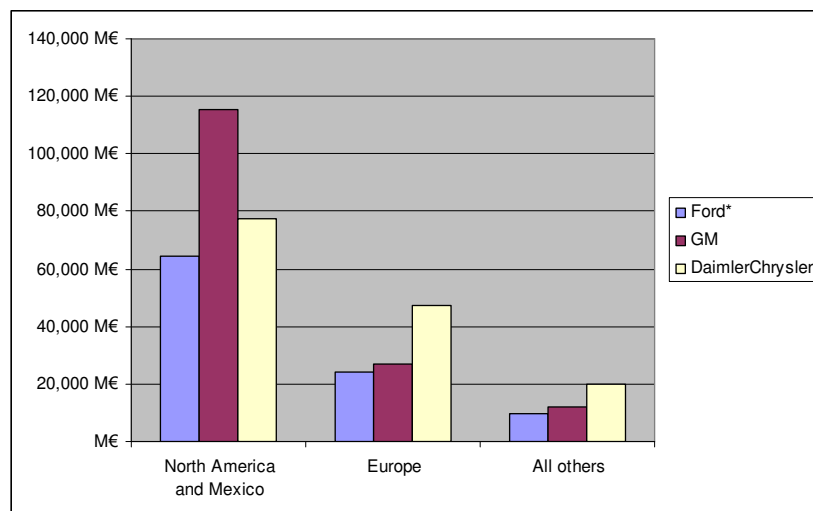


Figure 6. Regional revenues of the big three car manufacturers in 2005 (*figures do not include revenues from Ford Premier Automotive Group) [40-42]

While the revenues of automotive industry are colossal, the profit margins remain slim due to global competition; the average margins (before tax) are 3.9 percent for the original equipment manufacturers (OEM), 5.2 percent for the supplier, and 2 percent for automotive retailers [37]. Financial services and the aftermarket, however, have become more important sources of revenues providing higher margins as profits in the aftermarket business can reach as much as 53 percent [37].

Overall, the importance of aftermarket has increased throughout the automotive industry. Vehicle manufacturers have started to focus more strongly on the aftermarket to save their profits by advancing customer service. In the German automotive industry strong competition has already resulted in lower profit margins on traditional new car sales. Today, vehicle manufacturers are generating 50% of their profits through the aftermarket and franchise dealers receive up to 90% of their overall profits through after-sales services [43]. Also new regulations and laws have impacts on the automotive industry. The block exemption regulation (BER) that governs the way manufacturers distribute their products became effective on 2003, and as a result the vehicle manufacturers are competing to retain control of the spare parts market. With the BER, the European Commission aims to ensure that customers also get better deals and better services after buying a new car [43].

Following key figures help emphasizing the importance of automotive aftermarket: The Automotive Aftermarket Industry Association (AAIA) estimates that the U.S. motor vehicle aftermarket is a \$250 billion industry (2004) in the U.S. alone, with three quarters coming from cars and light trucks segment and one quarter from heavy duty vehicles. This industry encompasses all products and services purchased for light and heavy duty vehicles after the

original sale including replacement parts, accessories, lubricants, appearance products, service repairs as well as the tools and equipment necessary to make the repair [44]. The value of component and part sales within the aftermarket is estimated to value about \$50 billion in North America and \$113 billion worldwide (2003) [45].

The fastest growing product segment within the OEM market is electronic systems. They include transmission, fuel injection, ignition, cruise control, exhaust/emission control, airbag, ABS/ESP/TCS, security, entertainment, dashboard display, and navigation. According to forecasts of The Freedonia Group, global demand for OEM automotive electronics will grow 7 percent annually through 2009 which is much faster than vehicle production [46].

Today's automotive industry is characterized by battle over customers and keeping customers has become a top priority for companies. The supply side has currently over capacity as the global industry would be able to produce more than 20 million more cars than the world's customers would buy [37]. Another trend is retail consolidation where car retailers are growing to survive in the battle over customers, and the top 20 retailing groups now accounting for more than 10 percent of all new vehicles sold in North America [37]. In addition, also the OEMs have become concerned about their brand image and marketing [37].

Although there are at least two reported cases of complete counterfeit cars (in terms of car design [47, 48]), within the automotive industry it is the aftermarket for spare parts that is most affected by counterfeit products. In the automotive industry, it is important to make difference between copied original parts that do not bear any forged markings of origin⁶ (sometimes referred to as *pirated* good, even though they do not infringe a copyright and therefore are not considered pirated goods according to definitions of this study, subsection 02.1), and counterfeit parts that bear a forged trademark. In some mechanisms, illicit players buy copied parts (e.g., from Asia or East Europe) and brand them with a forged trademark to make them counterfeit products, and then distribute them to the market. Important sources of these copied spare parts are old licensed manufacturers who continue to produce the goods after expiration of the license. This is especially the case for generic parts that have long life-cycle and these parts are not rare in automotive industry, as today the manufacturers use modular parts in different vehicles and the life-cycles of parts are at least as long as those of the vehicles. In other words, the manufacturers of original goods cannot change their designs to make the infrastructure and know-how of counterfeit manufacturers obsolete. As mentioned in subsection 2.2.2, according to some estimates, up to 5 or 10 percent of automotive spare parts are counterfeits (including factory overruns, recycled items, copy parts, and stolen goods).

Expensive parts that are easy to copy and very frequently used are most often targeted by counterfeiters [49]. Examples of counterfeited car spare parts include spark plugs, headlamps, bumpers, side mirrors, and brake pads. But even accessories, merchandising and other lifestyle products are affected by counterfeiting [49]. Sales prices of corresponding original products vary from about 5 euros of single spare plugs, to several hundreds of euros

⁶ These copied goods can still infringe a patent or a design. If neither of these is the case, IPR protection is not possible and the remaining possible legal actions are slim (e.g., limited to claims of *unfair competition*).

of bigger or more sophisticated parts. According to expert interviews, counterfeiting cheaper parts that have lower margins (e.g. wiper blades) do not justify technology and manufacturing investments, and also the production quantities have to be high enough to make the business case interesting for the counterfeit players [50].

Internet is recognized as one important distribution channel of counterfeit car spare parts. Finding a counterfeit spare part on the Internet suggest a big problem, as it is very difficult then to stop it spreading. It is in general easier to tackle the problem from the roots [49] than only deal the symptoms, which could in this case mean rather to target the manufacturing than final distribution. According to a study of Protection International where 50 popular e-commerce sites were monitored during six months, the German automotive industry loses €28m due to online counterfeit activities [51]. Furthermore, extrapolating these findings to an industry wide scale indicates a loss of €10.9 billion. In particular, the study found that 5% of all transactions on the Internet involved imitation parts. According to expert interviews, in addition to the Internet there are two additional distribution channels of counterfeit and pirate spare parts, namely free garages and other, non-certified retailers [50].

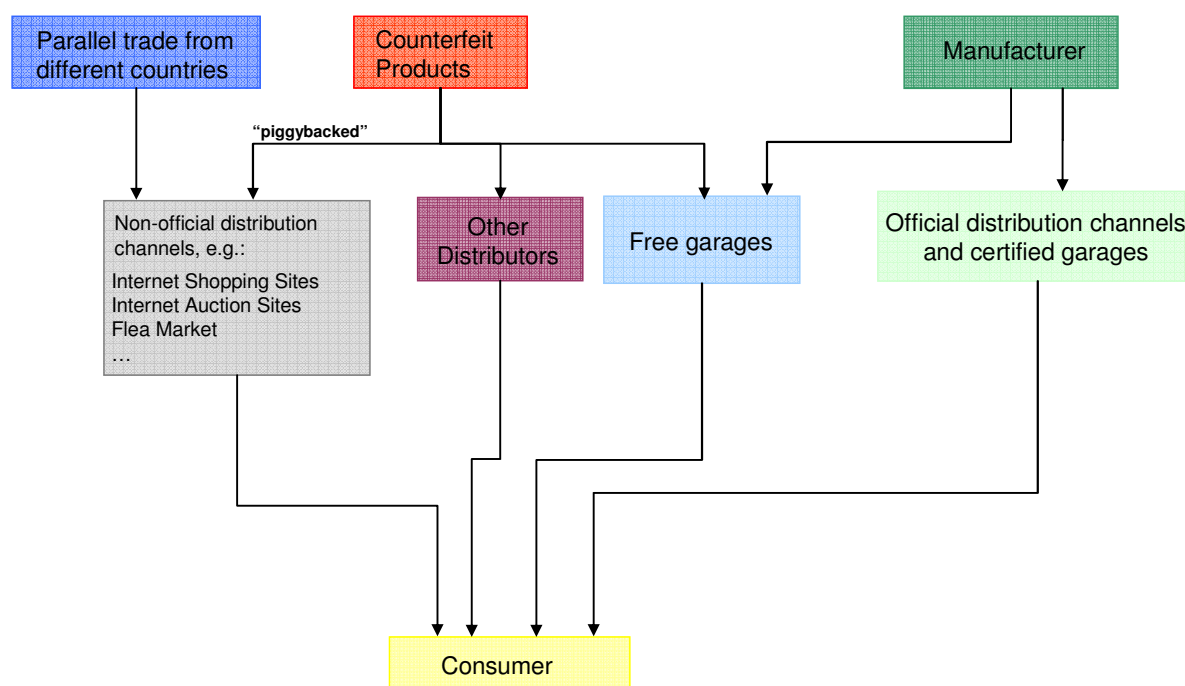


Figure 7. Distribution channels of counterfeit products in automotive industry

Next to the official distribution networks with officially certified retailers, the following distribution channels can be identified:

- Common distribution channels for parallel traded and counterfeit goods,
- Other distributors than the officials, (which are certified by the manufacturer) and
- Free garages that are not contractually bound to any manufacturer [52].

There are reported cases of free garages and non-certified retailers that acquire counterfeit products knowingly and sell them to their customers in order to obtain higher margins [50]. Free garages install counterfeit parts into their customers' cars. As soon as a part breaks, the

customer would return to his garage, where the faked product would be again exchanged by a counterfeit or this time by an original product. The estimated number of unreported cases is considered to be unknown [49], as neither manufacturers nor clients really know about the counterfeit product [50].

The majority of fake automotive spare parts however will be found on dubious distribution channels and on the black market [50]. They can equally be found on the flea markets. Most parts come from China, South East Asia, India, the Middle East, Turkey, Eastern Europe, South America, South Africa and to a little extent also from Europe [49]. Wholesalers in the Middle East offer original parts, clones and fakes. Due to too little knowledge and the good visible appearance of these parts, customers buy the parts knowingly, believing that it fulfils its purpose [53]. Faked parts appear in Europe even though, according to experts, European customers are loyal to the spare parts brands whereas in the Asian market, end-users require good quality at a low price. Again, security is of a major concern and counterfeit spare parts can also cause harm to the vehicle. Additionally, the customer will lose guarantee and has to come up for the follow-up costs caused by the faked spare parts [50].

3.3 Life Sciences and pharmaceutical industry

The pharmaceutical industry comprises research, development, marketing and distribution of drugs, most commonly in the context of healthcare. The industry is regulated and companies are subject to a variety of laws regarding the patenting, testing and marketing of drugs, particularly what it comes to prescription drugs. From 1998 to 2005, global pharmaceutical sales have almost doubled. With regard to both size and dynamics, the U.S. market is in the lead. At about 33 percent, sales in the U.S. market from 2001 to 2004 increased significantly faster than the other markets – in 2005, the growth of the U.S. market was below the average of the other industrial nations for the first time [54]. For the first time ever, in 2006, global spending on prescription drugs topped \$600 billion, even as growth slowed down in Europe and North America. Sales of prescription medicines worldwide rose 7 percent to \$602 billion [55].

The biggest companies in the pharmaceutical industry include Pfizer, GlaxoSmithKline, Sanofi-Aventis, Johnson & Johnson, Merck, Novartis and Astra Zeneca. Pfizer with annual revenue of 50.9 Billion USD is the biggest amongst all [56].

The United States still accounts for most, with \$252 billion in annual sales. Emerging markets such as China, Russia, South Korea and Mexico outpaced that market, growing a huge 81 percent [55].

Counterfeit drugs have been detected in the past. The World Health Organization (WHO) describes counterfeit drugs as “deliberately and fraudulently mislabelled [drugs] with respect to identity and / or source. Counterfeiting can apply to both branded and generic products. Counterfeit products may include products with the correct ingredients or with the wrong ingredients, or with fake packaging.” The (WHO) estimates that approximately 10% of all drugs are counterfeit [14].

But why is it so easy to counterfeit drugs? [57]

- Very good technology to produce everything from labels to active pharmaceutical ingredients is now widely available,
- Blockbuster “lifestyle” medicines that have created demand for illicit use,
- Globalization made distribution of counterfeit products easier,
- Internet provides easy access for counterfeiters,
- An increase in self-prescribing culture,
- Weak regulations in terms of enforcement and penalties,
- Organized crime has become increasingly involved in counterfeiting as it becomes more profitable with lower risks than other drug crime.

The consequences of counterfeit drugs are manifold: [57] (1) Patient’s safety and security [58], (2) Social and economic consequences, (3) Patients do not get safe drugs, (4) Producer patent and copyright infringements (loss of revenue), (5) Government loss of taxation revenues and undermining the National healthcare system, and (6) Considerable resources are required to combat the practice of counterfeiting.

Counterfeit products and parallel trading activities in life sciences are due to these societal and individual effects probably the most researched and besides the automotive and the aerospace industry the most security relevant fields. As a result of the varying premises of the pharmaceutical supply chain in the different countries, there will next to the industry specific split-up a country-specific break down. After an introduction to the US-American pharmaceutical supply chain and entry possibilities of counterfeit products into this market, the supply chain for pharmaceuticals of development countries and their weaknesses will be presented. For these countries and regions, the flows will be displayed in “maps”. These maps have been developed with research work and industry interviews.

3.3.1 United States of America

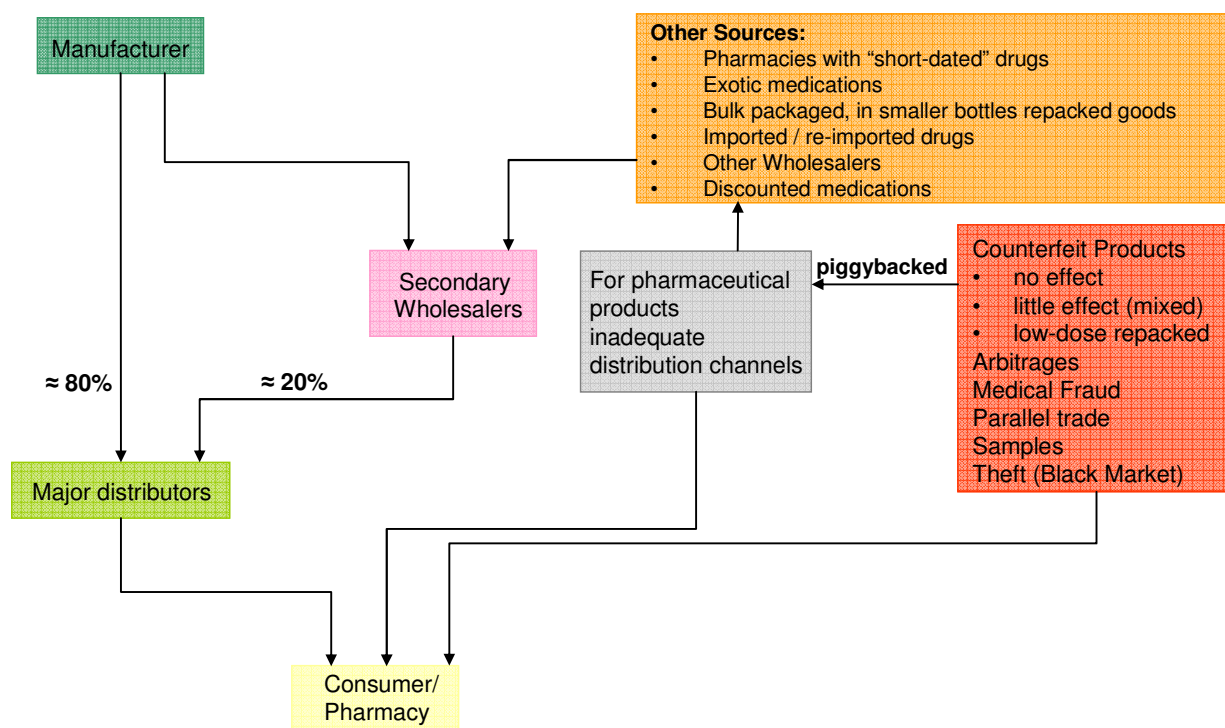


Figure 8. The US market maps

Counterfeit drugs are claimed to be a major problem in the US, for example in [59]. In the past five years 140 counterfeit drugs incidents have been reported to the US authorities but the estimated number of unreported cases is supposed to be much higher [60]. The reason for this high number is due to [60]: (1) The weaknesses and complexity of the US-pharmaceutical supply chain, (2) the complexity of government regulations and authorities (more than twenty federal associations are involved in the approval/admission of a drug), (3) the laxity of laws, (4) the little control possibilities of manufacturers, (5) fraud etc.

As it can be seen from Figure 8, counterfeit products enter the licit supply chain “piggybacked” via for pharmaceuticals inadequate distribution channels. Parallel trade, which is prohibited in the USA, is a more important getting driver for counterfeiting and fraud. 80% of parallel imports in the USA, which are supposed to stem from Canada, do not [58].

3.3.2 Developing countries

The fraction of counterfeit drugs in developing countries is especially high. Between 25-50% of all available drugs in are considered to be counterfeit [61]. The simplified supply chain shown below holds important reasons for it.

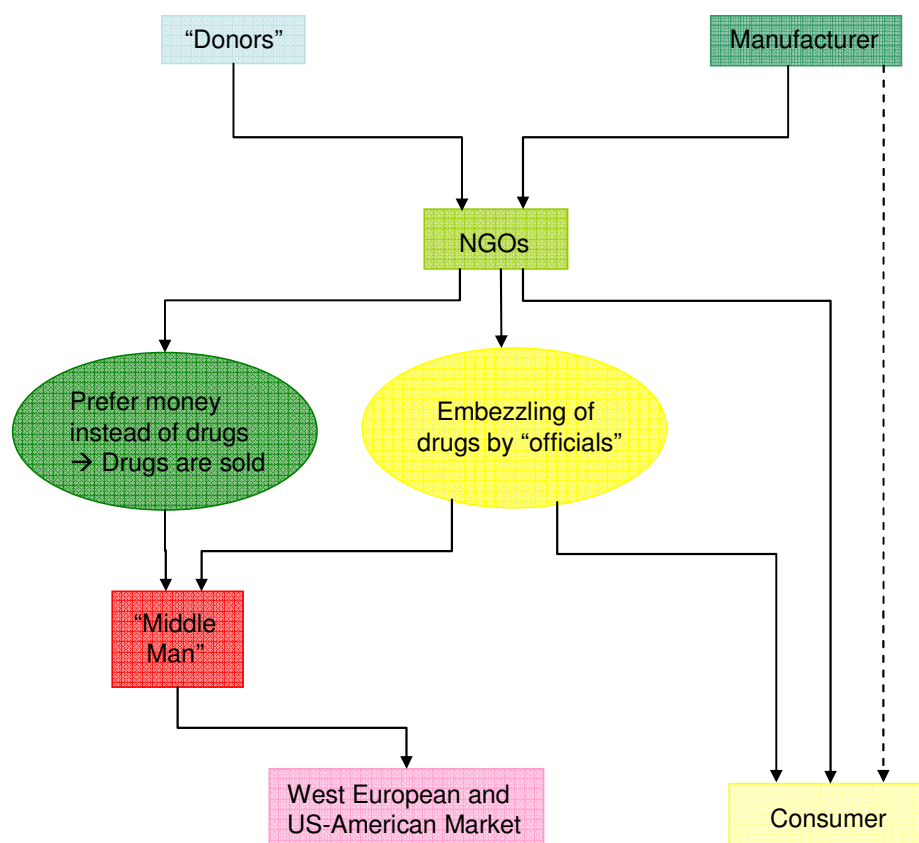


Figure 9. The Developing Countries market

Donors (churches, organizations, etc.) give drugs to Non-Governmental Organizations (NGO) and the Ministries of Health in developing countries. For most NGOs, the drugs are not suitable or they prefer money for other purposes. They sell the drugs to “middle men”, which then sell them back to West European and US-American markets. On the other hand, Health Ministries⁷ demand drugs in “Western Packages” only from donors for different reasons. These drugs can then be easily resold to Europe or the US. In the past, these drugs have been replaced by counterfeits.

3.3.3 European Union

Concerning counterfeit drugs entering the licit market, the European life science market is not as alarmingly threatened as the US-American or market of developing countries is. Nevertheless, a small number of counterfeit drugs could enter the legitimate supply chain in the United Kingdom [57]. As it is very difficult due to destroyed evidence to really find out about the number of counterfeit drugs that have been used, the dark figure remains unknown. Concerning parallel trading, estimations suggest that 13% of total sales in the United Kingdom have their origin in different countries, with an annual growth rate of 15-20% [62].

Tips for evaluating product sources and detecting counterfeit medicines [57]:

⁷ Reasons vary from “our doctors are trained in the US/in Europe and just know these kinds of drugs” or “the patients wouldn’t take African/Asian drugs”.

- Unusually cheap price,
- Unauthorized distribution channel or directly from the manufacturer,
- Signs of removed or switched product label,
- Altered expiry date,
- Subtle changes in the product’s package,
- Variations in the size if the container,
- Listen to patients,
- Physical characteristics of the product.

More detailed analysis about the mechanisms of illicit trade within the pharmaceutical industry will be addressed in project SToP (in deliverable D1.1 – Description of main drivers and mechanisms of illicit trade). Mass serialization and electronic pedigree (e-pedigree) of pharmaceutical products is addressed in BRIDGE WP6. This work relates closely to product authentication and anti-counterfeiting and therefore we expect to acquire mutual benefits between WP5 and WP6 in the following steps of the BRIDGE project.

3.4 Aerospace industry

Aerospace comprises air and space travel, manufacturing and associated research. Aerospace is a very diverse industry, with a multitude of commercial, industrial and military applications. In this subsection the focus is on civil aviation that comprises passenger and freighter aircrafts. Manufacturing of civil aircrafts is dominated by US based Boeing and Airbus that is owned by the European Aeronautic Defence and Space Company (EADS). In 2005, Boeing’s revenues were US\$54,845 million (€43,636 million⁸) and for Airbus €22,179 million. Overall, aerospace industry is a multi billion industry concentrated in North America, Europe and Japan. This is illustrated in Figure 10. The world passenger traffic is forecasted to grow more than 5 percent per year during the next twenty years and, together with fleet renewal, there is need for more than 16,000 new passenger aircrafts for the corresponding time period [63].

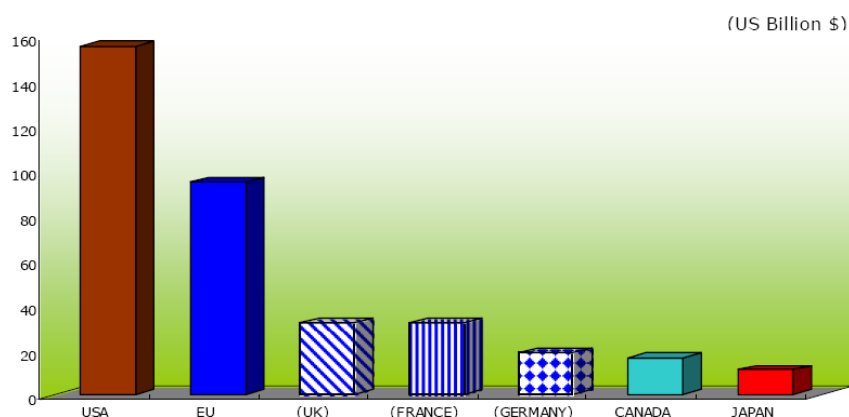


Figure 10. Aerospace turnover of major countries in 2004 [64]

⁸ 1 € = 1.25 US£

Engine and aircraft parts pass through numerous different states during their lifecycle. More specifically, they can change location, custodian, condition (i.e., new/used, serviceable/unserviceable, scrap), function and form, they can be installed, removed, repaired, maintained, stored, shipped or they can be exposed to various conditions (i.e. temperature, humidity, vibration). Currently, the burden of component data is being transferred from paper to automatically readable unique identification technologies [65]. For a maintenance and repair organisation to be able to show that the replacement part that they are about to fit to an aircraft is genuine and carries the appropriate certification and approvals is critical in providing the quality of service required to keep aircraft flying safely and legally [66]. To enable this, the industry is already tracking tools, documents, and spare parts using different identification technologies and the industry’s goal is full item traceability. The drivers for full item traceability in the aerospace supply chain lie in two dimensions: the regulations enforced by regulatory authorities and the need for optimization of business processes in the aerospace supply chain. Some important regulatory bodies of the aerospace sector are Federal Aviation Administration⁹, the Joint Aviation Authorities¹⁰, state Civil Aviation Authorities, the U.S Department of Defence¹¹, the U.S Department of Transportation¹².

Almost all parts that are built in aircrafts hold a certificate of authenticity. However, recent examples show that counterfeit parts could get on board of airplanes. The most susceptible parts are pieces like bolts and screws, because these units do not hold these certificates compulsively. Nevertheless, even for parts that require these certificates, faked products could find their ways into airplanes [67].

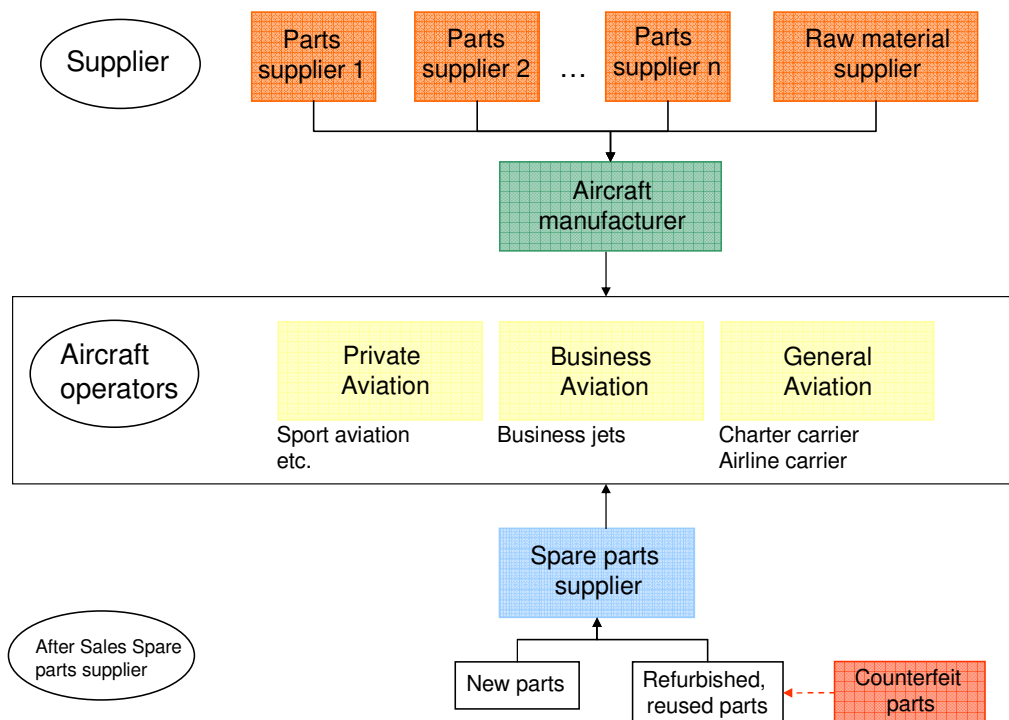


Figure 11. An illustration of how counterfeit spare parts reach aircraft operators [67]

⁹ FAA, Federal Aviation Administration Regulations and Policies http://www.faa.gov/regulations_policies/. 2005.

¹⁰ JAA, Joint Aviation Authorities Regulations <http://www.jaa.nl>.

¹¹ DoD, US Department of Defense <http://www.dod.gov/>.

¹² DoT, US Department of Transportation <http://www.dot.gov/>.

The above quoted figure shows how counterfeit products can still enter the licit supply chain. In contrast to other industries, refurbished and reused parts are legitimately used in the aircraft industry. This entrance point could be identified as the main but not exclusive/only gateway for counterfeit products [67]. But still, as money and margins are often the motivations for counterfeiters, the official equipment manufacturer are not immune against providing counterfeit parts, knowingly or unknowingly. Even the provided raw material can be of inferior quality but labelled differently and can thus be considered as counterfeit [67].

Counterfeit parts are most often detected in the private aviation and the business aviation sector. In the fields of general aviation, charter carriers are more affected than the airline carriers, although the general aviation is not as susceptible to counterfeit products as the private and the business aviation are [67].

Some spare part providers, especially the smaller ones that sell refurbished parts, might be selling them unknowingly, as it is very hard for them to distinguish original refurbished parts from counterfeits, as both hold the same certificate of authenticity. This problem becomes especially severe, when it comes to complex parts that consist only partially of counterfeit pieces. The damage which is caused by counterfeit products in aircrafts is however immense. Not only that there are insurance claims to be covered by the airlines, in the (recent) past, counterfeit products have caused various crashes and disasters (see subsection 2.2.5).

Every supply chain partner in the aviation industry that runs aircrafts, produces parts, refurbishes parts or maintains parts (so every partner except the retailer, who sells the parts or serves as an intermediary), has to fulfil special requirements to be licensed to deal with aircraft spare parts. These measures consist of (a) quality control tests (department) and (b) flight proficiency tests (department). Retailers however, are obliged to check if the parts correspond to the provided documentary. As the retailer is a link between partners that both fulfil the requirements, he can be excluded from the complex testing procedures.

As even small parts like bolts and screws have to meet special metallurgical requirements, that demand special tests, the prices for these parts can get very high. The same is valid for more complex parts. This is also a reason, why parts are refurbished and reused in aircrafts. Especially for price sensitive customers, buying reused parts can make a big price difference. Counterfeiters are attracted by high margins, refurbishing parts that are useless, faking certificate documentation and selling them to spare part providers. Even during D-checks, when aircrafts are generally overhauled, these parts are some overlooked and find their way back into the airplanes [67].

There is still research required to identify the whole scope of counterfeiting in the aircraft industry and especially in what concerns the distribution channels. Research on different distribution channels is still pending. However, the aircraft industry is heavily affected by counterfeiters and is in a need of a holistic solution to tackle the problem.

More detailed analysis about the mechanisms of illicit trade within the aerospace industry will be addressed in project SToP (in deliverable D1.1 – Description of main drivers and mechanisms of illicit trade).

3.5 Luxury goods industry

Luxury goods comprise various products such as leather goods, jewellery, watches, clothes, shoes, wines and spirits, and perfumes and cosmetics. Luxury products are characterized by strong brands that communicate design, quality, durability or performance that is superior to the comparable substitutes, or the brands (and the products) play the role of a status symbol. In a broader sense of the word, almost any high-quality goods can be seen luxurious, and so also expensive and exclusive cars, home-electronics and food, for example, are sometimes categorized as luxury goods. The sales prices of original luxury goods start from the order of magnitude of hundreds of euros for perfumes, cosmetics and wines, and from thousands of euros and more for fashion and leather goods, watches and jewellery.

As luxury goods are not bought for necessity, demand for luxury goods occurs and increases with increasing wealth. On the other side, the supply of luxury goods can be considered to be limited to guarantee the exclusiveness of products. According to estimates of Mintel International Group Ltd., the global luxury goods market in 2005 was worth €70 billion, up 9.2% on 2004, with the retail value of closer to €100 billion [68]. Fashion and leather category is the largest segments within the luxury goods market and the growth forecasts are strong, fostered by increasing wealth in many economies. The biggest players in the luxury goods industry are groups that manage a large number of different luxury good brands, comprising different categories of products. The leading luxury goods company is LVMH (Moët Hennessy Louis Vuitton) that is the parent of around 50 sub-companies that each manages a small number of prestigious brands. Some of the brands that belong to the LVHM are Hennessy, Moët et Chandon, Dior Watches, TAG Heuer, Louis Vuitton, Sephora, and Perfumes Christian Dior. The Richemont Group is another considerable luxury goods group comprising such brands as Cartier, Jaeger-LeCoultre, Montblanc, and Chloé.

The watch industry is dominated by the Swatch Group that is responsible of about 25% of watch sales worldwide. Their portfolio includes brands from high-end to normal consumer-level, such as Omega, Rado, Tissot, Calvin Klein and Swatch. Overall, Switzerland is the leading producer of luxury watches and the Swiss watches dominate the market, not with quantity of products, but with quality – the average price of exported Swiss watches was 377 dollars in 2005, compared to 1 - 6 dollars in China and Hong-Kong [69]. This is illustrated in Figure 12.

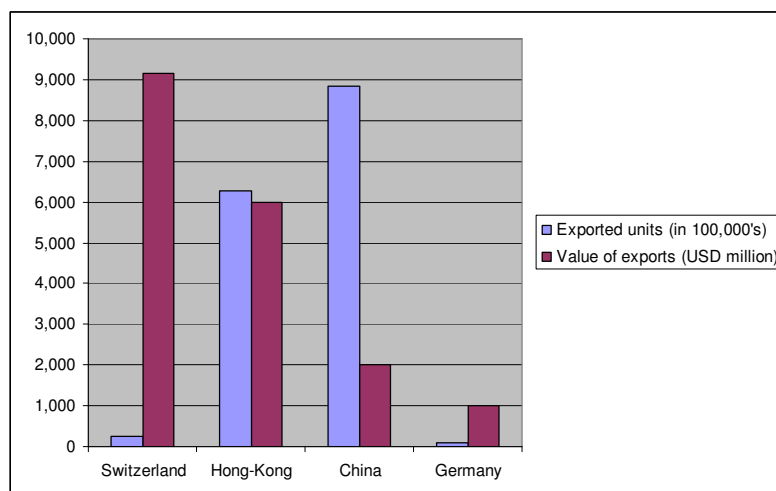


Figure 12. Quantity and value of exported watches (due to re-exporting, some of the single units are counted in multiple countries) [69]

Europe is currently the largest luxury goods market, driven by France [70]. Second biggest luxury goods market is the U.S., followed by Japan. According a study of the Boston Consulting Group, European consumers tend to be much more focused on conveying a personalized and individual sense of style in their clothing and accessory choices [71]. The same study states that Europeans tend to be more concerned about a product's *genuineness* and *provenance*. The US and Asia-Pacific markets experience considerable growth. According to some estimates, the China's luxury market is worth only €500 million (in 2004), but is growing between 50 and 60 percent a year [72]. Other estimates are more careful and predict yearly growth of 20 percents [73], but in any case the Chinese luxury market appears very attractive. The demographic changes characterise luxury market in Japan where about 40% of the population, or 50 million people, are over the age of 50, and control much of Japan's wealth. The Japanese have also adopted new luxury offerings in a range of categories, including food, personal care products, cars and home appliances, and even traditionally low-ticket categories such as soy sauce. Like premium olive oil in the U.S., super-quality soy sauces in Japan, which demand a 200% premium over conventional brands, have acquired the status of new luxury item [71].

Current trends from the luxury good companies' side include development in terms of distribution. Many of the leading luxury companies are looking to expand their own store networks, whilst cutting back on franchise and licensing deals. The main attractions of retail for the leading luxury companies are higher margins and greater control of how, when and where their products are sold. Second, the opportunity that China represents is too great for the leading luxury players to ignore [68].

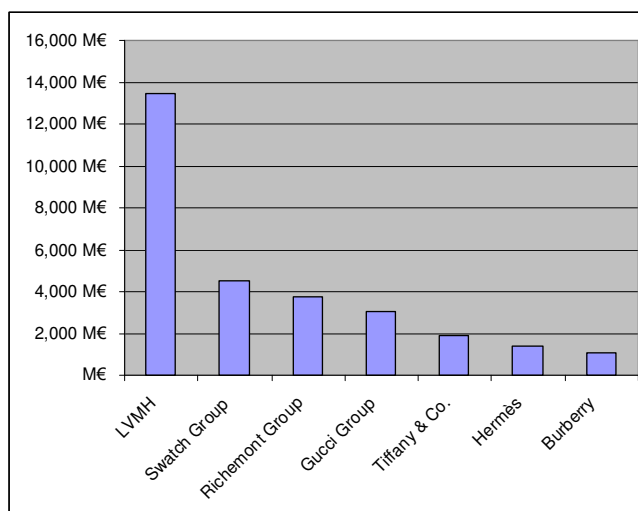


Figure 13. Revenues of major players in luxury goods industry

Luxury goods industry is free from industry specific regulations. The manufacturers of luxury goods are typically located in western countries despite the higher production costs; for example Richemont group has not outsourced any of its manufacturing to countries of cheaper labour. Different regional clusters within the industry can be distinguished due to historical reasons. For example, as mentioned above, a large number of luxury watches is manufactured in Switzerland which has lead to counterfeiting of the indication of source markings (i.e. *Swiss Made*). However, original luxury goods are also produced also in countries of lower production costs, such as in Asia, including many watches. Original luxury goods are distributed either through authorized regional dealers and agents (wholesale) or through the mother company's own retail network (retail) and controlling the distribution is important for the brand owners. These authorized distribution channels are in general considered to be clean from counterfeit products and also the best way to guarantee getting an original luxury product is to buy it from an authorized retailer. However, there are also cases where distributors of original goods have bought shipments of counterfeit goods non-perceptively from the grey market to seek higher margins, compromising the authorized dealer network. Luxury brands put effort in communicating who are their authorized retailers and some of the brands explicitly warn consumers from buying their products from other dealers, such as from the internet.

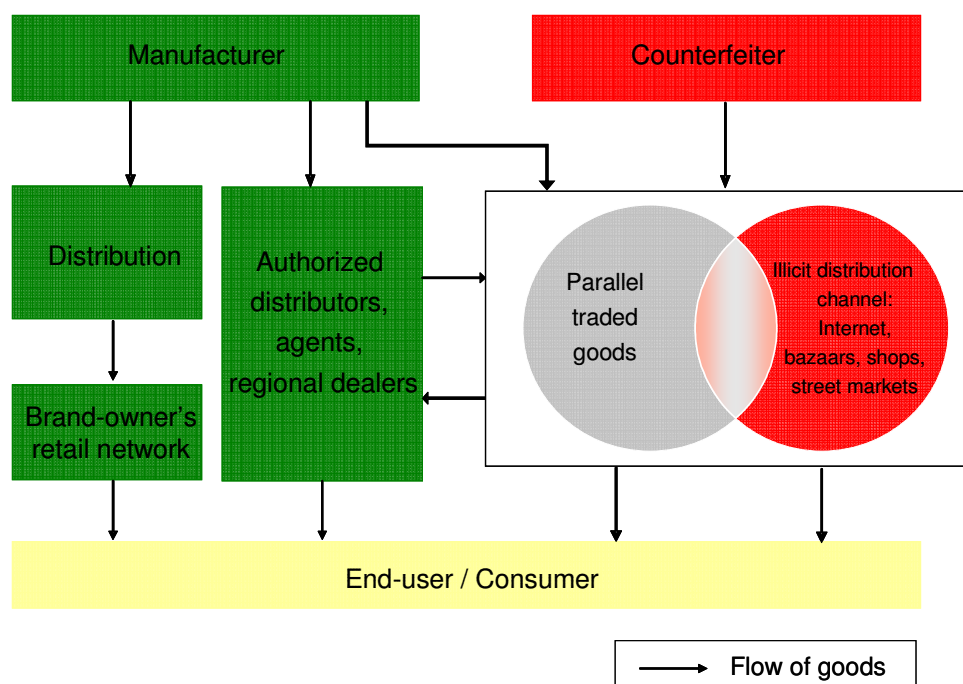


Figure 14. Illustration of flow of goods in licit and illicit trade of counterfeit goods.

As luxury brands are valuable, they are also often targeted by counterfeiters and thus luxury goods industry has been among the first industries to suffer from industrial scale counterfeiting. The intellectual property rights of luxury brands comprise trademarks, designs, indications of source and patents. Today, luxury goods industry claims it is “seriously affected” by infringements of their trademark rights [10] and problem of counterfeited branded goods is wide known.

According to industry experts, most counterfeit luxury goods are low-quality counterfeits sold outside the authorized distribution channels. These counterfeit products are sold at flea markets, fairs and street festivals, bazaars, small boutiques that sell only counterfeit products, over the Internet, from house and office parties and hotel sales [74]. Customs statistics show evidence that a large amount of counterfeit luxury goods are manufactured in Asia and exported to Europe [8] – most common sources for seized counterfeit clothing accessories are China and Thailand, and for counterfeit watches and jewellery China and Hong-Kong. Counterfeiters deploy different strategies to pass customs, for example by shipping counterfeit watches in components and assembling them in the target countries.

Following the general trends of counterfeiting, there are more and more high-quality counterfeits that are hard to distinguish from the original luxury products and sometimes authentication of high-quality counterfeit luxury products requires a considerable amount of effort, an expert, and special equipments. Second trend in luxury good industry is that counterfeiting is an ever increasing problem [10]. According to a consumer survey in the UK for some brands like Louis Vuitton and Cartier almost as many consumers buy a counterfeit product than an original one [19]. The same survey also shows that those who have bought counterfeits are actually more likely buy also original products, and that the buyers of counterfeit luxury products are not lower spenders as a whole. This is alerting for the brand

owners as it means that there is a demand for counterfeit luxury goods among buyers of original goods. As already mentioned in subsection 2.2.3, demand for branded goods is increasing. As a response to this demand on the supply side, luxury goods firms have created entry level products that allow consumers to engage with the brands at a much lower price point, but simultaneously also the availability of counterfeit products is increasing [19].

Figure 15 illustrates the percentage of UK population who has bought a counterfeit luxury or designer product in the past 12 months. According to the study, overall one in eight consumers buy counterfeits. The results reveal that luxury and design clothes are the most affected product category in the UK, followed by watches. It should be noted, however, that clothes and leather goods constitute also the biggest product category in the industry [68] so this result is expected.

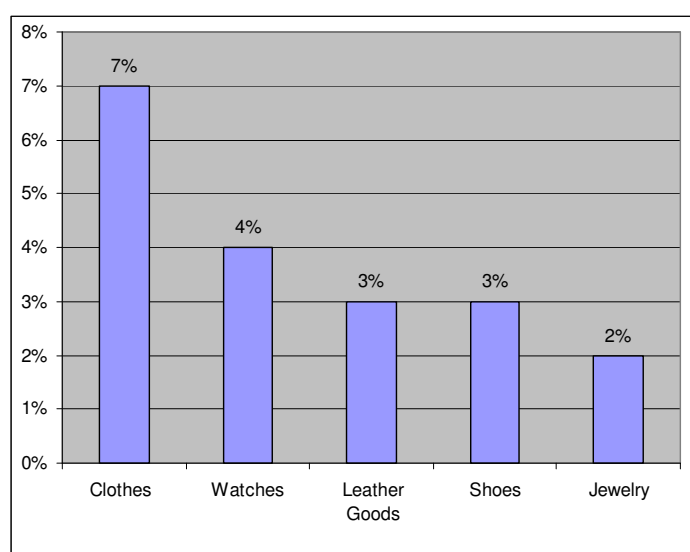


Figure 15. Percentage of UK population that have bought a counterfeit luxury / design product in the past 12 months [19]

When asked where the consumers have bought the counterfeit product, the actual purchase points were proven to be near the home rather than travelling outside Europe. Most alarmingly, the British consumers bought the counterfeit luxury goods most often from a shop or market in the UK, in particular more often than while travelling in Europe. Internet auction places were identified as the third most important distribution channel of counterfeit luxury or design goods in the UK. Complete results of this study are illustrated in Figure 16.

More detailed analysis about the mechanisms of illicit trade within the luxury goods industry will be addressed in project SToP (in deliverable D1.1 – Description of main drivers and mechanisms of illicit trade).

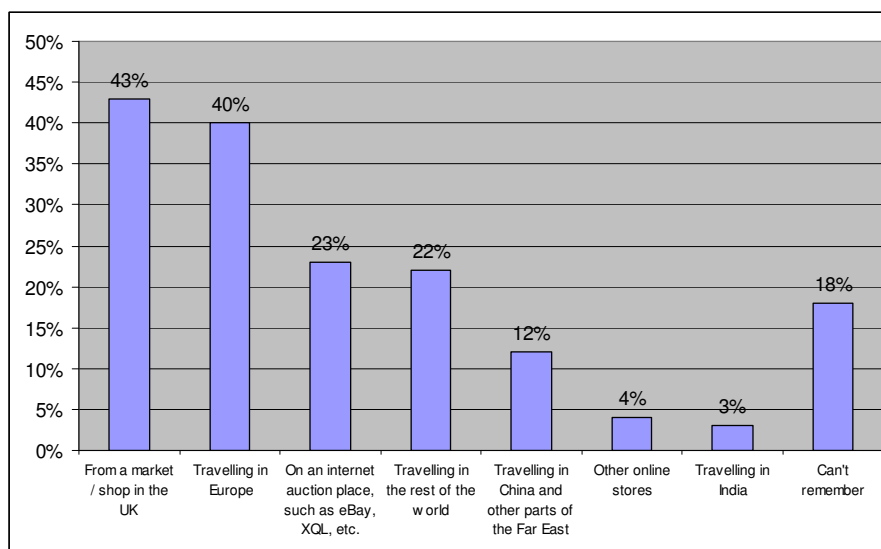


Figure 16. Where have you bought a counterfeit luxury or design good from in the past 12 months? [19]

3.6 Consumer goods industry and retail

Consumer goods are goods primarily bought and used for personal, family, or household purposes¹³. Examples include clothing, food and furniture. The standard way in which they are distributed is through retail [75]. This is why the problem of counterfeiting is regarded in a unified way for both retail and consumer goods industry.

A clear tendency for growing pervasiveness of the counterfeiting industry is perceived throughout the markets. While in earlier times mostly luxury products were copied, these days all types of products – including consumer goods – are potentially faked. Considering the domain of consumer goods, certainly the counterfeiting of shoes and textiles plays a major role. An example: Between August and November 2006, the German customs seized containers in the Hamburg port in the value of at least 383 Million Euros¹⁴. Amongst other consumer products, the containers included about one million pairs of shoes of the brand owners “Nike”, “Adidas” and “Puma”, fake toys of different companies and over 100.000 fake textiles. Never the less, counterfeit of consumer goods is not limited to textiles and sports equipment. Even faked handkerchiefs have been found repeatedly in the market [76] (See Figure 17).

¹³ Uniform Commercial Code

<http://www.law.cornell.edu/ucc/search/display.html?terms=consumer%20goods&url=/ucc/9/article9.htm#s9-102>

¹⁴ www.zoll.de



Figure 17: Original and counterfeit handkerchiefs

Counterfeiting of consumer goods occurs on all different levels of quality: from high quality forgeries of products, where the difference is not visible to the naked eye and fakes are thus bought non-perceptively, to only choosing similar designs, immediately visible for the customer that a fake is on hand. In some cases, the fake product even provides additional features to the original, such a Portable Sony PlayStation containing a mobile phone in addition to its original functionality, spotted in China recently [77].

Having regarded the consumer goods mostly affected by counterfeiting and having seen that consumer goods are faked on different levels of quality, still some questions remain: How do counterfeiters distribute their goods within the European Union? What is the role of the key actors in the counterfeiting business? To answer these questions, the distribution structure of consumer goods is visualized in Figure 18.

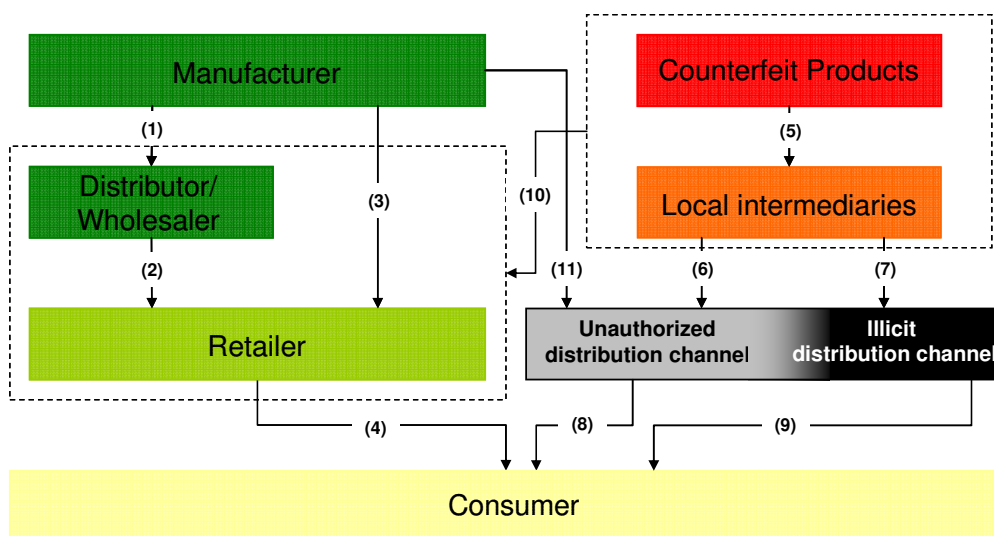


Figure 18: Structure of the distribution of consumer goods

The licit distribution of consumer goods is commonly done in a well defined structure, described in current marketing and logistics literature (e.g., [75]): The manufacturer of products usually sells them to an intermediate wholesaler (1, 2) or delivers directly to retailers, such as Metro or Carrefour (3). Finally the customer buys from retailers and uses the products (4). As an alternative way of distribution, some manufacturers also distribute their goods through inappropriate distribution channels (11) such as internet auction houses, or they distribute their goods directly to the customer. This may take place through a company owned web-shop, for example. Original products in inadequate distribution channels (11) can also result from parallel trade.

Counterfeiters have the possibility to sell their goods to local salesmen (5), having access to the local grey-markets (6) and black-markets (7). Examples for black-markets are illegal street markets, as they can be found in many bigger cities of the European Union.

Another possibility for counterfeiters in order to distribute fake consumer goods is to access the licit distribution channel of consumer goods (10). Somehow counterfeiters of perfume bottles have even made it into the supply chain of the Swiss retailer Migros without being recognized¹⁵.

Despite the distribution channels of consumer goods it is important to discuss the roles that the important actors in the trade with consumer goods have. The role of the customer in the trade with counterfeit consumer goods is rather questionable. Many consumers buy fake products knowingly, not caring about the consequences of their decision. Another important institution is the grey-market, such as established through the auction platform eBay. Grey-markets are an especially good opportunity for counterfeiters of consumer goods to distribute their commodities, due to the following reasons:

- Customers do not see the product they buy in advance. This makes it easy to cheat for counterfeiters.
- Many consumer goods are standard products, which in general do not need to be revised by the customer before buying.
- Many consumer products are cheap. This raises the possibility that customers take the risk of buying fakes, originally intending to make a bargain. In many cases of consumer goods it can be assumed that consumers would not care not to have the original, but a counterfeit product.
- Sometimes the person or organization offering an item through an auction can not be determined. This way, customers cannot claim their money back as soon as they notice that they have bought a counterfeit. This makes internet auctions a safe place for counterfeiters.

Another issue with regard to grey-markets is that some manufacturers or wholesalers use them to distribute original products. So counterfeits and original products are mixed up, which makes it hard for customers to find out about the authenticity of a product.

¹⁵ <http://www.migrosmagazin.ch/index.cfm?id=17144>

Due to ongoing globalization and knowledge transfer into regions that are known as strongholds of the counterfeiting industry, it remains to be investigated how the trade with counterfeit consumer goods will establish within the next years, and which impact technical solutions can have on anti-counterfeiting efforts. Especially the application of track-and-trace based anti-counterfeiting such as proposed in BRIDGE through the application of the EPC Global Network seems to be a promising solution in this matter.

3.7 Findings of this section

Analyzing illicit trade in different industries reveals as a first finding that counterfeiters are imaginative criminals who find and break security mechanisms of products, invent additional security features that are inexistent on original products claiming quasi-legitimacy for the counterfeited product, and deploy different strategies to pass customs and avoid seizures. Counterfeit products are shipped mixed with original products, in components, or without brand markings.

Second finding of the industry specific analysis is that illicit trade affects different industries in different ways. The automotive industry mostly suffers from counterfeit and copied spare parts in the aftermarket which is on the other hand is becoming more and more important source of revenues for automotive companies. In luxury goods industry the brands themselves are a particularly valuable part of the products and thus often targeted by counterfeiters. For pharmaceutical industry, securing patient safety is the top priority and the industry functions under heavy regulatory bargain. Counterfeiting and diversion of drugs can provide high profits for the illicit players and they are made easier by the fact that the product markings are typically not on the goods themselves but on the secondary packaging. Also counterfeiting of certain consumer goods such as food and beverages can threaten consumer health. In the aerospace industry, counterfeit products are often disguised as used spare parts, reused from old airplanes, and thus often hard to distinguish from original products. In addition, expert interviews confirmed that trends towards higher quality counterfeit products and increasing extent of illicit trade affect all industries.

The presented differences call for industry-specific approaches not only for the problem analysis, but also for design and development of countermeasures. While secure ways to authenticate original products enable to distinguish counterfeits in the licit supply chain, traceability of products and downstream visibility for the rights holder help detecting grey market activities. Under the root term of illicit trade, industries are affected by different mixtures of counterfeit goods, pirate goods, and various grey market activities. In addition, our first findings suggest that the grey market activities also facilitate counterfeiters to distribute their goods and there is evidence that both these activities go hand-in-hand [61]. Most experts in companies did not have estimates of the extent of grey market activities and illicit trade in their sectors, but in some special case some systematic methods to estimate the extent were applied. Parallel trading is not illegal in the European Union, but as grey markets are considered to be professional and established, they represent a danger as they signify an open door for counterfeiters and their merchandise.

4 Impact of counterfeiting and illicit trade

This section identifies the impact of illicit trade and counterfeiting on companies, societies, and consumers. An important part of this section is the identification of direct and indirect mechanisms that lead to financial losses. Impact of counterfeiting and illicit trade will be addressed in details in SToP Project (in deliverable D2.1 – Description of the impact of the main drivers and mechanisms fostering illicit trade).

4.1 Direct effects on companies

Counterfeiting is theft from the brand owner [13] and companies face several potential implications from illicit trade. First, counterfeit products substitute genuine products, at least partly, which leads to direct losses of revenues. Evaluation of the extent of this substitution is out of the scope of this work. The mechanism leading to these losses of sales, however, should address both perceptive and non-perceptive product counterfeiting, as it is clear that these two cases have different effect on the sales of original products. Most importantly, the case where a consumer who wants to buy an original product but buys a counterfeit one instead (non-perceptively), leads to loss of sales for the producer of original goods. This kind of direct loss occurs also when counterfeit products enter the licit supply chain.

The literature covering the impact of illicit trade is extremely sparse, mostly due to the fact that the losses are difficult to estimate. First, the lost estimates are based on estimates on the extent of illicit trade which themselves are inaccurate, as discussed in section 2.2.1. Second, the precise mechanisms leading to lost sales are complex and depend on the industry and product under study, and therefore the extent of direct effects of counterfeiting is often unknown also for the companies themselves. To illustrate the inconsistency among estimates of the impact of illicit trade, a research survey revealed that different companies ranged the damage caused by the counterfeiting and piracy of original products in the Swiss watch industry between tens of thousands and 800 million Swiss francs [10].

Besides lost sales, other direct effects of counterfeiting is increased number of liability claims, such as warranty repairs. The technical quality of counterfeits is inferior to originals and thus counterfeit products are more susceptible to cause warranty claims among customers. Even though it is straight forward to inspect whether a product has a valid guarantee by checking the original sales receipt, this is not always demanded for example in luxury goods industry due to practical reasons, because the receipt can be unavailable due to multiple reasons (the item was a gift or inherited, the receipt is simply lost etc.). For example, luxury good company Dooney & Bourke receives an average of sixty counterfeit purses each week from persons requesting warranty repairs [74].

Trade with counterfeit products also leads to increased workload for companies when they have to invest in monitoring, prevention and reactive measures. In particular, companies have to be involved in legal cases for example by proofing the counterfeit origins of a product for the court of law. This work involves lawyers and it is therefore costly, especially for small and medium sized companies that have to rely on external help.

4.2 Indirect effects on companies

Illicit trade has also diverse indirect effects on companies. First, counterfeiting decreases companies' goodwill and brand value. Presence of counterfeit products can diminish the exclusiveness of a brand, and lower quality of counterfeits can diminish the perceived quality of original products. Especially in luxury goods industry, exclusiveness of the brand is crucial and customers who pay considerable amounts of money for luxurious products do not want to see the large masses of consumers wear the same brand. The health and safety hazards of counterfeit products, as discussed in subsection 2.2.5, pose another risk to affected companies' goodwill and brand value: a public case where counterfeit products would be responsible of serious consequences on consumer health and safety has the potential to damage a company's reputation in a serious way and is therefore taken seriously in many interviewed companies. This is especially the case in pharmaceutical and aviation industry.

Second, counterfeiting has a negative effect on return on investment for marketing and research and development activities. Counterfeiting is a theft of intellectual property that licit companies have earned on their work and it has a discouraging effect on innovativeness. Third, illicit trade leads to development of future competitors as counterfeiting and product piracy helps illicit actors to gather know-how and infrastructure for production.

4.3 Impact on societies

Counterfeiting effects on societies do vary depending on the societies. Europe, with a strong focus on innovations, intellectual property rights and investments in research and development (R&D) will loose on the long term economic growth and innovativeness.

According to AIM, counterfeiting reduces economic growth [13]. Brands are the essence of a competitive economy. They differentiate through innovation which makes them relevant to the consumer. A cycle of sustained innovation leads to economic growth. Innovation is protected by trade mark, copyright, and other IP laws to allow manufacturers a return on their investment. Counterfeiting reduces the returns from innovation thus reducing the incentive to innovate, leading to reduction in economic growth [78, 79]. Additionally counterfeiting is theft from the public purse: counterfeiters do not pay taxes, they avoid duties, they are not model employers [13].

Societies which pay less respect to intellectual property rights and do not prosecute counterfeiting, gain from the violation of IPRs, as they don't have any investments into research and development nor into marketing activities. On the first sight, these societies gain more than they loose, but our findings suggest that even these societies are beginning to respect intellectual property rights [80].

4.4 Impact on consumers

Effects of counterfeit products are twofold: there are economical and individual effects to the consumers. In counterfeiting and violation of IPR scenarios, consumers will either have less innovation due to less investment into research and development or will have to pay higher prices for innovative products. Additionally, less innovation signifies smaller growth rates and can lead to stagnation.

In case of purchasing non-perceptive counterfeit drugs or car spare parts unknowingly, the danger aspects of counterfeit products are far more severe than the mere economical effects. The usage of counterfeit or expired drugs or spare parts can endanger people lives. The number of patients which died by taking counterfeit drugs cannot be quantified. Counterfeiting constitutes a severe risk to consumers' health, security and jobs and their wealth on the long term.

4.5 Findings of this section

Counterfeiting and illicit trade have a large number of identified direct and indirect impacts on companies, consumers, and societies. Companies themselves have a fair understanding of the overall impact mechanisms like substitution of original goods by counterfeits, but precise knowledge of the impact is rare and estimates of individual companies vary significantly. Especially the indirect effects to companies like decreased goodwill or increased risk of safety hazards are very hard to quantify, even though they play an important role in the decision making process of countermeasures. The most severe potential consequence for a company that was identified during the study was that big incidents from counterfeited security relevant goods, such as drugs, could even stop the sales of the genuine product.

Moreover, all estimates of significance of the impact are based on estimates of the extent of illicit trade which, as illustrated in subsection 2.2.1, are imprecise and have large error margins, so also the impact estimates inherit imprecision. As already mentioned, estimates of significance of different impacts of illicit trade require case specific information of the product, company, or country under study. Furthermore, the needed information for estimating the impact is rarely publicly available and no general methodologies of how to construct these estimates is published. Financial models of legal and illicit players will be studied further in deliverable D5.3 Business Case Report.

5 Conclusions

This report presents a comprehensive problem analysis of counterfeiting and illicit trade. The findings constitute an understanding of the problem which will provide solid grounds for the following stages of the project that comprise requirements analysis of technical anti-counterfeiting solution, development of the infrastructure, and business case calculations. Within this study we have defined terminology that is needed to address the issue in a formal way, studied the extent of counterfeiting to find that the published results are often exaggerated but also that the extent of illicit trade is industry specific. We have identified drivers and enablers of counterfeiting and presented which ones of these could be targeted by countermeasures and anti-counterfeiting strategies, analyzed the roles of different actors and presented what dangers counterfeit goods pose to consumers and end-users. We have identified distribution channels of counterfeit goods and their relation to parallel trade, found out the enablers of parallel trade and roles of different actors, in particular differences in country-wise and regional legislation.

During the research two industry wide trends were validated: the quantity of counterfeit products in the market is increasing, and the quality of the counterfeit products is improving. This finding is alarming because it constitutes a vicious circle where the increasing profits of counterfeit players allow investments in improving the manufacturing technologies and processes, further increasing the quality and quantity of counterfeit products.

The industry specific part of the analysis was conducted through expert interviews in different companies. Together with the literature review, we have acquired a very good base of knowledge of the problem and have identified the general patterns that characterize all industries and the industry specific parts of the problem. As a conclusion, we have found out that in all companies the overall problem consists of different kinds of mixtures of counterfeited and pirated goods of different qualities, as well as grey market and black market activities. These basic mechanisms exist in all industries but the extent is company dependent. Furthermore, the industry specific analysis identified also the demand for counterfeit goods. For luxury goods industry, there is demand among the consumers, while in other industries, the demand is among different players within the distribution channel who seek for higher profits through illicit practices.

Since companies are interested in dealing with all these problems with one solution, RFID as a mass serialization technique appears promising. The detection of counterfeit products and their distribution channels is the first problem in the fight against trade with counterfeit goods. Many companies only know whether their trademarks and copyrights are infringed or not, but the real extent of these activities is unknown. Learning more about the scope of the problem would surely motivate more companies to begin or extend their anti-counterfeiting measures. With a track and trace based solution that provides downstream visibility for the brand owner, EPCglobal network could meet the demands of accurate real time traceability on item-level. In addition, BRIDGE should work on solutions for different requirements. For perceptive counterfeits, solutions should help to fight against the illicit distribution channel. For non

perceptive counterfeits, BRIDGE should work on solutions that consumers can use to ensure they are buying genuine product. This will be addressed in Task 5.2 Requirements Analysis.

Overall, counterfeiting is an easy and attractive organized crime that normally goes hand in hand with other illicit trade activities. The motivations of criminals to engage in these activities are purely financial and illicit actors can take advantage of all opportunities where breaking laws or contracts lead to bigger profits. The negative impact of illicit trade touches companies, societies and consumers as a whole, but the burden of responding to these crimes and contract breaches lies mostly on the shoulders of the intellectual property rights holders. Given this background, designing technical solutions to mitigate the threats of counterfeit goods and to fight the problem at its source remains challenging. In addition, the role of technology in the overall anti-counterfeiting strategy should be carefully addressed. According to an ancient proverb, *an ounce of prevention is worth a pound of cure*, so careful evaluation is needed to find optimal ways to allocate the limited efforts and resources for anti-counterfeiting.

The next steps in WP5 of the BRIDGE project include elaboration of upcoming deliverables in terms of requirement analysis (D5.2 Anti-counterfeiting Requirements Report – detection and prevention of counterfeiting of products, illicit trade & piracy from end user, manufacturer and third party perspective) and assessment of anti-counterfeiting business case (D5.3 Anti-counterfeiting Business Case Report). As also mentioned earlier in this report, the problem analysis will continue in adjacent SToP project to learn more about the drivers and mechanisms of counterfeiting and illicit trade (SToP deliverable D1.1 Description of main drivers and mechanisms of illicit trade). As described in the Description of Work of BRIDGE project, these adjacent research projects will provide synergies that will deduce needed effort. Contents of deliverables of WP5 are illustrated below.

Deliverable	Content
 D.5.1 Problem-Analysis Report on Counterfeiting and Illicit Trade	<ul style="list-style-type: none"> • Problem analysis of product counterfeiting • Problem analysis of illicit trade • Illicit trade in different industries • Impact of illicit trade (qualitative)
D.5.2 Anti-counterfeiting Requirements Report	<ul style="list-style-type: none"> • Requirements of EPCnetwork based product authentication • Different use cases of product authentication • Level of security
D.5.3 Anti-counterfeiting Business Case Report	<ul style="list-style-type: none"> • Impact of illicit trade (qualitative) • Impact of countermeasures • Financial model of counterfeiters
D.5.4 Anti-counterfeiting Trial Preparation Report	<ul style="list-style-type: none"> • Selection of appropriate hardware • Integration of tags • System integration
D.5.5 Anti-counterfeiting Evaluation Report	<ul style="list-style-type: none"> • Evaluation of trials • TBD
D.5.6.1 Anti-counterfeiting Application Guidelines	<ul style="list-style-type: none"> • Application guidelines • TBD
D.5.6.2 Anti-counterfeiting Implementation Roadmap	<ul style="list-style-type: none"> • Implementation Roadmap • TBD

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Appendix A

Guideline of the semi-structured expert interviews

Definitions:

Counterfeit product – any good that bears without authorization a trademark which is identical to a validly registered trademark or which cannot be distinguished from such a trademark.

Pirated product – any good which is copied without the consent of the holder of the copyright.

Gray market – selling of branded or trademarked goods through distribution channels which are not authorized by the trademark owners (e.g. parallel importing).

Perceptive counterfeit – customer buying fakes knowingly

Non-perceptive counterfeit – customer buying fake goods without bad intentions

Data protection:

The interview results will be handled confidentially among the research project partners. No direct reference to your personal details or to your company will be published without permission.

Question 1: Please explain and illustrate the way counterfeit products enter the market?

Which of your products / trademarks are affected?

Which of your markets / regions are affected?

What are the strategies of counterfeit players?

How are the counterfeit products distributed to your supply-chain?

Do you make difference between high-quality fakes and low-quality fakes?

Do you make difference between perceptive and non-perceptive counterfeiting?

Has counterfeiting increased or decreased in recent years (the latter might be a signal of the increased quality of counterfeit products)?

Question 2: What are the roles of different stakeholders?

What is the role of your customers?

What is the role of your suppliers?

What is the role of the end-user?

What is the role of customs?

Question 3: What are the motivations of counterfeiters?

To make easy money / harm you / get ransoms / money laundry / etc.?

Question 4: What risks do the counterfeit products pose to you?

To your company?

To your customers?

To other stakeholder?

Question 5: Do you have estimates of impact of counterfeiting to your revenues?

What are these estimates?

How are the estimates derived?

What is the impact of grey market activities and piracy?

Question 6: What is the current status of your anti-counterfeiting activities?

How did you get to know about counterfeit products?

Do you invest in anti-counterfeiting? Why? / Why not?

Do you estimate the direct economic benefits of anti-counterfeiting? How?

Which anti-counterfeiting activities do you already use (regular checks, security features like RFID, legal activities, employee coaching....)?

At which step in the supply chain do checks occur?

To whom have you talked to already?

Question 7: What could you do to make the business less profitable for counterfeit players?

What countermeasures you have in your disposal that you haven't used so far?

What could customs / legal system / other stakeholders do?

Question 8: What technical requirements do you have for anti-counterfeiting solution?

What kind of product-authentication system would need?

Online / Offline authentication?

Where, by whom, how often, the products should be authenticated?

Do the tags need to provide cloning resistance?

Do the cloned tags need to be found? How?

How much effort can authentication of a single product demand?

Could you use an anti-counterfeiting solution which does not give 100% sure answers for authentication, but for example labels original products sometimes as fakes?

Question 9: What requirements do you have about information sharing?

What information you want to share? What information you have to share?

Is there any information you don't want to share?

Question 10: What other, non-technical requirements do you have for anti-counterfeiting solution?

What regulatory requirements do you have?

What organizational requirements do you have?

Who do you trust regarding anti-counterfeiting? Who don't you trust?

How do you ensure trust in different parties?

Which parties need to be involved in the authentication system?

Which parties should increase cooperation?

Question 11: Through which channels have illicit actors received knowledge about your products?

Technology transfer? Trade fairs? Company's factories in China? Industry Espionage?

Appendix B

Different associations and coalitions have been founded in the past, either with an industry-wide or an industry-specific scope to cope with counterfeits, grey markets and copyright infringements. Some of the most important groups are listed below.

- IACC: International Anti-Counterfeiting Coalition, www.iacc.org
- AGMA: Grey Market and Counterfeit Technology Abatement, www.agmaglobal.org
- GACG: Global Anti-Counterfeiting Group, www.gacg.org
- ACG: Anti-Counterfeiting Group, www.a-cg.com
- AIM: European Brands Association, www.aim.be
- INTA: International Trademark Association, www.inta.org
- ICC: International Chamber of Commerce, www.iccwbo.org
- APM: Arbeitskreis Deutsche Wirtschaft Gegen Produkt- und Markenpiraterie, www2.markenpiraterie-apm.de
- MV: Markenverband, www.markenverband.de