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The transnational tobacco companies' strategy to promote Codentify, their inadequate tracking and tracing standard

Luk Joossens,¹ Anna B Gilmore²

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¹Foundation Against Cancer, Association of European Cancer Leagues, Brussels, Belgium

²Department for Health, University of Bath, Bath, UK

Correspondence to

Luk Joossens, Foundation Against Cancer, Chaussée de Louvain 479, Brussels B-1030, Belgium; ljoossens@stichtingtegenkanker.be

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INTRODUCTION

In 2011 INTERPOL, the world's largest police organisation, accepted a donation from Philip Morris International (PMI) of €15 million,^{1,2} an 8% increase to its total annual budget (€60 million in 2011) for each of the next 3 years.³ Its 2011 budget was €60 million, of which 84% was contributed by member countries. With only 13% of INTERPOL's total income coming from externally funded projects, private foundations and/or commercial enterprises, this represents a substantial donation.³

Shortly afterwards, in July 2012, INTERPOL announced the creation of the INTERPOL Global Register (IGR)⁴ which, focusing on products under threat from illicit trade,⁵ aims to provide tools to help law enforcement and the public determine a product's authenticity. INTERPOL simultaneously stated it would be working with British American Tobacco (BAT), Imperial Tobacco Group (ITG), Japan Tobacco International (JTI) and PMI (specifically with their Digital Coding and Tracking Association—see below) to make the tobacco industry's supply chain control system, Codentify (see below), accessible via the IGR.⁴

The Framework Convention on Tobacco Control's (FCTC) Illicit Trade Protocol (ITP) was adopted in November 2012 following negotiations over a 4-year period. This protocol puts technological solutions to the global illicit tobacco trade, most notably a global track and trace system, at the heart of efforts to address the illicit tobacco trade.⁶ The tobacco industry's successful negotiation of a deal with an intergovernmental agency such as INTERPOL and its attempt to promote its own tracking and tracing system at this time therefore raises obvious concerns, not least because of overwhelming evidence of the tobacco industry's complicity in global cigarette smuggling on both a historical and current basis.^{7–12} This article aims to explain the background to the current situation, to critically examine the tobacco industry's Codentify system that the INTERPOL deal seeks to promote and to explore the policy implications of INTERPOL's support for Codentify. In so doing, it draws, inter alia, on two industry documents provided anonymously to the authors that detail a pan-industry agreement to promote Codentify.^{13,14}

CODENTIFY: FROM PMI PATENT TO SHARED TRANSNATIONAL TOBACCO COMPANIES STRATEGY

Codentify, a visible code printed onto tobacco packaging, was initially developed, owned and patented by PMI (EP1719070).¹³ Its primary objective, consistent with PMI's interests, was the

verification of a product's authenticity (ie, whether a product is genuine or counterfeit) (see box 1).

Leaked industry documents show that in November 2010, Codentify became a joint tobacco industry project when, in a highly unusual move, PMI agreed to licence Codentify for free to its main competitors, BAT, JTI and ITG.^{13,14} These four transnational tobacco companies (TTCs) jointly account for 71% of global cigarette sales (excluding China).¹⁵ A key part of the agreement was that all four companies would use the PMI Codentify marking system on their cigarette products and work collectively to promote this system to governments on a global basis to ensure 'The adoption of a single industry standard, based on Codentify'.¹³ In 2011 the four companies created a legal structure, the Digital Coding and Tracking Association, registered in Zurich, Switzerland. Collaboration with governments and international organisations is a key part of the new organisation's strategy; the deal with INTERPOL thus serving as an example of the industry's success to date.¹⁶ The stated aim of the Association—to promote cost-effective industry standards and support technology solutions for track and trace and digital tax verification—raises very serious concerns because of the serious technical limitations of Codentify and the inherent danger of an industry, known to have been extensively involved in the global illicit tobacco trade,^{7–10} coming to control the systems that seek to control such a trade (see box 1). The leaked documents also show that the industry is seeking to promote its own Codentify system over those of competing marking and digital tax stamp companies, such as SICPA (Switzerland), DeLaRue (UK), EDAPS (Ukraine) and 3M (USA).¹³

The INTERPOL Global Register and other such agreements

The INTERPOL Global Register is effectively a searchable online database⁵ containing detailed descriptions of tax stamps, control stamps and other security solutions and features used to protect and identify genuine products. Users—manufacturers, distributors, retailers, law enforcement, government officials and the general public—will be able to use an Internet-based application to scan and receive information on a product to verify its legitimacy, access product information and see what safety features are in place. The full contents of the database will be available to law enforcement officers and government institutions through websites and mobile applications to support global efforts against illicit

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Box 1 Codentify

What is Codentify

Each Codentify code is a unique, unpredictable set of 12 letters or numbers readable by the naked eye. According to Philip Morris International (PMI) 'Codentify avoids the requirement to store the codes by encrypting the information contained within them prior to printing through a patented combination of multiple keys and digital signatures.'¹⁷ As such, the system has no linked database which stores the codes. The codes may contain the following information:

- ▶ date and time of manufacture
- ▶ machine of manufacture
- ▶ brand and brand variant
- ▶ pack type
- ▶ pack size
- ▶ destination market
- ▶ price
- ▶ tax level¹⁷

The limitations of Codentify

As an industry system, we have access to only limited information on Codentify, through documentation PMI provides publicly,¹⁷ the patent¹⁸ and that leaked to the authors.¹³

Nevertheless, these documents acknowledge some limitations of Codentify, notably that if a code is used twice, the Codentify system cannot alone determine which of the two products with this code is genuine or counterfeit. An analysis of the package at the consumer service centre is required to confirm the authenticity.¹³ More generally it is noteworthy that the code is visible on the packs, making it easy to read and recognise, but less secure as visible codes are easier to falsify. A Framework Convention on Tobacco Control's review of code verification systems such as Codentify noted that their validity depends on the unpredictable nature of the codes and that independent audits are necessary to ensure this unpredictability.¹⁹ Yet the PMI Codentify brochure does not mention independent audits.¹⁷

The main concerns with Codentify, however, relate to the industry's apparent intention to use it for tracking and tracing and tax verification purposes. Tracking and tracing is defined in the illicit trade protocol (ITP) as 'the systematic monitoring and re-creation by competent authorities or any other person acting on their behalf of the route or movement taken by items through the supply chain'.⁶ Thus tracking and tracing should enable authorities to determine at what point in the supply chain a product is diverted into illicit channels. Article 8.10 of the ITP specifically requires the tracking and tracing system to deliver information up to the point that all duties and relevant taxes have been discharged.⁶ A database which registers data on the product throughout its supply chain is therefore required. Codentify does not meet these standards because it does not store the codes or register events after the product is manufactured. Article 8.4 of the ITP, for instance, requires information on the name, invoice, order number and payment records of the first customer or the intended shipment route, the shipment date, shipment destination, point of departure⁶; information that would be unavailable under Codentify. For the same reason, Codentify cannot determine whether a product subsequently enters an illegal distribution route. Furthermore, the Codentify system has no link between the codes on the packs and the cartons. While this is not an obligation under the protocol, it would facilitate tracking and tracing by establishing a parent-child relationship between different packaging units allowing, for instance, traceability of master cases without having to separately scan all cartons and packs inside the master case.¹⁹

The final concern is the industry's apparent intention to promote Codentify for tax verification purposes in place of tax stamps.^{13 14} This represents a very real danger. The use of tax stamps is supported by legislation, often with clear regulations on what constitutes an offence. A fake tax stamp is, for example, an offence. Tax stamp systems are fully under the control of governments or their agencies.²⁰ Replacing tax stamps with Codentify would require delegating the power and technology for tax collection from government to an industry that could and has obviously benefitted from non-payment of tobacco excise.

trade.⁵ The private sector and the general public will have more limited access to the details.⁵

Despite the limitations of the Codentify system outlined above, including its inability to track products through the supply chain, INTERPOL documentation makes misleading claims about Codentify, consistent with tobacco industry aims for its promotion.^{13 14} This includes INTERPOL's statement that 'through the Codentify system and utilising internationally agreed standards, it is possible to track and trace the movement of products through the supply chain, and identify whether products are genuine or counterfeit'.⁴ Moreover, while the subtitle of the INTERPOL Global Register brochure is: 'Everyone can fight illicit trade',⁵ its main focus is combating counterfeit, just one form of illicit trade, but notably the one the TTCs are most concerned with.²¹ According to Euromonitor, in 2010 counterfeit cigarettes represented just 13% of illicit cigarettes globally.²¹ The INTERPOL initiative

gives the impression that combating counterfeit trade will reduce illegal trade which is not the case if other types of illicit trade become more prominent.

According to INTERPOL Financial Regulation 3.7.1,²² all activities of the donor and all donations must be compatible with the principles, aims and activities of INTERPOL. INTERPOL statements suggest they believe this to be the case, claiming: 'In relation to combating the illicit tobacco trade, the alliance between the industry itself and governments with a common aim would perhaps see furtherance of the attempts at curbing the illicit trade of tobacco products, given the resources tobacco companies have at their disposal, and "insider" knowledge and technical expertise on the matter.'²³ Yet this overlooks overwhelming evidence that all four TTC have been extensively involved in tobacco smuggling.⁷⁻⁹ Even in 2012, a member of the Digital Coding and Tracking Association, JTI, has been accused of ongoing illicit trade activities.¹⁰

It is also unclear whether the appropriate authorisation has been given for PMI's INTERPOL donation. In cases when donations to INTERPOL exceed 5% of its total general budget, authorisation from the General Assembly, INTERPOL's supreme governing body comprising representatives of each of its 190 member countries, is needed. Yet publicly available documents give no indication that such authorisation was granted for the PMI donation.²⁴

Do Codentify and the INTERPOL industry deal comply with the WHO Framework Convention on Tobacco Control?

The WHO FCTC was adopted in 2003 and by September 2012 had been ratified by 176 parties representing 88% of the world population. Article 5.3 of the FCTC requires parties, in setting and implementing their 'public health policies with respect to tobacco control', to 'act to protect these policies from commercial and other vested interests of the tobacco industry in accordance with national law'.²⁵ The guidelines for implementation of Article 5.3 also state that 'International cooperation is essential for making progress in preventing interference by the tobacco industry with the formulation of public health policies on tobacco control'.²⁵

Yet, INTERPOL, an intergovernmental agency, is instead promoting tobacco industry interests over those of public health and its agreement with the industry should be interpreted as contravening Article 5.3.

Moreover, this agreement follows other controversial agreements reached between the TTCs and national and international agencies in recent years, suggesting a concerted campaign by the TTCs to ingratiate themselves with government agencies as part of the solution to the tobacco epidemic.^{26 27} Notable agreements include cooperation agreements signed with the European Union on cigarette smuggling which experts have suggested also contravene FCTC Article 5.3,^{26 27} and in South Africa an agreement reached between the tobacco industry, law enforcement agencies and revenue and customs authorities to explore the implementation of a digital marking system for product authentication, fiscal verification and—eventually—track and trace, based on the Codentify technology.²⁸

Illicit tobacco trade is regulated by Article 15 of the WHO FCTC and by the ITP, which has been negotiated as a supplementary treaty to the WHO FCTC. The ITP, adopted at the fifth conference of the parties (COP) in November 2012, will come into force on the 90th day following the date of the 40th ratification of the protocol. Only parties which ratify the protocol will be bound by its obligations.⁶ Article 8 of the ITP, which deals with track and tracing, specifically notes the need to avoid delegating tracking and tracing to the tobacco industry:

2. Each Party shall establish, in accordance with this Article, a tracking and tracing system, controlled by the Party for all tobacco products that are manufactured in or imported onto its territory taking into account their own national or regional specific needs and available best practice.

12. Obligations assigned to a Party shall not be performed by or delegated to the tobacco industry.

13. Each Party shall ensure that its competent authorities, in participating in the tracking and tracing regime, interact with the tobacco industry and those representing the interests of the tobacco industry only to the extent strictly necessary in the implementation of this Article.⁶

Article 8.12 is the most restrictive paragraph on the role of the industry. However, an internal tobacco industry document

on Codentify suggests the industry has already developed a strategy to circumvent this restriction.¹³ The document indicates that tobacco companies would licence the Codentify technology for free in a specific market to 'credible' third party providers who in turn would promote Codentify on their behalf, providing training and support to relevant government officials.¹³

In short, the industry's deal with INTERPOL and its promotion of Codentify appear incompatible with the obligations of Article 5.3 of the FCTC, and Article 8 of the ITP. Unsurprisingly, therefore, INTERPOL's application for observer status at the November 2012 FCTC COP caused alarm among the Parties to the FCTC. The decision on INTERPOL's application was deferred until the next COP with a mandate for the COP bureau to seek clarification on the INTERPOL-PMI deal.²⁹

DISCUSSION

The pan-industry deal to develop and promote PMI's tracking and tracing standard, known as Codentify, might undermine the FCTC and its ITP and raises key concerns about the ability of the ITP and governments to effectively control the illicit tobacco trade. The industry-INTERPOL deal and similar deals reached elsewhere^{26 27} illustrate the apparent ease with which the tobacco industry has been able to portray itself as part of the solution to the tobacco epidemic and, via INTERPOL's application for observer status, integrate itself into the FCTC processes as others have previously predicted.²⁷ Given that lack of technical and financial resources available for FCTC implementation, issues that are perhaps most keenly felt in the area of illicit trade²⁷ given the potential expense and technical complexity of, for example, tracking and tracing systems, have been identified as key barriers to successful FCTC implementation,³⁰ the industry's success in this area should not come as a surprise.

However, given that all four major companies have been accused of being involved in smuggling, that, even over the last 2 years, new information on industry involvement in cigarette smuggling continues to emerge detailing ongoing involvement in the illicit trade until at least 2010^{11 12} and that the European Union is currently investigating JTI's alleged illicit trade activities,¹⁰ the willingness of INTERPOL to collaborate with industry this way is surprising. These industry activities would imply that the deal contravenes INTERPOL Financial Regulation 3.7.1, an issue that INTERPOL should examine urgently. The deal would also appear to contravene Article 5.3, an issue which INTERPOL appears to have overlooked, illustrating the complexity of enforcing FCTC guidelines outside governmental and intergovernmental agencies that deal directly with public health issues.²⁷ The limitations of Codentify outlined above raise further concerns: Codentify cannot guarantee that a product is authentic, nor guarantee its legal status through the supply chain and is not a track and trace standard.

While the limited information available to us on the Codentify project makes it difficult to be certain of the industry's real objectives, we believe the evidence indicates that the following elements underpin the industry's strategy:

1. To establish alliances and partnerships with authorities at a national and international level to position the tobacco industry as part of the solution to the illicit tobacco trade and increase its ability to influence developments in this area.
2. To concentrate the debate on counterfeit instead of other elements of the illicit tobacco trade, notably the smuggling of TTC cigarettes.
3. To keep tracking and tracing, authentication, volume control and tax verification under industry control.

4. To ensure intelligence on the illicit tobacco trade remains under tobacco industry control so that such data can be used as part of the industry's efforts to undermine tobacco control policies, such as plain packaging or tax increases.
5. To avoid potentially superior and more expensive solutions for tracking and tracing systems provided by the security marking companies.

These issues, combined with the industry's history^{7–9} and vested interests in this area, also highlight the very real danger of regulatory capture by the tobacco industry in the area of illicit tobacco. Article 8 of the protocol, which deals with track and tracing, specifically notes that obligations assigned to a Party shall not be performed by or delegated to the tobacco industry. It is very likely that the tobacco industry will come up with the solution of 'credible' third party providers. Only technology companies selected through a governmental call for tender should be in charge of the markings and the data monitoring. Parties which ratify the ITP need to be aware of these issues and reminded of their obligations under the FCTC. Given evidence that low and middle income countries, where resources are particularly limited, are more susceptible to regulatory capture,³¹ the threat of the tobacco industry undermining the FCTC and its ITP in these countries must be taken particularly seriously.

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REFERENCES

- 1 Philip Morris International. Philip Morris International provides 15 million euro contribution to INTERPOL to fight trafficking in illicit goods, press release. Lausanne. 2012. http://www.pmi.com/eng/media_center/press_releases/pages/201206210200.aspx (accessed 5 Dec 2012).
- 2 INTERPOL. INTERPOL targets organized crime with global initiative against trafficking in illicit goods, media release. Lyon, 2012. <http://www.interpol.int/News-and-media/News-media-releases/2012/PRO050> (accessed 5 Dec 2012).
- 3 INTERPOL. *Annual report 2011*. Lyon, 2012.
- 4 INTERPOL. INTERPOL Global Register unveiled at Google Ideas INFO summit, Lyon, Interpol Red Notice. 2012. <http://interpolnoticeremoval.com/tag/secretary-general-noble/> (accessed 5 Dec 2012).
- 5 INTERPOL. INTERPOL Global Register, everyone can fight illicit trade. Lyon, 2012. <http://www.interpol.int/Crime-areas/Trafficking-in-illicit-goods/The-INTERPOL-Global-Register> (accessed 4 Jan 2013).
- 6 Conference of the Parties to the WHO Framework Convention on Tobacco Control, Fifth Session, Seoul, 12–17 November 2012, Decision FCTC/COP 5(1) Protocol to Eliminate Illicit Trade in Tobacco Products. 12 November 2012. [http://apps.who.int/gb/fctc/PDF/cop5/FCTC_COP5\(1\)-en.pdf](http://apps.who.int/gb/fctc/PDF/cop5/FCTC_COP5(1)-en.pdf) (accessed 3 Jan 2013).
- 7 Joossens L, Raw M. Progress in combating cigarette smuggling: controlling the supply chain. *Tob Control* 2008;17:399–404.
- 8 LeGresley E, Lee K, Muggli ME, et al. British American Tobacco and the 'insidious impact of illicit trade' in cigarettes across Africa. *Tob Control* 2008;17:339–46.
- 9 Collin J, LeGresley E, MacKenzie R, et al. Complicity in contraband: British American tobacco and cigarette smuggling in Asia. *Tob Control* 2004;13(Suppl II):ii96–111.
- 10 Solomon J. EU probes cigarette deal that may have aided Syria. *The Wall Street Journal* 21 August 2012. <http://online.wsj.com/article/SB10000872396390444233104577595221203321922.html> (accessed 5 Dec 2012).
- 11 Skafida V, Silver KE, Rechel B, et al. Change in tobacco excise policy in Bulgaria: the role of tobacco industry lobbying and smuggling. *Tob Control* 2012. Published Online First: 3 December 2012. doi:10.1136/tobaccocontrol-2012-050600.
- 12 Holland J, Jovanovic B, Dojcinovic S. Big trouble at big tobacco, Organized Crime and Corruption Reporting Project (OCCRP). 2011 https://reportingproject.net/troubles_with_big_tobacco/ (accessed 28 Feb 2013).
- 13 Hill M. Digital Tax Verification (DTV) Codentify, the industry standard. 2010.
- 14 BAT, IITL, PMI, JTI memo announcement of Industry Working Group (IWG). Agreement on Digital Tax Verification (DTV), November 2010.
- 15 Doira G. Marché mondial du tabac. *Revue des tabacs* July–August 2011 :6–13.
- 16 Hill M. Integrated solutions to secure the supply chain, digital coding and tracking association. Guangzhou, 25 November 2011.
- 17 Philip Morris International. Codentify, 2012. http://www.pmi.com/eng/documents/Codentify_E_Brochure_English.pdf (accessed 5 Dec 2012).
- 18 European Patent Office. European Patent Register: EP1719070. <https://register.epo.org/espatenet/application?number=EP05792643&lng=en&tab=doclist> (accessed 3 Jan 2013).
- 19 FCTC. Analysis of the available technology for unique markings in view of the global track and trace regime proposed in the negotiating text for a protocol to eliminate illicit trade in tobacco products, FCTC/COP/INB-IT/4/INF.DOC./1, 22 February 2010, Geneva.
- 20 Reconnaissance International. *Tax stamps: a technical study and market report*. Sunbury-on-Thames. 2012.
- 21 Euromonitor International. *Illicit trade in tobacco products—a world view*. London, 2010.
- 22 INTERPOL Secretariat. Financial regulations, Part 2, Chapter 3, Rule 3.7.1: conditions for acceptance of donations and sponsorship. Lyon, 2009.
- 23 Sollier J, Mangion R. INTERPOL - A Partner in Curbing the Illicit Tobacco Trade. TDM 5 (2012). www.transnational-dispute-management.com/article.asp?key=1876 (accessed 28 Feb 2013).
- 24 INTERPOL. General Assembly resolution 2011-RES-04, INTERPOL 2012 programme of activities and draft budget for 2012; Budget indications for 2013 and 2014. Lyon. 2012.
- 25 WHO Framework Convention on Tobacco Control: guidelines for implementation Article 5.3; Article 8; Articles 9 and 10; Article 11; Article 12; Article 13; Article 14. Geneva: WHO, 2011.
- 26 Heyward M. *Legal analysis of the agreements between European Union, member states and multinational tobacco companies*. New York, 2010. http://www.fctc.org/index.php?option=com_docman&task=cat_view&gid=73&Itemid=21 (accessed 28 Feb 2013).
- 27 Liberman J, Blecher E, Ramos A, et al. Opportunities and risks of the proposed FCTC protocol on illicit trade. *Tob Control* 2011;20:6, 436–8.
- 28 South Africa, cooperation between industry, police, revenue and customs. *Tax Stamp News* 2012;4:5–6. http://www.taxstampnews.com/images/stories/PDFs/TSN_Mar_12.pdf (accessed 28 Feb 2013).
- 29 Conference of the Parties WHO FCTC, fifth session, Decision FCTC/COP 5(2) applications for the status of observer to the Conference of the Parties. 12 November 2012. [http://apps.who.int/gb/fctc/PDF/cop5/FCTC_COP5\(2\)-en.pdf](http://apps.who.int/gb/fctc/PDF/cop5/FCTC_COP5(2)-en.pdf) (accessed 3 Jan 2013).
- 30 WHO Framework Convention on Tobacco Control Convention Secretariat. *2010 Global progress report on the implementation of the WHO Framework Convention on Tobacco Control 2010*. Geneva: WHO, 2010.
- 31 Soderlund N, Tangcharoensathien V. Health sector regulation—understanding the range of responses from Government. *Health Policy Plan* 2000;15:347–8.

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