

## Innovation Comparison of GlaxoSmithKline, UK with Sanofi, France and Bayer, Germany

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### Abstract:

A modified company innovation model was applied to assess innovation potential, capabilities, competencies and activities of GlaxoSmithKline (GSK), UK Sanofi, France and Bayer, Germany in Pharma and biotechnology sector under ever changing, demanding and uncertain economic, financial and social conditions. This report also proposes entrepreneurial opportunities for these companies.

**Keywords:** Bayer, Entrepreneurship, GSK, Innovation, Pharmaceuticals, Sanofi

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### I. INTRODUCTION

In this article entrepreneurship and innovation leadership in pharmaceutical company called GlaxoSmithKline (GSK), UK will be evaluated and compared with Sanofi, France and Bayer AG, Germany. The second part of the article will describe entrepreneurial opportunities for GSK, Sanofi and Bayer. The focus will primarily be on GSK. Before proceeding further, first we need to understand what is innovation? Innovation can be described as a novel concept or thought, novel or unique product or device and/or new way of doing things i.e. novel approach or method. Innovation has two components one is the novel consequence (result) and other is the procedure via which such novel outcomes materialize.

The next question is what is Entrepreneurship or who are entrepreneurs? Entrepreneurship is the ability to recognize novel business opportunities and effectively bring those opportunities to the market and generate either satisfactory or greater financial performance (Gunderson et al, 2014). In order to have business sustainability, CEOs and business organizations need to be innovative and innovation in turn can be brought about by encouraging entrepreneurship models and entrepreneurs. The current digital and globalized age offers competitive, challenging and unpredictable circumstances which makes business planning for next 5 years challenging. Thus leaders need to be innovative to handle ever growing challenges of digital and globalization era to survive in the market. Several case studies have shown that companies or businesses that fail to innovate gradually get erased from existence and lose their market share and customers or are taken over and left behind by their competitors (e.g. Blueberry phones). According to 23<sup>rd</sup> CEO survey-UK findings (2020b) conducted in 2019 found that 65% of CEOs in UK have plans to introduce a new product or service in the coming 12 months, 79% of CEOs are planning to implement operational efficiencies and 42% are exploring new markets (2019). In a PwC survey (2013), 58% of the Pharma executives said that innovation is a competitive necessity for present and future (Pharmaceutical industry perspectives on the Global Innovation Survey 2013, 2013). This shows innovation is deemed important for business growth. In PwC survey, over regulation, trade conflicts, uncertain economic growth, Cyber threat and Policy uncertainty were some of the top ten concerns on CEOs minds for 2020 (PwC, 2020a). In 2018 57% of CEOs thought global GDP growth will increase in coming year where as in 2019 53% of CEOs predicted a drop in global economic growth rate (PwC, 2019; PwC, 2020). The US retains its lead as top market for growth in 2019 apparently due to measures taken by presidential administration to reduce taxes and regulation. However the percentage of CEOs who consider US as top market for growth has reduced from 46% in 2018 to 27% in 2019 due to shift in Chinese investors away from US towards other economies i.e. mainly towards Australia (PwC, 2019, p.25).

Under these ever-changing economic and social conditions it is vital to see how pharma companies maintain their flexibility, resilience and innovation that will in turn ensure growth and sustainability of the company. The current COVID-19 pandemic has brought changes in economic, social and health sectors demanding new approaches to be utilized to carry on producing growth and improve human health. This warrants the assessment of innovation activities, potential and competencies of GSK, Sanofi and Bayer to see how they are coping with the changing socio-economic environment. Innovation capacity of an organization can

be measured either using innovation Inputs and outputs or by using its innovation activities and efforts. Some researchers favour former and others opt for later approach (Doroodian et al, 2014). In the present article a model developed by Blagoev and Yordanova (2015) will be used to measure innovative leadership at company level i.e. innovative leadership in GSK, SANOFI and Bayer. The model consists of 3 categories namely i) Innovation potential and capabilities, ii) innovation competencies iii) Innovation activity. The article will also describe briefly other Innovation indexes to see how they rank GSK, Sanofi and Bayer.

## **II. METHODOLOGY**

In this article Company innovative leadership model proposed by Blagoev and Yordanova (2015) is applied to assess the innovative leadership, innovation activities, potential and capabilities of GSK, Sanofi and Bayer. Under this model 12 metrics are used to assess innovation in a company. The researcher has modified the model by adding some extra metrics such as creativity, open collaboration, R&D one-year growth and snapshot of ranking given by other indices and analysts. Researcher also replaced the metrics titled: Number of introduced new products/process/marketing/organizational innovation/year with Projects in R&D pipeline. Furthermore in Part II of the article some more metrics were discussed (market capital, total assets and free cash flow). In total this article discusses 19 metrics to determine innovative activity, potential and competencies of GSK in comparison with Sanofi and Bayer. Descriptive statistics are used to describe data i.e. percentages, mean and medians. A score was given out of 10 to each company with respect to a particular innovation metrics. Score zero is least score and 10 is highest score whereas 5 is middle score. Section V provides recommendations.

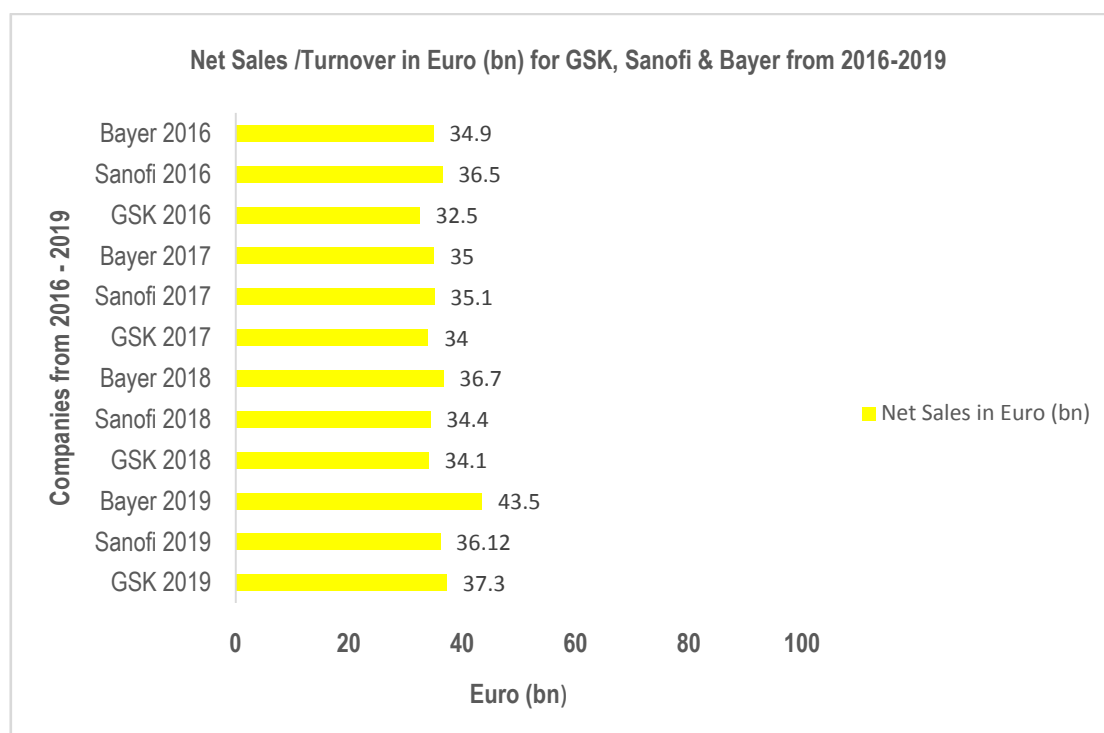
## **III. RESULTS**

The results are described under three main categories. Under each category various metrics are discussed. Results are shown in Figs. 1-13 and in tables I-V. Appendix A and B describe TWOS strategies and criteria used for VRIO scoring. Appendix C provides a recommended sample report format that Pharma companies should use to describe innovation indices and activities of the company in current and previous year.

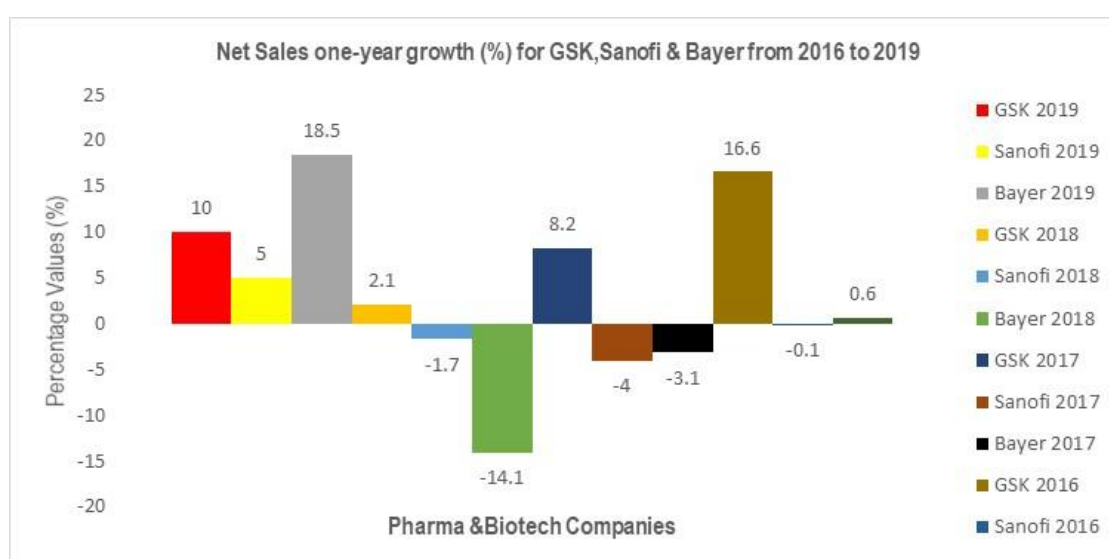
### **A. Innovation Potential and Ability**

A company's capability to be flexible and resilient to the economic, social and market environment is a good measure of its innovativeness especially amid an economic crisis. It can be gauged by using financial data for past 3 years or so and by comparing it to average financial performance sector wise or examining its consistency i.e. if the company data shows consistency a conclusion on company's flexibility can be reached. For this purpose, sales data and change in sales revenue from previous year are used. Other metrics used to judge the innovation potential and ability of these companies include social capabilities, Platform and data and Innovation leadership. Results are shown in Fig 1- 4 and in Table 1

**1. Net Sales/Turn over and change in Net sales:** These figures provide an indication of the funding available for commercialisation efforts and therefore is a good indicator of a company's ability to innovative i.e. commercialising the product. GSK's global vaccine sales increased by 15% to £23.8bn in 2019 from 2018 (internal data), 2% increase in 2018 in overall sales compared to 2017 (GSK Annual Report 2019a). Sanofi reported a rise in sales by 4.8% compared to 2018 whereas Bayer reported net sales growth by +18.5% (Sanofi 2019 Integrated Report, 2019a ; Bayer AG Annual Report 2019a). There is an overall rising trend in GSK Turnover from Euro 32.5bn to Euro 37.3bn from 2016 -2019, indicating GSK's reaction to the market and showing that its innovative capabilities are pretty good. Results are shown in Fig 1 and Fig.2.



**Fig. 1** Net Sales for GSK, Sanofi and Bayer from 2016-2019



**Fig. 2** Net sales one-year growth for GSK, Sanofi & Bayer from 2016-2019

**2. Social capabilities:** GSK's innovative capabilities can be measured by determining how many social networking channels it uses to interact with customers to predict and forecast trends. Results are shown in Table 1.

GSK uses 5 social media channels to interact and communicate with its clients as well as to deliver timely information to stakeholders and customers (GSK social media, 2020c). Fierce Pharma gave GSK a score of 25 for social media engagement (Staton, 2020) with 93318 facebook fans and about 36,000 views per video on Youtube (the highest Youtube view compared to other pharma companies). In 2018 Worldcom Public Relations scored Bayer as the top pharma social channel user while Sanofi secured 5<sup>th</sup> position (Bulik, 2019; Owen, 2019 ). In the study 12 digital channels were assessed for 25 pharma companies. The study concluded that Pharma companies are not using social media channels to their maximum potential. Bayer communicates with its customers in various languages and is also present on Xing (Humberg career oriented social networking site) and Vimeo (Bayer social media room, 2020c). Bayer has 8 Apps, one of which is Games App Bayer social media room, 2020c). According to Pocket.md Bayer has 496, Sanofi has 286 and GSK has 122 medical and health care Apps (Pocket.md, 2020a; 2020b; 2020c). Sanofi has blogs e.g. discuss diabetes, GSK has an

informative blog regarding respiratory conditions and Bayer has GlobalHealth Policy Insights blog (Bayer Pharmaceuticals, 2020; GSK, 2020e; Sanofi, 2020d ). GSK, Bayer and Sanofi are present on Pinterest (Grant,n.d., Bayer 2020c; PMLive,2020)

(GSK Pinterest, 2020; Bayer social media room, 2020; PMLive,2020]. GSK is present on Flickr (Flickr GSK, 2020; Flickr Sanofi corporate, 2020; Flicker Bayer Pharmaceutical Biotechnology Plant, 2010). Bayer, GSK and Sanofi are present on Tumblr but no new posts available.

**Table 1: Social Media Channel Usage**

	GSK	Sanofi	Bayer
LinkedIn	✓	✓	✓
Twitter	✓	✓	✓
Facebook	✓	✓	✓
Instagram	✓	✓	✓
Youtube	✓	✓	✓
Flickr	✓	✓	✓
Pinterest	✓	✓	✓
Tumblr	✓	✓	✓
Apps	✓	✓	✓
Blogs	✓	✓	✓

### 3. Platforms and Data:

GSK adopted Veeva cloud based CRM platform in 2015 (Decision marketing, 2015) and uses 8 oracle database. According to GSK Strategic Report, GSK also uses Adjuvant technology platforms such as ASO1, ASO3 and SAM (GSK, 2019a). Limited info is available on platforms and data. Thus it is not discussed further in this article

### 4. Innovation Leadership:

A company leadership style can encourage or discourage innovation climate within the organization. *To assess leadership style one needs to investigate the company's leadership practices e.g. mentoring and coaching programs.* A prerequisite for being an innovative business is to form a culture for innovation inside the organization (Horth and Buchner, 2014). The two tier innovation leadership approach is schematically depicted in Fig.3. that is designed by the researcher and describes innovation leadership with respect to GSK, UK for the purpose of this articles. The inspiration for the figure came from Horth and Buchner article (2014). Innovation is essential for future survival and sustainability of the organization. It gives an organization the necessary competitive edge. Innovation gives us novel and advance products, technologies and improved ways of doing things i.e. it brings social and economic progress, technological advances, improves human health and life style as well as increases our ability as a society and civilization to combat challenges of our times.



**Fig.3 Innovation leadership**

**Source:** Figure designed by Researcher

#### **4.1. Innovation leadership styles and values**

There are mainly 5 types of leadership namely: Servant, participative, transformational, Authoritative and directive leaderships. The former three forms of leadership styles promote and inspire innovation, collaboration and an open exchange of ideas in various manners whereas two latter leadership styles provide well-defined directions and objectives but suffer from absence of innovation and collaboration. The most common innovative leadership style is participative leadership as it fosters a culture of innovation.

A report by Panda (2020) found that despite having great mission, values, social contributions GSK needs to adopt transformational leadership style as its current transactional leadership style is unable to handle various operational challenges some of which have caused GSK numerous court fines. It seems that GSK is working to encourage innovative leadership style within the company and has adopted various measures to improve its leadership in recent years. However there is still work that needs to be done in this area as it is a continuous and dynamic process to create an innovative culture and lead by innovation.

Innovative leadership consists of six core values i.e. Passion, Integrity, Tenacity, curiosity, courage and Humility (Eckert, 2014). Barsh et al (2008) suggest that three people management approaches can lead to an innovative organization with first being formally incorporating into strategic management agenda of senior leader. In case of GSK, this approach is very obvious as GSK'S goal is to be one of the world's most innovative companies in health care sector. This is GSK's long term priority (GSK, 2019a). The second phase is to create an innovative climate without applying disruptive change programs by encouraging active innovation networks to arise and third stage is to take measures to nurture an innovative climate within the organization. GSK seems to show these traits as it has taken concrete steps to foster innovation culture within the organization e.g. investing in R&D, by following 70-20-10 learning and development model and by utilizing incentive schemes for scientists whose candidate molecule attain proof of concept stage (GSK,2019c). In GSK 20% of learning and development takes place via Developmental relationships which in turn deliver support and feedback from managers and peers through coaching and mentoring. GSK also offers leadership development programme for first-line leaders and is also a member of the 5% club i.e. UK company dedicated to employing young people in development programmes into at least 5% of UK roles (GSK, 2019a, P.36). Leadership summary of GSK, Sanofi and Bayer is shown in Fig.4.



<b>GSK</b>	<b>Sanofi</b>	<b>Bayer</b>
<b>CEO:</b> Emma Walmsley Recently became CEO. Emphasis on ethics and inclusion, decrease company's environmental impact, started a 2 year programme to prepare 2 new companies, R&D remarkable year 2019, increased open collaboration and acquisitions.	<b>CEO:</b> Paul Hudson Revived United Nations Global Compact initiative. Focus is on R&D Sustainability is part of strategy e.g. waste management, water consumption management, assessing the impact of Sanofi's products and energy efficiency policies. Increased open collaboration Achieved one of the top employer status.	<b>CEO:</b> Werner Baumann Driving company's operational business & strategic alignment, R&D and sustainability. Increased collaboration.
Global collaboration with CEPI and other companies to produce covid-19 vaccine	Sanofi in talks with EU to accelerate covid-19 vaccine development	Developed corona ticker and collaborating with Population health Research institute to produce covid-19 vaccine. Donated recently \$2.5m to support covid-19 initiative in USA.
<b>Analysis:</b> GSK is flexible & resilient in changing economic and social environment. Seem to encourage innovative climate in the organization e.g. by obtaining employee feedbacks. Offer on the job training, coaching and mentoring to encourage innovation	<b>Analysis:</b> Sanofi is flexible & resilient in changing economic and social environment. Seems to promote innovative climate within organization & employee well-being.	<b>Analysis:</b> Bayer is flexible & resilient in changing economic and social environment. Seems to promote employee training and education within organization which in turn promotes innovation within organization

**Fig. 4: Leadership style comparison**

Note: (Data obtained from GSK, Sanofi and Bayer strategic and financial Reports 2019, 2020, <https://www.bayer.com/en/coronavirus-covid-19-update.aspx>)

## 5. Strategy, planning and policies

The more innovation development policies, innovation methods, decision making on innovation and innovation process development and R&D departments a company has the higher score the company achieves. The scale consists of 10 points and each policy earns one point. GSK scored better than Sanofi and Bayer in this category. Results are shown in Table II.

**Table. II Strategy, planning and policies**

	<b>GSK</b>	<b>Sanofi</b>	<b>Bayer</b>
<b>Purpose</b>	"To improve the quality of human life by helping people do more, feel better, live longer" (GSK, 2019a)	"to do well and to do good at the same time"	"Science for a Better Life" (Bayer AG, 2020e)
<b>Goal</b>	"To become one of the world's most innovative, best-performing and trusted healthcare companies" (GSK, 2019a)	"Sanofi's ultimate goal is to make medicines to make people better"	"Health for all, Hunger for none with its focus on innovation and sustainability as a leading life science company" (Bayer AG, 2020e).
<b>Strategy</b>	"to bring differentiated, high-quality and needed healthcare products to as many people as possible, with our three global businesses, scientific and technical know-how and talented people". (GSK, 2019a)	"Our new strategy positions us to achieve breakthroughs with our most promising medicines. I'm confident we will deliver long-term growth and value for our shareholders, while turning innovation into transformative therapies for patients" (Paul Hudson, CEO) ii) Corporate Social Responsibility strategy iii) R&D Strategy to control new drug discovery platforms iv) establish strong partnerships	4 strategic levers: i) global leader in health & nutrition ii) Deliver world-class innovation. Escalating access to innovation by collaboration with external parties & digital transformation. iii) sustainability is integral part of strategy iv) strengthening operational performance
<b>Long-term priorities</b>	"Innovation We invest in scientific and technical excellence to develop and launch a	Four priorities: i) growth ii) pipeline of potentially transformative drugs iii)	"Ensuring employee safety and maintaining supply chains remain top priorities" (Bayer AG, 2020d)

	pipeline of new products that meet the needs of patients, payers and consumers” (GSK, 2019a)	efficiency iv) reinvent how they work (Sanofi, 2019a, p.13)	
<b>Business model</b>	Pharmaceutical, Vaccines and Consumer healthcare businesses have a wide portfolio of innovative medicines, vaccines and everyday health care brands.	Three core GBUs (Specialty care, Vaccines and General Medicine) and one standalone business unit to speed up digital transformation (Consumer Health care)(Sanofi, 2019a, p. 6)	Advance development of disruptive business models. Business model consists of 3 divisions:i) Pharmaceuticals, ii) Consumer health iii) Crop science
<b>Capital allocation frame work</b>	Includes innovation, R&D pipeline and new products	No information available	No information available
<b>Social Value and Sustainability policies</b>	GSK focuses primarily on UN SDG <b>Goal3:</b> Good health & well-being by utilizing science and technology to address health needs, and by making their products in expensive and available (GSK, 2019e). ii) <b>Goal 9:</b> Industry, Innovation & Infrastructure. <b>Goal 6:</b> Water & Sanitation-to reduce water usage by 30% by 2030.	19% Reduction in water consumption and 12% reduction in CO <sub>2</sub> emissions since 2015 (Sanofi, 2019a, p. 11)	<b>Sustainability goals:</b> “to become carbon neutral in our operations by 2030”, ii) ensure healthy lives and end hunger”(Chairman Bayer AG) iii) “targets for 2030 are aligned with the United Nations’ Sustainable Development Goals and the Paris Agreement” (Bayer AG, 2019a)
	<b>Goal 1:</b> No Poverty-via product donations. <b>Goal 5:</b> Gender Equality by increasing female representation to 37% in senior roles by 2022. <b>Goal 8:</b> Decent Work & Economic Growth via comprehensive preventive healthcare package for employees.	Climate change issues are embedded in decision making process. <b>Policies include:</b> enhancing environmental profile of its products, mitigate climate change, preserve biodiversity of every facility and reduce its environmental foot print	

**Note:** GBU= Global Business Unit, UNSDG= United Nations Sustainability Development Goals

## **B. Innovation Competencies**

A competency is a constant pattern of behaviour arising from Knowledge, proficiencies, capabilities and motivations (Boyd& Goldenberg, 2011; Illeris, 2009). Innovation competencies include collaboration, change management, creativity (Boyd & Goldenberg, 2011). Other researchers have listed visioning, decision making, networking, focus on tasks and ownership as innovation competencies (Waychal, 2016). These competences are not easy to assess and are not part of company innovative leadership model described by Blagoev and Yordanova (2015). However in this article researcher will attempt to measure some of the innovation competencies of GSK and compare them with those of Sanofi and Bayer’s innovative competencies focusing on creativity and open collaboration.

### **1. Creativity**

Creativity includes idea creators, critical analysis, creative challenge solving (Boyd, 2011). Barsh and colleagues (2008) encourage use of innovation networks to promote innovation and innovative culture within an organization. Innovation networks can help generate new ideas.The innovation network involves 4 stages (connect, set boundaries and engage, support and govern, Manage and Track) and aims at locating employees with right innovative mind set and then connecting them as a network with a particular objective to achieve. Innovation network also ensures how it will meet organization’s strategic goal. A network should be a mix of employees with diverse skills e.g. idea generators, researchers, Experts and producers. If a company is struggling with respect to new product commercialization then more producers and experts could be added to the network. Similarly if a company wants generation of new ideas then management might like to add more idea generators in the Innovation network. It is not clear if GSK, Sanofi and Bayer have this kind of innovation networks within their organizations to promote innovation leadership. However all three companies have consistently shown creativity in the form of creating innovative products that bring novel products to the society.

### **2. Open Innovation/Collaboration with External Parties**

Open collaborations can assist in acquiring advanced technology capabilities and allows access to external innovation potential. GSK, Sanofiand Bayer reported various open collaboration with oncology and Biotechnology companies in 2019 and 2020 (GSK, 2020a; GSK 2020b; GSK, 2019a; Sanofi 2019a; Sanofi 2019b, Sanofi 2019d; Bayer 2019a). Collaborations of GSK, Sanofi and Bayer are shown in Table III-V

**Table III** GSK Open collaborations in 2019-2020

2020	
<b>GSK</b>	GSK & Sanofi issued a signed letter to enter into collaboration to develop adjuvant vaccine for covid-19. Clinical trials scheduled in 2 <sup>nd</sup> half of 2020 (GSK,2020a)
	GSK & Vir Biotechnology joined in collaboration to create solutions for coronaviruses (GSK,2020a)
	GSK joined Queensland university, Clover Biopharma, Chongqing Zhifei collaboration (GSK,2020a)
	Clinical trials began with Ph1 study on COVID-19 Vaccine development in Collaboration with Clover biopharma (GSK,2020b)
	Collaboration with Medicago to develop new Adjuvanted COVID-19 candidate vaccine (GSK, 2020b, p.5)
2019	
<b>GSK</b>	Oncology focus-Acquisitions: i) Acquired Tesaro, ii) Completed transaction with Merck KGaA (GSK,2019a, p.2)
	To develop Platform Technologies: I) Uni of California, ii) Lyell Immunopharma iii) 23andMe (GSK,2019a, p.3)
	Concluded Healthcare Joint venture with Pfizer (GSK, 2019a, p.6)
	Founded partnership with Viome to create vaccine for chronic gut diseases (GSK, 2019a, p.25)
	Founded collaboration with Biotech company VBI to develop vaccine for recurrent glioblastoma (GSK, 2019a, pg.25)
	Established collaboration with Inovav Xiamen University of China to develop a vaccine to prevent cervical cancer (GSK, 2019a, p.25)

**Table IV** Sanofi Open collaborations in 2019-2020

Sanofi	
<b>2019</b>	Sanofi and Google to establish a new innovation lab to enhance understanding of patients & diseases; to improve Sanofi's operational efficiency and to enhance the experience of Sanofi's patients and clients
	Concluded an agreement with Roche for exclusive over the counter rights to Tamiflu for Influenza prevention and treatment.
<b>2020.</b>	Sanofi and Abbott declared partnership to integrate glucose sensing In Dec2019 Sanofi initiated open collaboration with biotech company, Synthorx, Inc., acquisition was finalized in Jan 2020

**Table V** Bayer Open collaborations in 2019 and 2020

Bayer	
<b>2019</b>	In July revealed a clinical collaboration agreement with Bristol-Myers Squibb, New York, USA & Ono Pharmaceutical Co., Ltd, Osaka, Japan to assess combination of multikinase inhibitor, Stivarga and Opdivo immune-oncology treatment in metastatic colorectal cancer patients. In Feb Acquired Loxo Oncology by Eli Lilly In May announced a collaboration agreement with Foundation medicine Inc, Cambridge, Massachusetts, USA. To commercialize companion diagnostics In July declared a joint lab with Brigham and Women's hospital and MGH, Boston, USA. To carry out joint research projects to treat chronic lung diseases. In November, started open collaboration with a biotech company, Dewpoint Therapeutics, Inc, Boston, Massachusetts, USA Declared full acquisition of Blue Rock Therapeutics, USA to obtain a leading position in cell therapeutics.
<b>2020</b>	Expansion of partnership with Evotec SE, Hamburg, Germany to develop candidates for polycystic ovary syndrome (PCOS). In Jan 2020 collaboration agreement concluded with Exscientia Ltd, Oxford, UK

### C. *Innovation activity*

In order to measure the innovation activity of a company certain metrics will be utilized as these metrics assist in determining the innovation score board. These metrics are discussed below:

#### 1. **Research and Development (R&D) Investment:**

These are operating costs associated with R&D development of a company's goods or services. In case of GSK and other two companies it means expenses associated with R&D of finding new vaccines, new biologics, or



creating new business models, new consumer health products etc. The results of R&D comparisons are shown in Fig.5a-5d. Fig 5a shows a comparison of R&D investment by GSK, Sanofi and Bayer over past 4 years (2016-2019). The graphs are created by the researcher using data obtained from Financial, annual and strategic reports and also from EU R&D Industrial scoreboards (GSK, 2019a; GSK, 2019b; GSK, 2018; GSK, 2017; GSK, 2016; Hernandez et al, 2019; Hernandez et al, 2018; Hernandez et al, 2017). In addition to it, interactive R&D data from EU and Excel spread sheets (.xlsx) were also used to create graphs (EU, 2019a; EU, 2019b; EU, 2019c). GSK shows gradual rise in R&D investment from 2016-2019 (GSK, 2019a; GSK, 2018; GSK, 2017; GSK, 2016). Annual financial Data on year 2020 is not available yet and therefore is not included in any graphs. However according to a press release GSK reported a turnover of £9090m and R&D investment of £1187m in Q1 of 2020 (GSK, 2020a). In Q2 press release which came out on 29<sup>th</sup> July 2020, GSK reported -2% AER decline in sales due to Covid-19 but respiratory sales went up 25% (£883 million, +17% AER) and consumer health care sales also were high i.e. 25% AER (GSK, 2020b) These sales were up due to covid-19. R&D investment in Q2 2020 was £1301 m (17% growth). GSK is not able to determine the full extent of impact of Covid-19 on its business performance for the full year 2020. However from analysing the data available so far it seems GSK has benefited from covid-19 pandemic e.g. sales growth reported by respiratory and consumer health care businesses.

Bayer reported a +4.6% change in R&D expenses to Euro 5.3 bn from 2018 to 2019 (Bayer, 2019a). Sanofi has reported in latest half-year Financial report increase in its total assets (Sanofi, 2020a). Fig.5c shows percentage contribution made by each company e.g. GSK's R&D investment accounted for 2.8%, 2.9%, 2.69%, 3.1% of total R&D investment made by Pharma sector in 2016, 2017, 2018 and 2019 respectively.

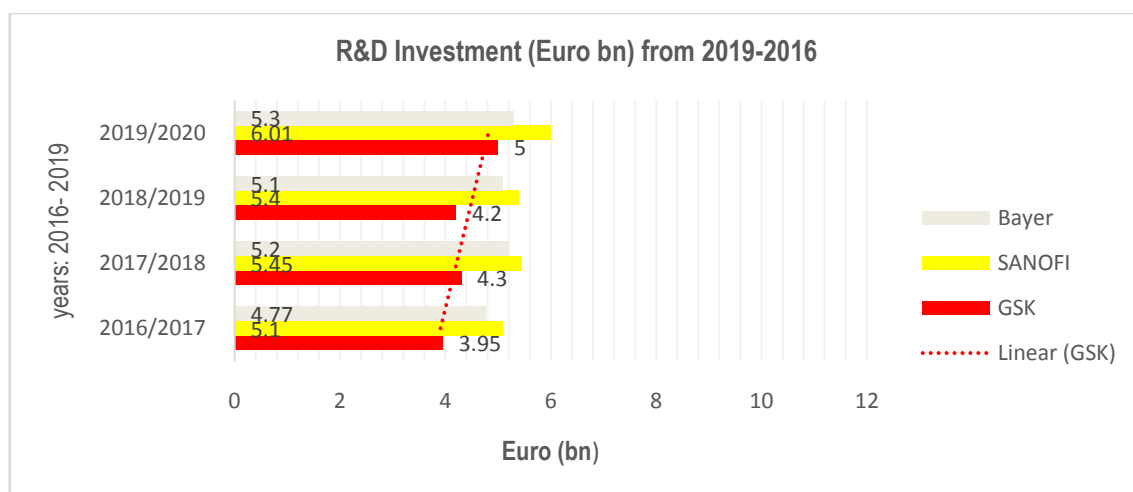


Fig 5a: R&D investment

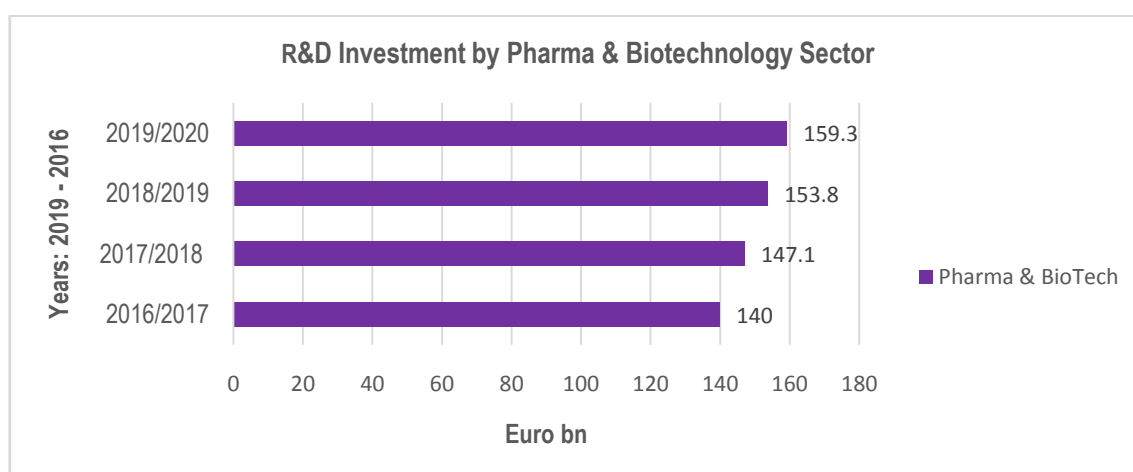


Fig.5b: R&D investment by Pharma & Biotechnology sector globally

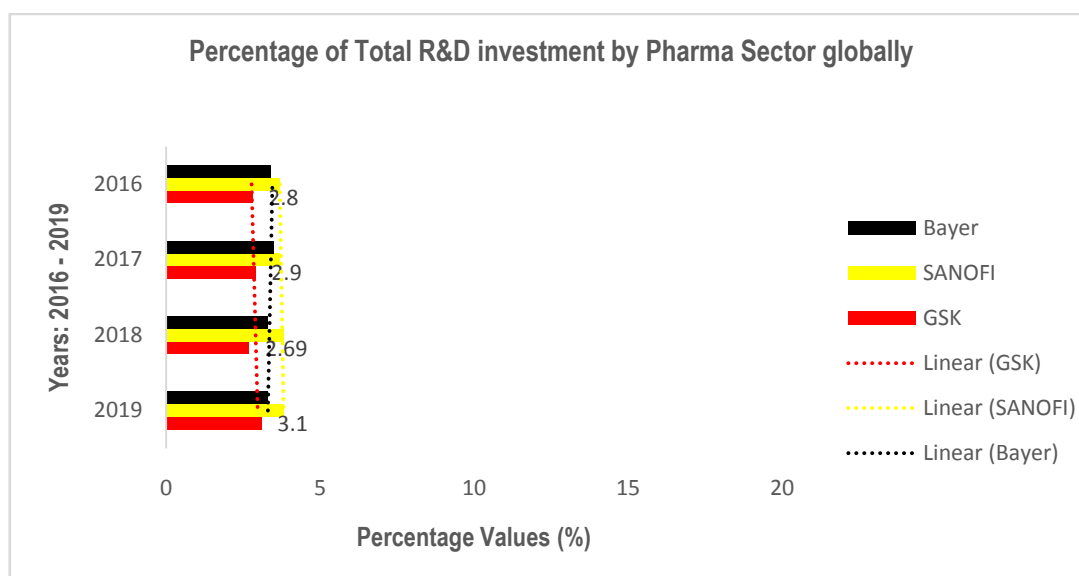


Fig.5c: Percentage of Total R&D investment by Pharma sector globally

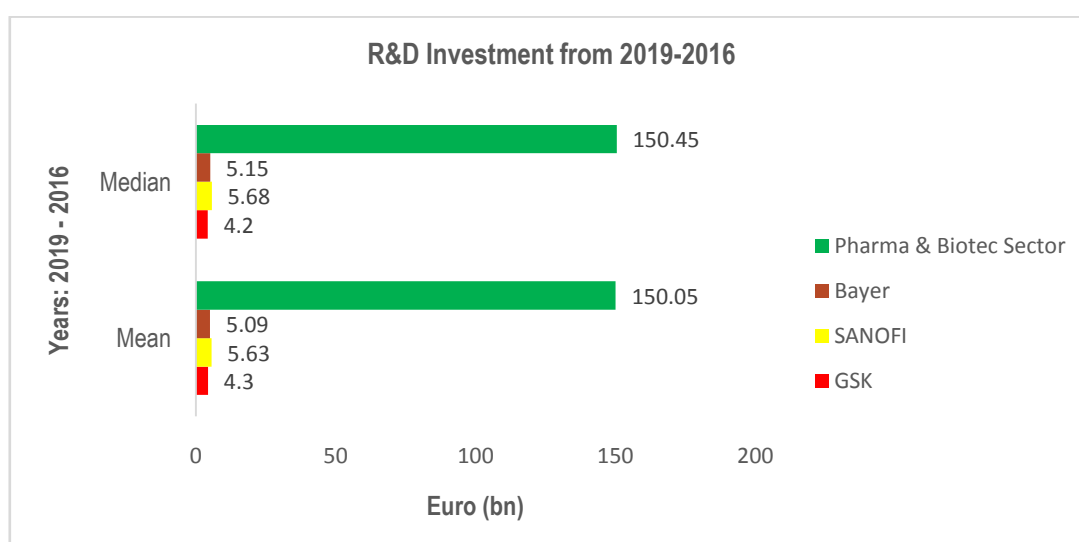


Fig. 5d: shows mean and median R&D investment by Pharma sector, GSK, Sanofi and Bayer from 2016-2019

**2. R&D Intensity:** R&D intensity is a good measure of a company's innovation and is used to compare the efficiency of R&D spending between companies in the same sector. It measures both effectiveness and innovative efforts carried out by companies. GSK reported R&D Intensity of 13.5% of turnover in 2019, up 17% due to substantial increase in study and clinical trial material expenses in oncology and increased expenditure on the advancement of key non-oncology assets. Sanofi has consistently shown higher R&D intensity from 2016-2019. Results for R&D intensity and one -year growth are shown in Fig 5-6.

**3. R&D intensity one year growth:** is another indicator that shows GSK's Innovative activity. GSK only had once one year growth in negative i.e. R&D one year growth was -3.3% in 2018. Bayer had -1% R&D one-year growth in 2018 whereas Sanofi had -1.7% R&D growth in 2016. See Fig.6

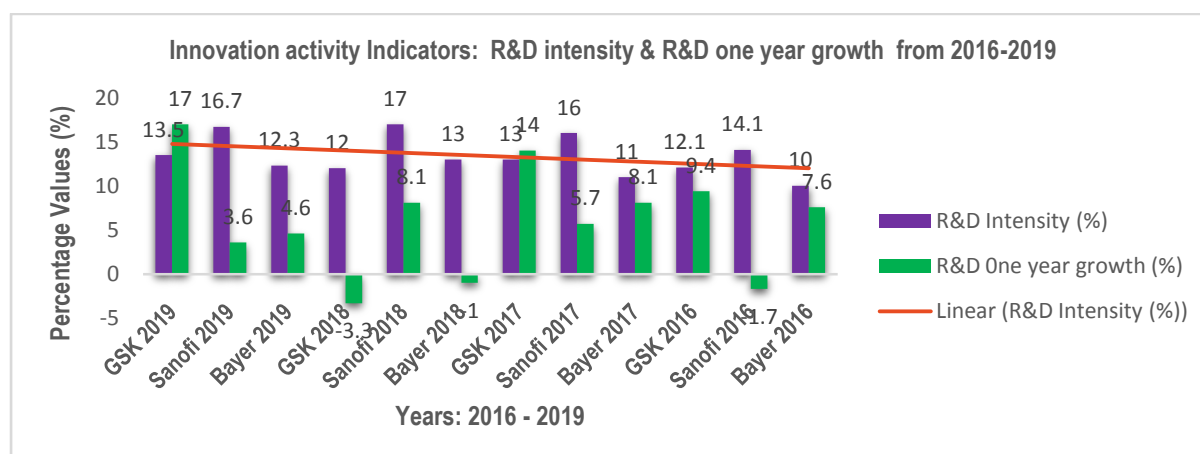


Fig.6 R&D Intensity, R&D one year growth for GSK, Sanofi & Bayer

#### 4. Registered trademarks and Patents

Bayer currently hold about 9 significant pharmaceutical patents whereas GSK and Sanofi also hold patents most of them are due to expire soon.

#### 5. Employees in R&D and Total number of employees

Comparative overview of three companies is shown in Table VI. Data was obtained from microtrends.net (2020a; 2020b; 2019). Sanofi has 15% of its work force in R&D development (Sanofi, 2019a, p.6). Bayer scores more points than GSK and Sanofi in this category as it has highest number of employees in R&D and Highest number of employees overall followed by GSK at position 2 and Sanofi at third position. Bayer also clearly stated number of Employees in R&D in each fiscal year.

Table VI Total number of Employees and Employees in R&D from 2016-2019

	2016	2017	2018	2019
<b>Total Number of Employees</b>				
<b>GSK</b>	99,827, <b>1.41%</b> down	99349, <b>0.48%</b> down	95490, <b>3.88%</b> down	99,437, <b>4.13%</b> up (over 16,000)
<b>Sanofi</b>	106,859, <b>7.59%</b> down from 2015	106566, <b>0.27%</b> down from 2016	104,226, <b>2.2%</b> down from 2017	100,409, <b>3.66%</b> down from 2018 ( <b>15061</b> )
<b>Bayer</b>	115,200, <b>1.37%</b> down ( <b>14213</b> )	99820, <b>13.35%</b> down ( <b>14041</b> )	110,838, <b>11.04%</b> up ( <b>16835</b> )	103,824, <b>6.33%</b> down ( <b>16006</b> )

Note: Number of Employees in R&D are shown in brackets. Percentage change from previous year in total number of employees is shown in Bold

#### 6. Training and Educational Improvements

Types of training programmes and Number of training programmes can show a company's innovative activity (Blagoev and Yordanova, 2015). GSK offers about 2000 skills training programmes via mylearning platform, provide coaching and mentoring programmes, on the job training, internal secondments, stretch assignments and leadership programmes (GSK, 2020d; GSK, 2019c). GSK also offer Employee volunteer opportunities via Pulse programme and participation in project search as well as health and safety programmes that encourage employee engagement, inclusion and wellbeing. Sanofi has been named Global Top employer in 2020 and offers leadership and bespoke programmes e.g. EVOLVE (Sanofi, 2020c). Bayer offers broad training and educational packages. Bayer also has a corporate university that provides training in leadership and general management (Bayer, 2020b)

#### 7. Ratio between the number of innovations made in-house and the number of innovations made in collaboration

Data on this metrics is very limited or not easily available. Sanofi integrated report describes its long term objectives which include 70% of the projects to be derived from in-house research with 80% of products to be first/best in class and 70% projects producing biologics (2019a, p. 27). Researcher could not find any clear information on this metrics for GSK and Bayer. Hence Sanofi tops this metrics.

## 8. R&D Pipe line

Data on number of new products, services, process introduced/year is limited and/or scattered. It is very time consuming to collect and arrange this data. Hence Researcher has replaced this metrics with Projects in R&D pipeline. AR&D pipeline full of new products is a source of potential solutions to life most pressing questions. It shows how innovative a company is and its innovation potential. Clearly GSK and Sanofi seems to have greater innovation potential than Bayer as shown in Table VII.

**Table VII. Comparative companies' over view of projects in pipeline**

	GSK 2020	GSK 2019	Sanofi 2019	Bayer 2019
<b>Projects in Pipeline</b>	37 Medicines in development, 15 vaccines	39 medicines, 15 vaccines. 3 main approvals 8 regulatory submissions 6 positive read-outs from pivotal studies advanced 4 new assets	87 projects (April, 2020)-out of 87projects, 49 are in Ph1&II stages, 39 projects are in Ph III & registration phases	12 drug candidates in PhII clinical testing 2 projects submitted for approval. In April 2019, US. FDA granted priority review status to one of the submissions (Darolutamide) In late July Darolutamide was approved for treatment

## D. Overview of Ranking of GSK, Sanofi and Bayer given by other indices

Ranking given to GSK, Sanofi and Bayer by Pharmaceutical Innovation index (PII) and EU Industrial R&D investment scoreboard (IRI) are shown in Fig.7-8. PII index was released by IDEA Pharma and shows innovation and invention indices which rank world 30 pharma companies (Idea Pharma 2020; Idea Pharma 2019). PII index rank companies by their capability to successfully commercialise products from PhaseI/II to market using clinical, regulatory and commercial metrics. In terms of both innovation and invention GSK secured higher ranking than Sanofi and Bayer in 2020



Fig.7a: Pharmaceutical Innovation Index 2020, 2019 & 2018 Ranking

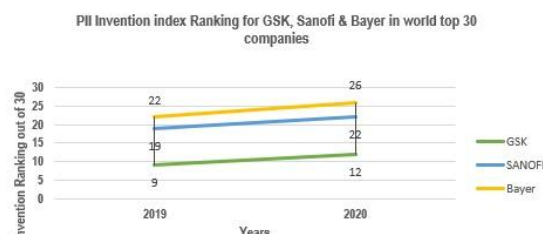


Fig.7b: Pharmaceutical Invention Index 2020, 2019 & 2018 Ranking

**Fig. 7** GSK, Sanofi and Bayer ranking by Pharmaceutical Innovation and Invention index

EU industrial R&D investment scoreboard ranked GSK, Sanofi and Bayer in world 2500 pharma companies as well as in EU 1000 companies (EU 2019a; EU, 2019b; EU, 2019c; EU 2018a, EU, 2018b; EU, 2018c; EU, 2017a; EU 2017b; EU, 2017c ). The data was extracted from EU IRI excel spreadsheets and interactive scoreboards from 2016-2019 and compiled in the form of graphs. All the graphs and figures are created by the researcher. It is interesting to note that in EU1000 companies GSK, Sanofi and Bayer are almost in top 10 pharma companies where as in world 2500 the ranking of these companies ranged from 21-38. The GSK ranking was lower than Sanofi and Bayer in EU IRI rankings in 2019, 2018 and 2017. EU IRI ranking 2019 shows company performance in 2018 and EU IRI ranking 2018 shows data from 2017 and so on.

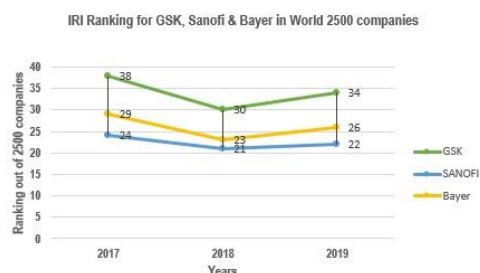


Fig. 8a: EU IRI Ranking in 2500 World companies

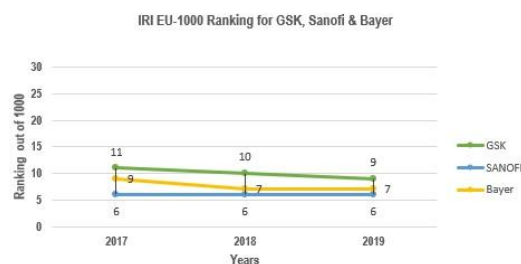


Fig. 8b: EU IRI Ranking in 1000 EU companies

**Fig. 8** EU Industrial R&D investment ranking in World 2500 and EU-1000 companies

Results for other Rating are shown in Table VIII. Other ratings include Fitch Rating, Better Business Bureau (BBB) ratings, Pharmaceutical Executive 2019 (Christel, 2019), Pharmaceutical Executive 2020 (Christel, 2020), BCG Survey (Ringel et al, 2020) and Corporate Knights (2020) and Access to medicine (2018). Fitch rates a company's sustainability of investment relative to the possibility of default. Fitch rated GSK A<sup>-</sup> (stable outlook), Sanofi A<sup>+</sup> (Stable outlook) and Bayer BBB+ (Fitch Ratings, 2020a; Fitch Rating, 2020b; Fitch Rating, 2020c). BBB rating looks at how a business interacts with its clients. GSK and Bayer are not BBB accredited businesses. BBB gave GSK D<sup>-</sup> rating, Sanofi-Aventis A<sup>-</sup> and Bayer A<sup>+</sup> rating (BBB, 2020a; BBB, 2020b; BBB, 2020c) GSK got D<sup>-</sup> due to failure to respond to 14 complaints recorded against the business and Sanofi got A<sup>-</sup> failed to respond to one complaint against it.

**Table VIII** Other Ratings and Rankings for GSK, Sanofi and Bayer

Rating/Rankings	GSK	Sanofi	Bayer
BBB	D <sup>-</sup>	A <sup>-</sup>	A <sup>+</sup>
Fitch	A <sup>-</sup>	A <sup>+</sup>	BBB+
BCGSurvey 2020 (Ringel et al, 2020)	Not in top10 and not in top 50	Not in top10 and not in top 50	Ranked: 38 (-14 from previous year)
Pharmaceutical Executive-Top 50 global Pharma companies (Christel, 2020)	9 (based on RX sales and R&D Spend in 2019)	7 (based on RX sales and R&D Spend in 2019)	15 (based on RX sales and R&D Spend in 2019)
Pharmaceutical Executive -Top 50 global Pharma companies (Christel, 2019)	8 (based on RX sales and R&D Spend in 2018)	6 (based on RX sales and R&D Spend in 2018)	14 (based on RX sales and R&D Spend in 2018)
Corporate Knights, 2020 (Global 100 most sustainable corporations)	79 (2020) 5 (2019)	28 (2020) 20 (in 2019)	Not in top 100 companies globally
The access to medicine Index (Access to medicine foundation, 2018)	1 (2018)	7 (2018)	16

**Note:** Rx = prescription sales, R&D= Research and Development

**Final Score:** All three companies are very resilient and have good R&D intensity. Overall Sanofi and GSK scored very high. From this analysis GSK has been ranked 1, Sanofi 2<sup>nd</sup> and Bayer third. In the past Sanofi was ahead of GSK but recently GSK has shown consistent increase in market cap, R&D intensity, net sales, open collaboration, acquisitions and invention.

#### IV. ENTREPRENEURIAL OPPORTUNITIES FOR GSK

There are Entrepreneurs and intra-preneurs. Entrepreneurs are those who notice an opportunity and then go on establishing an organization to pursue it whereas Intra-preneurs are those who operate Entrepreneurially within an organization (Bygrave and Hoff 1991, Tavakoli and Fayolle, 2017).

In order to have a successful innovative business culture we need to encourage Entrepreneurial mindset at various levels in an organization i.e. lead with Entrepreneurship mindset (McGrath and Macmillan, 2000). The Entrepreneurial mindset in turn will provide a frame work to recognize business opportunities and aid us in introducing those opportunities to market. This includes setting up organizational climate or culture that promotes Entrepreneurial behaviour and employing hands-on leadership. The capabilities and talents required to ensure Entrepreneurial strategy are defined by McGrath and Macmillan, 2000. This leads to our next question. What are opportunities?

Researchers and scholars have given various definitions of opportunities and opportunities can be objective or subjective. In objective approach, opportunities already exist waiting to be discovered and utilized



by an attentive individual where as in subjective approach, opportunities are created through interactions with various stake holders. An opportunity is something that can disturb the market and which when pursued by the Entrepreneurs form some sort of economic imbalance or opportunities are outcomes of an assessment of environment by an attentive person or Entrepreneur who acknowledges them as commercial openings -objective approach (Schumpeter, 1942; Kirzner 1999). According to a long scientific debate both types of these objective opportunities can co-exist (Shane and Venkataraman, 2000). This requires knowledge of current state of the market and full understanding of supply and demand on the market. If a person have full understanding of the market or supply/demand then all he/she needs to do is recognize the business opportunity to launch a novel product or service (Tavakoli and Fayolle, 2017). However when an Entrepreneur does not exactly know the prevailing market situation or does not have correct information on supply/demand than he/she will create an opportunity. Gartner (1990) proposes that Entrepreneurship consists of 4 dimensions: individual/ Entrepreneur, environment, process and organization

The resources that can be obtained and accessed from alliances, networks and stakeholders motivate the development of innovative entrepreneurship (Eisenhardt and Schoonhoven 1996; Elfring and Hulsink 2003). After analysing the literature it seems appropriate to suggest that Entrepreneurs should use both objective and subjective approaches to recognize opportunities. In this way opportunities can be found and/or made via a series of human interaction with their environment and by using cognitive abilities and skills to generate greater value for customers, themselves and for the entire society.

### A. **TWOS Analysis**

TWOS analysis is carried out to identify and assess Entrepreneurial opportunity for GSK to follow. TWOS Analysis was chosen over SWOT as it provides a relationship between factors (Strengths, weaknesses, opportunities and threats) to come up with planning strategies or strategies to minimize threats while taking advantages of opportunities i.e. strategies that GSK can pursue. Appendix A describes TWOS strategies. Results of TWOS analysis are shown in Fig 9. Fig.10-11 shows ten Entrepreneurial opportunities for GSK

	<b>Strengths</b> <ul style="list-style-type: none"><li>• Large cash reserve/ strong financial base</li><li>• Enormous resources at its disposal</li><li>• High income from existing products</li><li>• Skills in drug discovery, vaccines and consumer health care products</li><li>• Ability to expand</li><li>• Advanced R&amp;D capabilities</li><li>• Good R&amp;D investment record and capability.</li><li>• Huge number of international client</li></ul>	<b>Weaknesses</b> <ul style="list-style-type: none"><li>• Product innovation is expensive and time consuming.</li><li>• Less green patents</li><li>• Number of patents has declined /year in EU and USA.</li><li>• Less Biotech companies in EU compared to USA.</li><li>• Need to drive revenue growth</li><li>• Need to speed up innovation.</li><li>• Less use of AI</li><li>• Comprehensive data on customer needs not available for decision making due to lack of analytical talent.</li><li>• Insufficient Digitalization</li></ul>
<b>Opportunities:</b> Green products/services New treatment domains e.g. Nanomedicine/Diagnostics Converting big data into Smart data Creating value for money Use of new technologies e.g. <ul style="list-style-type: none"><li>• Virtual platforms, AI, Quantum computing power</li><li>• Data analytics</li></ul> To streamline R&D processes, shorten clinical trial duration and number of patients, predict toxicity of the candidate molecules, improve manufacturing, enhance drug discover and design	<b>SO (use strength to maximize opportunities):</b> <ul style="list-style-type: none"><li>• Provide green products/services</li><li>• Work to get more green patents.</li><li>• This will enhance company reputation</li><li>• Will also result in getting government financial incentives</li><li>• GSK to use digital technologies &amp; digital transformation (digitalisation).</li></ul>	<b>WO (overcoming weakness by taking advantage of opportunity)</b> <ul style="list-style-type: none"><li>• GSK should progress in innovation in business models, systems, processes, supply chain and services.</li><li>• 13% of pharm companies make business model innovation a top 3 innovation priority (BCG survey, 2020)</li><li>• Collaborate with external parties e.g. biotech companies, academic institutes, even competitors to ensure revolutionary innovation e.g. GSK &amp; Pfizer co-operating to find drug for melanoma</li></ul>
<b>Threat:</b> <ul style="list-style-type: none"><li>• Skill Gap</li><li>• Difficulty retaining best talent to ensure innovation occurs. 59% pharma CEOs say locating and retaining best talent to ensure innovation is challenging (PwC, 2013).</li><li>• Over regulation</li><li>• Uncertain economic growth</li><li>• Threat of new entrants</li><li>• Cyber threats</li><li>• Customers &amp; Governments demand more value for care Pharma products/services</li><li>• Increasing job automation.</li><li>• Diminished talent availability</li><li>• Ageing talent</li><li>• US leadership in Biotech sector is a main threat for EU</li><li>• Changing Consumer behaviour</li><li>• Policy uncertainty</li></ul>	<b>ST (use strength to min threats):</b> <ul style="list-style-type: none"><li>• GSK to promote upskilling programmes to handle skill gap and shortage of talent. This will lead to superior innovation and better work force productivity.</li><li>• GSK to let staff participate in high profile innovative projects and give financial &amp; non-financial rewards to help create innovative climate (PwC, 2013b).</li><li>• GSK to hire talent directly from academic institutes</li><li>• GSK to hire staff from competitors if required.</li><li>• Creating a climate where failure &amp; risks are modestly endured.</li><li>• Encourage senior executives to take part in innovative projects. This will help nurture innovative climate (PwC, 2013b)</li></ul>	<b>WT(min weaknesses and avoid threats)</b> <ul style="list-style-type: none"><li>• Have a flexible business strategy as this will help the company in uncertain economic growth conditions.</li><li>• Mergers and collaboration with US Biotech companies.</li></ul>

**Figure 9:** TWOS Analysis to identify Strengths, weaknesses, opportunities and Threats and establishing relationship between these factors to help choose strategies on their bases.

### B. **Challenges and Opportunities for GSK**

The challenges and opportunities identified in TWOS analysis are described in detail in Fig 10-11.

**Challenge / Opportunity 1:**

US is world leader in biotechnology and this is a challenge for EU as this sub sector is source of plenty of new drugs. EU and UK has comparatively less number of biotech companies than USA (EU industrial R&D Investment scoreboard, 2019). A further challenge is presented by the fact that larger US pharma companies are purchasing smaller US biotech companies thereby consolidating their new drug pipelines.

**Possible solution:** Mergers with biotechnology companies and acquisition of Biotechnology companies to improve access to innovation

**Challenge / Opportunity 2:** Pharma companies need to push authorities to implement electronic exchange of data and setting up of Electronic Patient Records so that Tele-care, Tele-trials and Remote patient monitoring can be run and managed at long distances and even at international level. This will speed up trial recruitment. Pharma should also deliver drugs under trials/testing to primary and satellite facilities.

**Challenge / Opportunity 3:** Lack of green patents & decline of number of filed patents: Analysis of data from various sources has shown that there is lack of green patents and Green technology in Pharma and biotech sector (Hernandez et al, 2019; ). There is a decline in number of patents filed in EU and USA from 2012-2015 despite significant increase of R&D investment. This business opportunity is in line with UN environmental sustainable development goals like responsible consumption and production, climate change (2030 Agenda for sustainable development).

**Possible Solution:** USE UNSDG goals to improve product impact and provide innovative products and processes to achieve UNSDGs.

**Challenge / Opportunity 4: Access to Data-Information Gap**

In order to develop innovative product/service and to make financial and customer related decisions GSK and other Pharma companies need access to clean orderly and labelled data. Currently CEOs do not have access to adequate data to make decisions i.e. there is an information gap spanning last ten years (PwC, 2019).

**Possible Solution:** Adopt and integrate digitalization and technologies that can turn data into smart data so that CEOs have sufficient information to make timely decisions. Build Open collaboration with IT giants and acquire analytical talent.

**Challenge / Opportunity 5:** Market analysis has shown governments, payer and patients want value for money.

**Possible Solution:** GSK should also think about offering unique care packages with their products. This will also ensure profitability and better value for care for customers.

**Challenge / Opportunity 6:** Remote patient monitoring of treatment induced side effects.

**Possible Solutions:** Covid-19 has presented us with an opportunity to develop systems that assist in remotely controlling patient care by using e.g. digitalization process, tele-trials, electronic informed consents (E-consents).

**Fig. 10: Challenges and Entrepreneurial opportunities for GSK (opportunities 1-6)**

**Challenge / Opportunity 7:** Venturing into new treatment field -Nano-medicine / Nano-diagnostics

GSK can invest in Nano-medicine and nano-diagnostics for better Cancer diagnosis and treatment. Nanotechnology is a rapidly emerging technology and can help GSK maintain competitive edge in the market over its peers. This will also help GSK to handle generic erosion by small companies which is likely to erase significant percentage off the turn over of top 10 companies (Bernstein Research, 2008). These treatments will not be easy to imitate and will thus assist GSK to safeguard its intellectual property more efficiently.

**Challenge / Opportunity 8:** Pharma companies primarily focus and excel at product innovation (PwC, 2019). However product innovation in Pharma industry is very expensive and time consuming business with lot of regulatory requirements.

**Possible Solution:** Try innovation in business models and processes, reduce trial times by using virtual platforms e.g. Virtual man, organs and/or computer modelling or bio-simulation

**Challenge/Opportunity 9:** Development of Virtual platforms, Use of AI, Quantum computing, predictive bio simulation

To be innovative Pharma industry need to develop Virtual platforms employing new technologies to simulate the research process & accelerate clinical progress (PwC, 2020c). Use of AI and quantum computing can help provide computing powers required to create a biological virtual model capable of showing genetic and phenotypic changes. This can be used to design virtual patient models, virtual cells and organs to determine different dose levels on various subsets of patient population. This will decrease the necessity to test on living creatures

**Challenge/threat 10:** Shortage of digital / technical / soft skills - Skills Gap PWC 22<sup>nd</sup> CEO survey (2019) showed there is shortage of people possessing digital, analytical, technical, soft skills and STEM skills. The 23<sup>rd</sup> survey (2020a) also showed reduction in talent availability, rising job automation, decline in mobility of skilled labour and ageing talent. The skills gap results in reduced growth & higher people costs.

**Possible Solutions:** Advancing use of upskilling programmes for employees within the organization, Acquiring university students doing Masters and PhDs to provide required skills and work on projects. Participating in Industry based educational programmes e.g. Industry based PhDs as offered in Australia, employing from outside their industry, repurposing trade and technical schools

**Fig. 11 Challenges and Entrepreneurial opportunities for GSK – (Opportunities 7-10)**

**C. GSK Market analysis of Financial Resources**

In order to see if GSK has sufficient resources to pursue these entrepreneurial opportunities to ensure sustainability of the company further market analysis has been done along with VRIO analysis

In first half of 2020 (H1 2020) Bayer reported sales of Euro 22.89bn where as Sanofi reported sales of Euro 17.15bn (Bayer AG, 2020d; Sanofi, 2020a). GSK reported turnover of Euro 17.59bn with 8% AER (the combined turnover of Q1 and Q2 2020) (GSK, 2020a; GSK, 2020b). The results are shown in Fig. 11. GSK reported change of +19% AER in Q1 2020 but in Q2 2020 reported change was -2% AER in sales. Bayer reported H1 2020 net sales change of -0.3% and Sanofi reported H1 2020 net sales +0.9%. All three companies reported decline in quarter 2 sales due to Covid-19 impact. Results are shown in Fig 12-13

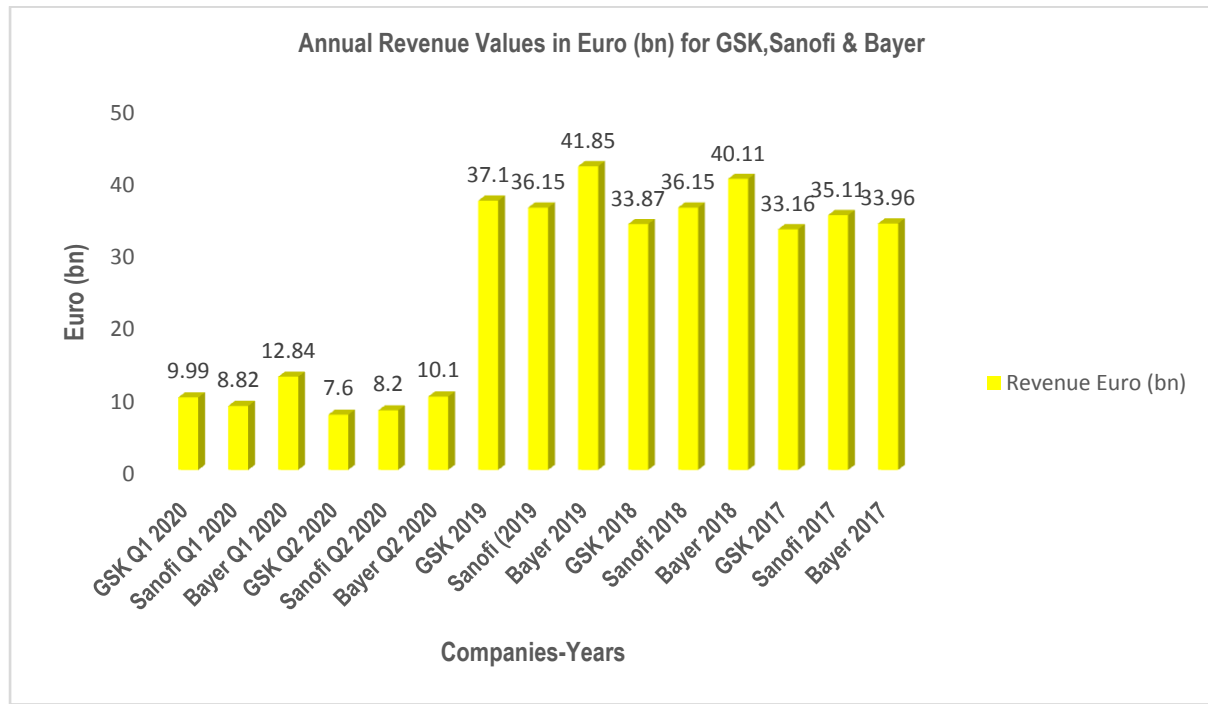
**1. Total Assets**

Results are shown in Fig. 13. In Q1 and Q2 Bayer reported total assets of Euro 125.47bn and Euro 123.67bn respectively with a decline of Euro 1.8bn from 31st March to 30<sup>th</sup> June 2020 i.e. a change of -1.4%

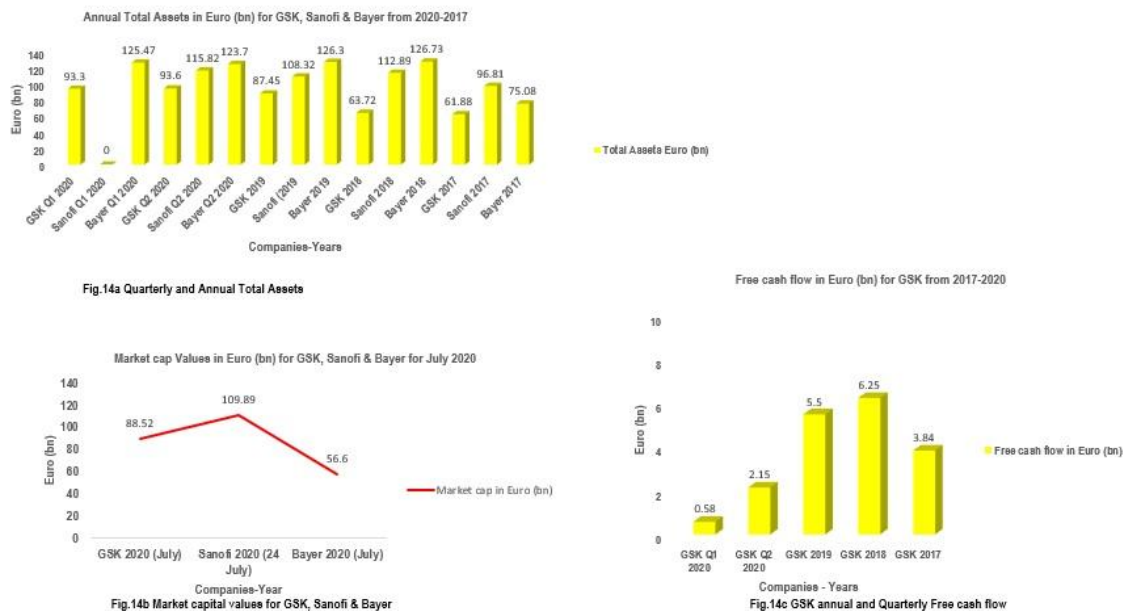
(Bayer 2020d, P.20). GSK reported total assets of £84.38bn by 31<sup>st</sup> March 2020 and in Q2 (GSK Press release First quarter 2020, p.32). Sanofi reported Total assets in Q2 of Euro 115.82bn (Sanofi, 2020e, p.23).

## 2. Market capital and Free cash flow

Results are shown in Fig. 13. GSK has a market capital of Euro 88.52bn, Sanofi Euro 109.89bn and Euro Bayer 56.6bn in 2020.



**Fig. 12** Market analysis of Sales/Turnover



**Fig. 13** Market analysis of Total Assets, Free cash flow and Market cap

## D. VRIO Analysis for GSK

To assess a company's competitive advantage VRIO Analytical framework is used. This framework is chosen as it emphasizes on competencies and resources of the firm which in turn determine a company's competitive advantage. Fig 14-15 shows VRIO analysis of GSK Resources.



<b>GSK Financial resources:</b>	<b>Value</b>	<b>Rarity</b>	<b>High cost to imitate</b>	<b>Organize</b>	<b>Advantage</b>
Adequate capital revenue enables to commercialize drugs	Y	No	Y	Y	Competitive conformity/parity
Free cash flow (Euro 5.5 bn in 2019)	Y	No	Y	Y	competitive conformity
Total assets (tangible/intangible) e.g. Euro 87.45bn in 2019	Y	Y	Y	Y	Long-term competitive advantage
Tangible assets (e.g. Euro 11.36bn or £10.34bn in 2019)	Y	Y	Y	Y	Long-term competitive advantage
intangible assets including goodwill (e.g. £41.52 in 2019)	Y	Y	Y	Y	Long-term competitive advantage
Market cap (e.g. Q1 2020=Euro 88.52bn) vs. Bayer Euro 56.6 bn)	Y	NO	Y	Y	Competitive conformity/parity

**Fig 14a. VRIO Financial Resources analysis for GSK**

<b>GSK HR resources:</b>	<b>Value</b>	<b>Rarity</b>	<b>High cost to imitate</b>	<b>Organize</b>	<b>Advantage</b>	
Large sales & marketing force (40,000)	Y	Y	Y	Y	Long-Term advantage	Competitive
Employees in R&D (over 16,000)	Y	N	Y	Y	Long-term Advantage	competitive

**Fig 14b. VRIO Human Resource analysis for GSK**

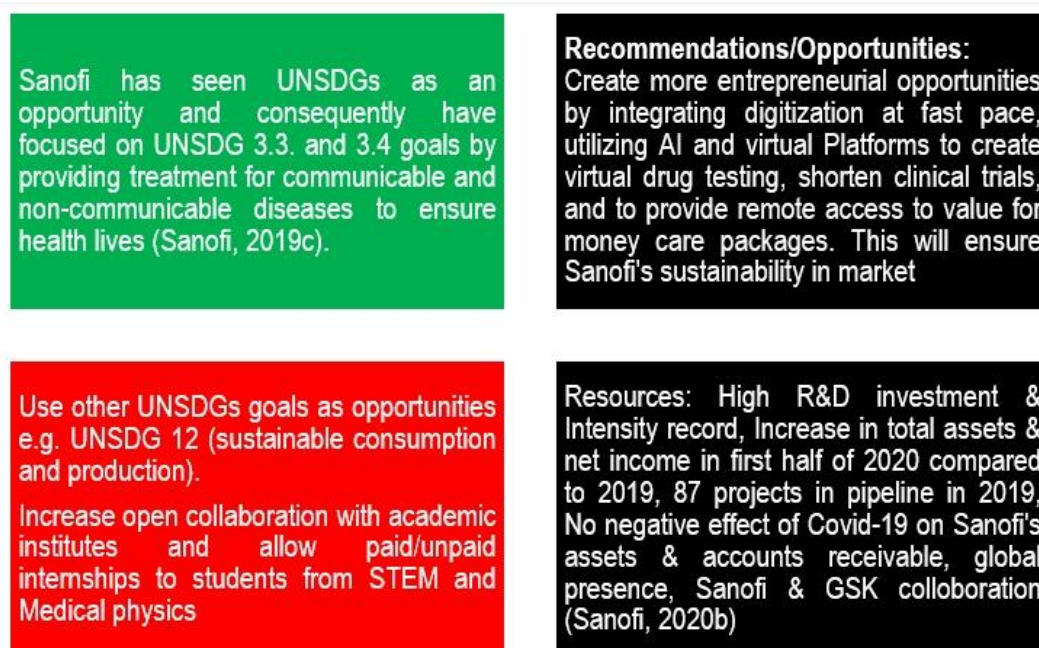
**Fig. 14 VRIO analysis of GSK Financial and Human Resources**

<b>GSK Material Resources:</b>	<b>Value</b>	<b>Rarity</b>	<b>High cost to imitate</b>	<b>Organize</b>	<b>Advantage</b>	
Extensive R&D pipeline (e.g. 37 Medicines in development, 15 vaccines in 2020)	Y	Y	Y	Y	Long-term advantage	competitive
Capability to merge, acquire & open collaboration (able to merge with its rivals, small Biotech, academic institutes). This helps to acquire external knowledge and technological know how	Y	N	Y	Y	Competitive conformity	
Strong distribution network	Y	Y	Y	Y	Long-term advantage	competitive

**Fig. 15 VRIO analysis of GSK Material Resources**

**E. UN Sustainability Development goals and Entrepreneurial opportunities for Sanofi and Bayer (UNSDG)**

Entrepreneurial Business opportunities for Sanofi and Bayer are shown in Fig 16-17 along with a snapshot of their current status with respect to UNSDGs and what these companies trying to achieve in future and whether current resources are sufficient to exploit these opportunities. Sanofi can focus on UNSDG goal 12 – sustainable consumption and production by investing in innovative processes to produce environmentally sustainable products, by adopting new technologies such as AI and data analytics to streamline vaccine and other drug production and testing. Bayer can produce remote and virtual platforms to provide value for money care packages to consumers and patients globally.



**Fig.16**UNSDG and Entrepreneurial opportunities for Sanofi



**Fig. 17**UNSDG and Entrepreneurial opportunities for Bayer

The researcher recently attended a webinar on Tele-Trials in Australia and from the talk of guest speakers the researcher learned that Pharma companies need to provide drugs that are being tested in trials to primary trial sites and also the process of Tele-trials need to be standardized at national level so that Tele-trials can be easily adopted ensuring access to health care to remote populations in Australia. These were useful suggestions and have been incorporated into this report. See fig 10-11 and Recommendations. This will enhance patient recruitment in trials and will speed up R&D process (Tele-Trial webinar, 2020).

## V. RECOMMENDATIONS

Recommendations are made after market, financial analysis and literature review for GSK to continue to be innovative and sustain their businesses under changing economic and social conditions

- GSK needs to improve its customer interactions and better handling of complaints filed against it.



- GSK needs to actively develop and adopt digital technologies and connectivity. Integrate extensively digitalization into business models to achieve competitive edge
- GSK to enhance upskilling of the work force
- GSK to adopt AI at all levels and at wider scale not just limited use.
- GSK to create virtual platforms to better understand disease mechanisms and to shorten clinical trials.
- GSK to adopt predictive bio-simulation at wider scale in R&D process.
- GSK is a socially responsible organization and should carry on with good work by improving their product impact and by providing affordable oncology care and treatment to third world countries.
- Increase use of social media to obtain customer views about products, to interact with stakeholders and to educate professionals and public about their products.
- GSK to enhance collaboration with academic institutes and should offer placements and internships to university students in the fields of research, project management, medical physics, Data analytics and IT.

#### **Recommendations for all three Pharma companies and entire Pharma sector:**

Pharma and Biotechnology companies are recommended to include clear information on the metrics discussed in the present article in their annual and quarterly reports as it will make assessment of their innovation capabilities and activities and comparison with other companies within same sector easier. For their convenience researcher has designed a simple reporting format which these companies can use either part of their annual and quarterly reports or as a supplement to these reports. Pharma companies can modify this format to suit their needs and include other relevant information. See Appendix C.

- GSK, Sanofi and Bayer should consider delivering drugs/medicines/vaccines to primary and if possible satellite sites to assist in use of Tele-trials so that oncology and health care can reach remote parts of the world e.g. remote parts of Australia

#### **Recommendations for Policy makers and Government**

- Introduce new procedures for simplifying over regulation in Pharma sector
- Ensure that Electronic patient Records systems are used by all health care providers
- Allow where appropriate Electronic exchange of patient data from hospitals and data from pharmaceutical companies about biologics and new biomarkers.
- Start the process of standardization of Tele-Trials across regional centres and nationally so that Tele trials can be adopted fast and health care can reach remote areas easily.
- Advise pharma companies to deliver drugs under trials/under testing to be delivered to primary and if possible satellite trial centres.
- Manage economic and policy uncertainty by having clear and well defined objectives and issuing well defined directions. This will facilitate growth.
- Advise academic and health care centres to allow principle investigators from other countries to contribute to Tele-trials while ensuring observance of local and regional regulations.

### **VI. CONCLUSION**

This study has shown that a modified company innovation model can be successfully applied to compare the innovative capabilities and potential of pharma companies.

A number of CEO surveys conducted in UK and globally have highlighted challenges and opportunities faced by Pharma sector such as shortage of skills, information gap, over regulation, economic uncertainty, policy uncertainty, rapid change of technology, changing customer and government expectations, costly and time consuming R&D process as well impact of COVID-19 pandemic. Many of these challenges also can be taken as entrepreneurial opportunities and there are possible solutions available to tackle these issues and improve company growth and innovation. This report shows that GSK, Sanofi and Bayer are resilient and flexible companies with huge innovation capabilities and activities. GSK has increased innovation potential and activities and has consistently shown increasing R&D investment from Euro 3.95bn to Euro 5.0bn from 2016-2019, R&D intensity, Net sales (from 2017-2019) and a good market cap of Euro 88.52 bn in 2020. GSK has shown significant number of projects in R&D pipeline (37 medicine and 15 vaccines) in 2020 and over 16,000 Employees in R&D with one of the largest sales force in Pharma sector. GSK accounted for 2.8% of Euro 140bn, 2.9% of Euro 147.1bn, 2.69% of Euro 153.8bn and 3.1% of Euro 159.3bn of total R&D investment made by Pharma sector globally. GSK mean R&D investment value was Euro 4.3bn from 2016-2019 whereas median value is Euro 4.2bn. GSK has shown good innovation competencies in terms of open collaboration with various external parties. GSK had better ranking (GSK= 9, 2019 & 12 in 2020) than Sanofi and Bayer in terms of invention in 2019 and 2020 and superior ranking in terms of innovation in 2020 by Pharmaceutical invention and innovation index. There is no doubt that Sanofi has out-performed GSK in some aspects e.g. R&D pipeline

has 87 projects, higher R&D investment than GSK, best Employer of the year and better handling of customer complaints. However GSK is showing continuous and consistent efforts towards innovation, invention and growth improvements and this report shows that GSK has a stable outlook. All three companies are socially responsible and are working towards UN sustainability Development goals. To speed up innovation and company sustainability as well to achieve competitive advantage GSK needs to adopt and integrate digitalization at wider scale, turn huge amount of data into smart data by employing data analytics and professionals outside the pharma sector so that CEOs have sufficient information to make decisions and adopt upskilling programmes at wider scale to fill skills gap. This in turn will help in adoption of AI. GSK needs to accelerate the formation of virtual platforms (e.g. virtual cells, organs and man) to speed up R&D process and to have better understanding of patho-physiological process of normal and diseased human body. GSK to implement better handling of customer complaints and to develop care packages for customers. GSK can venture into nano-medicine and diagnostics to produce effective personalized cancer treatment. This will give GSK competitive advantage. GSK has sufficient resources to pursue these opportunities. Total assets, Extensive R&D Pipeline, number of employees in R&D and in sales and strong distribution networks give GSK long term competitive advantage over its peers.

### Appendix A

TWOS Strategies

**Strength/Opportunities (SO):** how each internal strength enables GSK to capitalise on external opportunities

**Strength/Threats (ST):** This enables the analyst to establish how each internal strength can assist GSK to avoid external threats

**Weaknesses/Opportunities (WO):** This section of TWOS analysis enables the analyst/entrepreneur to ascertain how each internal weakness can be eliminated by using external opportunities

**Weaknesses/Threats:**

This analysis enables the GSK to determine how the threats can be avoided or minimized. Some of the threats and weaknesses in the TWOS analysis can be used as an entrepreneurial business opportunity.

### Appendix B

How the VRIO scoring/ranking was done

- **resource is not valuable** -outsource it as it brings no value to company
- **resource is valuable but not rare** – means company is not worse than its competitors/peers (competitive conformity)
- **resource is valuable and rare** but it is not costly to imitate it – gives **temporary competitive advantage**. In future other companies will make an effort to imitate it and at that point, the company will lose its competitive advantage.
- **resource is valuable, rare and is costly to mimic it** but unable to **organise** our company - the resource becomes **expensive** (unused incurred costs)
- if we can manage the advantage and we are able to organize our company and temporary competitive advantage, it becomes as **permanent competitive advantage**

**Source:** Management Mania (n.d.)

### Appendix C

Suggested Sample Report format to describe innovative and entrepreneurial metrics of the pharma company

**Date issued:**

**Company Name:**e.g. GSK We are Science led global health company

**Purpose:**

**Goal:**

**Strategy:** e.g. Innovation development strategy and policy

**Long-term priorities:**

**Business Model (including divisions):**

**R&D investment and Intensity:**

**Net sales/ Turnover:**

**Net sales one -year growth:**

**Capital Allocation framework:**

**Platforms and Data used by company to drive innovation:** e.g. customer management system, online trade, automatic and smart processes, CRM, product databases

**Knowledge management systems and strategies:**

**Total Assets in current and previous year:**

**Market Cap:**

**Share value:**

**Work Force statistics**

	2020	2019	% change
Total number of employees			
Employees in R&D	e.g.16000	e.g. 17000	% up or down
Employees in Sales			
Employees in Production			
Employees in Marketing			
Employee education & Training programmes	e.g. upskilling		

**Registered Patents and Trademarks**

	2020	2019
Significant registered patents/trademarks		
Pharmaceuticals		
Vaccines		
Consumer Healthcare		

**Innovation**

	2020	2019
Number of introduced new products/services/processes /year	e.g. introduced one new business model or introduced two novel vaccine for covid-19 or glioblastoma this year	
Innovations made in House	e.g. 3 in-house innovations	
Innovations made in collaboration	e.g. 4 innovations made in collaborations	
Projects in R&D Pipeline		
Average time from PH I/II to commercialization		

**UNSDG and company strategy**

	2020	2019
strategy	Embedded UNSDG goals in company strategy	
Goals: working towards goals e.g. 3, 5, 7	e.g. reduced carbon foot print significantly this year e.g. improved product impact	

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