

Deconstructing Disruptive Industry Technological Models: Concord between Smoking and Vaping

*Waseem Iftikhar and Syed Ali Wasif Naqvi**

ABSTRACT

Domination of the tobacco industry's innovative business models has forced many countries to develop defensive tobacco control strategies. Pakistan has been routinely adopting new legislation for this industry for the past several decades. However, constant tension exists between the legislative/policy development process and the transnational tobacco industry trying to outpace and evade new regulations. Expanding on the 'Disruptive Industry Technological Model' adopted by the transnational tobacco industry, this paper posits that the business model adopted during the previous century was radically disruptive, focusing on selling a product designed to kill almost half of its customers (WHO 2020). Subsequently, during the first two decades of the 21st Century, the tobacco industry adopted the 'Electronic Nicotine Delivery Systems (ENDS)' to displace its traditional cigarette sales. This paper deconstructs the adoption of such radically disruptive technological models by the tobacco industry and finds concord between both. It recommends the development of broad-spectrum proactive and preventive policies for Pakistan instead of reactive ones in the tobacco control regime.

Keywords: Disruptive technology, vaping, smoking, tobacco industry, Pakistan.

* *Mr Waseem Iftikhar* is a PhD Scholar at the Center for International Peace and Stability (CIPS), National University of Sciences and Technology (NUST), and Project Lead at Sustainable Development Policy Institute (SDPI), Islamabad, Pakistan.

Mr Syed Ali Wasif Naqvi is Research Associate at the Sustainable Development Policy Institute (SDPI), Islamabad, Pakistan.

1. INTRODUCTION

The concept of ‘Disruptive Technology’ gained currency towards the end of the 20th Century (Christensen 1997), and many industries felt the brunt of these technological changes. The philosophy of disruptive technologies encompasses creation and growth in the industrial sectors by penetration, or creation of entirely new ways of doing business or introducing technologies, products or services which are completely novel, non-existent, challenge the status quo, and are designed to attract new customers through dramatically low prices or value addition in the end product. Innovation and novelty are the essence of disruptive technology business models. On the one hand, customers need knowledge about these technologies to make correct choices, and on the other hand, incumbent industries are struggling to sustain brand loyalty and customer base, fearing loss of business or market elimination. Existing industries are also adopting innovative techniques to attract new clientele. Scholarship argues that research on disruptive technological models is slow to acknowledge their socio-psychological impacts (Appiah et al. 2019), and tobacco growth, production, value addition, and consumption is intricately linked to human social psychology (Laughlin and Wake 1970; Kamal et al. 2011). This paper presents an emic deconstruction of two disruptive technological models, both adopted by the tobacco industry. By examining the theoretical scholarship related to disruptive technology and its concomitance with the transnational tobacco industrial practices (and with a special reference to Pakistan), this study signposts the unique concord between the two different disruptive models. In this vein, this paper aims to understand the adoption of successive disruptive industrial models by the tobacco industry, their effectiveness, and implications for policy and legislation in Pakistan.

In the first section, the paper briefly explains the *modus operandi* of the transnational tobacco industry which makes it a challenging area for public health. The second section is a brief explanation of the history of tobacco control laws in Pakistan and establishes that multiple governments have been enacting tobacco control laws. However, the laws have been reactionary and their implementation has been sluggish. It, then, offers a conceptual understanding of disruptive models and their adoption by the tobacco industry. The next section further explains the 21st Century disruptive model and tobacco industrial connivance with this disruption. The final sections offer policy recommendations and briefly touches upon the creation and pollution of knowledge by the tobacco industry to support their claims and evade governmental regulations.

2. EXCESSES BY THE TRANSNATIONAL TOBACCO INDUSTRY

The dilemma for the transnational tobacco industry is that, on the one hand, it must 'sell' the product and remain profitable, while on the other hand, due to its ill-health effects, it faces resistance in every country where tobacco is grown, processed and tobacco products are sold. Tobacco products contain many known and unknown carcinogens (Hecht 2002) which are capable of causing multiple kinds of cancers. There are ongoing arguments on either side of the aisle, with those who are in favour of the tobacco industry and highlight the loss of hundreds of jobs in case of a complete ban on tobacco growth and processing (Hall and West 2008; ILO 2003). While, on the other side, are those calling for the complete elimination of tobacco and related products referring to the process as the *End Game* (Callard et al. 2005; Khoo et al. 2010; Malone 2010; Hall and West 2008; McDaniel et al. 2016). Such contrasting interests and associations make the tobacco industry (from production to consumption and secondhand ingestion) (Flouris et al. 2009, Hong and Bero 2002), highly volatile, contested, marred with tough competition, with an uncanny attachment to personal emotions and beliefs, besides socio-psychological implications. Consequently, the tobacco industry has been capitalising on such support and has responded vigorously around the globe with full force and capital investment. There is conclusive evidence that the tobacco industry has been coercing Low and Middle Income Countries (LMICs) to get favourable policy outcomes (Kalra et al. 2018). Its responses have been noteworthy in Australian cases of plain packaging (Chapman 2012), and the implementation of plain packing in Ireland and the United Kingdom (O'Faolain 2015; BBC News 2015). Similarly, the transnational tobacco industry has violated internationally recognised treaties in signatory countries (Janjua 2019), for example, in Pakistan the delay and eventual retraction in the implementation of a proposed increase in the Graphic Health Warning (GHW) from 40% to 85% and back to 50% (Janjua and Naqvi 2019).

Despite all these hurdles and challenges by the powerful transnational tobacco industry, many Western and developed countries have been successful in offsetting this influence and enact laws such as the very high price for a pack of cigarettes (Hirono and Smith 2018), excessive taxation and need for replication of successful models in low and middle income countries (Ho et al. 2018), ban on ads (Magrini and Font 2007; Basharat 2020) and plain packaging or packing with up to 90% GHW.

However, there is an ongoing struggle to enact new laws, especially in the LMICs. Moreover, a lot needs to be done in the implementation of these laws (Hoe et al. 2019). This process becomes even harder in the countries where the tobacco industry is a major taxpayer, such as in Pakistan (Kalra et al. 2018). Despite all the resistance, as

discussed in the next section, Pakistan has a reasonably long history of tobacco control and regulation through legislation.

3. BRIEF HISTORY OF TOBACCO CONTROL POLICIES IN PAKISTAN

Traditionally, Pakistan has been on the forefront to enact tobacco control laws, although, given the constraints in passage and promulgation, these laws have been fragmented. The ‘Tobacco Vendors Act’ was enacted as far back as 1958, and ‘Tobacco Pack Warning Act’ came into effect in 1979. Similarly, Pakistan promulgated the ‘National Health Ordinance’ in 2002 and became a signatory of the ‘Framework Convention on Tobacco Control (FCTC)’ in 2004. A series of tobacco control laws came into effect during the first two decades of the 21st Century, including the policy for GHW in 2009-10. Unfortunately, the implementation side of these laws has been sluggish due to ineffective enforcement mechanisms. The tobacco industry has been highly influential in tailoring the policy formulation process to suit its needs, and the latest case for increasing the GHW to 85% is noteworthy. Despite the lapse of almost five years, the case is still pending implementation and remains undecided in front of the Islamabad High Court (SDPI 2019).

Despite legislation, tobacco consumption in Pakistan remains a pandemic as compared to other LMICs, with almost 24 million active users who continue to smoke more than 85 billion sticks annually (Khalid 2019). Almost 1200 children start smoking in Pakistan daily (TCC 2018), which is one child almost every minute. Alarming, school children and college youth in Pakistan are smoking at a very early age and are trying new smoking contraptions, including *sheesha* and e-cigarettes. Besides this, the policy process has also been influenced by vested interests of the elite and politicians. The health burden due to tobacco use is bearing heavily on the national exchequer.

4. THEORY OF DISRUPTION

Theory of Disruption in technological advancement was first introduced by Bower and Christensen (1995). It posits that a technology must displace existing businesses and replace them with an altogether different product. Disruptive technologies interrupt workforce participation and force technologically challenged individuals, to either exit the job market or to face a competitive workforce through knowledge and skill enhancement (Kostoff et al. 2004). Initially, a disruptive technology only satisfies a niche market, and it must be supported with robust R&D investment and knowledge creation to expand its customer base and displace the incumbents (Danneels 2004). Four aspects decide if it is a *disruptive technology* or not: first, if the technology is

supported by the market and finance, just like its predecessors, it is not disruptive; second, the strategic focus of disruptive technology is not on current customers, rather on non-existing future customers; third, there is a need to ‘create’ the knowledge market for disruption before the actual customer market shapes up; and finally, it needs to be an altogether new and independent business, which over time will create its own niche and probably completely replace existing businesses.

Relatedly, Markides (2006) posits that a disruptive technology needs to be segregated by its users and academicians in two ways: disruptive technological innovation in ‘business model’; and radical disruption as in, ‘new to the world, product model’. A similar division was observed by Henderson and Clark (1990) as they divided innovation into ‘incremental innovation’ which reinforces the capabilities of established organisations and ‘radical innovation’ which forces organisations to ask a new set of questions, drawing on new technological and commercial skills and adapt to new solutions. Additionally, there is a cautious and valid argument that many of the business and industrial entrepreneurs find misplaced usage of this term, and replace it with innovation, as they try to find the value of innovation in its current utility instead of its future use (Bower and Christensen 1995).

5. TOBACCO INDUSTRY – DISRUPTIVE MODELS

The literature argues that dominated by the large tobacco conglomerates, the 20th Century was rightly labeled as the ‘cigarette century’ (Abrams 2014). One of the major fallouts of the tobacco pandemic is the premature deaths of millions of users every year. Combustible tobacco products and smoke have been scientifically and empirically proven to be the direct contributing causes of cancer (Hecht 2003), pulmonary and heart diseases (Curkendall et al. 2006), and to a variety of diseases caused by smokeless products (Boffetta et al. 2008).

A closer look into the statistics shows that almost 40% of Americans smoked during the 1960s. The tobacco industry remained immensely powerful and sales remained high attracting new and younger customers. Within a short span of almost four decades in 2002, the World Health Organization (WHO) estimated that almost 15 billion cigarette sticks were being sold across the globe daily, and transnational tobacco companies spent US\$ 1 million every hour on the promotion of cigarette sales (Hill 2020).

Unfortunately, the industry has been employing life-threatening and endangering techniques and technologies from excessive use of pesticides in crops (Damalas and Koutroubas 2016; Kahl et al. 2018), to harvesting and storage of chemical sprays (Grisan et al. 2016), manufacturing a product which has no health benefits and can only

cause cancer, lung, heart and pulmonary diseases to its direct and indirect users (Charlton 2004). ‘Tobacco is a pesticide-intensive crop’ (McDaniel et al. 2005), using millions of pounds of insecticides, herbicides, and suckercides. Moreover, using heavy doses of chemicals for better yield have a direct environmental impact (Tariq et al. 2007), and have been directly linked to harm children (Roberts et al. 2012). These pesticides remain in the tobacco even after it has been exhaled by the smoker. The American Cancer Society goes a step ahead and claims that there are more than 7000 chemicals and almost 70 confirmed cancer-causing agents (also known as carcinogens) in a cigarette (ACS 2017). A significant aspect that needs signposting is the cultivation and harvesting of a product that is designed to kill its own farmers (Khan et al. 2010) as well as customers (Tarar 2017). The WHO (2020) claims that the tobacco industry follows a business model which causes the death of almost half of its own customers, which apparently cause a drop in profitability and market shares. This radically disruptive business model has remained in practice under the watchful eyes of the tobacco industry throughout 20th Century.

Designing a product which kills almost half of its users, consequently disrupting the tobacco business, is certainly an interesting area of inquiry for tobacco critics and an opportunity for the tobacco industry. The opportunity opens up new vistas for targeting new markets in the shape of much younger customers (children), who would be willing to adopt smoking as a habit from a very young age. The same age group which has indulged in the latest wave of technological disruption is fast adopting the next forms of radically disruptive technological products in the shape of e-cigarettes or Electronic Nicotine Delivery Systems (ENDS). The next section explains the eruption of a new disruptive technological model within the tobacco domain.

6. NICOTINE DELIVERY SYSTEMS AND THE TOBACCO INDUSTRY CONNIVANCE

Kunze et al. (1998) refer to these products as Alternative Nicotine Delivery Systems (ANDS), also called Heated Tobacco Products (HTPs), Heat no Burn (HnB) products and e-cigarettes. All these products are electronic devices that produce aerosol (containing nicotine and toxic chemical products) by heating processed tobacco instead of combusting it (Simonavicius et al. 2019). The aerosol is inhaled by the user through sucking or smoking – a process known as ‘vaping’. These aerosols contain highly addictive nicotine, non-tobacco additives, and flavouring substance. These e-cigarettes contain liquid solutions, including chemicals such as anti-freeze, diethylene glycol, and carcinogens such as nitrosamines (Walley and Jenssen 2015). According to the WHO, they contain more than 20 potentially harmful chemicals - more than a normal cigarette.

In the absence of any discernable policy in most Western countries, including the United States (US), the youth e-cigarette endemic has worsened with almost 5 million children using these products (Isidore 2019). In a more serious development, 80% of more than 1000 lung injury patients in the US examined, who were less than 35 years old, had vaped during the past 30 days, and almost 18 deaths were directly caused by the use of ENDS until October 2019 (The Lancet 2019). These figures increased to 2807 cases of hospitalisation and deaths, as of February 2020 (Weiss et al. 2020; CDC 2020). However, CDC (2020) claims that the officials investigating EVALI (e-cigarettes or vaping product use-associated lung injury) revealed the presence of additional compounds such as tetrahydrocannabinol, cannabinoid oil, and vitamin E oil; and that the users mostly obtained these products from a friend, family member or an illegal manufacturer/distributor (Schroeder and Hoffman 2014).

In another related study published by the *New England Journal of Medicine*, it was found that lung injury among 11 out of 17 patients, was directly attributable to vaping (Butt et al. 2019). Because of these and other lungs related deaths and diseases, the CEO of Juul (the largest vape product in the US market) had to step down (Isidore 2019). This development also ended the buy-out deal of Altria (holder of 35% shares in Juul) by Phillip Morris. Tough US Federal Drugs Administration (FDA) laws, and possibly an Anti-Vaping Policy, is likely to reduce the sales of these products in the US. Resultantly, the manufacturers of e-cigarettes are likely to push these products to the countries where there are no laws to control such products, or if laws are there, implementation is lax. Pakistan is a lucrative market for the transnational tobacco industry, and socially, vaping has become the new normal among the youth. Currently, electronic smoking products are unregulated in Pakistan and serious policy vacuum exists in this field alongside smokeless tobacco. Many stores continue to sell these products with impunity.

The electronic delivery systems are a serious and growing threat to public health, especially in LMICs. Their main constituents are propylene glycol, with or without glycerol, flavouring agent, and a few more chemicals. ENDS such as e-cigarettes, vapes, *e-hookahs* or vape pens have a wide variety of toxicant production capacity which varies due to differences in designs, battery voltage used for heating the products, internal electronic circuitry, (in)availability of modification options and adaptability for use with substances other than nicotine. Philip Morris adopted this technology through IQOS (I Quit Original Smoking) products. Similarly, the model was replicated by many other manufacturers, and currently, more than 7760 unique flavours of e-cigarette solutions exist. These flavours have been tested on children, and

there was a 650% increase in the number of kids who had used these devices in the 30 days preceding one survey conducted in the US (Walley and Janssen 2015).

This radically disruptive industrial model was perceived as a replacement model for the tobacco industry. However, the latter was quick, not only to try and buy out these businesses but to develop their indigenous products. These products could continue to entangle the world into vaping well into the next century. As argued by de Andrade et al. (2017), the e-cigarettes market is highly contested and transnational tobacco companies resort to all possible means to show a financially profitable portfolio, even at the cost of adopting ethically questionable practices, besides producing and promoting the objective science and creation of knowledge to support their claims. Although the tobacco industry has routinely made serious 'risk reduction' claims through marketing these products, there is no scientific evidence that ENDS products are less harmful as compared to conventional smoke/smokeless products (Unger and Unger 2018).

As argued by Abrams (2014), two philosophies are at work in the tobacco control regime: abstinence and harm reduction. Abstinence focuses on avoiding tobacco use behaviour based on the available scientific evidence claiming that there are no safe levels of nicotine or tobacco consumption. If escaping this behaviour is not practical or realistic, the second aspect of tobacco control – harm reduction, gains priority. There is constant friction and an ongoing debate between these two philosophies. The tobacco industry has been focusing on this tension throughout the previous 'tobacco century', and the sudden rise of ENDS has added to this tension. Abstinence was effectively marginalised as an option by the addictive nature of nicotine and its craving by smokers, and unfortunately, harm reduction has been disrupted by the electronic means of nicotine delivery. ENDS also provided the tobacco industry with a significant amount of space to claim that vaping is not harmful through passive smoking as was the case with a normal cigarette. This new class of nicotine delivery systems has been projected as much safer (Benowitz and Goniewicz 2013), and as an instrument in speedy disruption of smoking behaviour and cigarettes.

Moreover, the tobacco industry has been fast adopting the electronic systems, promoting these products much safer through HnB technology as compared to tobacco, reduced levels of nicotine inhaled through vaping, and reduction in the amount of aerosol (Simonavicius et al. 2019). Traditionally, Philip Morris owned Altria until both broke up almost a decade ago (Bary 2008). However, a new merger plan appeared due to the unprecedented success of *Juul* – electronic cigarettes dominating the US market, and in which Altria is a major stakeholder (Foley 2019). Juul started as a micro-level project with three employees in 2015. However, within a short span of four years, it

became a multibillion-dollar company. This is a classic example of the power of disruption as Altria purchased 35% of the Juul shares for US\$ 13 billion (Tedder 2019). The three main reasons for Juul's sudden popularity are:

1. Vape comes in multiple user-friendly and attractive designs;
2. Flavours are popular among youth; and
3. They have been aggressively promoting the product on social media.

As a result of Juul popularity, Philip Morris made a US\$ 200 billion merger bid to Altria, which was called off due to a ban on electronic cigarettes in the US (Klebnikov 2019). Understanding the impact disruptive technology can have, and how to best capitalize on it by adopting these technologies, Philip Morris has stated that they envision a time when they will completely stop producing smoking products (Tedder 2019). For this, they have set up a US\$ 1 billion fund in the United Kingdom (UK) to persuade smokers to give up smoking (Boseley 2020).

According to the UK Office of National Statistics data, almost 7.4 million adults (15.1% of the population) smoked cigarettes in 2017. However, the number of e-cigarette smokers went up from 3.7% in 2014 to 5.5% (2.8 million users) in 2017 (ONS 2018). Bloomberg Industries has predicted that by 2047, vaping will surpass the traditional tobacco industry in sales (Robehmed 2013). Consequently, trends in the adoption of disruptive technologies are too obvious in the tobacco industry which will add diversity to their portfolio. In case of vaping, instead of complaining or countering the new products, the incumbent tobacco industry has fully embraced e-cigarettes, because these products not only allow them to continue selling tobacco products, rather are likely to add to their profits.

7. EPISTEMOLOGICAL CONTAMINATION

In today's epistemologically overloaded world, people can only take responsibility for their health and make the right choices, if they meet certain epistemic conditions (Levy 2018). However, like many other areas where knowledge is being produced, the tobacco industry is constantly polluting and contaminating the epistemology of the tobacco domain. The tobacco industry is producing and delivering knowledge that supports its disruptive technological model adaptation on one side, and altering the evidence in support of this adaptation, claiming that these products help a smoker quit smoking. The creation of this knowledge varies in its forms and generation of evidence both in the US and the UK. In the UK, a general perception has been created, through this knowledge, that vaping or the use of e-cigarettes leads to smoking secession and has, therefore, is a reason for the protection of the health of current smokers (Fairchild

et al. 2019). On the contrary, in the US such tainted information is being used to prevent children from initiating smoking through these products, besides harms caused to non-smokers through second-hand smoke. The debate in the UK regarding the vitality of e-cigarettes is also inconclusive as hardly any evidence exists on the role of ENDS products as a quitting aid (Patterson et al. 2016). Similarly, in the US, association of underage deaths to vaping has caused a lot of criticism against these products. Pakistan is looking for a middle ground where the decision regarding legality or illegality of these products can be ascertained with scientific evidence.

The tobacco industry supports its claims through scientific evidence and production of knowledge, thereby influencing the public and customers' opinions (Bero 2005). For example, in one of the analyses carried out by Simonavicius et al. (2019), it was observed that out of 31 peer-reviewed journal publications, 20 were sponsored by the tobacco industry, generally favouring scientifically known health-damaging products used in vaping. The harmful effects of passive smoking varied between 42% to 96%, making validity and reliability of such studies, highly questionable. The same study showed 83% nicotine delivery through HnB products, a claim which left open-ended and attractive choices for those who are vaping, to continue using these products even though the intake and vape frequency varied significantly among the individuals (Patterson et al. 2003). Finally, the findings of chewing gum as a replacement to smoking a cigarette showed that the nicotine reaching the human blood was slow and lesser in quantity as compared to a cigarette (Russell et al. 1976) and therefore, it was not recommended as replacement therapy.

Nicotine yearning determines the amount of nicotine intake by smokers through regular cigarettes or e-cigarettes. The topography of cigarettes constitutes multiple characteristics of tobacco, dependence, type of reward sought, gender, race, social class and pulmonary-related symptoms (Patterson et al. 2003; Bridges et al. 1986; Zacny et al. 1987; Ahijevych and Gillespie 1997). There is a scientifically proven relationship between the consumption of cigarettes per day, years of smoking, and the sensitivity or severity of nicotine dependence, which can be clinically measured through the Nicotine Dependence Syndrome Scale (Donny et al. 2008). The e-cigarettes tend to deliver less nicotine per puff as compared to traditional cigarettes, especially for inexperienced users (Schroeder and Hoffman 2014). To fulfill the desired level of nicotine consumption through e-cigarettes, the users' behaviour is critical and tends to be altered resulting in an increasing number of puffs, contributing towards an enhanced level of addiction. This factor also contributes 'to the products' ability to maintain nicotine dependence' (Schroeder and Hoffman 2014) and diminishing utility in secession therapy. Similarly, Davis et al. (2019) noted an increased number of 'puff rate' to calm

the craving and because the heat stick just lasts for six minutes, followed by the device getting shut down needing a recharge. As argued, the vaping individual might end up inhaling more nicotine as compared to a normal cigarette.

The nicotine injected into the human body affects the brain and behaviour of the smokers, and a 1974 memorandum from Philip Morris claimed that a 'general premise in our model of the cigarette smoker is that the smoking habit is maintained by the reinforcing effect of the pharmacologically active components of smoke' (Hilts and Collins 1995). These studies and experiments were carried out on college students for over 15 years and highlighted nicotine craving to a certain level, failing which, desire to inhale deeper and keep smoke in the mouth for a longer duration, or smoking an increased number of cigarettes.

Moreover, the tobacco industry has a history of adding flavour to its products (Kostygina et al. 2016), especially when focusing on selling them to new customers, children and to make it attractive, as temporally the addictive nature of nicotine sets in after persistent use (American Academy of Pediatrics et al. 2017). Simple, yet attractive concepts such as choice of colour and text on the cigarette packs are also guided by the promotion of sales. The same concept has been transformed into electronic products to attract younger smokers who would continue using these products for decades in the future.

Emic analysis of the tobacco industry's approach towards this disruptive technology shows rare disconcert among these transnational conglomerates due to the sudden rise of the disruptive e-cigarettes. The available evidence shows their concern turned into a profitable solution for this disruption through buyouts (Klebnikov 2019; Robehmed 2013). Theoretically, any disruptive technology usually takes small strides in its nascent stages, before it starts hurting the business of the incumbents. The tobacco industry has an existing edge due to the availability of enormous financial resources, loyal clientele in the shape of smokers who have been using their products for decades, and additional expertise in manipulating nicotine content through research on younger smokers (Hilts and Collins 1995). Additionally, this provides an opportunity to the tobacco industry to diversify its investment portfolio keeping the stakeholders in increasing profitability zone, without hurting their reputation. To show positive impact through Corporate Social Responsibility, the industry routinely resorts to tactics which seem to hurt their customer base (Foley 2019), but are designed for long-term promotional, advertisement and profitability.

The transnational tobacco industry is turning electronic smoking devices into a profitable venture which is fast gaining global popularity. Moreover, to repeat the

dictum ‘business of business is business’ (Ridgers 2012), the tobacco industry has been upgrading itself for adapting to this profitable business model. Academics also argue allowing diversification in the tobacco industry (Branston and Sweanor 2015). Unfortunately, the health impact of this diversification and adoption of disruptive models will continue to harm public well-being in the foreseeable future, and resultantly the protection of public health in LMICs will continue to be expensive and unmanageable. It is, therefore, necessary to understand the knowledge pollution caused by the tobacco industry and formulate policies after reviewing unbiased evidence.

8. POLICY RECOMMENDATIONS

Day and Schoemaker (2000) argue that the incumbents in any industrial sector generally concede to disruptive technologies because of two reasons: 1) a rather defensive reason, that the newcomers are plotting to disrupt and attack the existing trends and the incumbents must defend themselves from such disruption; and 2) if the disruptive technologies optimise their potential, it will be too attractive to be ignored.

The transnational tobacco industry has adopted the disruptive e-cigarettes model, only after their traditional disruptive model of killing almost half of their customers (WHO 2020) and replacing them with the much younger clientele, has been actualised and time tested. This is a socially implausible and dichotomous business model which is also an industrial double realignment to disruptive technology.

Like many other LMICs, the policies in Pakistan are generally reactive rather than proactive. However, due credit must be given for the tobacco control laws which were enacted much earlier than other countries. Ironically, revenue-starved successive governments placed excessive dependence on tobacco taxation, and some of these policies could not be implemented in letter and spirit. The transnational tobacco industry has been operating in Pakistan with a lot of leverage over policy formulation, and is sometimes involved in blatant denial of regulatory abeyance (SDPI 2019). Resultantly, most of the policies in the tobacco control regime have been reactive, delayed, vague and a significant portion have been implemented through Statutory Regulatory Ordinances (SROs), which need to be finally stamped by the legislature to prevent retraction. Given the transnational tobacco industry’s strategies of influencing and resisting laws, only a few policy recommendations are being made as follows:

1. There is an urgent need to develop a comprehensive ‘Multi-Sectoral Tobacco Control Policy.’ Addressing the issues in a disjointed manner exposes policies to industrial interference, eventual evasion, or sometimes court challenges. The Ministry of National Health Services Regulation and Coordination and its

subsidiary Directorate of Tobacco Control, in collaboration with the civil society partners working on tobacco control, need to develop this policy, linking the tobacco tax to public health and related diseases.

2. The tobacco industry, just like the other large multinationals including beverages, pharmaceutical, fertilizers, or cement industries is one of the largest taxpayers. However, tax revenues must not be allowed to be used as a coercion tool, especially at the cost of public health. Many small and large countries both from the developed world and the LMICs have set examples of robust tobacco control laws to safeguard public health. Pakistan needs to follow the regional as well as global best practices.
3. As mentioned above, e-cigarettes have effectively captured the children market in the US and many other countries, including Pakistan. As the scientific evidence becomes abundant, and known cases of death and injury are reported (Shanahan and Paybarah 2019), many countries are likely to enact new laws controlling the marketing and sales of vaping products. The disruptive technological focus of the tobacco industry is to promote these products as replacement therapy and as less harmful as compared to traditional smoke products (Glasser et al. 2017). The next logical step for the tobacco industry would be to target the LMICs as a new market for these products. A growing number of vape stores and hubs can be noticed across Pakistan. This endemic is likely to become popular among children and youth necessitating immediate preventive policy development and enforcement.
4. As mentioned above, the tobacco industry has made the most innovative use of disruptive technology in the domain of smoking by killing half of its customers during the previous century and has engaged in targeting the most vulnerable customers through yet another disruption i.e., vaping, during the 21st Century. The tobacco control regime needs to be aware of these disruptive technologies and facilitate the government in developing laws addressing these issues. A related school of thought argues that sometimes prohibition proves to be a failure, and drives banned industries underground. The chances are that by going underground the products become dangerous and excessively unhealthy. Similarly, the profits and stakes in such products are generally high, consequently, the methods of public access and provision become violent. Some countries (such as the UK) are legalising these products to know the extent of usage and understand the health issues, and taxing e-cigarettes (which would hopefully be) followed by a comprehensive ban. Such options could also be considered by the policymakers in Pakistan.
5. Although a ban on advertising tobacco products came into effect recently in Pakistan (Basharat 2020; The Union 2020), e-cigarette marketers would still be

able to access the target clientele through social media and the Internet. Online payment purchase and delivery systems are porous and the problem is compounded by the absence of laws and implementation of policies regulating the social media and cyberspace in such cases. This aspect needs to be addressed if prevention and protection have to be the focus of policy. In the presence of an increasing number of deaths across the world associated with tobacco use and more specifically because of the e-cigarettes, it is time for Pakistan to start developing legislation controlling the import, transportation, and spread of e-cigarettes, through pre-emption. Reactive policies are much less likely to yield any fruitful results.

6. E-cigarettes are trendy and have gained sudden popularity. Longitudinal studies are needed to validate the degree of harm and harm reduction, efficacy of cessation through vaping (if any), reduction in craving, and possibilities of preventing relapse. The Directorate of Tobacco Control, in collaboration with the civil society, needs to conduct such studies and draft policy recommendations based on contextual studies.

9. CONCLUSION

Pakistan is one of those countries where smoking is on the rise and as mentioned above, more than 1200 children start smoking every day. The existing laws to control tobacco usage lack implementation and are marred by excessive influence by the tobacco industry. Despite multiple experiments in Pakistan, such as the creation of multiple tax tiers (Burki et al. 2013) and price increase, the number of smokers is rising, and so are the tobacco industry profits. Unfortunately, the only thing declining is tax revenue. Traditionally, there was little or no competition to drive smokers away from nicotine craving, and the addiction kept smokers attached to their favourite brands, bringing them back for more. Vaping could not have come at a better time for the tobacco industry which is aware of a smokers' behavioural patterns. The ensuing melding of e-cigarettes into the tobacco market through buy-outs or the development of indigenous products was a natural dovetailing of both disruptive models.

This paper argues that the transnational tobacco industry has been operating around the globe for decades. Smoking and nicotine intake psychologically and physiologically become a habit over time. The initial disruptive model was based on killing half the customers through cancer and lung diseases, simultaneously luring much younger customers, who would keep the tobacco industry's portfolio alive and well. Subsequent disruption became popular over the last few years in the shape of e-cigarettes and HnB products. The tobacco industry was quick to adapt to this disruption as a profitable venture. The quick and seamless adoption of this disruption model points to the

possibility of another tobacco century, for which tobacco regulation regimes need to develop forward-leaning policies.

REFERENCES

Abrams, D. B. 2014, 'Promise and Peril of e-Cigarettes: Can Disruptive Technology Make Cigarettes Obsolete?' *JAMA*, vol. 311, no. 2, pp. 135-136.

ACS 2017, 'Harmful Chemicals in Tobacco Products', American Cancer Society, <https://www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/carcinogens-found-in-tobacco-products.html#written_by>, accessed 19 October 2019.

Ahijevych, K. and Gillespie, J. 1997, 'Nicotine Dependence and Smoking Topography among Black and White Women', *Research in Nursing & Health*, vol. 20, pp. 505-514.

American Academy of Pediatrics et al. 2017, 'The Flavor Trap - How the Tobacco Companies Are Luring the Kids with Candy Flavored E-Cigarettes and Cigars', Cancer Action Network, American Heart Association, American Stroke Association, American Lung Association and Campaign for Tobacco Free Kids.

Appiah, D. Ozuem, W. and Howell, K. 2019, 'Disruptive Technology in the Smartphones Industry', in Bowen, G. and Ozuem, W. (eds.), *Leveraging Computer-Mediated Marketing Environments*, Hershey, PA: IGI Global, pp. 351-371.

Bary, A. 2008, 'The Long-Awaited Spinoff of Philip Morris from Altria is the Smart Thing to Do', *The Wall Street Journal*, 31 March.

Basharat, R. 2020, 'Ministry Bans All Kind of Advertisements of Tobacco across Country', *The Nation*, 2 February.

BBC News 2015, 'Tobacco Firms Challenge Plain Packaging Law', 22 May, <<https://www.bbc.com/news/business-32843205>>.

Benowitz, N. L. and Goniewicz, M. L. 2013, 'The Regulatory Challenge of Electronic Cigarettes', *JAMA*, vol.310, pp. 685-686.

Bero, L. A. 2005, 'Tobacco Industry Manipulation of Research', *Public Health Reports (1974-)*, vol. 120, no. 2 (March-April), pp. 200-208.

- Boffetta, P. Hecht, S. Gray, N. Gupta, P. and Straif, K. 2008, 'Smokeless Tobacco and Cancer', *The Lancet Oncology*, vol. 9, pp. 667-675.
- Boseley, S. 2020, 'Philip Morris Drew up Plan for £1bn Tobacco Transition Fund', *The Guardian*, 24 February.
- Bower, J. L. and Christensen, C. M. 1995, 'Disruptive Technologies: Catching the Wave', *Harvard Business Review*, vol. 73, pp. 43-53.
- Branston, J. and Sweanor, D. 2015, 'Big Tobacco, E-Cigarettes, and A Road to the Smoking Endgame', *International Journal of Drug Policy*, vol. 29, pp. 14-18.
- Bridges, R. B. Humble, J. W. Turbek, J. A. and Rehm, S. R. 1986, 'Smoking History, Cigarette Yield and Smoking Behaviour as Determinants of Smoke Exposure', *European Journal of Respiratory Diseases*, vol. 146, Supplement, pp. 129-137.
- Burki, S. J. Pasha, H. A. Jha, P. Kamboh, G. N. and Pasha, A. G. et al. 2013, 'The Economics of Tobacco and Tobacco Taxation in Pakistan', Paris: International Union Against Tuberculosis and Lung Disease.
- Butt, Y. M. Smith, M. L. Tazelaar, H. D. Vaszar, L. T. and Swanson, K. L. et al. 2019, 'Pathology of Vaping-Associated Lung Injury', *New England Journal of Medicine*, vol. 381, pp.1780-1781.
- Callard, C. Thompson, D. and Collishaw, N. 2005, 'Transforming the Tobacco Market: Why the Supply of Cigarettes Should be Transferred from For-Profit Corporations to Non-Profit Enterprises with a Public Health Mandate', *Tobacco Control*, vol. 14, no. 4, p. 278-283.
- CDC 2020, 'Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products', Centers for Disease Control and Prevention, <https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html>, accessed 15 March 2020.
- Chapman, S. 2012, 'Legal Action by Big Tobacco against the Australian Government's Plain Packaging Law', *Tobacco Control*, vol. 21, no. 2, pp.80-81.
- Charlton, A. 2004, 'Medicinal Uses of Tobacco in History', *Journal of the Royal Society of Medicine*, vol. 97, pp. 292-296.

- Christensen, C. M. 1997, *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Massachusetts: Harvard Business School Press.
- Curkendall, S. M. Deluise, C. Jones, J. K. Lanes, S. and Stang, M. R. et al. 2006, 'Cardiovascular Disease in Patients with Chronic Obstructive Pulmonary Disease, Saskatchewan Canada: Cardiovascular Disease in COPD Patients', *Annals of Epidemiology*, vol. 16, pp. 63-70.
- Damalas, C. A. and Koutroubas, S. D. 2016. 'Farmers' Exposure to Pesticides: Toxicity Types and Ways of Prevention', *Toxics*, vol. 4, no.1, p.1, <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5606636/>>.
- Danneels, E. 2004, 'Disruptive Technology Reconsidered: A Critique and Research Agenda', *Journal of Product Innovation Management*, vol. 21, pp. 246-258.
- Davis, B. Williams, M. and Talbot, P. 2019, 'iQOS: Evidence of Pyrolysis and Release of a Toxicant from Plastic', *Tobacco Control*, vol. 28, pp. 34-41.
- Day, G. and Schoemaker, P. 2000, 'Avoiding the Pitfalls of Emerging Technologies', *California Management Review*, vol. 42, no. 2, pp. 8-33.
- De Andrade, M. Spotswood, F. Hastings, G. Angus, K. and Angelova, N. J. S. B. 2017, 'Emotion in the ANDS (Alternative Nicotine Delivery Systems) Market: Practice-Theoretical Insight into a Volatile Market', *Social Business*, vol. 7, pp. 391-418.
- Donny, E. C. Griffin, K. M. Shiffman, S. and Sayette, M. A. 2008, 'The Relationship between Cigarette Use, Nicotine Dependence, and Craving in Laboratory Volunteers', *Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco*, vol. 10, pp. 934-942.
- Fairchild, A. L. Bayer, R. and Lee, J. S. 2019, 'The E-Cigarette Debate: What Counts as Evidence?' *American Journal of Public Health*, vol. 109, pp. 1000-1006.
- Flouris, A. D. Vardavas, C. I. Metsios, G. S. Tsatsakis, A. M. and Koutedakis, Y. 2009, 'Biological Evidence for the Acute Health Effects of Second-hand Smoke Exposure', *American Journal of Physiology-Lung Cellular and Molecular Physiology*, vol. 298, L3-L12.

- Foley, K. E. 2019, 'The World's Largest Tobacco Company's Anti-Smoking Campaign relies on Smokers', *qz.com*, <<https://qz.com/1674309/philip-morris-internationals-unsmoke-campaign-relies-on-smokers/>>, accessed 13 February 2020.
- Glasser, A. M. Collins, L. Pearson, J. L. Abudayyeh, H. and Niaura, R. S. et al. 2017, 'Overview of Electronic Nicotine Delivery Systems: A Systematic Review', *American Journal of Preventive Medicine*, vol. 52, pp.e33-e66.
- GoP 1979, 'Cigarettes (Printing of Warning) Ordinance No. LXXIII, 1979 - September 1, 1980', 31 December, Government of Pakistan.
- Grisan, S. Polizzotto, R. Raiola, P. Cristiani, S. Ventura, F. and Di Lucia, F. et al. 2016, 'Alternative Use of Tobacco as a Sustainable Crop for Seed Oil, Biofuel, and Biomass', *Agronomy for Sustainable Development*, vol. 36, no. 55, <<https://doi.org/10.1007/s13593-016-0395-5>>.
- Hall, W. and West, R. 2008, 'Thinking about the Unthinkable: A De facto Prohibition on Smoked Tobacco Products', *Addiction*, vol. 103, pp. 873-874.
- Hecht, S.S. 2003, 'Tobacco Carcinogens, their Biomarkers and Tobacco-Induced Cancer', *Nature Reviews Cancer*, vol. 3, pp. 733-744.
- Hecht, S. S. 2002, 'Tobacco Smoke Carcinogens and Breast Cancer', *Environmental and Molecular Mutagenesis*, vol. 39, nos. 2-3, pp. 119-126, DOI:10.1002/em.10071.
- Henderson, R. M. and Clark, K. B. 1990, 'Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms', *Administrative Science Quarterly*, vol. 35, pp. 9-30.
- Hill, G. 2020, 'How Vaping Managed to Disrupt the Tobacco Industry', *Channels*, <<https://channels.theinnovationenterprise.com/articles/how-vaping-managed-to-disrupt-the-tobacco-industry>>, accessed 2 February 2020.
- Hilts, P. J. and Collins, G. 1995, 'Records Show Philip Morris Studied Influence of Nicotine', *The New York Times*, 8 June.
- Hirono, K. T. and Smith, K. E. 2018, 'Australia's \$40 Per Pack Cigarette Tax Plans: The Need to Consider Equity', *Tobacco Control*, vol. 27, no. 2, pp. 229-233.

Ho, L.M. Schafferer, C. Lee, J.M. Yeh, C.Y. and Hsieh, C.J. 2018, 'Raising Cigarette Excise Tax to Reduce Consumption in Low-and Middle-Income Countries of the Asia-Pacific Region: A Simulation of the Anticipated Health and Taxation Revenues Impacts', *BMC Public Health*, vol. 18, no. 1, p. 1187.

Hoe, C. Kennedy, R. D. Spires, M. Tamplin, S. and Cohen, J. E. 2019, 'Improving the Implementation of Tobacco Control Policies in Low-and Middle-Income Countries: A Proposed Framework', *BMJ Global Health*, vol. 4, no. 6, p. e002078.

Hong, M.K. and Bero, L. A. 2002, 'How the Tobacco Industry Responded to an Influential Study of the Health Effects of Second-hand Smoke', *British Medical Journal (Clinical Research Edition)*, vol. 325, no. 7377, p.1413.

ILO 2003, 'Up in Smoke: What Future for Tobacco Jobs?', International Labor Organization, <https://www.ilo.org/global/about-the-ilo/newsroom/features/WCMS_071230/lang--en/index.htm>, accessed 10 February 2020.

Isidore, C. 2019, 'Juul CEO is Out, and It Stops All Advertising as Vaping Crisis Escalates', *CNN Money*, <<https://edition.cnn.com/2019/09/25/business/juul-ceo-resigns/index.html>>, accessed 10 October 2019.

Janjua, W. I. 2019, 'Donating Death - An Open Letter to the Prime Minister of Pakistan', *Daily Times*, 8 May.

Janjua, W. I. and Naqvi, S.A.W. 2019, 'Defiant Tobacco Industry in Pakistan', *Daily Times*, 15 June.

Kahl, V. F. Dhillon, V. Fenech, M. Souza, M. and Silva, F. et al. 2018, 'Occupational Exposure to Pesticides in Tobacco Fields: The Integrated Evaluation of Nutritional Intake and Susceptibility on Genomic and Epigenetic Instability', *Oxidative Medicine and Cellular Longevity*, vol. 2018, pp.1-13.

Kalra, A. Sayeed, S. and Lasseter, T. 2018, 'Pakistan Diluted Proposed Tobacco Health Warnings After Philip Morris, BAT Lobbying', *Reuters*, 29 May.

Kamal, S.M.M. Islam, M.A. and Rahman, M. A. 2011, 'Socio-psychological Correlates of Smoking among Male University Students in Bangladesh', *Asia Pacific Journal of Public Health*, vol. 23, no. 4, pp. 555-567.

- Khalid, R. 2019, 'Tobacco Industry influencing Policies on Graphic Warnings', *The News*, 10 October.
- Khan, D. Shabbir, S. Majid, M. Naqvi, T. and Khan, F. 2010, 'Risk Assessment of Pesticide Exposure on Health of Pakistani Tobacco Farmers', *Journal of Exposure Science & Environmental Epidemiology*, vol. 20, p. 571.
- Khoo, D. Chiam, Y. Ng, P. Berrick, A. J. and Koong, H. N. 2010, 'Phasing-out Tobacco: Proposal to Deny Access to Tobacco for those Born from 2000', *Tobacco Control*, vol. 19, no. 5, pp. 355-360.
- Klebnikov, S. 2019, 'Philip Morris International and Altria Call Off \$200 Billion Merger', *Forbes*, 25 September.
- Kostoff, R. N. Boylan, R. and Simons, G. R. 2004, 'Disruptive Technology Roadmaps', *Technological Forecasting and Social Change*, vol. 71, pp. 141-159.
- Kostygina, G. Glantz, S. A. and Ling, P. M. 2016, 'Tobacco Industry Use of Flavours to Recruit New Users of Little Cigars and Cigarillos', *Tobacco Control*, vol. 25, no. 1, pp. 66-74.
- Kunze, U. Schoberberger, R. Schmeiser-Rieder, A. Groman, E. and Kunze, M. 1998, 'Alternative Nicotine Delivery Systems (ANDS) - Public Health Aspects', *Wien Klin Wochenschr*, vol. 110, no. 23, pp. 811-816.
- Laughlin, T. J. and Wake, F. R. 1970, 'Socio-psychological Aspects of Cigarette Smoking', *Canadian Journal of Public Health*, vol. 61, pp. 301-312.
- Levy, N. 2018, 'Taking Responsibility for Health in an Epistemically Polluted Environment', *Theoretical Medicine and Bioethics*, vol. 39, pp. 123-141.
- Magrini, N. and Font, M. 2007, 'Direct to Consumer Advertising of Drugs in Europe', *British Medical Journal (Clinical Research Edition)*, vol. 335, no. 7619, p. 526.
- Malone, R. E. 2010, 'Imagining Things Otherwise: New Endgame Ideas for Tobacco Control', *Tobacco Control*, vol. 19, no. 5, pp. 349-350.
- Markides, C. 2006, 'Disruptive Innovation: In Need of Better Theory', *Journal of Product Innovation Management*, vol. 23, pp. 19-25.

- McDaniel, P. A. Smith, E. A. and Malone, R. E. 2016, 'The Tobacco Endgame: A Qualitative Review and Synthesis', *Tobacco Control*, vol. 25, no. 5, pp. 594-604.
- Mcdaniel, P. A. Solomon, G. and Malone, R. E. 2005, 'The Tobacco Industry and Pesticide Regulations: Case Studies from Tobacco Industry Archives', *Environmental Health Perspectives*, vol. 113, pp. 1659-1665.
- O'Faolain, A. 2015, 'State wants Tobacco Packaging Challenge referred to EU Court', *The Irish Times*, 27 April.
- ONS 2018, 'Adult Smoking Habits in the UK: 2017', UK Office of the National Statistics,
 <<https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/bulletins/adultsmokinghabitsingreatbritain/2017>>, accessed 3 February 2020.
- Patterson, C. Hilton, S. and Weishaar, H. 2016, 'Who Thinks What about E-Cigarette Regulation? A Content Analysis of UK Newspapers', *Addiction*, vol. 111, no. 7, pp. 1267-1274, DOI: 10.1111/add.13320.
- Patterson, F. Benowitz, N. Shields, P. Kaufmann, V. and Jepson, C. et al. 2003, 'Individual Differences in Nicotine Intake per Cigarette', *Cancer Epidemiology Biomarkers & Prevention*, vol. 12, p. 468.
- Ridgers, B. (ed.) 2012, *The Economist Book of Business Quotations*, London: Profile Books Ltd.
- Robehmed, N. 2013, 'E-cigarette Sales Surpass \$1 Billion As Big Tobacco Moves In', *Forbes*, 17 September.
- Roberts, J. R. Karr, C. J. and Council on Environmental Health 2012, 'Pesticide Exposure in Children', *Pediatrics*, vol. 130, no. 6, pp. e1765-e1788.
- Russell, M. A. Feyerabend, C. and Cole, P. V. 1976, 'Plasma Nicotine Levels after Cigarette Smoking and Chewing Nicotine Gum', *British Medical Journal*, vol. 1, pp. 1043-1046.
- Schroeder, M. J. and Hoffman, A. C. 2014, 'Electronic Cigarettes and Nicotine', *Clinical Pharmacology*, vol. 23, pp. ii30-ii35.

SDPI 2019, 'Defiant Tobacco Industry and Future of Graphic Health Warning', Sustainable Development Policy Institute, *YouTube.com*, <<https://www.youtube.com/watch?v=b4wB2gFtPVg>>, accessed 12 October 2019.

Shanahan, E. and Paybarah, A. 2019, 'Bronx Teenager's Death is the Youngest Vaping Fatality in U.S.', *The New York Times*, 8 October.

Simonavicius, E. McNeill, A. Shahab, L. and Brose, L. S. 2019, 'Heat-not-Burn Tobacco Products: A Systematic Literature Review', *Tobacco Control*, vol. 28, pp. 582-594.

Tarar, S. A. 2017, 'Tobacco Control Cell', Ministry of National Health Services Regulation and Coordination, Government of Pakistan, <<http://www.tcc.gov.pk/index.php>>, accessed 8 December 2017.

Tariq, M. Afzal, S. Hussain, I. and Sultana, N. 2007, 'Pesticides Exposure in Pakistan: A Review', *Environment International*, vol. 33, pp. 1107-1122.

TCC 2018, 'Significant Initiatives/Achievements of Tobacco Control Cell', Tobacco Control Cell, Ministry of National Health Services Regulation and Coordination, Government of Pakistan, <<http://tcc.gov.pk/achievements.php>>, accessed 19 October 2019.

Tedder, A. 2019, 'Up in Smoke: Tobacco Firms Feel Burn of Disruption', *Schroders*, <<https://www.schroders.com/br/br/schroders-brasil/visao-de-mercado/rendera-variavel-em-ingles/up-in-smoke-tobacco-firms-feel-burn-of-disruption/>>, accessed 12 February 2020.

The Lancet 2019, 'E-cigarettes: Time to Realign our Approach?', Editorial, vol. 394, no. 10206, p. 1297, DOI:10.1016/S0140-6736(19)32277-9.

The Union 2020, 'Pakistan Bans Tobacco Advertisement at Point of Sale', <<https://www.theunion.org/news-centre/news/pakistan-bans-tobacco-advertisement-at-point-of-sale>>, accessed 5 February 2020.

Unger, M. and Unger, D. W. 2018, 'E-cigarettes/Electronic Nicotine Delivery Systems: A Word of Caution on Health and New Product Development', *Journal of Thoracic Disease*, vol. 10, pp. S2588-S2592.

Walley, S.C. and Jensen, B.P. 2015, 'Section on Tobacco Control Electronic Nicotine Delivery Systems', *Pediatrics*, vol. 136, no. 5, pp. 1018-1026, DOI:10.1542/peds.2015-3222.

Weiss, P. Egan, M. Chupp, G. Canapari, C. and Bazy-Asaad, A. 2020, 'E-cigarette or Vaping Product Use-Associated Lung Injury (EVALI), Yale Medicine, <<https://www.yalemedicine.org/conditions/evali/>>, accessed 15 March 2020.

WHO 2020, 'Tobacco', World Health Organization, 27 May, <<https://www.who.int/news-room/fact-sheets/detail/tobacco>>.

Zacny, J. P. Stitzer, M. L. Brown, F. J. Yingling, J. E. and Griffiths, R. R. 1987, 'Human Cigarette Smoking: Effects of Puff and Inhalation Parameters on Smoke Exposure', *Journal of Pharmacology and Experimental Therapeutics*, vol. 240, no. 2, pp.554-564.