FemTech (Women's Digital Health) Economic Opportunity Report for Scottish Enterprise

March 2023

Report completed/submitted by:	Pamela Reid and Richard Whitcomb
Proof check completed by:	Lewis Randak and Jack Easton
Date:	28th March 2023
Report reviewed by:	Richard Whitcomb and Pamela Reid
Date:	28th March 2023

Contents

1 Introduction

1.1 This report presents a review of the FemTech (Women's Digital Health) sector's economic opportunities for Scotland. FemTech is in many ways a nascent area of activity, however, there may be market opportunities in the sector provided that the correct building blocks are put in place to allow FemTech to develop and grow. Scottish Enterprise has recognised the opportunities for the growth of the sector and has commissioned this study to identify an evidence base and analyse the market value of the sector in Scotland.

1.2 Scotland has a strong history in medical technology (MedTech) and its reputation as a prime manufacturing location has made it a world leader in the development of tech-based health solutions. A comprehensive supply chain, highly rated innovation centres and a robust online health records system provide invaluable data resources for research and development.'[1] This is a very sound basis for the development of the Scottish FemTech sector.

1.3 At the same time, Scotland has been at the forefront of advancing the women's health agenda in recent years, not least as the first in the UK to develop a Women's Health Plan (see Chapter 2). Digital health's rapid growth in the last few years has led to the proliferation of new technologies and novel solutions to long-standing health problems. FemTech, in particular, has become a major movement in women's healthcare, and the market appears ready to support this rapid growth.

1.4 The Global Wellness Institute identifies FemTech as a key driver of the wellness economy.[2] This highlights an increase in 'health consciousness', amongst the female population, and indicates that normalising and proactively addressing women's health issues is contributing to high market growth. It is also recognised that increasing disposable income, digital literacy, smartphone penetration, internet connectivity, digital health infrastructure, and the emergence of start-ups focusing on women's health present new and potentially lucrative opportunities to new and existing FemTech companies.

1.5 As such, FemTech has the potential to deliver against the aspirations of the national Health for Wealth Programme and its twin objectives to 1) fully exploit the potential of digital technologies and data to transform health and care and to 2) build a world leading health and care ecosystem that optimally links the triple helix of the NHS, academia and industry.

Study aims and methods

1.6 This study seeks to provide a robust evidence base that quantifies the nature and scale of the FemTech economic opportunity for Scotland, identifying growth areas which align with Scotland's strengths and capabilities and which offer a route to securing competitive advantage and benefits for Scotland's economy and the health of the population. The review has involved a series of scoping consultations with key industry, academic and Government representatives, wide-ranging desk-research and a workshop to review findings and build consensus on how best to support the FemTech sector going forward.

1.7 The desk-based element of the review has included a reprise of the Scottish economic and health policy context and a broad review of FemTech sector literature, analyses and wider sources. Analysis of the global FemTech sector is presented, as well as an estimate of the potential economic opportunities for Scotland, the so-called 'size of the prize'. The desk-based work has also included mapping of Scotland's assets, including research excellence. The report presents conclusions and priority areas for action, as well as a roadmap for how best to support the FemTech sector in the future.

[1] https://www.scottish-enterprise.com/learning-zone/success-stories-and-case-studies/components-folder/success-stories-listing/scottish-medtech-companies-pioneering-healthcare-innovation

[2] https://www.globalwellnesssummit.com/2022-global-wellness-trends/the-future-of-wellness-2022-executive-summary/

1.8 The workshop was an important stage of the review, a session which brought together policy-makers, industry, investor support and academia. Emerging findings were presented and sense-checked, and the workshop explored a wide range of issues relevant to the review, from the definition and understanding of FemTech, to identifying and validating key opportunities, to informing prioritisation and the recommended actions.

1.9 The remainder of the report is set out as follows:

- Chapter 2: Policy and Strategic Environment, covering the economic and health policy contexts;
- Chapter 3: The FemTech Market, including an overview of the global FemTech market as well as drivers and opportunities in the FemTech sector;
- Chapter 4: Challenges and Inhibitors, a review of the barriers to developing the FemTech sector in Scotland, including the ability to access funding, markets and commercialisation challenges, as well as specific challenges related to women's data, clinical trials and the 'language' of FemTech;
- Chapter 5: Scotland's Strengths and Assets, a review of the research strengths, support infrastructure assets and existing FemTech company base;
- Chapter 6: The Potential Value of the sector, including a quantified estimate of the economic opportunities and wider social benefits arising from FemTech; and
- Chapter 7: Conclusions, Recommendations and Roadmap.

2 Policy and Strategic Environment

Introduction

2.1 FemTech has a valuable contribution to make to Scotland's economy and can impact economic recovery and future growth. Scotland's National Performance Framework has several indicators closely aligned to the FemTech agenda which include increasing the wellbeing of people living in Scotland and creating sustainable and inclusive growth.[3]

2.2 This section provides an overview of the current policy context for the strategic development of the FemTech sector in Scotland and the potential of FemTech to contribute to the achievement of key policy objectives. It firstly covers the policy context in relation to the economy, enterprise and innovation and then in terms of health and wellbeing.

Box 2.1: Strategic Environment: Strategies relevant to FemTech

- There is a favourable and supportive policy and strategic environment for FemTech in Scotland
- Developing FemTech has the potential to contribute to key economic, health and wellbeing, and social policy agendas and Scotland's National Performance Indicators
- Entrepreneurship is at the heart of the FemTech sector and aligns with both the National Strategy for Economic Transformation and the ambitions and recommendations of the Scottish Technology Ecosystem Review
- Scotland is the only UK nation to have a Women's Health Plan

Economy

- Scottish Enterprise's Strategic Framework 2019-2022, Building Scotland's Future Today
- Highlands and Islands Enterprise Strategy 2019-2022
- National Strategy for Economic Transformation
- Scottish Enterprise Strategic Priorities 2022
- Scottish Enterprise Business Plan 2021
- South of Scotland Enterprise Operating Plan 2021/22
- Scottish Technology Ecosystem Review
- National Performance Framework
- Campbell Report: A roadmap to investment for health innovation life sciences and healthtech in Scotland
- Scotland: a trading nation 2019
- Scottish Government, 2023, Pathways: A new approach for women in entrepreneurship

Health

- Public Health Scotland's (PHS) Strategic Plan 2020-2023: A Scotland Where Everyone Thrives
- PHS Digital Strategy
- Scottish Government's "A Healthier Future: Scotland's Diet and Healthy Weight Delivery Plan", 2018
- Scotland's Mental Health Strategy 2017-2027
- Scottish Government's Women's Health Plan
- Scottish Health Industry Partnership (SHIP) Demand Signalling Plan 2022-23
- Life Sciences in Scotland Industry Leadership Group Digital and Data Subgroup Opportunities and Priorities: Final Report
- Life Sciences Strategy for Scotland 2025 Vision
- Health and social care: data strategy 2023

Economic, Enterprise and Innovation

Overview

2.3 Overall, Scotland offers a broadly supportive policy and strategic environment for the development of a strong and sustainable FemTech sector. *The Campbell Report: a roadmap to*

[3] https://nationalperformance.gov.scot/

investment for health innovation life sciences and innovation, states that "Scotland is the perfect size to do business" and has the relevant infrastructure in place, for example through the creation of a network of Tech Scaler centres, Scottish Enterprise Account Managers, business to business events and excellent transport connectivity.

National Strategy for Economic Transformation

2.4 Scotland's National Strategy for Economic Transformation (NSET) aims to deliver sustainable economic prosperity for Scotland. It has six Programmes for Action spanning entrepreneurship, new market opportunities, productive business and regions, a skilled workforce, fairness and equality and a new culture of delivery.[4] Arguably a thriving FemTech sector in Scotland has the potential to contribute to all six by encouraging and supporting new businesses to grow, innovate and capture new opportunities, develop skills, support high value jobs and rewarding careers, improve health and contribute to tackling health inequalities, and increase the productivity of Scottish businesses.

2.5 Whilst the FemTech sector can contribute to each of NSET's six programmes, the two key areas of alignment are 'Entrepreneurial People and Culture' and 'A Fairer and More Equal Society'. FemTech is a nascent sector with huge growth potential, and as a new sector entrepreneurialism (and supporting this culture of enterprise in the sector) will be key to its success. FemTech's ability to deliver women's health and wellbeing solutions directly helps address NSET's aspirations of creating a more fair and equal society by reducing health inequalities.

2.6 The NSET aims to encourage and enable greater diversity in entrepreneurial activity and business start-ups. The FemTech sector can play a strong and active role here. There is already a higher than average proportion of female founders and entrepreneurs in FemTech than in other parts of the Digital Technology sector[5], and whilst it is extremely important not to conceptualise FemTech as a female-only led sector (far broader cultural and institutional engagement is required) FemTech can nonetheless contribute to diversity in enterprise and start-ups championed by NSET.

Scottish Technology Ecosystem Review

2.7 Another key document is the Scottish Technology Ecosystem review which was commissioned to explore how Scotland's technology sector could contribute to post COVID-19 recovery and to provide a strategic vision for the sector. Its focus is on products and services that use a high degree of software engineering and iterate quickly, adopting internet economy methodologies.

2.8 The review's recommendations are primarily concerned with stimulating and accelerating the maturity of Scotland's "Technology Ecosystem". They are intended to significantly improve the creation rate of profitable, scaled technology businesses and to reduce the time taken for viable individual start-ups to reach scale. The FemTech sector is well aligned to the aspirations of the Scottish Technology Ecosystem Review and the network of Tech Scalers. The global growth of FemTech provides market opportunities to scale-up successful FemTech businesses in Scotland once created.

2.9 The review directly led to the creation of the Scottish Technology Ecosystem fund, launched in October 2021, which has received £1m and had supported 30 projects by November 2022, including a programme provided by Female Founder Squad to encourage women-led start-ups.[6] Separately, £42 million has been invested into the network of six Tech Scalers centres in Dundee, Glasgow, Edinburgh, Stirling, Dumfries, Inverness and Aberdeen. These will be both physical and virtual hubs providing entrepreneurial focused education programmes for tech founders. They will provide opportunities for networking and community building amongst the tech founders, other stakeholders and industry actors across Scotland.

[4] https://www.gov.scot/publications/national-strategy-for-economic-transformation-delivery-board-terms-of-reference/

[5] https://www.mckinsey.com/industries/healthcare/our-insights/the-dawn-of-the-femtech-revolution

[6] https://www.digit.fyi/scottish-tech-ecosystem-review-update/

2.10 In addition, and supporting the recommendations of the STER, the Female Founder Fund, delivered by Investing Women Angels and the Scottish National Investment Bank aims to support the growth of female-founded companies in Scotland.[7] It, along with other investment announcements and opportunities arising from the STER have the potential to stimulate and expand growth in the FemTech sector.

The Campbell Report

2.11 The Campbell Report: a roadmap to investment for health innovation life sciences and healthtech in Scotland examined strategies to attract, and increase levels of private investment into the ecosystem, building on Scotland's first Global Capital Investment Plan, Investing with Purpose[8], and Scotland's Technology Ecosystem Review.

2.12 The report brought together a series of stakeholders from Scotland's life sciences sector and came up with a total of 18 recommendations. A number of the recommendation themes have relevance to the FemTech sector in Scotland such as supporting innovation and commercialisation, and driving further risk taking in investors.[9]

Scotland's Economic Development Agencies

2.13 In its Business Plan, **Scottish Enterprise** states its commitment to supporting high growth entrepreneurs, start-ups and spin-outs, with a particular focus on digital; health and wellbeing; advanced manufacturing; and net zero. Scottish Enterprise recognises the economic (as well as health) opportunities arising from a successful digital health sector, notably through its support and active engagement in in the Health for Wealth Programme.

2.14 Aligning with its Strategic Priorities, Scottish Enterprise has three key ambitions and these are around: international economic potential; innovation performance; and investment opportunities. A sizeable FemTech sector has the potential to contribute to these through innovation, R&D, exporting, inward investment, and new enterprise development and scale-up.

2.15 An important opportunity for new start FemTech Enterprises is Scottish Enterprise's provision of patient capital investment for early stage companies. Patient capital means that SE will embark on a steady and supportive journey with these companies to ensure financial stability.[10]

2.16 Scottish Enterprise has, for many years, supported projects and programmes for digital technologies and through specialist teams, including digital transformation specialists. Its innovation support service offers expert advice to companies to develop an innovation roadmap, alongside multiple one-to-many support offers and financial support such as DSL Business Finance which provides loans to start and grow a business, including social enterprises.[11]

2.17 The **South of Scotland Enterprise (SOSE)** Operating Plan aims to ensure sustainable economic and social development in the South of Scotland and improve the amenity and environment of the region.[12] Central to this, and aligning with the development of the FemTech are the following two ambitions:

- To promote innovation and international competitiveness; and

[7] https://www.digit.fyi/scottish-tech-ecosystem-review-update/

[8] https://www.gov.scot/publications/investing-purpose-scotlands-global-capital-investment-plan/documents/

[9] https://www.gov.scot/publications/campbell-report-roadmap-investment-health-innovation-life-sciences-healthtech-scotland/

[10] Ibid

[11] https://dsl-businessfinance.co.uk/

[12] https://www.southofscotlandenterprise.com/media/1852/sose-operating-plan_2022-23_a4l_final_18-11-22.pdf

- Maintain, enhance and encourage business start-ups and entrepreneurship.

2.18 A critical ambition contained in the **Highlands and Islands Enterprise (HIE)** Operating Plan is its commitment to *'…building an internationally competitive economy founded on entrepreneurship and innovation'* – something that FemTech and its supply chain could be well-positioned to help deliver. Linked to this are actions relating to developing new markets, and building successful, productive and resilient enterprises, again, closely aligning with the opportunities presented by FemTech.[13]

Innovation policy and programme support

2.19 The latest Scottish Government Innovation Strategy sets out to develop a ten-year vision to transform Scotland's innovation ecosystem in order to ensure that Scotland's businesses, people and institutions are ready to meet global economic challenges and opportunities.[14] Innovation is an essential tool to create a resilient economy, to support people's wellbeing and improve health outcomes. The FemTech sector is uniquely positioned to deliver on these ambitions and harness them as Scotland seeks to position itself as a potential world leader in the sector.

2.20 Scotland's Innovation Centre ecosystem is an important component of driving sustainable economic growth. The Innovation Centres Programme aims to enhance innovation and entrepreneurship across Scotland's key economic sectors, create jobs and grow the economy. Innovation Centres have backing from industry and seek to maximise Scotland's research expertise in the relevant sector to work on problems and opportunities identified by industry. The FemTech sector has the capabilities to build on the expertise of the likes of CENSIS and The Data Lab with their focus on data driven innovation and AI solutions. The FemTech sector has the potential to harness the considerable research strengths Scotland has in data science.

2.21 The Innovation Centre Programme, supports seven ICs, including CENSIS and The Data Lab, mentioned above, which both have a digital focus, and also the Digital Health-focused Innovation Centre, DHI. The ICs work to connect industry to academic expertise in Scotland through industry-academia/IC collaborative projects. Certain ICs including The Data Lab also provide skills development support and all provide industry networking support. The DHI aims to support transformational collaboration between universities and industry in the field of digital health There is a focus on the development of the AI ecosystem in Scotland, encapsulated in Scotland's Artificial Intelligence Strategy.[15] AI is extremely relevant to FemTech and the two working together will positively impact on women's health and further catalyse the need for women-specific health data. Some examples of the intersection of AI with FemTech include: using genetic testing to assess and offer personalised data-based health advice for women; identification of patterns and indicators for potential underlying conditions; and using AI to gather and use data so that women are more adequately and accurately represented in data sets.

2.22 There is also UK-wide innovation support infrastructure for businesses, notably through Innovate UK.[16] Innovate UK are the UK based Innovation agency which provides grants and funding towards up and coming businesses. A recent accelerator programme by them was targeted specifically towards the HealthTech and FemTech sectors.[17]

2.23 NHS Scotland's newly announced Accelerated National Innovation Adoption (ANIA) pathway will speed up the process of bringing innovative ideas (such as FemTech products) to Scottish patients.[18] ANIA seeks to lead robust value assessments to help prioritise innovations that will improve patient

[13] https://www.hie.co.uk/media/12635/hie-operating-plan-final-2022.pdf

[14] https://www.gov.scot/policies/supporting-business/innovation/

[15] https://www.scotlandaistrategy.com/

[16] https://www.ukri.org/councils/innovate-uk/

[17] https://apply-for-innovation-funding.service.gov.uk/competition/1360/overview/ccb79931-b26d-4278-b8f6-035cee1b841b

[18] https://www.nhscfsd.co.uk/media/euil5qvw/introducing-the-ania-pathway-booklet-a5-1.pdf

outcomes and experience, improve staff experience and which are both financially and environmentally sustainable.[19]

2.24 As well as the practical support through advice and investment, there are centres of research excellence across Scotland in Universities, some of which are active in start-up and spin-out activity, or research/project work to help businesses innovate. These are expanded upon in Chapter 4. The work of Interface (also highlighted in Chapter 4) is important here in connecting businesses looking for academic input to the relevant Higher or Further Education Institute. Scottish Enterprise's High Growth Spin Out Programme (HGSP) aims to support the creation of new high growth companies that have the potential to have significant economic impact in Scotland. It provides funding to support the commercialisation of advanced technologies developed at Scotland's universities, research institutes and NHS Boards.[20]

Health and wellbeing

National Performance Framework (Health)

2.25 As well as the economic benefits and how it can contribute to economic prosperity in Scotland, FemTech has a role to play in the health and wellbeing of society as a whole. Improving Scotland's health outcomes is a key Scottish Government objective, and the move from crisis intervention to early intervention and conditions management continues. The Scottish Government National Performance Framework indicator categorises health as being an area which falls under "performance worsening". FemTech has a key role to play here, both in terms of helping to tackle health inequalities and in supporting women to maintain good health and wellbeing.[21]

Scotland's Women's Health Plan

2.26 Scotland is the first country in the UK to have a Women's Health Plan, which outlines ambitious improvement and change in areas including menopause, heart health, menstrual health including endometriosis, and sexual health. [22] The Women's Health Plan sets out 66 actions to ensure all women enjoy the best possible healthcare throughout their lives.

2.27 One of the Scottish Government's ambitions is to provide consistent, reliable, and accessible information to empower women to make informed decisions about their health and healthcare.[23] This is underpinned by a desire to address inequalities, prioritise gender equality and intersectionality, provide respectful and inclusive services and take a life course approach to healthcare.

2.28 A key area of priority for the Scottish Women's Health Plan, focuses on menopause.[24] Women experiencing the menopause are the fastest growing demographic in the workforce across the UK. Major challenges exist around stigma, awareness, and support – particularly in the workplace. Nearly half of menopausal women in the UK feel that menopause symptoms had a major impact on their ability to work, and as a result, 1 in 10 quit their job. The Scottish Government's Women's Health Plan reaffirms the vast challenges facing those with the menopause at work. Specific events in relation to the menopause in Scotland are now becoming more commonplace such as the latest Holyrood Insights event in March.[25]

[19] https://www.nes.scot.nhs.uk/nes-current/fast-track-innovation-scheme-will-benefit-patients/

[20] https://www.scottish-enterprise.com/support-for-businesses/business-development-and-advice/scale-your-business

[21] https://nationalperformance.gov.scot/national-outcomes/health

[22] https://www.cso.scot.nhs.uk/innovationfellowships/

[23] https://www.gov.scot/publications/womens-health-plan

[24] https://www.cso.scot.nhs.uk/innovationfellowships/

[25] https://www.holyroodinsight.com/events/menopause-in-the-workplace-conference/?booking_code=email2T-787473

2.29 One of the key actions in the Health Plan is establishing a Women's Health Research Fund to close gaps in scientific and medical knowledge.[26] This fund would provide the opportunity for cutting edge FemTech start-ups to test out products and research. The research and investment landscape is indeed growing in Scotland and after the UK Government's digital health and social care strategy launch, Heriot-Watt University's Medical Device Manufacturing Centre (MDMC) announced a collaboration with InnoScot Health to help bring new ideas and innovations from healthcare professionals to life through research and development.[27]

UK Plan for Digital Health and Social Care

2.30 Building on the wider digital transition and economic transformation, the UK government recently published a policy paper that provides a plan for digital health and social care. The paper recognises several opportunities relevant to FemTech including digitally supported diagnoses, scaling digital health self-help, and investing in health technology R&D.[28] There are strong economic opportunities arising from the direction of travel and Scotland is seeking to be at the vanguard of digital health solutions.

Scotland's Health for Wealth National Programme

2.31 One of the key programmes coming out of the Scottish Enterprise Business Plan 2020/21 is the Health for Wealth (HfW) national programme which forms one of the eight national programmes.[29] Flowing from the Health for Wealth programme is a strategic focus on healthtech as a key sectoral priority.

2.32 The HfW Programme has two overarching aims; build a world leading health and care innovation ecosystem that optimally links the triple helix of NHS, academia and industry and is optimised by a "once for Scotland" approach within the NHS.[30] Fully exploiting the potential of digital technologies and data to transform health and care is the other aim of critical importance to the programme.

2.33 A thriving and sizeable FemTech sector could make a substantial contribution to delivering both strategic aims of the HfW National Programme. It is a key area of opportunity that strongly aligns with Scotland's policy and asset base. If FemTech opportunities are realised, it will help to build Scotland's position as a world leading health and innovation ecosystem, cementing the country's reputation as a leader in healthtech and health innovation potentially for example in the area of women's health data . Given its specific focus, FemTech therefore has the potential to bring new opportunities to Scotland's digital and data community in terms of companies already operating in the FemTech sphere or through other digital and data companies pivoting to FemTech solutions.

2.34 The strategic added value provided by FemTech will, in turn, catalyse inward investment opportunities, attract and retain talent, and support a high value supply chain thus contributing to the SDI Healthtech (digital health technology, data capture and analysis, sensors and AI, to create personalised health solutions) prioritised opportunity area.

2.35 The "triple helix" aim of the HfW Programme is particularly important for the FemTech sector as it looks to forge links into each of the NHS, academia and industry.[31] Opportunities exist for businesses to develop new technologies and business models to support health and wellbeing. These include everything from assistive technologies through to personalised nutrition solutions. European Connected Health Alliance has partnered with Scottish Enterprise in the wake of the Health for Wealth programme

[26] https://www.gov.scot/publications/womens-health-plan/pages/11/

[27] https://www.hw.ac.uk/news/articles/2022/heriot-watt-university-and-innoscot-health.htm

[28] https://www.gov.uk/government/publications/a-plan-for-digital-health-and-social-care/a-plan-for-digital-health-and-social-care

[29] https://www.scottish-enterprise.com/media/4008/se-business_plan_may_2021.pdf

[30] https://www.parliament.scot/chamber-and-committees/committees/current-and-previous-committees/session-6-economy-and-fair-work-committee/correspondence/2021/response-from-scottish-enterprise

[31] https://www.lifesciencesscotland.com/news/scottish-enterprise-joins-eu-partners-to-map-the-future-of-digital-health

to look at forging links between European counterparts and Scotland in order to enhance the global digital health ecosystem.[32]

2.36 The intersection of FemTech with other key HfW projects, in particular its potential to support Precision Medicine and Personalised Nutrition is an important opportunity to leverage additional impact from HfW by linking projects, providing mutual support and achieving synergies.

Wider health strategies

2.37 In addition, there are a variety of strategies and policies which put addressing health inequalities at the heart of the policy agenda, and which provide a favourable environment for the development of FemTech. Public Health Scotland's (PHS) *Strategic Plan 2020-2023: A Scotland Where Everyone Thrives* sets out the vision to make Scotland a place where everyone thrives, where the nation's health is protected and where health inequalities are a thing of the past. It also has a focus on the areas where the biggest difference can be made to the public's health: mental wellbeing, communities and place, and poverty and children.

2.38 The Scottish Health Industry Partnership (SHIP) Demand Signalling Plan provides an updated source of priority areas for health innovation in Scotland. Endorsed by the key decision making leadership groups, it sets out the areas in which SHIP will stimulate innovation in health, social care and life sciences. The Demand Signalling Plan 2022-23 has Women and Children as one of its innovation challenge areas.[33]

2.39 The Scottish Government's "A Healthier Future: Scotland's Diet and Healthy Weight Delivery Plan"[34] provides an in depth analysis on smoking, alcohol, diet, physical activity and obesity. Information on general health, mental health and dental health are also included. The analysis focuses on the steps needed to address health inequalities and also gender equality. Several companies of the FemTech community have gender inclusion at the crux of what they do which creates an obvious parallel.

2.40 Scotland's Mental Health Strategy 2017-2027 commits to working on achieving parity between mental and physical health.[35] The scale of the challenge to achieve parity is considerable: over the 10 years of the Strategy, there are a number of key aims which have been identified as priorities; equal access to the most effective and safest care and treatment, equal efforts to improve the quality of care, allocation of time, effort and resources on a basis commensurate with need, equal status within healthcare education and practice, equally high aspirations for service users and equal status in the measurement of health outcome.

Conclusion

2.41 There is a supportive policy environment within which FemTech in Scotland can grow and develop, both in terms of the economic and innovation support environment, and the health agenda. However currently there is nothing in place – strategically or operationally – specifically aimed at driving the development of FemTech specifically. Whilst the women's health agenda is extensive, the area remains under-invested in and under-developed. Institutions, investors and existing innovation and technology support initiatives remain dominated by men, and unconscious bias remains. Much more may need to be done to facilitate the growth of FemTech and for the sector to break through some of the barriers that exist. This is further explored in the subsequent chapters.

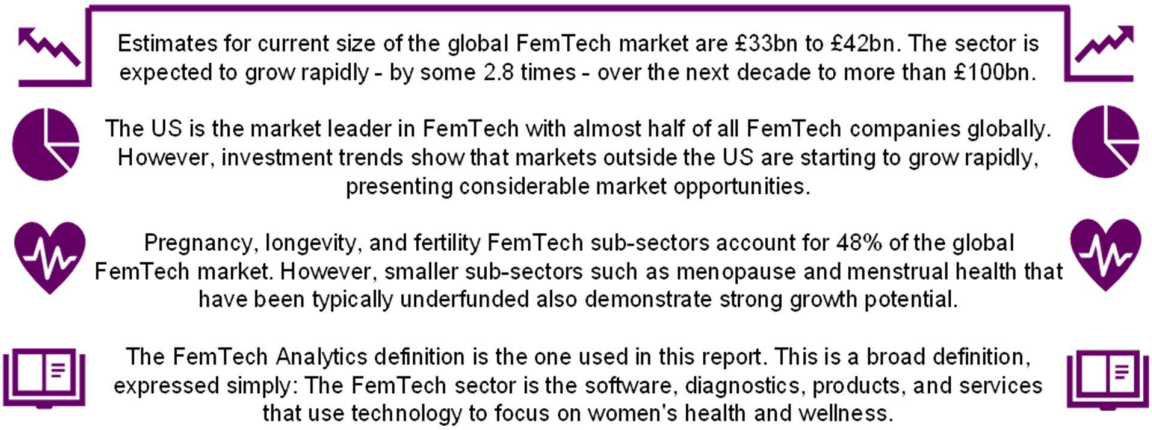
[32] https://www.lifesciencesscotland.com/news/scottish-enterprise-joins-eu-partners-to-map-the-future-of-digital-health

[33] https://www.gov.scot/groups/scottish-health-and-industry-partnership-group/

[34] https://www.gov.scot/publications/healthier-future-scotlands-diet-healthy-weight-delivery-plan/

[35] https://www.gov.scot/publications/mental-health-strategy-2017-2027/

3 The FemTech Market



Introduction

3.1 This section of the report considers the FemTech market from a regional, national and global perspective and discusses a range of definitions used to identify female-health related technologies and companies.

3.2 The FemTech market has potential for growth and aligns with the women's health agenda and the development of the wider healthtech market. FemTech's offerings tend to be moving increasingly towards consumer-centric, convenient and, most importantly, available on demand. Because of these innovations, the FemTech industry is well positioned to disrupt the broader health care marketplace as we currently know it.

3.3 FemTech is a subsector of the wider health technology (healthtech) market. FemTech products typically range from digital health software to technology-enabled service providers and they tend to focus on the specific health needs of women.

3.4 The term was coined in 2016 when Danish CEO, Ida Tin, used the phrase "FemTech" to legitimise her work and gain investment for the development of a women's health application. Today, FemTech is a growing area with hundreds of companies moving into the market to provide a wide-range of female-centred products and applications.[36] Figure 3.1 shows the range of areas comprising FemTech globally. It does not indicate the scale of each.

[36] https://www.sheppardhealthlaw.com/2022/10/articles/digital-health/the-femtech-revolution/#_edn2

Figure 3.1: FemTech Markets

3.5 There are several different definitions of FemTech. The FemTech Analytics definition is the one agreed at the workshop and used in this report and also the basis of the estimated market size in Scotland (see Chapter 6). This is a broad definition, expressed simply:

The FemTech sector is the software, diagnostics, products, and services that use technology to focus on women's health and wellness.[37]

3.6 The FemTech Analytics definition includes longevity, fertility and period, pregnancy and nursing, diagnostics and PharmTech, general healthcare, sexual healthcare and wellbeing, and beauty for FemTech amongst others.[38] This 'working definition' focuses on specific medical and health categories where technologies are used. Implicit in this definition is technology to develop drugs and other treatments for women's health. As such, companies that provide female orientated technologies for these specified medical categories can be classified as FemTech companies.

3.7 Demonstrating the fact that there are different approaches to defining FemTech, McKinsey & Company uses a different working definition, although this again focuses on (technological) solutions to address women's health issues. It states that:

'FemTech provides a wide range of solutions to improve healthcare for women across a number of female-specific conditions, including maternal health, menstrual health, pelvic and sexual health, fertility, menopause, and contraception, as well as a number of general health conditions that affect women disproportionately or differently (such as osteoporosis or cardiovascular disease)'.

3.8 The McKinsey & Company work highlights there are different approaches to defining the FemTech Sector. In its research, McKinsey analysed 763 FemTech companies that were designated as largely tech-enabled, consumer-centric solutions addressing women's health, excluding biopharma and incumbent medical devices.[39] Non-digital consumer products (with materials science innovations), devices (that are patient friendly), and health clinics (that are consumer-centric) that were female focused were included in the research whilst companies older than 20 years and those not focused on women's health (diagnostics, supplements, telemedicine) were excluded.[40] Male and female health solution companies were included in the data but excluded from funding calculations. McKinsey's 'working definition' encompasses more companies than FemTech Analytics' definition because medical categories are non-specific, under this definition, and some male health solutions are also included.

[37] https://www.femtech.health/interactive-charts

[38] https://analytics.dkv.global/FemTech/FemTech-Industry-2021-Report.pdf

[39] https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/the-dawn-of-the-femtech-revolution

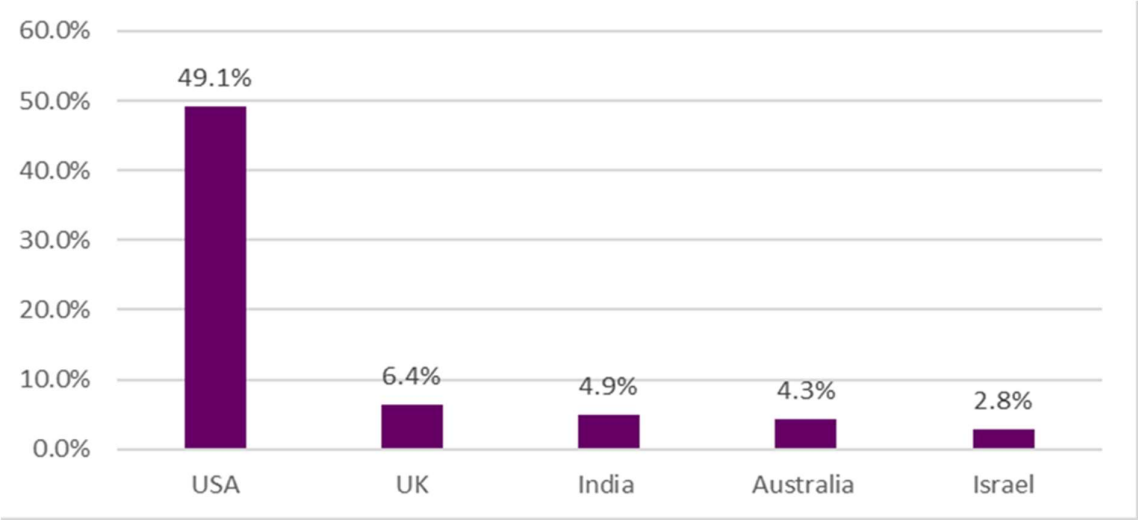
[40] (ibid)

The global market

3.9 There are various estimates of the size of the global FemTech market, via US-based research and analytics companies. These estimates put the global market for FemTech in the region of $40bn[41] (source: FemTech Analytics) to $52bn[42] (Precedence research) (circa £33bn-£42bn). Based on these two sources of research, the FemTech sector is also expected to grow rapidly, by some 280% over the next 10 years, which represents a major opportunity for Scotland if it can access some of this market growth (Economic Opportunity and 'Size of the Prize', Chapter 6 explains this more fully).

3.10 The US has the largest number of FemTech companies globally (nearly 52% of the total as of 2021) and it is the world leader in the industry, with other countries and regions having a much smaller FemTech company base and less developed sectors.[43] Within Europe, the UK FemTech market is the largest – and indeed, the number of companies in the UK FemTech sector is estimated to be the second highest of all countries globally (see Figure 3.2).

Figure 3.2: Countries with the Largest Number of FemTech Companies, 2021



Source: FemTech Analytics

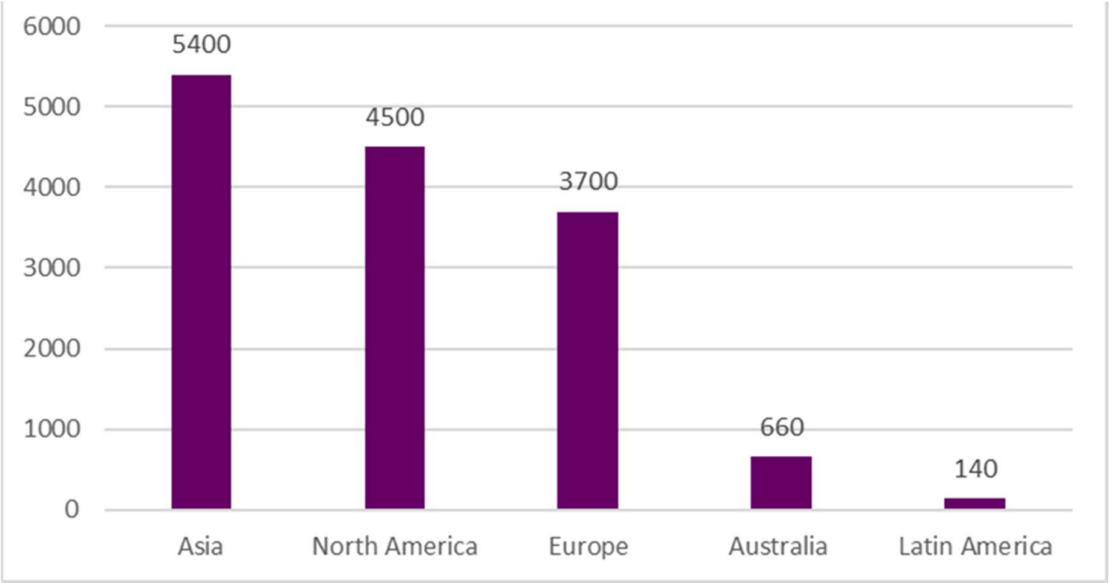
3.11 FemTech markets outside the US are starting to see significant growth and investment. As Figure 3.3 below highlights, it is the Asian market that is seeing the greatest investment, with European markets following closely behind North America. These new and emerging markets for FemTech will help contribute to global growth expected over the next decade.

[41] https://www.femtech.health/interactive-charts

[42] https://www.globenewswire.com/en/news-release/2022/08/19/2501714/0/en/Femtech-Market-Size-to-Worth-Around-USD-103-Billion-by-2030.html

[43] https://analytics.dkv.global/FemTech/FemTech-Industry-2021-Report.pdf

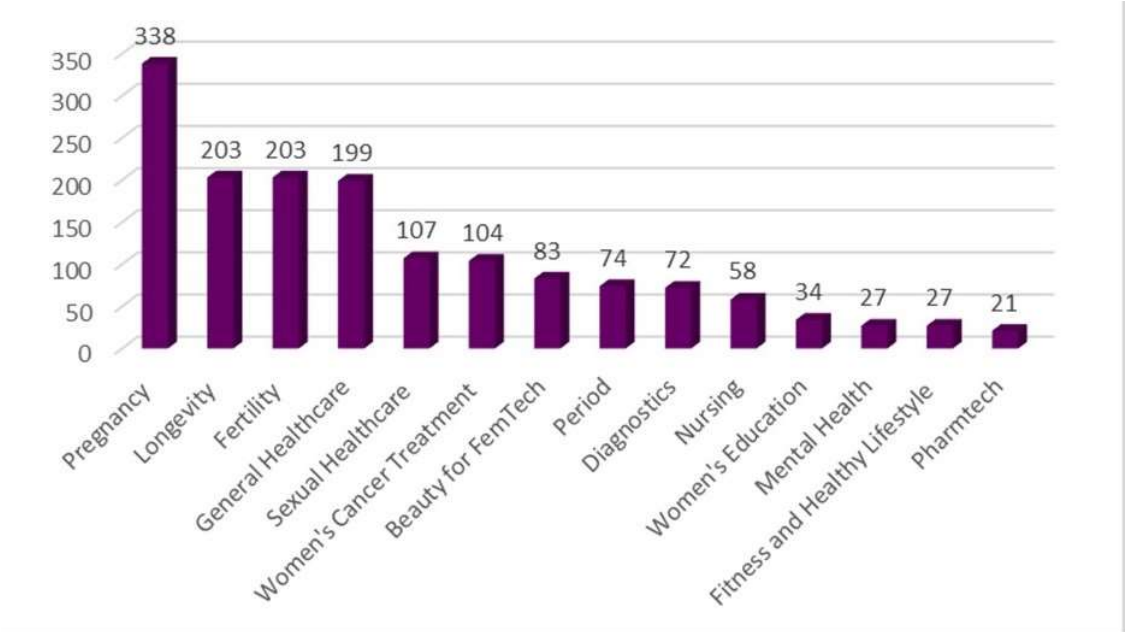
Figure 3.3: FemTech investment by region, 2021



Source: FemTech Analytics

3.12 The adopted FemTech Analytics definition comprises many sub-sectors. The largest sub-sectors are 'pregnancy', 'longevity' and 'fertility', and as such these represent market opportunities for Scottish companies, given their scale. Combined, these three sub-sectors make up 48% of the global FemTech market. However, many of the smaller sub-sectors represent considerable future growth opportunities, given their potential for growth and current small scale. Examples include the 'menstruation' sub-sector, 'mental health' and women's 'fitness and healthy lifestyle', given the growth trends in this sector more widely. The following figure shows the distribution of global companies by FemTech sub-sector.

Figure 3.4: Global Distribution of FemTech Companies by Subsectors 2021



Source: FemTech Analytics

3.13 Within the global market it is also important to note that there is an unequal distribution of both investment and supply across the different subsectors. Hence, whilst 'pregnancy', 'longevity' and 'fertility' account for 48% of the global industry, sub-sectors such as 'menopause' are far smaller (5% of the market share) and chronically underfunded. Further, the health and wider societal context of each country differs and so FemTech markets will also grow within the context of this and the demand of both public and health provider. There are also global and local drivers for growth, which are considered in the following section.

Drivers and opportunities

3.14 There are a range of drivers and opportunities for the FemTech sector in Scotland and this section provides an overview of the trends and drivers of interest to policy makers and market players. They cover key trends such as the increasing adoption of digital healthcare solutions, including the role of data within this, the ongoing need for efficiencies in health and care, and the rise in awareness, of (and interest in) women's health management and care, to date is an under-developed area of market interest.

3.15 Overall, while FemTech is still a nascent sector, all indicators point to the fact the drivers and dynamics underlying FemTech are accelerating, with increasing public and policy awareness, rising new company formations, and growing interest from investors.

Increasing adoption of digital healthcare solutions

3.16 In recent years there has been an increase globally in the development and implementation of digital health, driven by technological innovation and capability and the need for cost efficiency. In Scotland, some of the original piloting and application of digital health was in rural and isolated areas but this has since spread and been accelerated, not least by the COVID-19 pandemic. Digital health includes solutions for telemedicine and teleconsultation, remote monitoring, connected devices, digital health platforms and health apps. It also covers health data analysis and application.

3.17 Digital health can deliver efficiencies in diagnosis, treatment and conditions management. Companies are exploring how to use digital health technology to provide improved screening and diagnoses including (as examples) the use of digital platforms and artificial intelligence to more efficiently and accurately detect cervical cancer cells in women; a cryoablation medical device to freeze and remove abnormal cervical lesions; and digital therapeutics as part of breast cancer treatment plans to promote behaviour modifications to improve patient outcomes.[44]

Peppy Health

Peppy Health is an app that supports women during life transitions such as becoming a parent and the menopause. It connects women to relevant expert practitioners, one-to-one support, group forums, webinars and other content. They can access the content at any time and in a format that suits them. NHS England piloted the app. At the start, 55% of participants reported that they had taken time off work due to menopause symptoms. Having used the app, 90% said their menopause symptoms were more manageable.

https://peppy.health/

3.18 This increase in digital health is set to continue and is both a driver and an opportunity for FemTech. Interestingly, women are 75% more likely to use digital health tools than men.[45] Demonstrating this, FemTech companies are creating wearable wellness technology that integrates with smartphones. These technologies offer data-driven approaches for managing women's healthcare and allow women to take control of their care and health-related data. The wearables market's larger tech giants (such as Apple or Fitbit) have also been entering the market with products aimed towards personal women's health and wellness solutions.

A smart breast pump tells its user when the milk container is full and automatically stops pumping.

Women's health

3.19 There is no doubt that women's health has a higher profile now than at any other time and conversations about it are increasingly in the public domain. Illustrating this, in The Dawn of the FemTech Revolution, McKinsey & Co. reports that between 2008 and 2021, the annual number of FemTech articles published rose from almost zero to over 700; FemTech funding grew from around zero to $2.5 billion; and the number of deals grew from zero to just under 300 per annum. FemTech start-ups were less than 10 per annum in 2008 and just under 50 in 2020, with peaks in 2016 and 2017 where they were close to 100.[46]

3.20 There has also been a growing awareness among women regarding their own health and wellness which has led to a rise in demand for products that meet their needs. There is much greater awareness and recognition of the menopause, its symptoms and how it can impact on every aspect of a woman's life; menstruation and campaigns around period poverty and reproductive health. Prime examples of breakthrough FemTech solutions include advances in egg freezing and embryo screening.

3.21 Analysis of global market trends shows that the three largest areas of women's health opportunities are currently pregnancy, longevity and fertility which combined account for 48% of the total

[44] (ibid)

[45] https://www.taylorwessing.com/en/interface/2021/femtech-and-issues-around-digital-health-products/dl-femtech-funding-challenges-and-opportunities

[46] https://www.mckinsey.com/industries/healthcare/our-insights/the-dawn-of-the-femtech-revolution#/

market. The largest of these is pregnancy which encompasses pregnancy planning, post-partum care, and motherhood and baby care. Given pregnancy, longevity and fertility are the three largest FemTech sub-sectors globally, there are market opportunities for Scottish companies in all three of these areas, although other niche sub-sector opportunities also exist across the FemTech sector.

3.22 The evidence gathered during the study both at the workshop and through stakeholder engagement showed that there is currently no appetite in Scotland to be prescriptive about which parts of FemTech Scotland should focus on, given there are opportunities right across the sector and its stage of development here. There is consensus that the opportunities in FemTech are varied, valuable and still developing, with a strong sense that it is too early to narrow the market opportunities within FemTech with a need to look out for emerging niche opportunities.

3.23 The following quote from a workshop participant illustrates this:

'[currently] we need to stay wide and shallow, rather than narrow and deep'.

3.24 And another participant noted that:

'a narrow definition will underplay the extent of FemTech'.

3.25 However, this should be closely monitored, and the assets and capabilities tracked so that, when the time is right, a more focused approach can be taken if this is considered appropriate. Whilst the definition may, at this stage, remain quite broad for the reasons outlined, we already know Scotland has assets to harness, for example AI, and data expertise, supported by The Datalab Innovation Centre.

3.26 Areas within FemTech that are anticipated to develop significantly in the short-medium term include PharmaTech (development of drugs suitable for females), FemTech diagnostics (early detection and prevention of female diseases), and FemTech digital therapeutics (software solutions to prevent treat or manage disease or conditions). Scotland has the potential to be active in all these areas given its data science/AI and health research base (see Chapter 5). There are also interesting pockets of opportunity and activity for FemTech companies to partner with established firms not in health or life sciences. For example, the cosmetics company L'Oréal entered a partnership with the period-tracking app Clue. The aim is to better understand and advance knowledge on the relationship between skin health and the menstrual cycle. This is part of what is described as Beauty for FemTech which involves applying advanced technologies and AI to skin and hair care (including female hair loss), and other beauty devices to meet the needs of women.

3.27 It has also been noted that some activities and opportunities that are not generally within the definition of FemTech utilised within this report nonetheless relate specifically to women's health. For example, companies and research organisations are turning their attention to examining diseases that primarily affect women (such as endometrial, skin cancers, as well cervical, breast and ovarian cancers) and conditions which affect women more severely or differently (including recent research into how cardiac arrests work differently in women). These are broader drivers of opportunities in women's health beyond the narrow definition of FemTech.

Precision medicine

3.28 Precision medicine and pharmacological innovation is recognised as having huge potential for developing new treatments for disease, conditions and health (with recent research for Scottish Enterprise identifying the market opportunities in Personalised Nutrition, for example). This is part of the global drive for increased efficacy, cost effectiveness and safety in healthcare and treatments, but also the desire to offer personalised and precision healthcare relevant to individuals' needs. Given the pressures on healthcare systems in the UK and other parts of the world, efficacy and cost effectiveness are key public policy (and hence market) drivers in FemTech.

3.29 Precision medicine is a particular strength in Scotland not least through the Precision Medicine Scotland Innovation Centre. The development and application of precision medicine increases the potential to better diagnose and treat conditions that are specific to women, occur more frequently in women, or present with different symptoms and outcomes for women. There are, therefore, opportunities at this intersection of FemTech and Precision Medicine, demonstrating how FemTech can support projects within the HfW National Programme. For example, the Precision Medicine Scotland Innovation Centre (PMS-IC) currently has a collaborative Ovarian Cancer project which aims to:

'improve and develop standardised approaches to clinical data [ovarian cancer] across Scotland, so that patient outcomes can be robustly monitored'.

3.30 The challenge for Scotland is to translate this type of project into commercial product and services. This is not unique to FemTech but is a barrier that needs to be overcome (see Chapter 4) to commercialise research outputs.

Data

3.31 Research, development and monitoring of diagnostics, treatments and care delivery have traditionally been skewed by male-dominated data, particularly in biological and clinical studies. This has meant that products and treatments have been built on how males prevent diseases and conditions and respond to treatment, including how they may experience side effects. As reported in Forbes Magazine:

*'Women have been highly under-represented in clinical trials for chronic conditions. For example, only **35% of the participants in clinical trials around cardiovascular disorders are women; only** 25% of the trials report gender-specific results.*[47]

Latch Aid

A breastfeeding and early parenthood support application that uses pioneering 3D and AI technology to help parents and parents-to-be learn parent and infant feeding skills. The NHS trial studied data between October 2021 and March 2022. In that period 77% of participants reported that the app helped to establish breastfeeding. Users had a two times higher exclusive breastfeeding rate than the average.

https://anya.health/

3.32 There is a strong sense that big pharma companies are very interested in women's health and solutions but currently lack the data they require as it has a gender-bias. These large companies, as well as new starts and enterprises of all sizes need access to relevant data about and from women. There has been more activity in gathering this data in recent times, for example how to integrate primary and secondary healthcare data, curating specific data sets, and building on the quality and detail of data. This activity and capability may, in future, support the need for gender specific data sets and granularity, but, currently, it remains relatively limited. The need for data therefore represents both a driver for research and data collection, and an opportunity for data gathering, analysis and supply to companies and researchers who require it.

[47] https://www.forbes.com/sites/reenitadas/2019/03/07/femtech-fights-gender-equality-how-do-social-determinants-of-health-impact-women/?sh=3de149e6293f

FemTech can contribute to and benefit from data collected from wearables, apps (e.g. menstrual trackers) and crowd-sourced data. AI and machine learning can be applied to this data to offer personalised data-based health advice to women. It can also be used to identify patterns and indicators for potential underlying conditions.[48]

[48] https://www.sidley.com/en/insights/publications/2022/07/artificial-intelligence-considerations-for-femtech-and-beyond

4 Challenges and Inhibitors

→ There is no shared understanding of what FemTech means. Coupled with limited awareness of the opportunities and benefits amongst investors, clinicians, patients, researchers, and businesses.

→ Selling new products into the NHS can be difficult, particularly for new entrants. Pathways are difficult to find and navigate.

→ Researchers and industry face challenges in accessing efficacy-testing and clinical trials. These are required to build a credible and clinically proven evidence base.

→ There is a need to more effectively commercialise the outputs of research to capitalise on innovations in FemTech.

→ The FemTech private funding landscape is under-developed, although more players and investors are entering the space.

→ There are challenges in accessing funding at every stage of innovation, testing, development, and commercialisation.

Introduction

4.1 This chapter of the report considers the findings of the research in terms of the challenges and opportunities that may inhibit Scotland from realising the potential of FemTech. The findings are based on the desk research, literature review, consultations and the workshop with stakeholders, including industry representatives.

Challenges

Position and language

4.2 If Scotland is to capture the value of FemTech, all relevant audiences must have a good understanding of what the sector means, the potential benefits, and the opportunities for innovation, business growth and equalities in health and wellbeing. The audiences include clinicians, investors, research organisations, industry, education, patients and wider society. This will stimulate interest and buy in to the development of FemTech, from the very earliest stage of science, research and innovation to testing, clinical trials, attracting investment, and adoption of FemTech.

4.3 There is a strong sense that existing businesses operating in related activities often do not understand the size of the FemTech opportunity or the specific areas that FemTech covers. A clearer awareness and understanding would encourage existing healthtech and related businesses to pivot into FemTech from an established start. Some lifesciences businesses are involved in FemTech opportunities but don't consider themselves to be FemTech (the term may not be familiar to them), and do not show up in data about FemTech. These companies and their involvement in the FemTech market are effectively 'hidden'.

4.4 The research identified that clinicians very often do not have a good level of awareness of FemTech products which can act as a barrier to the adoption of new technologies in clinical settings.

4.5 Overarching the lack of awareness and understanding of the sector, the benefits it can bring to healthcare, and the economic opportunities, is the question of terminology. The term FemTech is not widely used and more generally, there is currently no clear and shared understanding amongst the range of audiences of what FemTech might encompass. This is illustrated by the following quote:

'For a sector that attracted around $2.4 billion of venture capital money in 2021, "FemTech" continues to be plagued by misconceptions.'[49]

4.6 The Scottish Health Industry Partnership team (SHIP) does not use the term FemTech even though innovation in women's health is a specific SHIP challenge area. It is also reportedly not a term that is used or widely recognised by clinicians, and it is not a common term in health innovation. This lack of awareness and understanding is very likely to act as a barrier to engagement with FemTech for organisations and individuals engaging for example in research, innovation, enterprise and application in healthcare. Added to this, using FemTech as a specific term within healthtech may not communicate its range and the opportunities which could be detrimental to attracting investment and support.

4.7 Whilst the term FemTech may not currently be widely used and recognised in Scotland, there is no suggestion that it should be changed or dropped. Rather, it signals a need for awareness raising and communication across all audiences and levels of the term, what it comprises and the benefits and opportunities for investors, innovators, enterprises, clinicians and patients.

Access to market

4.8 It is widely reported that selling into the NHS in Scotland, and the UK more widely, can be challenging. Businesses (not just FemTech) can find it hard to navigate the processes and find the right route in. Recognising this, supporting businesses to sell into the NHS is part of the role of the Scottish Health and Industry Partnership.[50] However, whilst the NHS is clearly an important market for Scottish FemTech companies, further commercial opportunities exist in the wider global market place.

4.9 Difficulties in accessing the market are inextricably linked to the perception, profile, and terminology as set out above. To access the NHS market, and wider markets, there must be a recognised need that creates a demand for FemTech products. This demand will be created by clinicians, patients, and healthcare organisations and so they must have a very good understanding of what FemTech is, and the benefits.

4.10 Operating in a global market, FemTech enterprises must be cognisant of the fact that the health, economic and societal context of countries differ and so the make-up and size of individual FemTech markets will grow differently and that access to these markets, and communication, will need to be tailored.

4.11 There are reported market failures in converting the outcomes of FemTech research and innovation into commercial opportunities and taking these to the market. This is a challenge more broadly but undoubtedly is a constraint that inhibits Scotland's ability to accrue the full potential value of FemTech. This is discussed more fully under the heading of Commercialisation and Enterprise Development.

Data and efficacy testing

4.12 Developing and taking a new drug or healthcare product to market comprises four key stages:

- Discovery and development;
- Preclinical research and testing
- Clinical research; and
- Regulatory approval

[49] https://www.morningstar.co.uk/uk/news/226695/tech-week-do-we-really-need-femtech.aspx

[50] https://www.gov.scot/groups/scottish-health-and-industry-partnership-group/

4.13 Alongside this, a product's efficacy must be proven in order to create a demand for it from healthcare providers, clinicians and patients. In essence, FemTech solutions must be clinically proven through a strong body of robust and credible evidence based on quality and detailed data.

4.14 There was agreement amongst the stakeholders participating in the workshop undertaken as part of this project that FemTech companies, along with others involved in related fields, tend not to consider the need for clinically-driven testing at an early stage or in sufficient detail. Going forward, there is a need for companies involved in FemTech to be encouraged and supported to factor in clinical trials at the design, development and scale-up stages. This will have the added effect of driving the demand for access to health data and clinical test environments.

4.15 Accessing health data to use in testing can be a challenge as there is resistance to sharing what may be sensitive information and concerns about data security breaches. Traditionally, health data has involved using data from healthy men, and clinical studies have also focused on men as 'subjects', for example in cardiovascular disease, muscular sclerosis, and strokes. There has been a degree of rebalance in recent years but much of the data available is still skewed towards men.

4.16 There is a challenge in Scotland and across the UK in accessing clinical settings in which to trial new products and build evidence of efficacy. To do this requires resources and importantly, the buy in of clinicians and patients. This has been exacerbated by the current context of workforce issues such as fatigue and staff shortages, along with the pressures of post-pandemic recovery. The SHIP and the three NHS Innovation Hubs provide NHS testbed opportunities which is very valuable, however, with limited resources, the opportunities that they can unlock for companies, including FemTech companies, is far outstripped by demand and need.

4.17 This lack of access to what is required at each stage of innovation, development and testing is a key challenge that could inhibit the development of Scotland's FemTech sector.

Commercialisation and enterprise development

4.18 There are challenges for the FemTech sector to undertake the necessary commercialisation of R&D in order to bring products and services to market, although this is a challenge not unique to the FemTech sector. This is a wider innovation ecosystem challenge, and a number of interventions exist that attempt to address the issues of translating R&D into product. The Innovation Centres, cited in Chapter 2, are an example of intervention in this space, including DHI.

4.19 However, the capacity to nurture and grow businesses in Scotland, and in FemTech in particular, remains under-developed. A number of Innovation Centres, for example, say they would welcome more lab space on-site at Universities, and industry is always seeking ways to scale-up and undertake more manufacturing in Scotland (due to a lack of capacity in Scotland and cost advantages elsewhere).

4.20 Some of the lack of production capacity relates to the investor market and the willingness of investors to take risks at the post research stages, including manufacturing trials at scale before full commercial roll out. Again, this challenge is not unique to the FemTech sector. The new Scottish National Investment Bank Fund for female-founders[51] is welcomed, but more is likely to be needed for the full potential of FemTech to be realised (see also Access to Finance below).

4.21 Scotland has major strengths in its research base (see Chapter 5), and there is a continuing need to extract this research from Universities. FemTech sector start-ups and growth businesses need to be able to extract this research and/or to translate this research into start-up activity. There is evidence that this is starting to happen, for example through more Stage 2 drug trials in FemTech sub-sectors of menopause and endometriosis. There remains a lack of understanding of the term

[51] https://www.thebank.scot/media-centre/female-founder-fund-on-horizon-as-investing-women-restructures-for-growth

"FemTech" amongst the academic community[52], and it is likely that this does not help the translation of research into commercial product.

4.22 Specific support for translational opportunities is available through the NHS Scotland Innovation Fellowship scheme, although this is small in scale and only available to those in the NHS. This provides a unique opportunity for FemTech entrepreneurs to harness the innovation opportunities in the NHS. The aim of the Innovation Fellowship Scheme is to strengthen the innovation culture to solve real problems in the NHS and social care, improving the quality, efficiency and sustainability of health and care delivery and supporting NHS Scotland's Re-mobilise, Recover, Re-design Framework.[53]

4.23 Better commercialisation of FemTech solutions being developed can be supported by clinical evidence which demonstrates the efficacy of the solutions[54], as identified in previous sections.

Access to funding

4.24 The ability of FemTech companies to access funding can be challenging, especially early-stage and start-up companies. During the research, it was highlighted that women's health is historically underfunded in terms of research and enterprise development. Part of the issue may be a level of "unconscious bias" that exists in the male-dominated investment community, who are yet to fully understand the FemTech products and services offerings.

4.25 The FemTech private sector funding landscape is under-developed, although there are more players and investors entering the space, for example Goddess Gaia ventures who are "building a £100m venture fund that will invest in tech, products and solutions that cater towards the service of women's healthcare needs in Health, Wellness and FemTech".[55] Companies such as this are recognising the potential of FemTech and women's health.

4.26 There is however recognition that there needs to be a better connection between FemTech businesses seeking to scale-up and grow and the Scottish investment community, and also a better connection with wider UK and global investors, particularly given global market opportunities. This represents a challenge for FemTech companies in looking beyond local investors to connect to larger market opportunities, with businesses needing support to help make these connections.

4.27 Despite recent progress, there continues to be a need to demonstrate to the private sector investment community that FemTech is an investable proposition. Here there is a role for the public sector and public policy and programmes. Public policy commitments can help show the private sector that there are increased prospects of investment returns.

4.28 McKinsey research has identified that more than 70% of companies in the FemTech market had at least one female founder, far higher than the norm for new companies.[56] Whilst this is positive in terms of female representation in the sector, it may show that there remains unconscious bias in the male-dominated investment sector who may lack the understanding of FemTech products and services, and the wider women's health agenda.[57]

4.29 More widely, there are additional challenges and barriers in relation to access to funding, that are not confined to the FemTech sector. Through the research it was highlighted anecdotally that the UK Government spends a greater proportion of the NHS budget on Research, Development and

[52] Interface consultees, FemTech workshop.

[53] https://www.woshealthinnovation.scot/latest-updates/second-round-of-nhs-scotland-innovation-fellowship-scheme-opens/

[54] https://www.gendereconomy.org/the-rise-of-femtech/

[55] https://www.ggventures.co.uk/

[56] https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/the-dawn-of-the-femtech-revolution

[57] https://www.gov.scot/publications/scotlands-national-strategy-economic-transformation-nset-programme-2-new-market-opportunities-equality-impact-assessment-record-results/

Innovation (RDI) than the less than 1% that the Scottish Government allocates.[58] More funding for RDI in health in Scotland, and more funding support for Universities in Scotland to carry our research on women's health and FemTech would help support the growth of the sector.

Achieving business and sector growth

4.30 There are further market failure challenges in terms of the business's knowledge and ability to grow, once a FemTech sector business has started. In general, Scotland lacks the critical mass of growth management expertise needed for the FemTech sector to develop strongly. Further, labour costs such as recruiting, training and retaining the best talent can be prohibitive for early-stage companies (an issue the affects sectors beyond FemTech) and Scotland's domestic market still remains small compared with larger and emerging health and care systems internationally.[59]

4.31 With a small FemTech sector in Scotland, these growth management concerns often arise around not only the ability to compete in wider European and Global markets, but also how to create a sustainable domestic market that is not over-reliant on one customer (the NHS) which, as mentioned earlier, can be difficult to access.

4.32 This is a key reason behind the recommendation by The Campbell report[60] for a national health innovation life science cluster. As a part of the wider HealthTech industry, FemTech has been recognised as potentially benefiting from a coming together of key stakeholders, to create a collaborative national cluster in Scotland. This collaborative partnership would benefit from the 'triple helix' of industry, academia and health and care coming together. The review here supports such increased, facilitated collaborated activity.

Conclusion

4.33 This chapter has identified a range of challenges and market failures for the FemTech sector, many of which are typical of an emerging or nascent sector, but are also more broadly applicable across the Healthtech sector generally. There are challenges translating the R&D strengths in Scotland into commercial products and services, and challenges for start-up businesses to attract investment and to scale-up and grow. There are challenges associated with recruiting staff and achieving business growth ambitions.

4.34 The challenges for the FemTech sector are, however, exacerbated by difficulties for FemTech businesses in articulating the market opportunity presented by the FemTech sector, and in demonstrating their products and services in what is institutionally and culturally a male-dominated investment landscape. Whilst there are a growing number of female founders, for the sector to grow and reach its full potential, public sector and private sector funders and investors need to understand the opportunities and market potential for FemTech (and women's health more widely). This is not an inconsiderable challenge, although as the subsequent chapters show, Scotland has strengths on which to build and the prize, if it can be attained, is very large indeed.

[58] https://www.kingsfund.org.uk/projects/nhs-in-a-nutshell/nhs-budget

[59] https://www.gov.scot/binaries/content/documents/govscot/publications/independent-report/2021/12/campbell-report-roadmap-investment-health-innovation-life-sciences-healthtech-scotland2/documents/campbell-report-roadmap-investment-health-innovation-life-sciences-healthtech-scotland/campbell-report-roadmap-investment-health-innovation-life-sciences-healthtech-scotland/govscot%3Adocument/campbell-report-roadmap-investment-health-innovation-life-sciences-healthtech-scotland.pdf

[60] https://www.gov.scot/publications/campbell-report-roadmap-investment-health-innovation-life-sciences-healthtech-scotland/

5 Scotland's Strengths and Assets

Introduction

5.1 Scotland has a range of assets that can support the FemTech sector. These assets extend across a number of academic institutions and key companies undertaking R&D and product, process and service development. The assets include innovation support mechanisms, including testing for healthcare solutions, building on research strengths allied to the Health Service. This chapter considers these and, as with all mapping exercises, it is difficult to be exhaustive.

5.2 Whilst not exhaustive, the following gives an indication of the breadth and depth of Scotland's assets. It draws on some of the mapping work pulled together by Interface, as part of this project, as well as a variety of other sources. Interface work to connect businesses to academic expertise in Scotland and the organisation had carried out some analysis of FemTech company interaction with academia (and potential interaction) and initial mapping of FemTech relevant University research activity.

Data, AI and health assets

5.3 Scotland has substantial strengths in data and artificial intelligence and a large part of this operates in the space of human health. The Data Lab (see below) is an example of this, with TDL leading on multi-partner projects such as the Cancer Innovation Challenge alongside other Innovation Centres. A lot of the data and health research and innovation activity can be pivoted to incorporate FemTech – and some activity is directly FemTech related. The following list is illustrative, rather than exhaustive.

Centre/ Research Institution/ HEI	Strength/ asset	Potential FemTech opportunities
University of Edinburgh/ Bayes Centre (including The Usher Institute)	Major asset in data and AI. The Usher Institute a University Data Driven Innovation Hub hosting the Health and Social Care Data Driven Innovation Programme (See also The Data Lab)	• Strong fit in the space of data/AI and healthcare • Research capable of commercialisation • May require some pivot to be more FemTech sector specific
University of Dundee – Health Informatics Centre (HIC)	Provides services in secure data management, governance, data engineering, research infrastructure, software and business support. Acts as a 'Safe Haven' for Scottish Government and NHS Health Boards for secure, research managed data acces.	• Strong fit with the FemTech sector; directly brings together expertise in data and health. • May require some pivot to be more FemTech sector specific • May require support for commercialisation to exploit sector opportunities.

Centre/ Research Institution/ HEI	Strength/ asset	Potential FemTech opportunities
Glasgow University - Artificial Intelligence Research Laboratory	Expertise in public health nutrition, clinical and community dietetics, health promotion and sports nutrition.	• Likely to be earlier stage/ more basic research (TRL1-3) • May be possible for spin outs/ scale up with more commercialisation support • Strong fit, but small scale
Robert Gordon University School of Computing	Works with the public and private healthcare sector; projects related to machine learning and data science, for services and experiences for the final users. Capability in developing and providing tools, algorithms and models to aid users on their dietary, behavioural and personal decisions	• Operating closer to commercialisation space • May not be directly operating in FemTech but has potential to pivot/ use data for FemTech products/ services/ female end users • Likely to be relatively small scale – will need support for scale up/ spin out type activities • Strong fit, but small scale
St Andrew's Computer Science Department	Uses combined techniques for optimal solutions to the treatment requirements of a diverse range of patients. Seeks to optimise drug efficacy, cost, and other factors. It could be explored further to nutrition needs (e.g., athletes).	• May not be directly operating in FemTech but has potential to pivot/ use data for FemTech products/ services/ female end users. • Likely to be relatively small scale – will need support for scale up/ spin out type activities • Good fit, but small scale
University of Stirling - Division of Computing Science & Mathematics (CSM)	Expertise in machine learning and decision support. Can bring in expertise from Stirling's Faculty of Health Sciences and Sport if it is helpful.	• May not be directly operating in FemTech but has potential to pivot/ use data for FemTech products/ services/ female end users.

Centre/ Research Institution/ HEI	Strength/ asset	Potential FemTech opportunities
		• Likely to be relatively small scale – will need support for scale up/ spin out type activities • Good fit, but small scale
University of Strathclyde -	Software engineering research, working on the significant problems associated with designing, testing, and evolving large software systems. Application of machine learning in a variety of industrial projects such as forecasting customer buyer behaviour, predicting building energy performance, and modelling interventions to combat sedentary behaviour.	• May not be directly operating in FemTech but has potential to pivot/ use data for FemTech products/ services/ female end users • May have greater links to industry but will still require further support for scale up/ spin out type activities • Good fit, but small scale
DHI Digital Health Innovation Centre -	Can track, manage and improve health and care, leading to greater independence and improved health outcomes. Example Projects- digital decision support. DHI has formed a consortium with Skills at Work Ltd, Technip and NHS Scotland Healthy Working Lives to develop a learning resource and mobile app, Well@Work, to enable individuals to proactively manage and improve their personal health and wellbeing.	• DHI work strong on innovation and good use of data • More typically focused on solutions within NHS and other public sector which may limit commercialisation opportunities • Innovation in digital health and care • Typically have a healthy ageing focus • No direct commercialisation activity • Good fit, but limited direct FemTech work at present
The Data Lab Innovation Centre (hosted by University of Edinburgh) -	Oversight of the AI Strategy for Scotland. Applies data science and AI skills to real life business problems.	• Big data innovation • Estimated £17bn revenue opportunity in Scotland

Centre/ Research Institution/ HEI	Strength/ asset	Potential FemTech opportunities
	Strong data and human health cross-over. Includes major strategic projects and industry collaborative and 1-1 projects.	alone for new data solutions. • Major enabler of personalised health and potential new opportunities • Strong fit, commercialisation focused, good links to investors
Edinburgh Bio-quarter[61] -	Major asset for Scotland now in second phase. Next innovations in healthcare practice for new treatments and cures – strong commercialisation.	• Major enabler of personalised health and potential new opportunities • Strong fit, commercialisation focused, good links to investors
The Precision Medicine Scotland Innovation Centre (PMS-IC)[62] -	Therapies and diagnostic tools for the management of chronic diseases; strong links to health and wellness and preventative public health. Precision medicines and access to NHS. Incorporates computing centre – links to data/AI.	• Typically working with public sector • Also needs pivot to specifically look at FemTech • Moderate fit, good links to data/AI but would need pivot to FemTech
Centre of Excellence for Sensor and Imaging Systems (CENSIS)[63] -	The Centre of Excellence for Sensor and Imaging Systems (SIS) and Internet of Things (IoT) technologies. Focus on developing products and services for global markets. Can Carry out prototyping and proof of concept. Have carried out projects in next generation fitness trackers.	• Strong links into wellness technologies • Strong fit, commercialisation focused, potentially good links to investors

[61] https://edinburghbioquarter.com/about/our-story/

[62] https://censis.org.uk/

[63] https://censis.org.uk/

Manufacturing, wearable devices and sensors

5.4 Scotland has specific expertise in wearable devices and sensor-style products and services. Whilst this is not directly FemTech in many instances, there would be an easy transition from general markets to FemTech focused market opportunities. The following list is illustrative, rather than exhaustive.

Centre/ Research Institution/ HEI	Strength/ asset	Potential FemTech opportunities
Centre of Excellence for Sensor and Imaging Systems (CENSIS)[64] -	The Centre of Excellence for Sensor and Imaging Systems (SIS) and Internet of Things (IoT) technologies. Focus on developing products and services for global markets. Can Carry out prototyping and proof of concept. Have carried out projects in next generation fitness trackers.	• Strong links into wellness technologies • Strong fit, commercialisation focused, potentially good links to investors
Heriot Watt University - Scotland's Medical Device Manufacturing Centre – MDMC - based in the School of Engineering and Physical Sciences at Heriot-Watt's Edinburgh campus -	Close collaboration between engineers, clinicians and business development experts from four universities across Scotland: Heriot-Watt, Edinburgh, Glasgow, and Robert Gordon, track record in manufacturing, testing and clinical translation of medical devices. Partnership planned with medical device design companies, clinicians, and patient groups, to ensure that medical device manufacture is both practical and commercially viable.	• Seeks to be driven by unmet clinical and industrial needs • Strong links into wellness technologies • Good fit, although may need pivot for FemTech specifically. May also need further commercialisation focus and support e.g., links to investors, spin out
University of Strathclyde Computer and Information Sciences in the Digital Health and Wellbeing Group -	Research focuses on usability of mobile systems including health & wellbeing applications, sensor driven interaction, evaluation of mobiles, visualisation of data in	• Good fit, although may need pivot for FemTech specifically. May also need further commercialisation focus and support e.g.,

[64] (ibid)

Centre/ Research Institution/ HEI	Strength/ asset	Potential FemTech opportunities
	usable ways and mobile text entry.	links to investors, spin out. Likely to be small scale
The Data Lab Innovation Centre -	See above	See above
National Manufacturing Institute Scotland's (NMIS's) Lightweight Manufacturing Centre (also an asset with wide ranging areas of potential influence beyond public health etc.) -	An asset with wide ranging areas of potential influence beyond public health etc. Allied world-class expertise and technologies that can be highly relevant to FemTech.	• Moderate fit, would need specific focus on FemTech • Good commercialisation links
Medicine Manufacturing Innovation Centre (MMIS) -	See Table below	See Table below

Health and health-related assets

5.5 Scotland has major research strengths in relation to the human health agenda, beyond the medical technologies identified in the wearable devices and sensors section above. The Covid-19 pandemic provided a considerable impetus into the preventative health agenda both in policy terms and in terms of public and private investment to develop solutions. Scotland has the potential to capitalise on its health research expertise to benefit the FemTech sector. Again, the following list is illustrative, rather than exhaustive.

Centre/ Research Institution/ HEI	Strength/ asset	Potential FemTech opportunities
Health Innovation Hubs[65] (via the Scottish Health Industry Partnership – SHIP, and largely funded through the Scottish Government's Chief Scientist's Office, with some additional funding -	Three regional innovation hubs within Scotland. Lead on innovation in the NHS. Companies can approach the hubs to access testbeds which provide a pathway to data, to patients and to patient data - as well as information governance which can be a considerable barrier for companies accessing the NHS.	• Very strong and explicit focus on health innovation, although FemTech not a term used by the innovation hubs • Excellent fit, although pathways still being developed and funding available is relatively small scale

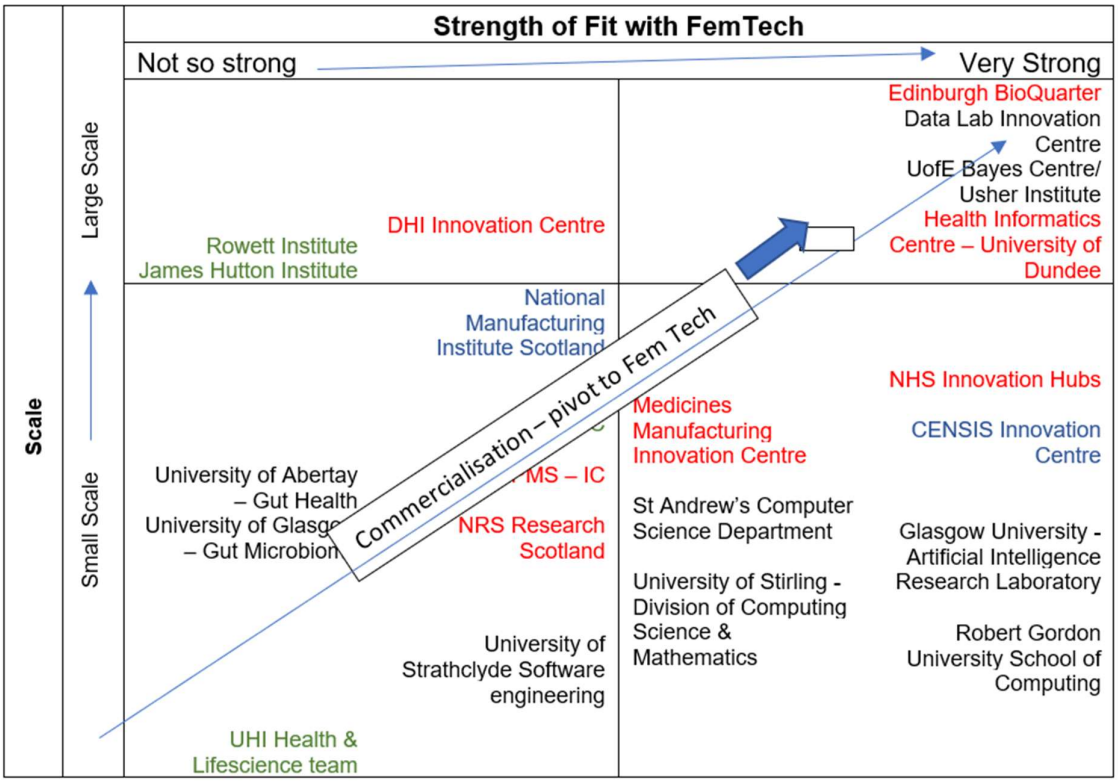
[65] https://www.woshealthinnovation.scot/

Centre/ Research Institution/ HEI	Strength/ asset	Potential FemTech opportunities
		• Strong focus on solutions to priority health issues
NHS Research Scotland (NRS) -	Has an explicit mission to "support and promote excellence in clinical research in NHS Scotland, that will make a positive difference to patients health within Scotland, the UK and internationally". An overarching aim of NRS is to ensure NHS Scotland provides the best environment to support clinical research (e.g. accelerate R&D permissions).	• Very strong and explicit focus on the health agenda, although patient centred approach. Not specifically FemTech focus • Good fit, but would need agency/ body translating clinical trial evidence into new products or processes • Focused at lower end of the TRL (1-3) – would need further steps to commercialise R&D
Medicines Manufacturing Innovation Centre (MMIS) -	It is hoped that Pharma 4.0 will "solve major pharmaceutical industry challenges and accelerate access to affordable medicines". Develops the next-generation pharmaceutical manufacturing processes for the medicines supply chain.	• Emphasis on novel medicines manufacture – no specific focus on FemTech • Moderate fit, however, there may be opportunities to develop medicines that are directly relevant to the FemTech sector • New medicines manufacture could directly lead to the creation of new products
Edinburgh BioQuarter -	The BioQuarter's mission is to "discover new ways of changing people's lives" with objectives to "embrace and contribute to the next innovations in healthcare practice and to translate ground-breaking research and discoveries into new treatments and cures that will change people's lives". There are also other biohubs in Scotland.	• Strong fit, commercialisation focused, potentially good links to investors • The BioQuarter is well used to operating in the space between academia and industry • FemTech could readily be a focus of attention for the BioQuarter

Centre/ Research Institution/ HEI	Strength/ asset	Potential FemTech opportunities
Digital Health Innovation Centre (DHI) -	Leading edge research into solutions for the NHS/ public sector in terms of efficiencies and cost reduction, including preventive health. Typically focused on solutions rather than direct support for SMEs to capitalise on new markets.	• Very strong and explicit focus on the health agenda – and on technical solutions (product/ process) – although not specifically FemTech • Good fit but would need much more SME focused approach. If taken in the business support and investment direction, DHI could work with start-up and growth companies to exploit FemTech opportunities
University of Dundee Health Informatics Centre (HIC)	Research under the University's Population Health and Wealth research theme	• Strong fit with good links to data management (see Data/ AI/ Health above)
Industrial Biotechnology Innovation Centres (IBioIC) -	Collaborative projects between industry and academia, including those utilising biological processes in drug discovery, pharmaceuticals and other human health processes.	• Less direct focus on the FemTech sector specifically ▪ Modest fit, however IBioIC could readily pivot to identify FemTech opportunities at solutions given its ability to create new value chains, e.g., plant-based women's health solutions.

5.6 The list in the Table is not exhaustive, and there are other organisations and initiatives involved in health research, including University departments. Glasgow University's Crichton Campus, for example, has a focus on Healthy Ageing, other Universities are involved in specialist areas of health research. For many University research activities, there is a need to move from basic research (TRL 1-3) to much higher levels of Technology Readiness before they can be translated into FemTech product and process opportunities.

5.7 The following chart shows the research strengths in Scotland across the Health/digital health, Manufacturing/wearable/sensors, Data science/ AI and lifesciences sectors. The chart illustrates that much of the current research strengths are relatively small scale (i.e., the research departments may be quite modest in scale). Once again, it should be emphasised the chart is illustrative and designed to indicate that research institutes need to pivot to more fully exploit the potential presented by the FemTech sector.



Other Life Sciences and nutrition

5.8 Scotland has significant research strengths in life sciences and in the field of nutrition. Whilst under the Wellness Economy banner, the link to FemTech lies in the intersection with Personalised Nutrition, a key project under the Health for Wealth programme and so an area which can be developed further if there is a more formalised link between the two. Examples of active research institutions include:

- The Rowett Institute - Gut Health, Obesity and food health choice, population health Human studies;
- James Hutton Institute - Linking plant composition to health benefits;
- University of Abertay - Metabolism and gut health CVD Clinical Trials;
- University of Glasgow - Significant work on Gut Microbiome associated with many conditions and diseases including inflammatory bowel disease, cancer, CVD, and brain conditions and cognitive function;
- University of Edinburgh – various functions across a wide range of research activities;
- Heriot Watt University - including the physicochemical and functional properties of foods, beneficial food related phytochemicals, vaccine development for the aquaculture industry and the toxicology of food additives;
- And University of the Highlands and Islands - Health and life science team with a wide range of expertise looking at chronic disease.

Other assets: finance and support

5.9 Scotland has infrastructure to support access to finance and an active angel and investor network. Support includes the Scottish National Investment Bank, Scottish Technology Ecosystem Fund, SE, HIE and SOSE Account Managers and National Programmes and business to business events. These practical support arrangements are highlighted in Chapter 2. The investment support side has recently received a major boost with the announcement of the new fund for female-founded companies in Scotland through the SNIB and Investing Women Angels.

5.10 The latest fund announcement is an indication of the willingness to nurture and develop the investment community for FemTech in Scotland. This may need to be accompanied by further support, including support for investors. Whilst there may be UK and international investors willing to support nascent companies and activities, it is likely that the Scottish-based investor community for FemTech is less well developed.

Other assets: other infrastructure

5.11 Scotland has other supporting infrastructure, including other research and manufacturing space not identified above, including commercially lettable space although it is beyond scope to review these here. Scotland also has a good transport infrastructure and, in being "the right size to do business", research centres and major employment centres are well connected physically by road and rail, as well as virtually, which makes networking between industry and academia easy in practice. There are also good air connections between Scotland and the rest of the UK, and further afield. Finally, Scotland has assets in terms of its strong skills, including those associated with Further and Higher Education. The Data Lab, for example, runs a successful MSC programme, that provides employment readiness support and work placements which are of value to students and to industry seeking to recruit data scientists. IBioIC run a similar programme with 10-week placements for MSC students as part of their Masters. Both of these examples help Scotland produce a pipeline of industry-ready skills.

A developing company base

5.12 Scotland has a developing company base in FemTech and sectors potentially related to FemTech. The following is a snap shot in time of potentially active Scottish companies in the FemTech sphere identified by Interface (in their role as business to academia sector intermediary). Further work will be required to explore the aspirations of the above with respect to FemTech. The valuable role of Interface in supporting the project by providing this information is acknowledged and our thanks is extended to them.

- Acting- up
- Miscarriage Information Support Service
- BirthSparks
- Crossereach
- Talent on Leave/Bundle Babies Ltd
- Codebase
- Wrap Designs
- On parent families Scotland
- Scottish Women's Aid (SWA)
- Holoxica
- BLISS Academy
- Enkula Wellness Hub
- Wanderwomen Scotland Ltd
- LU Innovation
- Pregnancy and Parents Centre
- GoodBridge App Ltd
- Vocalista Limited
- CogniHealth
- ESquare Innovations Limited
- Third Platform Technologies Ltd
- Pinna.io Ltd
- Where Giants Roam
- Rise Nutrition UK Limited
- Playmob Labs Ltd
- Yaldi Games
- Boyd Digital
- Studentplus Technologies Ltd
- This is Milk
- Electrek Explorer
- LRNG.IO Ltd
- TrackGenisis Limited
- Pacioli Biz Forecaster ltd
- eCom Scotland Limited
- Nudge Exchange Ltd
- Wardwatch Limited
- Yoti Ltd

- Wellbot
- Houston we have
- RAD 365 Limited
- Think Analytics - Think360
- Thermafy
- Estendio Ltd
- Mesomorphic Ltd
- Investment Solver Limited
- Story Learning Ltd

Conclusions

5.13 The review of assets in Scotland demonstrates that that there is a very strong research community in Scotland, in particular through its Higher Education and other research Institutes, and via Scotland's Innovation Centres which are at the interface between academic research and industry. The research areas of strength notably include both data science/AI and health research, two of the underpinning areas of the growing FemTech sector. The assets also include major clinical research expertise, including specialist expertise that resides in the NHS.

5.14 At the same time, the review of assets in this chapter shows that the majority of the identified HEIs/ research institutions and Innovation Centres are not specifically working in the FemTech sector. There are varying degrees of alignment to FemTech between Institutes that are or could be involved in some way in the FemTech sector and so in almost all cases some pivot to the FemTech sector will be required, with further work required to raise awareness of the opportunities the FemTech sector affords. Similarly, not all institutions will have the capability to commercialise their research - and support is likely to be required to take the analysis of patient health data, for example, and to translate this into FemTech products and services.

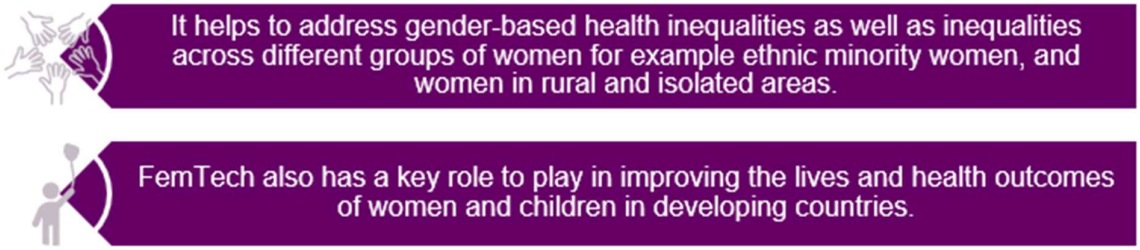
5.15 The challenge as ever in new technology and in new sector development is therefore in translating academic research into new products and services, for example via spin out and scaled up companies. Further, the investor community for FemTech remains under-developed and needs supported and nurtured, although, as the review highlights, there has been growth in female investors of FemTech and Scotland can capitalise on this phenomenon, if investors are given the right support. Overall, the size of Scotland and the extent of interactions between business, academia and the public sector through existing and developing networks, makes Scotland an ideal place for building on the asset base and taking a lead in FemTech sector development.

6 The Potential Value

Introduction

6.1 This section of the report draws on the evidence gathered from the market assessment and a desk review of the assets available to FemTech companies in Scotland in order to demonstrate and capture the value of the FemTech market for Scotland. This section considers the potential economic impact of the market, as well as the wider societal benefits and constraining factors to this potential impact that FemTech can have on Scotland. Case studies representing best practice in FemTech in Scotland have been highlighted, and the possibility of using NHS Scotland as a potential test bed for FemTech products has been explored.

6.2 It is important to note that there is limited available data on the size of the FemTech sector in Scotland. The economic impact estimates are largely derived from research by US-based firms on the size of the global market and their analysis of international markets, disaggregated to the UK-level. No bespoke research has been undertaken on the FemTech market in Scotland; rather the impact assessment seeks to draw on available intelligence and existing published data sources. An assumption is made on the proportion of existing lifescience sector firms who may be working in FemTech (i.e., technology-based solutions for women's health) that are effectively 'hidden' within the FemTech definition of companies; this is estimated at between 5% and 10% of all lifescience sector business. This assumption is to be tested and proven, however it is acknowledged and known that some firms will be involved in technology to address women's health without terming this as FemTech. Given the paucity of available data, considerable caution should be exercised when interpreting the data below.



The Economic Opportunity and 'Size of the Prize'

Introduction

6.3 The opportunities for Scotland arising from FemTech are very considerable, notably the economic opportunity from capitalising on the market growth potential identified in Chapter 3 and by harnessing Scotland's assets (set out in Chapter 4).

6.4 Drawing on global economic market size and trend data, combined with region-specific data where available, and an interpretation of growth trends for Scotland, it is possible to estimate the scale of the economic opportunity, the so-called 'size of the prize'. The following analysis sets out the steps by which the size of the prize has been estimated.

The Global Market Size and Growth Rate

6.5 At the **global** level, the value of the FemTech sector is between $40.2bn (£33,000m, or £33bn) (2020) (FemTech Analytics[66]) and $52bn (£42,000m, of £42bn) (2021) (Precedence research[67]). These have been converted to £m using 20/12/22 $ to £ exchange rate of 0.82.

6.6 The value of the FemTech sector is expected to grow 2.8 times (280%) by 2031 to £105,000m[68] (using the same S$ to £1 exchange rate). The growth rate of 280% is the midpoint of Combined Annual Growth Rates of 13.1% CAGR (FemTech Analytics) for 2020-2025, extrapolated to 2031, and 8.1% (Precedence research) for 2022-2030. The midpoint CAGR converts to an increase of 280% over 2021 to 2031.

6.7 The 280% global growth rate is the **policy-off** scenario, and is based on current trends. This is the forecast global growth rate; that is not to say the FemTech sector in Scotland is able to achieve this rate of increase.

The UK Share of the Global Market

6.8 The UK share of the global market is estimated to be around 10% (FemTech Analytics[69]). The majority of available data sources do not give a specific UK share of the global FemTech market, although Precedence research gives a Europe share of 21%. Both of the two key sources say the UK is the largest market in Europe. This indicates the UK market is worth an estimated £3,739m. or £3.739 bn, 10% of the £33-£42bn cited above. .

Value of the FemTech Market in Scotland

6.9 No available source provides a Scotland wide market share of the FemTech sector. The estimated value of the Scottish market is therefore based on Scotland's share of the overall UK business

[66] https://www.femtech.health/interactive-charts
[67] https://www.globenewswire.com/en/news-release/2022/08/19/2501714/0/en/Femtech-Market-Size-to-Worth-Around-USD-103-Billion-by-2030.html
[68] based on mid-point of estimates, CAGR = 10.6%
[69] https://www.femtech.health/interactive-charts

base (6.17%[70]). Alternative approaches would take Scotland's per head of population or GVA per head share, although all are broadly similar. Using the UK business share, **the value of the FemTech market in Scotland is an estimated £231m.**[71] As highlighted in the introduction, this is the *estimated* value of the FemTech market in Scotland, based on relatively limited data and the assumptions identified above. It assumes that the FemTech market in Scotland is proportionately equal to the UK market.

6.10 It is helpful to put the value of Scotland's FemTech market in context. The size of the market is therefore:

- Broadly equivalent to the market size of the Mental Wellness sector in Scotland (£236m), and larger than the Workplace Wellness sector based on the Wellness Economy work for Scottish Enterprise, led by Additional Research, itself based on Global Wellness Institute data.

- Globally, the FemTech sector is also comparable to the Drug Discovery market in terms of size of £39bn[72].

Growth of the FemTech Market in Scotland (Policy-off)

6.11 Applying global market trends, by 2031, the value of FemTech market in Scotland will be £645m. This is the policy-off scenario i.e., simply applying anticipated market growth rates to the sector in Scotland. The estimation applies the 280% (x 2.8) increase, based on global CAGR above.

Estimating the FemTech Business Base in Scotland

6.12 There are challenges in estimating the number of FemTech businesses in Scotland, given the lack of readily available data. US research estimates there are c.1,550 FemTech companies globally (FemTech Analytics).[73] However, this implies only 10 FemTech businesses in Scotland (on a pro-rata basis, as per the market share analysis above). There are few other sources that seek to estimate the number of FemTech businesses.

6.13 Examining the LifeSciences Scotland database, for example, there are 23 actors involved in reproductive health/childbirth alone,[74]although the 23 actors here are largely research institutes/centres.

6.14 Rather, if we assume that 10% of the lifesciences business base are involved in the FemTech, then Scotland has 60 businesses.[75] This is based on 605 lifescience sector businesses (from the Scottish Growth Sector database – Table 1.1[76]).

6.15 The 10% assumption above is based on ekosgen research into selected companies and their product ranges.[77] However, this is an inexact approach and based on a relatively low sample and implies that 10% of lifesciences companies are wholly involved in FemTech and so a 5%-10% range may be more suitable. Some lifescience (and indeed digital tech companies) are involved in providing the FemTech sector related products and services, although few are purely involved in FemTech. The 5%-10% of the lifesciences sector active in FemTech is 30-60 *VAT-registered* businesses i.e., businesses operating above the VAT threshold of £83,000 per annum.

[70] https://www.gov.uk/government/statistics/business-population-estimates-2020/business-population-estimates-for-the-uk-and-regions-2020-statistical-release-html

[71] based on Scotland's per business share of the market, although London & South East likely to have larger proportionate share of UK total

[72] https://www.verifiedmarketresearch.com/product/drug-discovery-market/

[73] https://analytics.dkv.global/FemTech/FemTech-Industry-2021-OnePager.pdf

[74] https://www.lifesciencesscotland.com (see therapeutics subdivision)

[75] Business equivalents i.e. translating 10% of all business activity (at 10%) into whole business equivalents

[76] https://www.gov.scot/publications/growth-sector-statistics/

[77] This is based on a selected review of the Interface companies and lifesciences database companies; for example the proportion of robotics/AI and medical device companies with women-focused tech products and services. Example companies are provided in the following paragraph

6.16 **It is possible that 5%-10% (30-60 businesses) is an under-estimate of the size of the FemTech business base in Scotland.** There are 45 businesses known to Interface for example, and just 10 businesses implied by FemTech Analytics research and both of these are under-estimates of the total. Analysis of the companies known to Interface gives an average employee level at less than 4 – so many are micro or even pre-trading companies amongst the cohort known to them i.e. early stage businesses seeking to work with academia, which again is not likely to reflect the full scale of FemTech sector activity. There are many examples of larger existing companies involved in FemTech, for example Blackford Analysis in Edinburgh providing AI platforms that include iCAD, a global medical technology solution providing innovative cancer detection and therapy solutions, notably in advanced breast cancer detection solutions built on artificial intelligence and their Screenpoint platform, using AI to fight against breast cancer with leading clinical evidence and latest deep learning technology[78]. Other leading digital health companies are involved in FemTech-related activities, including the Glasgow-based Metix Medical company which uses data/AI to automate patient transport processes which including neonatal transfers[79], one of the top 100 UK SMEs.

Estimating Employment and GVA in the FemTech Sector in Scotland

6.17 The Scottish Growth Sector database identifies GVA per head in the lifesciences sector as £86,812. Applying this to the estimate of 30-60 businesses[80] and 900-1,800 employees equates to total GVA in the Scottish FemTech sector of £82.5m-£165m. That is, Table 2.5 of GSD – total GVA divided by Table 2.4 – total employees. On the basis above, 900-1,800 employees may work in FemTech in Scotland, either directly in FemTech businesses or indirectly, as employees in businesses where part of the focus is FemTech.

6.18 The midpoints from the analysis above imply £123m in GVA and 1,350 jobs in the FemTech sector in Scotland. This is an estimate, based on the available data, and would need to be tested/ confirmed through more detailed primary research.

Policy-On Scenarios

6.19 The preceding analysis identifies the policy-off scenario i.e., where the Scottish market grows at the same rate as the global growth rate. However, **achieving this growth rate is not guaranteed, given that global growth is driven by the US, where the FemTech is more mature, and fast growing**. Scotland matching the global growth would be an extremely good outcome for the sector in Scotland. We have therefore assumed that Scotland matching the global growth rate would equate to a high growth rate given the current nature of the sector.

6.20 The low growth rate below therefore assumes that Scotland fails to match the global growth rate (of 280% to 2031) but nonetheless achieves a 50% increase to 2031.

6.21 The high growth (policy-on) scenario envisages Scotland performing at the global growth rate i.e. matching the US-driven growth rate. This high growth scenario anticipates that the FemTech sector grows by 280% by 2031, through a combination of global market growth opportunities and effective policies to support the active growth of the sector.

6.22 Again it is acknowledged that the growth projections are based on variations to forecast global growth rates (there are no Scotland-specific projections). The three scenarios are also applied to the best-guess estimate of the size of the FemTech sector in Scotland, given limited available date. However, applying the low, medium and high growth scenarios to the (midpoint) baseline GVA and jobs for the FemTech sector generates the following increases in GVA:

[78] https://www.blackfordanalysis.com/

[79] https://www.metixmedical.co.uk/

[80] Business equivalents i.e. translating 10% of all business activity (at 10%) into whole business equivalents

- A low growth scenario (x 0.5 - 50% 1.0 – 100%) = £60.5m in additional GVA and 675 jobs (over 10 years)for Scotland

- A medium growth (x 1.5 – 150%) = £185m in additional GVA for Scotland and 2,025 jobs (over 10 years). This is where Scotland matches just over half the expected global growth rate .

- **A high growth (x 2.8 – 280%) = £344m in additional GVA for Scotland and 3,790 jobs (over 10 years). This is the policy on scenario where Scotland matches global growth.**

Ability to Achieve Growth

6.23 Scotland is well positioned to achieve medium-high growth rates in the FemTech sector, given that the UK as a whole has the second-largest share of the world's FemTech companies, allied to Scotland's research strengths summarised in Chapter 4.

6.24 Further, achieving strong growth rates is also possible given the estimated value of Scotland's Health and Social Care data, and the opportunities for FemTech (and MedTech generally) to access this market. Overall, SCDI estimates that Scotland's Health and Social Care data alone could be worth an estimated £800 million every year to the economy in Scotland, with the potential for an estimated £5.4 billion in savings for NHS Scotland, 38% of its current budget and three times its predicted budget shortfall by 2025.

6.25 The scale of the opportunity for growth in FemTech is even larger when considering the untapped potential associated with women's health more widely. Women's health receives only 4% of healthcare R&D funding worldwide and this proportion will undoubtedly increase as awareness of women's health continues to rise. Further, as highlighted in the report, women are 75% more likely to use digital healthcare tools than men. This indicates huge potential for growth in the women's health and FemTech markets.

6.26 The benefits to Scotland arising from the FemTech sector go beyond the direct economic benefits to companies via market share alone. There will also be considerable opportunity through the supply chain to FemTech businesses (with benefits increased if manufacturing can be located/retained in Scotland arising from research-based businesses) and also wider related benefits arising from Scotland as a market leader in FemTech. As a market leader, Scotland can attract further investment (leverage) in R&D and in growth funding, bring in investment more quickly (catalytic benefits) and act as a leader in the field (strategic leadership, influence, reputational benefits).

6.27 There are both short and long-term opportunities in the FemTech sector. While it is important for innovators to have a long-term vision, there are also opportunities that can be seen as "quick wins" that are easily achievable in tech in the NHS that can be implemented quickly. This can be seen in FemTech in England through the Women's Health Strategy, which acknowledges that that there are 10 digital health technologies that are ready for early value assessment, which will test their clinical and cost effectiveness. If these products demonstrate a sound level of evidence for clinical and cost-effectiveness, they will receive a conditional recommendation from NICE for use in the NHS, pending a full NICE assessment. This evaluation framework is being piloted this year, ahead of the launch of the full policy framework in spring 2023.[81]

6.28 Whilst there is no specific reference to new technologies in the same way in the Women's Health Plan for Scotland, the Plan acknowledges the priority areas for improving health outcomes (Contraception, abortion, sexual health and pre-pregnancy; Menopause, menstrual health including endometriosis; Heart health; Establishing gender and cultural competence in healthcare policymaking and provision; and Seeking women's living experience to inform healthcare policymaking and future provision). Taken together with the establishment of Accelerated National Innovation Adoption (ANIA)

[81] https://www.gov.uk/government/publications/womens-health-strategy-for-england/womens-health-strategy-for-england#data-and-digital

as a testing ground for innovative products in the wider health technology sphere, there is potential for early identification of relevant FemTech products relevant to improving women's health outcomes in the named priority areas for action.

6.29 It is clear from the asset mapping that Scotland has very considerably research capabilities in relation to those areas that underpin the FemTech sector. The research capability extends to the health agenda, from clinical research to drug discovery and medicines manufacture to other patient-centred solutions and also in relation to data science and Artificial Intelligence. The twin capabilities in health and data provide Scotland with competitive advantages in this sphere. In particular, FemTech can add value and maximise the impact of the Health for Wealth National Programme through its intersection with Scotland's research strengths in Precision Medicine and Personalised Nutrition.

6.30 Scotland also has capability in early stage translation of research into commercial opportunity. The Innovation Centres, now in their second phase in Scotland, are increasingly focusing their support activities further up the Technology Readiness Level scale, certainly in TRL 4-6 and even more towards TRL 7-9. Again, this capability – to develop new businesses from the research – is a developing Scottish strength.

6.31 Further, Scotland has tremendous capabilities in terms of generating a pipeline of intellectual talent. Scotland produces large numbers of highly qualified talent in health and data science, and this is sought after by industry, particularly those MSc and PhD students who also have employability skills. Some of the Innovation Centres run MSc (and PhD) programmes with placements and so students are industry-ready and valued by businesses.

Social and wellbeing

6.32 As well as the economic benefits, FemTech has the potential to bring social and wellbeing benefits to Scotland. FemTech products help address traditionally overlooked women's physical needs by breaking taboos and developing solutions for example in menstruation, menopause and infertility. It therefore contributes to enhancing the health outcomes for women through better prevention, diagnostics treatment and conditions management, so addressing the gender-health gap. Supporting better health and wellbeing in women, and helping them to manage symptoms of, for example, the menopause and menstruation, then FemTech is likely to mean that fewer working days are lost to sickness absence impacting on productivity. FemTech products can support women to breastfeed and increases the success rate which delivers health benefits to the mother and baby.

6.33 As well as the gender-health gap, FemTech has the potential to address health inequalities between different groups of women in the population. In the UK, black women are four times more likely to die from childbirth complications than white women and women from Asian backgrounds are two times more likely.[82] Through the development of FemTech, there is the potential for more bespoke and accessible women's healthcare solutions and a greater focus on issues that impact on women.

6.34 FemTech can also ensure that women in rural and isolated areas have better access to healthcare and conditions management through, for example, high quality virtual consultations by specialists, more accessible support and treatments, and less need to travel (which can be time consuming, costly and disruptive).

6.35 Technology and FemTech is being used in developing countries to improve the health of women and girls, for example by helping to combat ovarian cancer including an AI-based cervical screening test; storing and sharing data for screening and diagnosis; providing accessible information (through

[82] https://www.npeu.ox.ac.uk/mbrrace-uk

apps) on puberty, menstruation and fertility, and improving access to assistive reproductive procedures.[83,84]

[83] https://www.ft.com/content/a7a79e1e-f630-11e9-bbe1-4db3476c5ff0

[84] https://www.raconteur.net/healthcare/fertility/femtech-africa/ https://www.raconteur.net/healthcare/fertility/femtech-africa/

7 Conclusions, Recommendations and Roadmap

Conclusions

Overview – drivers of the FemTech sector

7.1 The FemTech sector is a nascent sector in Scotland but one that has considerable market and economic growth potential alongside the potential to deliver major benefits to women's health. The evidence from the review indicates a global FemTech market which is expected to treble in size over the next 10 years, alone providing major opportunities for Scottish businesses capable of accessing this market.

7.2 Scotland has some key market advantages, not least in its strong research capabilities in health, digital health, data science/AI and in manufacturing/wearables and sensors. There are also strong global drivers of FemTech through the increased adoption of digital healthcare solutions, a growing awareness of women's health issues, the rise of precision and personalised medicine and the increased need for women's data to drive new products and service provision.

7.3 These drivers are underpinned by a strong and supportive policy environment in Scotland from both economic and health perspectives. Scotland's Women's Health Plan was the first in the UK, and this sets the tone for ambitious improvements and changes in areas including menopause, heart health, menstrual health including endometriosis, and sexual health. The Health for Wealth programme seeks a world-leading health and care innovation system and to exploit the transformative potential of digital technologies and data in achieving this.

Challenges and barriers

7.4 Despite the huge potential in the FemTech sector, success for Scotland in accessing the opportunity is not guaranteed. Whilst there is a strong research base, there is a need for this research to be commercialised into new products and processes. There is a need for new drug and healthcare products to be sufficiently proven clinically, which for FemTech requires access to clinically-driven testing and the collection and analysis of women's data. There is a need for more research in the women's health space in Scotland, and for more start-up and spin-out activities to be nurtured and scaled. There is a need for investment post start-up to grow FemTech companies, and for that growth to be managed effectively.

7.5 Not all of these challenges are unique to FemTech, with commercialisation, route to market and technology scale up challenges evident across innovation sectors. What is unique to FemTech (and the broader women's health sector) is the historic male-dominated bias in all its aspects, from the use of men's data in clinical trials, to the prioritisation of men's issues to male-dominated investment and institutional support landscapes. There is a need for a new language (and thinking) that puts women's health at the centre of new healthcare solutions and within this, a greater understanding, throughout the innovation ecosystem, of FemTech and what this means in practice. Whilst there are exceptions – and a notable rise in female-owned companies in FemTech – there is a long, long way to go for women's health issues to have parity.

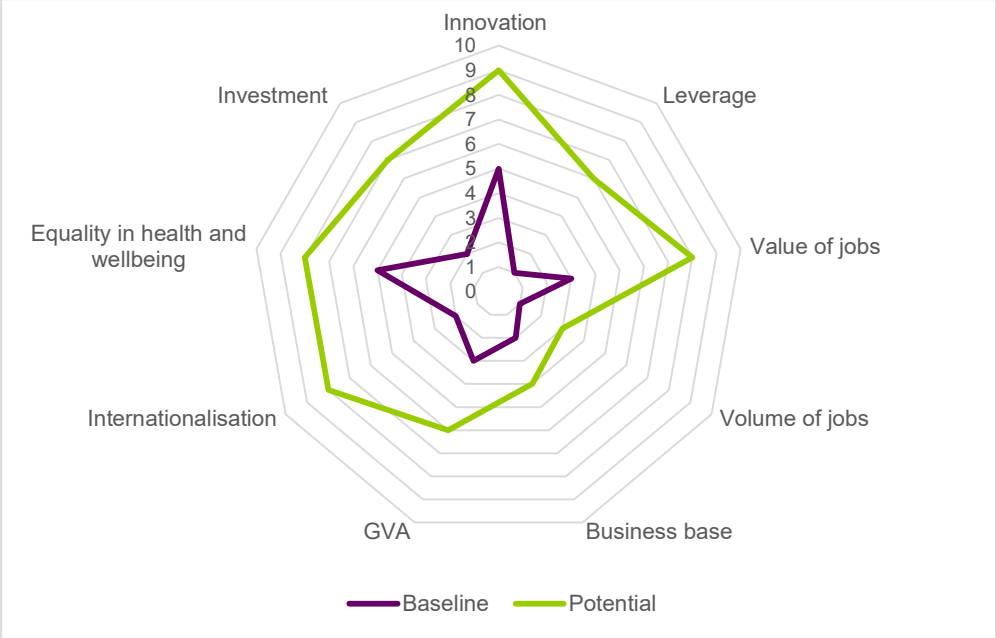
The Economic Opportunity 'Size of the Prize'

7.6 What is clear from the research is that the size of the prize in FemTech is considerable. The value of Scotland's FemTech sector, if matching global growth rates, will be £645m by 2031, from a current estimated value of £231m. The value could be higher still if encompassing the women's health agenda more widely. The identified drivers – not least the growing awareness of the need to embrace women's health issues – will only get stronger, both in policy terms and in terms of increased investment. Investors are already looking at the market opportunities in FemTech, and these are considerable.

7.7 Scotland has all the right ingredients to capitalise on the growing FemTech market opportunities, but further awareness of the opportunities that exist in FemTech is required, alongside tangible support to overcome specific challenges, such as the collection and analysis of women's health data, clinical trialling, the demonstration of FemTech products and attracting investment. The following section identifies the priorities going forward for harnessing Scotland's potential and for capitalising on the opportunities that exist.

7.8 Figure 7.1 shows the current position of FemTech in Scotland and its contribution to key areas such as employment, health and wellbeing and internationalisation. It also illustrates the potential of FemTech overall and against these indicators. It shows the potential, for example, for contributing to innovation, high value employment and the internationalisation agenda.

Figure 7.1: FemTech in Scotland: Current and Potential



Priorities

7.9 The research has identified a number of priorities for the development of FemTech in Scotland and these underpin the recommendations and roadmap.

- Promote awareness of FemTech amongst the wide range of audiences with a role to play. This must include clear articulation of the benefits for clinicians and patients, and the scale of the opportunity for investors, enterprises, research organisations (and Government).
- Maintain a broad definition of FemTech categories in Scotland and not over-define where support will be targeted. There are multiple opportunities within the broader women's health agenda which may not fit a narrow definition of FemTech.
- At the same time, there must be on-going monitoring of the market to identify emerging and niche areas that Scotland could and should focus on.
- Stimulate and support FemTech research and ensure a continuum to commercialisation through clear and effective pathways for translating research into products to take to market.
- FemTech solutions must be clinically-evidenced. Building on existing activities, there must be enhanced access to data and efficacy testing at every stage of development, including clinical

trials. This will ensure and demonstrate that solutions are co-designed – clinicians, research organisations, patients.

- Leverage the benefits and additional impacts of the intersection of FemTech with Precision Medicine and Personalised Nutrition.
- As well as supporting the development of new enterprises, it is important that existing companies in Scotland are encouraged to build on their current activities, skills, expertise, and markets to move in to the FemTech market.
- Alongside this, there should be recognition, and a higher visibility of lifesciences companies that are involved in FemTech activities but that are 'hidden' in the data.
- The development of FemTech must be set within the global market context to maximise the economic impact and contribute to Scotland's internationalisation policy objectives.
- Investors need to support the growth of the FemTech sector through making finance available at various stages of business development. In turn, investors should be supported through information and awareness-raising raising approaches above, and through businesses supported with investor-ready propositions.

Recommendations

7.10 The following set of recommendations have been developed, drawing on the research evidence base, the consultations and the workshop with stakeholders and industry. They are underpinned by the priorities set out above.

Recommendation 1: A Communications Plan for FemTech

7.11 The opportunities in FemTech are substantial, and they are growing and developing. To capture the value for Scotland, stakeholders need to coalesce around the term 'FemTech'. They must have an agreed and shared understanding of what it does and could encompass and the potential value and benefits.

7.12 As a priority, a Communications Plan should be developed to target the range of audiences: researchers, investors and funders, entrepreneurs, businesses, clinicians and women as end users. It may be useful to consider this as a 'proof of concept' stage. The messaging will be tailored to the audience, demonstrating the benefits and opportunities that will be of interest to that group.

7.13 The Communications Plan should use existing organisations and networks to communicate the opportunity and potential value. A bank of awareness raising collateral should be developed to implement the Plan including 'stories' and 'journeys' of companies, research organisations, clinicians, patients/end users, and the development journey of products and treatments taken to market.

Recommendation 2: Championing FemTech

7.14 There must be a mechanism to drive the Communications Plan and coalesce audiences. This will require nominated staff resource, likely one person, to act as a FemTech 'animateur'. This role will operate across the policy areas with which FemTech aligns. It will engage with policy makers and strategic decision makers and a key part of this will be implementing the recommendations arising from this study.

7.15 The role will work closely with and be supported by a FemTech Leadership Group (name to be determined). The membership of this group is likely to include industry, clinicians, researchers and other relevant stakeholders including those who participated in the workshop for the study.

7.16 As part of championing FemTech, the Scottish Government could consider creating FemTech as an area of national priority in governmental planning and policy intervention.

Recommendation 3: Access to Finance

7.17 Access to finance at each stage of development and then taking a FemTech product or service to market is an important barrier that must be addressed. Raising awareness about FemTech opportunities and demonstrating the potential return on investment will contribute to unlocking funding and investment. However, the investment landscape can be hard to navigate and it is competitive.

7.18 Consideration should be given to undertaking a feasibility study in to establishing a fund, or financial opportunity that is specifically for FemTech. This could be a ringfenced strand within, for example, the Scottish National Investment Bank, the Scottish Venture Fund or the Scottish Co-Investment Fund, or by establishing a specific fund. There would have to be a very clear and persuasive evidence-based rationale for any public sector investment.

7.19 There are a number of support mechanisms to help companies secure finance, for example the Scottish Enterprise Entrepreneurship and Investment Team. Whilst these are open to FemTech, if it is recognised as a priority industry, there could be more targeting and awareness raising with FemTech enterprises at each stage of their development and growth.

Recommendation 4: Accelerating FemTech

7.20 The research has shown that Scotland has a large and varied base of research and wider strengths and assets that could be harnessed to develop the FemTech industry and secure the value for Scotland. It is not necessary to create a wholly new entity or agency, or to invest large capital funds, for example in a building. However, it is recommended that a virtual FemTech Centre of Excellence and Accelerator is created, hosted in an existing organisation such as an innovation centre or university as the hub with spokes in to the 'community' of research, enterprise, and clinical settings. As a first step towards this and to test and shape it, FemTech should be identified as a specific theme across existing innovation capabilities with targets attached to it in order to drive activity.

7.21 It will essentially 'badge' a set of activities under the umbrella of FemTech drawing on existing activities and support mechanisms. It will create a 'circle' around these for FemTech and work to a set of objectives for example: enhancing access to clinical trials, accelerating enterprise development and growth, translating research into products and services for the market, support investor-ready propositions, undertake market options assessment and unlocking barriers for FemTech. The parameters for, mechanics of, the Accelerator (or Centre of Excellence) will need to be established, including associated staff and financial resource, however there could be considerable benefits of such an approach.

Recommendation 5: Embed FemTech in Health For Wealth

7.22 The Health for Wealth National Programme (HfW) is key to Scottish Enterprise's delivery. With HfW's strategic focus on healthtech as a priority sector, FemTech aligns very closely with its overarching and synergistic strategic aims:

- to build a world leading health and care innovation ecosystem , adopting triple helix model; and
- transforming health and care by exploiting the potential of digital technologies and data.

7.23 Through HfW, Scottish Enterprise seeks to maximise the economic impact for Scotland by working with industry, academia, government and health and care provides to develop products and processes that will underpin global health and care systems. FemTech could benefit from this, and also contribute to achieving the HfW ambitions.

7.24 It is recommended that FemTech is fully integrated in to HfW and becomes a key project within it, linked to other projects such as personal nutrition and precision medicine to help leverage additional impact from HfW.

Recommendation 6: Data and Trials

7.25 There is a great deal of data available but it is far more limited for women, and can be difficult to access for product and service development. There should be strategic level discussions to examine this issue in more detail and understand how a) the data that is available can be better used in FemTech and b) how to increase the amount of women's data – and of course this would have wider applications and benefits across health and life sciences. Key informants from health, industry and research organisations must be engaged in these conversations to position Scotland as a world leader in women's health.

7.26 The research has identified the critical importance of clinically-evidenced solutions, and being able to demonstrate how products fit in to the clinical pathway. Products must be co-produced with clinicians and so boosting access to clinical trials is essential. The Scottish Health Industry Partnership helps to facilitate this, but resources are quite limited. Consideration should be given to ways to boost the number of clinical trials and to ensuring that there are entry routes to access the facilities and staff time required. This is particularly difficult given the current pressures of clinicians and in health settings.

7.27 The FemTech 'animateur' and the FemTech Leadership Group will have a key role in driving this recommendation.

Recommendation 7: Monitoring the Global FemTech Market

7.28 The research has demonstrated that there is a substantial opportunity in the global FemTech market, and that with the right strategic support and focus, Scotland could capitalise on it. It is a nascent sector and there are likely to be opportunities and developments on the horizon and further in the future, some that have perhaps not been thought of yet. This is the rationale for a flexible and broad approach to the definition, and that the definition for Scotland, and the strategic focus, may change and narrow over time.

7.29 It will be important for policymakers and strategic partners to have up to date intelligence about the development of the FemTech market, emerging sub themes, new innovations, new and growing markets, and loci of activity. There should be a process for monitoring this and synthesising and disseminating the market intelligence to all relevant audiences. A critical part of this will be overlaying the market information with the developing sector in Scotland and our assets, which will also evolve over time.

7.30 Key areas to monitor include PharmaTech (development of drugs suitable for females), FemTech diagnostics, FemTech digital therapeutics, women's fitness and healthy lifestyle, and developments in more established fields such as pregnancy, longevity and fertility.

7.31 This information will be an important source for the FemTech Leadership Group and will help to inform and shape the strategic focus and policy response.

Roadmap

Table 7.1 sets out a Roadmap for planning and driving activities to support the development of a strong and sustainable FemTech sector in Scotland. It reflects the study findings and the outcomes of the consultations and workshop. Figure 7.1 provides a visual representation of the sequencing and timing of the recommendations and associated activities.

Table 7.1: Recommendations, Activities, Timing and Roles

Recommendation	Activities	Timescale	Lead and partners
Recommendation 1: Communication Plan for FemTech	Develop a strategic Communication Plan. Identify existing organisations and networks to channel communications through. Develop a bank of awareness raising collateral drawing on what already exists, and new materials.	Within 6 months This is a priority that will underpin the recommendations and activities to develop FemTech in Scotland.	**TBC**
Recommendation 2: Championing FemTech	Establish a Scottish FemTech Leadership Group with the necessary administrative support. Plan the role of a FemTech Animateur. Finance plan and relevant support.	Within 6 months. This can build on the participants in the consultations and workshop. 6-9 months 6-9 months	Scottish Enterprise with partners to identify and recruit membership from the range of areas of interest. Administrative support: Scottish Enterprise
Recommendation 3: Access to Finance	Harness and promote existing funding opportunities and support mechanism to FemTech companies and research organisations. Promote FemTech to funders and investors, and raise awareness amongst organisations that offer support to access funding Feasibility study for a specific funding stream ringfenced for FemTech.	9-12 months	**TBC**

Recommendation	Activities	Timescale	Lead and partners
Recommendation 4: Accelerating FemTech	Identify FemTech as a specific theme across existing innovation interventions and capabilities. Feasibility study to establish a FemTech Centre of Excellence and Accelerator.	6-9 months 9-12 months	TBC
Recommendation 5: Embed FemTech in the Health for Wealth national programme	Demonstrate the intersectionality of FemTech and other HfW projects, and how FemTech aligns closely with HfW. Fully integrate FemTech as a HfW project.	0-3 months 3-6 months	SE
Recommendation 6: Data and Trials	Detailed review of current access to data and clinical trials for FemTech research and development. Gap analysis and challenges for accessing data and efficacy testing. Plan to enhance access to health data for FemTech research and development – and awareness raising of pathways. Plan (including) funding to boost the number of FemTech clinical trials across clinical areas and health and care settings.	12-24 months	TBC
Recommendation 7: Monitor the Global FemTech Market	Establish this evidence base, as the baseline.	0-2 months	

Recommendation	Activities	Timescale	Lead and partners
	Develop a proforma of data needs and sources required to monitor the global market and the activity in Scotland. Highlight data gaps and limitations – these may be addressed over time.	6-7 months	
	Create a repository to hold data and information for example research reports, data and other materials with market insights.	8-9 months	
	Prepare a short dissemination plan and reporting template (using infographics) and a schedule for updating and reporting.	8-9 months	
	Monitor and report on the FemTech market	On-going	

Figure 7.2 Roadmap

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Recommendation 1: Communication plan for FemTech																								
Develop a strategic communication plan.																								
Identify existing organisations and networks to channel communications through.																								
Develop a bank of awareness raising collateral drawing on what already exists, and new materials																								
Recommendation 2: Championing FemTech																								
Establish a Scottish FemTech Leadership Group with the necessary administrative support.																								
Plan the role of a FemTech Animateur.																								
Finance plan and relevant support.																								
Recommendation 3: Access to Finance																								
Harness and promote existing funding opportunities and support mechanism to FemTech companies and research organisations.																								
Promote FemTech to funders and investors, and raise awareness amongst organisations that offer support to access funding.																								
Feasibility study for a specific funding stream ringfenced for FemTech.																								
Feasibility study to establish a FemTech Centre of Excellence and Accelerator.																								
Recommendation 4: Accelerating FemTech																								
Identify FemTech as a specific theme across existing innovation interventions and capabilities.																								
FemTech Centre of Excellence and Accelerator: Feasibility study																								
Recommendation 5: Embed FemTech in Health for Wealth																								
Demonstratge intersectionality of FemTech and other HfW projects																								
Fully integagret Femtech as a HfW project																								
Recommendation 6: Data and Trials																								
Detailed review of current access to data and clinical trials for FemTech research and development.																								
Gap analysis and challenges for accessing data and efficacy testing.																								
Plan to enhance access to health data for FemTech research and development – and awareness raising of pathways.																								
Plan (including) funding to boost the number of FemTech clinical trials across clinical areas and health and care settings.																								
Recommendation 7: Monitor the Global FemTech Market																								
Develop a data and information proforma and collection process																								
Create a data repository																								
Prepare a dissemination plan and reporting template																								
Ongoing monitoring and reportng of the market																								

Appendix 1: Workshop Participants

Table A.1 details the participants at the workshop on 10th January 2023.

Table A.1: Workshop Participant Organisations

Organisations represented in the workshop
Mesomorphic
FemTech World
Becky Warnes Consultancy
Scottish Government
Goddess Gaia Ventures
South of Scotland Enterprise
Holoxica
Scottish Enterprise
Digital Health and Care Innovation Centre

Appendix 2: Individual Consultees

Table A.2 provides the names of the organisations participating in qualitative consultations. over the course of the research.

Table A.2: Organisations Consulted

Consultees
The Data Lab
Holoxica
Goddess Gaia Ventures
FemTech World
Mesomorphic
University of Strathclyde, Department of Digital Health and Care
Scottish Government, Scottish Health Innovation Partnership
Digital Health and Care Innovation Centre
Interface
Age Scotland