



Design Brief:

Chemical Detector System (CDS) – Veyerus

Alison Morris

2117339



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Contents

Synopsis.....	5
Aesthetics.....	6
Branding.....	7
Circular Economy.....	8
Company constraints.....	8
Competition.....	9
Customers.....	11
Documentation.....	12
Environment.....	13
Ergonomics.....	13
Installation.....	14
Intellectual property.....	14
Legal.....	15
Life in service.....	16

Materials.....	17
Manufacturing facilities.....	17
Market constraints.....	18
Maintenance & repair.....	18
Packaging.....	19
Performance.....	20
Politics.....	20
Processes.....	21
Prototyping.....	21
Product cost.....	22
Product life span.....	22
Quality.....	23
Quantity.....	24
Reliability.....	24
Safety.....	25
Size.....	25
Shelf life and storage.....	26

Shipping.....	26
Social & Cultural.....	27
Standards & specifications.....	27
Testing.....	28
Timescale.....	28
Weight.....	29
References.....	30

Synopsis

We are a well-established producer of electronic breathalyser systems which are used by police and security forces. We have identified an opportunity to develop this technology for clinical, personal and other workplace uses.

Product overview

We have developed our current alcohol detector system to detect breath generated organic materials including viruses.

We anticipate that this chemical detection system (CDS) will solve the current issue of a lack of quick, non-evasive covid-19 testing in a range of settings.

We expect that the projected manufacturing volumes in the first year is likely to be no more than 750,000, potentially 3 million per annum afterwards.

Goals

Bringing this product to market will tap into a new customer base and create increased brand awareness. Our goal is for our product, 'Veyerus' to be synonymous with virus testing is referred to as an umbrella term for all products that do a similar job, i.e., Hoover/vacuum cleaners. In short, we want to be market leaders for chemical detection systems that can detect covid-19 and other circulating viruses. We anticipate that this product will generate a new revenue stream and increase sales for the company.

Historically testing for covid-19, in a variety of settings, has required the user to perform an at-home lateral flow/antigen test and report the result. We suggest that there are flaws in this system. 'Veyerus' is a chemical detection system which is simple and easy to use, and crucially can be used by the layman. Used in a similar way to the our current breathalysers, a user blows into the device and an accurate test is then provided. This quick and simple test allows for testing to be performed on any site, for example, prior to entry to a hospital, airport or music venue. The device will be wi-fi and Bluetooth enabled and will also have a complementary app where the result will be reported to. We aim to discuss the possibility of having the result reported to the NHS with the relevant bodies.

We have conducted extensive market intelligence and appreciate what is needed to bring this to market. We now recommend that this product is suitable to take to market and propose the following points for consideration.

Aesthetics

Aesthetics of the CDS are important as research suggests that good aesthetic design can lead to an increase of sales from new customers (Candi, 2010).

Visual products that look good are perceived by users to have other qualities (Nikolov, 2017).

- The colour of the device will be white.
- The device needs to be comfortable to hold and easy to use for both left and right handed people.
- Clear LCD display – show results, battery life, whether the test was completed correctly (in the same way a control line appears on an antigen test), result of the test.
- On/off button (with light to show when device is on)
- Soft touch buttons:
 - On/off
 - Clear current display (i.e., new user)
- Red/light function, so user can clearly see whether the test is negative (green) or positive (red).
- USB charging port.
- Black wrist strap.

Cross reference:

Competitors

Branding

Packaging

Branding

- Proposed product brand name – ‘Veyerus’.
- Play on words with virus and vision (i.e., being able to see the result clearly); ‘V-eye-rus’.
- Following the brand name will be ‘visual virus detection system’.
- Suggested logo/package design – see below:



- Company brand also needs to be prominent to increase brand awareness as this product will move us away from our traditional client base.
- Company and product name embossed into the device itself so the name does not fade/rub-off over time.
- Product brand name will need to be registered (see IP).

Cross reference:

IP

Packaging

Aesthetics

Circular Economy

- Incorporate paper mouthpieces (as opposed to plastic) which can be easily recyclable.
 - Obtain certified supplier status from the Forest Stewardship Council (FSC) (Forest Management Certification, 2022).
 - Offer additional sales of the mouthpieces so users can buy more in the future.
 - Offer a reduction in price for new mouthpiece for the return of the used ones (which we can then recycle).
- In conjunction with traditional B2B / B2C routes, trial a leasing system for the device.
- Produce the device using fully recyclable plastic.
- Offer an annual service package to keep the device in use for as long as possible.
- At end of life, offer a buy-back service and re-use the parts for a new device.
 - Ensure the parts used for this device could be used in other products in our range.

The packaging for the device will not include any plastic (Ellen Macarthur Foundation, 2017.).

- Disassembly should be kept in mind when designing the product.

Cross reference:

Maintenance and repair

Packaging

Company constraints

- Staff engagement
 - Communicate as much as possible so all staff feel part of this new project.
- Capacity
 - This device will be produced in conjunction with others in the range – how this is managed will need to be considered.
- Warehousing

- Space in warehouse will need to be managed.
- Expertise
 - Identify elements of the new product that are not familiar to the business and outsource where appropriate.
- Finance
 - Prepare realistic budget for the project.
- Time
 - How much time can be spent on this project alongside 'day-job'.

Cross reference:

Timescales

Manufacturing facilities

Competition

- Worlds Inc.: 'Worlds Protect' covid-19 monitoring system (Preston, 2020).
 - Worlds Protect is a breathalyser kiosk whereby a person blows into the unit using a paper straw.
 - The result is available within a minute.
 - Worlds Inc. are planning to shrink this technology into a smaller device but this has not been brought to market as yet (Mannan, 2021).
 - The cost of Worlds Protect has not been divulged.



(www.engineering.tamu.edu., 2021)

- Owlstone: producer of chemical detectors for medical, commercial and military applications.

- Medical: ReCIVA breathalyser, currently being used in clinical trials to detect lung and colorectal cancer, as well as asthma.
- Result obtained in ten minutes.
- Considerations: the ReCIVA does not currently test for covid-19, although with the technology they have it could be suggested that they could pursue this market.
- No costs to purchase item given.



(owlstoneinc.com, 2022)

- InspectIR Covid-19 Breathalyzer
 - Very recently approved breathalyser for use in US by Food and Drug Administration (FDA) (FDA.gov, 2022).
 - Intended to be used by a trained operator under supervision.
 - Provides results within 3 minutes.
 - Footprint – comparable with a piece of carry-on luggage.
 - Approximate production rate – 100 per week.
 - Correctly identified 91% of covid-19 cases in trials (Mole, 2022).



(arstechnica.com, 2022)

Considerations:

- The above examples are cumbersome and not intended for use by a layman.
- Costs are not divulged in any case.
- We have the capability to produce in far greater numbers compared to InspectIR.
- With on-going development in chemical detection technology supports our view that there is demand and space for our CDS on the market.
- Obtain physical examples of the above if possible.

Cross reference:

Customers

Reliability

Product cost

Customers

The customer base for the product is far-reaching.

- Healthcare
 - Hospitals and GP surgeries
 - Dentistry
 - Maternity/health visitor services (home visits)
- Education settings
 - Schools (less intrusive than current antigen testing.
 - Universities
 - Libraries
- Transport
 - Public transport
 - Aeroplanes and airports
 - Border force
- Entertainment industry
 - Nightclubs
 - Live music venues
- Places of worship
- Personal/home use

- Personal preference over antigen/PCR tests.
- Non-evasive testing maybe more suitable to children and those with learning difficulties/disabilities.

Cross reference:

Aesthetics

Branding

Environment

Documentation

- Instruction manual:
 - Consider having the manual translated into a number of languages
 - Include advise on how to store the device correctly when not in use.
- Include certification (i.e., UKCA/CE certification).
- Include a helpline number for any repairs/additional service requests.
- Reference Declaration of Performance/material safety sheet (provide link to website).
- Include QR code for app installation and website.

Cross reference:

Circular economy

Software

Installation

Legal

Shelf life and storage

Environment

The device will be potentially used in a variety of settings. It therefore needs to:

- withstand fluctuations in temperature.
 - Average UK temperatures can range from 1°C to 23°C (Weather Spark, 2022).
 - Can withstand humidity (nightclubs, outdoor venues).
- Endure inclement conditions as this may be used in outdoor as well as indoor environments.
- Must be able to withstand drops, knocks and bumps.
- Must be able to withstand radio-waves/x-rays etc.) (clinical & airport).
- Noise and vibrations must also be considered.
- The device will be packaged well to mitigate any damages in transit, but this type of damage must be considered.
-

Cross reference:

Life in service

Materials

Ergonomics

- Have indents in the body of the device so it is easy to hold.
- Be comfortable to hold for both left and right handed individuals.
- The device needs to be easy and intuitive to use.
- Easy to change mouthpieces.
 - The case for the device will need to include space to hold a number of mouthpieces
- Safe to use under a range of different conditions (see environment).
- The device will have a wrist strap for ease of holding and to mitigate any drops to it.

Cross reference:

Performance

Aesthetics

Environment

Installation

Intellectual property

- Apply for a registered Trade Mark to protect the brand name and logo.
 - Make the application for UK, EU, USA and China.
 - Employ a Trade Mark watch service for the protection of the product (Trademark Eagle, 2022)
- Apply for registered design rights to protect the appearance of the device.
 - Make the application for UK, EU, USA and China.
- Make an application to the Intellectual Property Office to patent the product.
 - Make an European and International application at the same (ISO, 2020).

Cross reference:

Legal

Packaging

Installation

- The product needs to be easy and intuitive to use.
- Initial set-up and installation should be minimal, i.e., plug and go.
- QR code in instruction manual should direct user to website and video guide, plus link to the complementary app which will be free to download.
- The user will need to:
 - Connect the device to wi-fi
 - Download the app and link it to the device (user name and password).
- The device will be charged using a USB lead with compatible UK (or EU/other country compatible) plug adaptor.

Cross reference:

Performance

Ergonomics

Legal

- Incorporate legal counsel from early design stage.
- Legal counsel to collaborate with marketing, design and technical from offset (Cohen, n.d.)
- Consider product liability and regulatory requirements throughout project.
- Consider how the requirements differ from sector to sector i.e., clinical to travel industry.
- Designers to liaise with legal regarding application of patents (see IP).
- Marketing to discuss product launch with legal to ensure that information on packaging and other documentation is within the law.
- Consider GDPR/Data Protection laws – data from the device can be stored on the complementary app, this needs to fall into Data Protection law.
- Apply for UKCA and CE accreditation in UK and Europe respectively (see safety).
- Ensure legally binding technical documentation (i.e., Declaration of Performance) is accurate and kept up to date.

Patent search (Intellectual Property Office, n.d.):

A search of similar patents in the UK was conducted using relevant keywords:

- ‘Breath’: breath detection unit with a biometric sensor to test lung function
 - Similar concept, but for testing function not disease.
- ‘Medical’: no relevant patents found.
- ‘Virus’: no patents found.
- ‘Mouthpiece’: no relevant patents found.

Trademark search:

A search of similar trademarks in the UK was conducted using relevant keywords:

- Veyerus:
 - ‘VERUS’: Class 9 (relating to mobile phones and other similar devices and accessories).
 - ‘VERUS’: Class 16 (relating to paper, card and stationary).

- 'VERUS': Class 18 (Luggage); Class 26 (Martial arts uniforms); Class 28 (Sporting equipment).
- Virus:
 - 'Virus': Class 9 (musical instrument component/accessory); Class 15 (musical instrument); Class 42 (hardware relating to musical performances).
 - 'Vyrus': Class 12 (vehicles); Class 25 (clothing); Class 28 (toys).

Cross reference:

IP

Standards and specifications

Testing

Documents

Life in service

- The device will be constructed of a durable and hardwearing plastic which can withstand drops and knocks.
- Ensure the display is shatterproof.
- The device will be powered by a lithium-ion battery which could provide 3-4 days use without charging (Getoptim, 2022).
- Provide a repair service for the product.
- Offer annual service package.
- Obsolescence vs. product-life extension: adopting circular economy principles, the goal is to extend the life of the product rather than a planned obsolescence (Designing buildings, 2022).

Cross reference:

Circular economy

Environment

Performance

Materials

- Device
 - Will be constructed of hard-wearing durable plastic which can be recycled.
 - Consider PVC which is rigid and can be recycled back into PVC (Trademark Eagle, 2022).
 - LCD backlit display
 - Wrist strap made from recycled fibres.
- Mouthpiece
 - Easily recyclable paper mouthpieces to be used.
- Carry case
 - To preserve the life of the product a carry case should consist of:
 - Outer shell to be produced using EVA (Monmouth Rubber and Plastics, 2022).
 - Easily recyclable
 - Foam inner will protect the device from knocks and drops.
- Packaging
 - Carboard with printed branding (see packaging).

Cross reference:

Circular economy

Life in service

Packaging

Manufacturing facilities

- The running capacity of the factory and how the production of the new device can be incorporated needs to be considered.
- Manpower – train a team who will specialise in this project (factory floor and office staff).
 - Account for holidays/sickness.
 - Communicate will whole of workforce on project to increase staff engagement.

- Need to consider how the factory will handle capacity when volumes increase as forecast.
- Consider warehousing and storage capacity.

Cross reference:

Company constraints

Quantity

Market constraints

- Meeting the clinical requirements for detection (Krisher, Riley and Mehta, 2014).
- (Potential) High cost item.
- Reduced demand if testing requirements change.
- Reduced demand if covid-19 cases decrease.
- Possible limitations should our competitors bring a comparable device to market.
- It is crucial that we are first to market with this product to support our goal of being market leader in this field.

Cross reference:

Competition

Politics

Timescale

Maintenance & repair

- Aftersales – offer purchase of paper mouthpieces (see circular economy).
- Calibration
- Annual service
- Repair service – would this be under guarantee for a certain number of years?
- Need to consider the number of parts that would need to be kept in stock for maintenance and repair.
- Need to consider staff levels and forecast demand for the service (if possible).
- Software updates.

Cross reference:

Circular economy

Life in service

Packaging

Palletised:

- The boxes will be palletised on a Europallet (1200mm x 800mm) (standardised pallet in UK and EU).
- Maximum weight to a Europallet – 1500kg (EPAL Euro Pallet, 2022).
- The size of the packaging will be 90mm (W) x 165mm (L) x 50mm (D), the weight will be 400grams.
- We will be able to store/ship 3750 boxes to a pallet.
- The complete pallet will be covered with a recycled cardboard sheath for protection and banded for security.
- Cardboard has been chosen over plastic due to its environmentally friendly qualities.

Individual packaging:

- The device will be stored in a cardboard box which will also house the carry case, number of paper mouth pieces and the instruction manual.
- The box will need to be drop tested to ensure that the product will be protected in transit.
- The box will be printed with the brand name and logo – see suggested artwork:
- Packaging printed using Biomaster antimicrobial protection (Galloway, 2020).



Cross reference:

Branding

Shipping

Shelf life and storage

Performance

- Software – complementary app for mobile phones – the result from the device can be sent directly to the app which can store the data (see legal).
- Updates – consider how any software updates can be performed.
- Discuss the possibility of reporting the test directly to NHS with them, so the user doesn't have to report manually, which is the case now with antigen testing.
- Website – to include technical information, user instructions and repair and service section.
- Rechargeable battery which can be charged via a standard USB cable.
- Unit will be powered by a lithium-ion battery, which should have same performance capabilities as a mobile phone.
- Device should be able to show result within 60 seconds.
- Accuracy needs to be tested – consider false positives/negatives.
- Consider how often the product will be in use and whether this, or conversely, dormancy, will effect performance.
 - What can be done to counter this?
- Consider calibration and whether this needs to be performed over time.
- Using the manufacturing facilities in house, we believe that this will be economically viable.

Cross reference:

Maintenance & repair

Life in service

Legal

Politics

- Investigate whether Government policy is likely to change in the future.
 - Will there be a mandatory requirement to test in the future?
 - And if so, which areas are these likely to be?
- Consider any changes to the Government's vaccination policy – cases of covid-19 may increase if it chooses not to vaccinate en masse.

- At home antigen tests are no longer free issue – there may be a requirement for Veyerus for businesses/general public for at-home use.

Cross reference:

Customers

Social and cultural

Processes

- The manufacturing process will be similar to what we have in place already due to the other products in the portfolio.
- Special attention will need to be made to the differences in technology between this device and others we produce.
- Our production process will conform to HSE requirements.
- The process will be UKAS accredited (see safety).

Cross reference:

Standards and specification

Manufacturing facilities

Safety

Prototyping

- A prototype should be considered following successful completion of the design process.
- Producing the prototype will highlight the:
 - Timescale of the manufacturing process.
 - Any arising issues with the manufacturing process.
 - Any issues with the device.
- The prototype needs to be assessed by different areas of the business to identify as many issues as possible.
- The prototype should also be tested by end users in a variety of settings for feedback.

Cross reference:

Testing

Manufacturing facilities

Product cost

- Our competitors have not divulged their costs so unable to use this as a comparison.
- As a comparable, alcohol detection systems price point is from approximately £550 to £1350.
- We need to consider the cost of making the device against our the cost of other products within our portfolio.
- Our goal is for this device to be seen as a quality item, however we need to ensure that the price point is not too high.
 - Retailers' margins will need to be considered.
- Supply chain, materials and energy price increases will need to be factored into the cost and margins.
- Producing the device on pre-existing lines with tooling in-situ will help to keep the costs on target.
- Other project costs including legal fees and prototyping will need to be considered.

Cross reference:

Competitors

Quality

Prototype

Legal

Product life span

- We envisage that the device will be in production for circa 15 years in its current format.
- Further innovations should continue to adapt the technology to detect other circulating viruses (i.e., monkeypox (BBC, 2022)).

- How the UK situation changes regarding testing for covid-19 is crucial to the long-term outcome for the product.
- This is why developing the technology further is crucial to its long-term success.
- In the short-term it is proposed that this project is additional to the other more established products and revenue streams in our portfolio.
- Understanding our competitors and their products is also key to the longevity of the device.

Cross reference:

Politics

Competition

Social and cultural

Quality

- The device will be intended for use over a range of industries and settings.
- It therefore needs to be perceived as a quality item.
- It needs to uphold the company's reputation as being a market leader on breath detection systems.
- The product will not be at an entry level cost, so the look needs to reflect this.
- Conform to ISO 9001 Quality Management (BSI Group, n.d.):
 - Ensure required regulations are met.
 - Communicate quality policy.
 - Identify risk and opportunities within the business to increase sales and reduce waste (see circular economy).

Cross reference:

Maintenance & repair

Aesthetics

Legal

Quantity

- Anticipated manufacturing volumes are likely to be no more than 750,000 in the first year.
- In year two onwards we expect a potential of 3million per annum.
- We need to consider the cost of additional tooling and the extra capacity required.
 - The frequency of replacing tooling also needs to be considered.
- Should the sales growth continue a dedicated production line will need to be considered.
- How the current facility will manage with increased capacity also in terms of workforce needs to be factored in to future HR recruitment plans.
- Warehouse and storage – how much additional m³ will we need in the warehouse?

Cross reference:

Materials

Manufacturing facilities

Reliability

- Given the nature of the industries we anticipate the device being used, reliability is paramount.
- Price point and high quality – the perception is that this is a robust device that will not fail.
- As established there is no known direct competition at the moment, but this is likely to change.
- The potential is there for this product to be market leading, but this will not happen if there are reliability issues.
- To mitigate reliability issues annual servicing should be offered and a speedy and efficient repair service should be available.

Cross reference:

Quality

Maintenance & repair

Competitors

Safety

Apply for independent accreditation:

- UKAS Accreditation (UKAS, n.d.)
 - Audited to ensure equipment and processes are accurate and safe.
- CE and UKCA marking (UK's equivalent following Brexit) will need to be obtained.
 - Covers environmental protection, safety and health requirements (Gov, 2021; Europa, n.d.).
 - Being both CE and UKCA tested/marked will ensure that the product can be sold in both the UK and EU.

EU Battery Directive (2006/66/EC) (Intertek, n.d.)

- Batteries need to be labelled correctly.
- Support battery collection and recycling.
- Recycle batteries appropriately during aftersales support.

Cross reference:

Standards and specification

Documentation

Legal

Life in service

Maintenance and repair

Size

- The footprint of the product will be 150mm (L) x 70mm (W) x 30mm (D).
- It will weigh approximately 200 grams.
- Handheld size for comfort and ease of use.
- The size of the packaging will be 90mm (W) x 165mm (L) x 50mm (D), the weight will be 400 grams.

Cross reference:

Shipping

Aesthetics

Weight

Shelf life and storage

- Within the factory the product will be stored in its own packing, palletised and covered with a recycled cardboard sheath for protection.
- Due to the environment within the factory, we do not envisage any product degradation.
- The customer will be advised that the device should be stored in its carrycase when not in use.
- The life of a lithium-ion battery is between two and three years.
- Our aftersales support service will replace the battery if the customer experiences this issue.

Cross reference:

Circular economy

Packaging

Maintenance and repair

Shipping

- Ensure that the pallets used conform to ISPM 15 standards.
 - Heat treated to 56°C to stop the spread of pests (Metroshipping, 2020).
- Product pallets should have cardboard sheath protecting product – more sustainable alternative to plastic wrapping (will be branded).
- ISO standard Europallet.
- Using a standardised pallet will ensure that we can make use of the palletised distribution network.
 - This is ideal when smaller quantities of product need to be dispatched, as opposed to a HGV lorry.

Cross reference:

Packaging

Social & Cultural

- We will need to consider if people will accept being tested in this way.
 - Is it considered better than the alternative?
- Will there be certain demographics which may take exemption to being tested in this manner than others?
 - Specific marketing for these groups may be necessary.
- Cost of living increases
 - Will our product be unaffordable?
 - Will there be a need for our product if there is an economic downturn?
 - Correct price point is crucial.

Cross reference:

Politics

Product cost

Standards & specifications

Standards:

International Organization for Standardization (ISO) standards to consider (ISO, n.d.):

- ISO 13485:2016 – Medical devices.
 - required for regulatory purposes.
 - Covers design and development and servicing of a medical device.
- ISO 9001:2015 – Computer software
 - Relates to the development, provision, maintenance of computer software.
- ISO 56002:2019 – Innovation Management.
 - Related to innovation management systems including products and services (ISO and Innovation, 2019)

Certifications relating to the above will need to be made available on the website.

Specifications:

- A product specification will need to be drawn up and agreed by the team before progressing the project.
- A Declaration of Performance will need to be created and made available on the website.

Cross reference:

Testing

Legal

Documentation

Safety

Testing

- The device will need to be tested at the prototype stage and after manufacture.
- The device should be tested in-house but also in a variety of settings.
- How the device performs under a range of conditions should also be tested.
- External auditors will need to test the device to conform to the relevant certifications.
 - Initial type testing.
- Quality control testing – this should be done on a regular basis (one per hour).

Cross reference:

Testing

Safety

Timescale

- It is crucial that this device is brought to market as soon as possible to ensure that we are the first to bring it to market.
- Prototyping needs to be actioned as soon as the design specification is finalised and the design process is completed in order to test the product.
- The changing position of testing at Government level should also be a consideration in timescale.

Cross reference:

Company constraints

Competitors

Prototype

Politics

Weight

- The footprint of the product will be 150mm (L) x 70mm (W) x 30mm (D).
- It will weigh approximately 200 grams.
- When packaged, it will weigh approximately 400 grams.
- It is essential that the product is of a weight which is easily held for long periods (i.e., transport industry and entertainment/events).
- The device is light enough so it can be held in one hand comfortably.

Word count – 4341.

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