Institution: University of Ulster
Unit of Assessment: 19
Title of case study: Case 1 - Promoting innovation adoption in high-tech small firms (HTSFs)
1. Summary of the impact (indicative maximum 100 words)
The promotion of innovation adoption in high-tech small firms (HTSFs) has long been a European priority, but despite decades of attention, there is still a dearth of innovative HTSFs and, worryingly low participation levels of HTSFs in European R&D and innovation funding programmes. To capitalise on emerging high-tech markets it is imperative that HTSFs have the capacity to exploit these new opportunities and crucially, to contribute to the development of a modern economy. This multidisciplinary impact case investigates how to encourage the involvement of HTSFs in European funding projects. The impact of this research includes; methods for promoting the adoption of high-tech innovation across Europe and the development of European HTSF innovation and R&D funding policy recommendations that feed into the European Parliament, Horizon 2020 and numerous national and European high-tech associations and influential EC innovation networks.
2. Underpinning research (indicative maximum 500 words)

HTSFs are the lifeblood of modern economies and hence the EU has been working towards creating a friendlier business environment for small businesses by adopting the 'Small Business Act' (SBA) (McAdam *et al.*, 2010). The SBA serves as a useful reference point for the overall focus of this case study: "The EU and Member States should encourage investment in research by SMEs and their participation in R&D support programmes, transnational research, clustering and active intellectual property management by SMEs".

This case study refers to a body of related research projects that have been ongoing since the mid 2000s. The research addresses how to nurture innovation adoption by HTSFs, by significantly influencing policy at EU and national level and by promoting European-wide adoption of high-tech innovations. The user-driven and multidisciplinary approach of the research was to engage directly with HTSFs and related stakeholders to investigate the real latent needs that affect their capacity to innovate and promote European wide innovation adoption (Gilmore *et al.*, 2013).

The focus of promoting innovation adoption in HTSFs in this case study is to:
- Investigate the low participation levels of HTSFs in national and European R&D and innovation funding programmes
- Make policy recommendations to the European Commission, European Parliament and national innovation policy-makers in the EU27 on how to design and implement more effective HTSF innovation funding programmes.
- Identify best practice elements amongst HTSFs funding programme clusters.
- Collaborate with transnational partners to co-develop, pilot and promote the adoption of novel high-tech innovations and methodologies that help speed up their adoption.

The research on promoting innovation adoption, from a policy perspective, was built on earlier work (McAdam *et al.*, 2004) that identified the need to harmonise innovation and R&D policy at both a national and EC level. This is essential in facilitating and nurturing the growth of high tech HTSFs and important high-tech sectors (Gilmore *et al.*, 2013). Research on innovation adoption by HTSFs has investigated the role of innovation intermediaries (McAdam and McAdam, 2008), modelling innovation implementation (McAdam *et al.*, 2010) and on a practical side, beta-testing of a range of research experiments has led to the development of the *'Engage'* eParticipation innovation toolkit - helping promote wider adoption of European high-tech innovation (Galbraith *et al.*, 2013).

The constant wave of new technologies has raised the opportunity to promote HTSFs to innovate across a wide range of public services and processes. For example, although the European Commission's eGovernment agenda has called for more innovative technologies to enhance citizen engagement in democratic processes, there is a dearth of successful eParticipation innovations, particularly by HTSFs across multiple international markets (Galbraith *et al.*, 2013). Moreover, healthcare innovation adoptions from advances in technology are fundamental to

improving the efficiency of health and social care services; however, many healthcare technologies suffer from poor implementation and adoption (Davey *et al.*, 2011). Inaccurate assumptions on the user needs and a failure to gain acceptance from slow and encumbering public healthcare procurement bodies are significant barriers to adoption.

Staff members: Galbraith in post at Ulster since 2005; McAdam in post at Ulster since 1995; Brennan in post since 1990.

3. References to the research (indicative maximum of six references)
There were a number of publications in peer-reviewed journals a selection of which include:

Davey, S., Brennan, M., Meenan, BJ. and McAdam, R. (2011) 'Innovation in the Medical Device Sector: An Open Business Model Approach for High-Tech Small Firms', *Technology Analysis and Strategic Management*, Vol. 23, No. 8, pp. 807-824. DOI**:** 10.1080/09537325.2011.604152
Galbraith, B., Cleland, B., Martin, S., Wallace, J., Mulvenna, M. and McAdam, R. (2013) 'Engaging user communities with eParticipation technology: findings from a European project', *Technology Analysis and Strategic Management*, Vol. 25, No. 3, pp. 281-294.
DOI: 10.1080/09537325.2013.764986
Gilmore, A., Galbraith, B. and Mulvenna, M. (2013) 'Perceived barriers to participation in R&D programmes for SMEs within the European Union', *Technology Analysis and Strategic Management*, Vol. 25, No. 3, pp. 329-339. DOI:10.1080/09537325.2013.764987
McAdam, R., Moffett, S., Hazlett, S.A. and Shevlin, M. (2010) 'Developing a model of innovation implementation for UK SMEs: A path analysis and explanatory case analysis', *International Small Business Journal*, Vol. 28, No. 3, pp. 195-214. DOI:10.1177/0266242609360610
McAdam, M. and McAdam, R. (2008) 'High tech start-ups in University Science Park incubators: The relationship between the start-up's lifecycle progression and use of the incubator's resources', *Technovation*, Vol. 28, No. 5, pp. 277-290. DOI: 10.1016/j.technovation.2007.07.012
McAdam, R., McConvery, T. and Armstrong, G. (2004) 'Barriers to innovation within small firms in a peripheral location', *International Journal of Entrepreneurial Behaviour & Research*, Vol.10, No. 3, pp. 206- 221. DOI: 10.1108/13552550410536780

The underpinning research in this case study was completed through three major awards as follows:

MAPEER SME (Making Progress and Economic Enhancement a Reality for SMEs). FP7-SME-2009-1. 2009-2011. Value £136,000. Awarded to Galbraith.
PARTERRE (Electronic Participation Tools for Spatial Planning and Territorial Development*).* CIP-ICT-PSP-2009-3bis (FP7). Value £130,000. Awarded to Galbraith.
MATCH (Multidisciplinary Assessment of Technology Centre for Healthcare). EPSRC. 2008-2013. Value £330,000. Awarded to Brennan.

4. Details of the impact (indicative maximum 750 words)
Our research has made a significant impact and influenced the innovation decision-making process across Europe in a number of tangible ways, including new policy programmes affecting EC innovation funding for HTSFs in Horizon 2020 and EU member states, as well as contributing to the European-wide adoption of novel high-tech innovations. A wide range of beneficiaries have been affected, including SMEs, SME support agencies, innovation development agencies, European Commission, European Parliament and international business alliances, as evidenced by factual statements from influential national and European stakeholders **(1 - 5** - numbers in bold refer to evidence in Section 5**)**.

The international *reach* of European-wide HTSF policy recommendations has extended to the highest echelons of EC decision-making, including the European Commission **(1,2,6,7)** and European Parliament **(1,8)**. Policy developments targeting HTSF innovation adoption covered all EU member states. SMEs were extensively engaged through the creation of a 100-member European SME Experts Panel with the support of influential MEPs **(7 - p7),** EC officials and EU innovation bodies such as Enterprise Europe Network, Eureka, Nessi **(7 – p22)** and the European Network of Living Labs **(5)**. A summary of the evidence of impacts and indicators is provided in Table 1.

Table 1: Enhancing Innovation in High-tech SMEs – Research Impacts			
Key Research Areas	**Impacts and Dates**	**Evidence**	**Impact Indicators**
Influencing SME innovation funding policy in EC and all members states	-15 EC-level HTSF innovation policy recommendations. - Identification of SME best practices for funding programme clusters -HTSF policies presented in European Parliament EC and EU innovation clusters -Creation of 100-member European SME Experts Panel 800+ SME engaged in policy development - EC endorse research impact -200+ SME policy programmes covering all of EU27 were benchmarked (2009-11)	-Testimonials from MEP **(1)** and senior EC official **(2)** -Reports from EC **(6)** and to EC **(7)** -4 EC SME Experts Panel Meetings **(7)** -Endorsement from EC SME & Industry Associations **(3,4,5)** -30+ workshops held throughout EU27 **(7)** www.mapeer-sme.eu **-**Horizon 2020 affected by MAPEER SME recommendations including risk finance (loans), less administration, access for SMEs and public procurement **(1,2)**	- Recommendations fed into Horizon 2020 **(1,2)** EC Green Paper "Common Strategic Framework' and national innovation policy for all of EU 27. -Post-project SME support website www.mapeer-sme.eu -HTSF Innovation Conference accepted for *'European SME Week'* attended by 100+ EC officials and SMEs www.mapeer-sme.eu/en/sme-conference -SME Risk Finance loans in Horizon 2020 (COSME) **(1,2)**.
Promoting high-tech innovation adoption in Europe	High-tech innovation adoption in NI, Italy, Finland and Cyprus. -Invention of 'Engage' high-tech innovation. (2010-12) -'Engage' commissioned for two consultations for public and third sector (2012) -Engage invention used by an Italian regional government for eight public consultations (2012) -Healthcare technology assessment methods for UK and US Procurement (2008-12)	-Parterre project website http://www.parterre-project.eu/ -'Engage' released under an open source licence. **(10)** -'Engage' software published on EC's Open Source Join-up website. **(10)** -Improves decision-making in procurement process. **(4)**	-PARTERRE selected by EC's ePractice website as an exemplar innovation case study and awarded 'Editors Choice' for 2012 **(9)** -'Engage' used to support winning tender for eight regional government events in Italy (500+users) and two social economy policy events (160 users) in NI **(3)** -Validated by extensive engagement with UK and US healthcare regulatory bodies. **(4)**

The 15 major EC policy recommendations on the design, implementation of HTSF funding programmes and exploitation of innovation outputs **(7** - pp.73-85**),** directly impacted beneficiaries such as the European Parliament, economic ministries in all EU member states, a range of HTSF clusters, associations and networks **(1,6).** In addition, our HTSF innovation policy findings were fed into the development of Horizon 2020 **(1,2)** and the EC Green Paper - *Common Strategic Framework* (http://mapeer-sme.eu/news-and-events/news/2011/05/the-european-experts-panel-on-smes-and-research-contributed-to-the-green-paper-on-future-eu). The key issues that were addressed in the HTSF innovation policy recommendations were how to remove barriers for HTSFs when designing and implementing HTSF funding programmes and practical ways to support HTSFs commercialise and exploit their results after the project lifecycle has expired. A senior EC official (DG Research European Commission) endorsed our policy recommendations,

stating that they *'will greatly contribute to SME's special attention in FP8'* **(8)**. The adoption of our policy recommendations **(7** - p82**)** contributed to the inclusion of new financial instruments benefitting SMEs proposed in early drafts of Horizon 2020 (see COSME in Table 1) that offers equity and loan guarantee facilities for SMEs **(1).** Another senior official at the EC (DG Research and Innovation) concluded that the research *"produced a number of significant and scientific reports that have benefit for EU and national policy makers, programme managers, SME organisations and associations, and SMEs* **(6)**. The EC further singled out the *'unique impact'* **(6)** of the large-scale research reports on barriers which SMEs experience in getting involved in R&D and innovation funding initiatives at national and EU level and identified best practice elements amongst programme clusters, stating: *"This is a significant achievement as it is the first time that this information has been collected and analysed, allowing comparisons to be made between member states, and each country can compare its position with the EU average"* **(6**). For example, there have been considerable entry barriers for HTSFs in public procurement, and in our best practice reports we identified exemplar SME-focused HTSF funding policy programmes, such as the SBIR programme in Holland and the UK, that offer policy makers in depth instructions on how to replicate these programmes for widespread adoption **(7** - p80**)**. We also addressed this adoption barrier for HTSFs in public procurement in a practical way, by developing bespoke methodologies for healthcare procurement bodies to make the procurement process, particularly for HTSFs less cumbersome **(4).**

The lowering of innovation barriers for HTSFs has greatly enhanced the international ***impact*** of this multidisciplinary high-tech innovation adoption research – leading to endorsement from the EC as a European exemplar of high-tech adoption, through its publication as a case study on the ECs prestigious 114,000 member *ePractice* website **(9)**. A spinout of this multidisciplinary research collaboration that also involved the Institution's School of Computing and Mathematics and School of Health Sciences was the development of the *'Engage'* innovation eParticipation software tool **(10)**. This innovation was pivotal to ensuring eParticipation adoption in the UK market and was validated by end user acceptance of over 94% of 380 end users in eight consultation events, including an Open Data consultation for the UK Cabinet Office **(9)**. The '*Engage'* invention was released on an open source licence on the EC's *Joinup* open source website, which has dramatically increased the ***reach*** and benefits as the *Engage* software is free for everyone to use. The release of Engage under an open source licence has paved the way for wider adoption of the innovation in Europe, as Engage was used as the primary eParticipation technology in a winning tender by an Italian HTSF to conduct eight consultations for a regional government in Italy **(3)**.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. Member of European Parliament (EP), Factual Statement, Member of Committee of Industry, Research and Energy (EP) and President of SME Global
2. European Commission, Factual Statement, Senior Advisor Innovation Systems at DG CONNECT and Co-chair of EU Open Innovation Strategy and Policy Group.
3. Regione Piemonte, Italy, Factual Statement, Member of Scientific Commission for Innovation.
4. European Health Alliance, Factual Statement, President.
5. Council Member of European Network of Living Labs and President of the European Society for Concurrent Enterprising Network (ESoCE-Net)
6. Final MAPEER SME Assessment Report by European Commission
7. Policy Recommendations Report for European Commission, http://ec.europa.eu/research/csfri/pdf/contributions/post/european_organisations/european_experts _panel_on_smes_and_research.pdf (pp. 7,22,73-85)
8. MAPEER SME Policy Findings supported by MEP and presented in European Parliament: (i) http://mapeer-sme.eu/news-and-events/news/2010/11/smes-work-together-to-break-down-barriers-towards-enhanced-participation-in-rtd-programmes (ii) http://mapeer-sme.eu/news-and-events/news/2011/05/mapeer-sme-results-were-presented-in-the-european-parliament
9. Selected exemplar EU high-tech adoption case study: http://www.epractice.eu/en/cases/parterre
10. Software on EC's open source portal: http://joinup.ec.europa.eu/software/engage/description