

Institution: Cardiff Metropolitan University		
Unit of Assessment: UOA17: Business and Management Studies		
Title of case study: Using Contemporary Operations Management Paradigms (COMPS) to transform business performance.		
Period when the underpinning research was undertaken: 2012-2019		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Prof Mark Francis	Prof of Management	2012 – present
Prof Andrew Thomas	Prof of Production & Supply Chain Management	2015 – 2019
Dr Peter Dorrington	Research Fellow	2013 – 2017
Dr Claire Haven-Tang	Reader in Tourism Management	2004 – present
Dr Rachel Mason-Jones	SL in Supply Chain Management	2016 – present
Period when the claimed impact occurred: 2015 - 2019		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact (indicative maximum 100 words)		
<p>Value Flow Centre (VFC) researchers have used £100k of competitively-won research grant funding from The UK Commission for Employment and Skills and Welsh Government to develop and apply Contemporary Operations Management Paradigms (COMPS) in aerospace, architectural, automotive, food and medical manufacturing businesses. This has resulted in just under £32 million in company savings through business performance enhancements, a return on investment of ~32,000%. VFC research has delivered these impacts by assisting Make UK (Wales) to support manufacturing businesses more effectively, improving the business performance strategies of 319 companies and by helping to develop more efficient and collaborative supply chain networks.</p>		
2. Underpinning research (indicative maximum 500 words)		
<p>The VFC was established in 2013 to provide a more holistic approach to the development and application of business improvement paradigms. While existing tools and techniques such as Lean, Theory of Constraints (TOC), Six Sigma and Agility are useful, the ‘off the shelf’ application of a single tool in isolation without iterative, applied learning is ultimately limited [R1]. The VFC research on the clustering and deployment of such tools and paradigms led to the creation of COMPS - Contemporary Operations Management Paradigms – a toolkit for context-sensitive, double-loop learning business improvement that extends beyond error detection and correction, to a deeper examination of organisational policies and objectives [R2]. Research by Francis, Thomas and collaborators led to the application of COMPS in a range of vehicle [R3], [R4] and aerospace [R5] manufacturing companies, leading in turn to a more complete understanding of the application of COMPS in manufacturing and production sectors.</p> <p>Thomas’s subsequent research extended COMPS into multi-company supply chains based on an identified gap between the lack of Organisational Learning Culture (OLC) in complete supply</p>		

chains as compared to single companies [R1]. This was instrumental in obtaining external funding from the *UK Commission for Employment and Skills* (a) in 2015 for the Innovative Supply Chain Project (InSCaPe), a cross-school collaboration between **Thomas** in Cardiff School of Management (CSM) and **Dorrington** in the International Centre for Design and Research (PDR). The aim of InSCaPe was to develop a model for sustainable business innovation and improvement through implementation of COMPS and to create a new supply network of companies focused on the development of a new product concept. InSCaPe investigated how companies within this supply chain co-created a new product concept over a single year by examining the enabling and inhibiting factors to sustainable change and development of a learning culture. The purpose was to understand the Organisational Learning Culture (OLC) that emerged from the implementation of COMPS within a four-tier supply chain. InSCaPe provided evidence to redefine COMPS into Supply Chain Organisational Learning and Innovation Framework (SCOLIF) in order to make the connection with the supply chain and to guide the training and implementation of these paradigms [R2].

VFC supply chain research was further developed by **Thomas, Haven-Tang, Mason-Jones and Francis** through the application of the COMPS framework to the development of sustainability in the food industry [R6]. In 2016, the VFC, Welsh Centre for Tourism Research (WCTR) and the Zero2Five Food Industry Centre in the Cardiff School of Sport and Health Sciences were funded by Welsh Government via the Engineering Employers Federation (EEF) (Wales) - since rebranded with the trading name Make UK (Wales) - to analyse the Welsh food supply chain sector (b). This research evidenced supply chain and production inefficiencies which Make UK (Wales) then used to leverage an additional £500k of Welsh Government funding for a food supply chain development programme addressing these issues.

3. References to the research (indicative maximum of six references)

The selected underpinning research has all been published in international double blind peer-reviewed journals, four of which are ABS 3-star journals. Five are being returned to REF2021.

- [R1] **Thomas, A.J**, Pham, D.T., **Francis, M.** & Fisher, R. (2015) Creating resilient and sustainable manufacturing businesses – a conceptual fitness model, *International Journal of Production Research*, 53, 13, 3,934-3,946. ABS 3* DoI: <http://dx.doi.org/10.1080/00207543.2014.975850> [Returned to REF2021]
- [R2] **Thomas A.J.**, Dorrington P., Loudon G., Costa F., **Francis M.** & Fisher (2017) Organizational Learning Capability in SMEs: An Empirical Development of Innovation in the Supply Chain, *Cogent Business and Management*, 4, 1. Taylor and Francis OA Journal. DoI: <https://doi.org/10.1080/23311975.2017.1364057> [externally rated as 2*]
- [R3] Darlington, J., **Francis, M.**, Found, P.& **Thomas, A.J.** (2016) Targeting Lean Process Improvement Projects for Maximum Financial Impact, *Production Planning & Control*, 27, 2, 114-231. ABS 3* DoI: <http://dx.doi.org/10.1080/09537287.2015.1082665> [Returned to REF2021]
- [R4] Darlington, J., **Francis, M.**, Found, P. & **Thomas, A.J.** (2015) Design and Implementation of a Drum-Buffer-Rope Pull System, *Production Planning and Control*, 26, 6, 489-504. ABS 3* DoI: <http://dx.doi.org/10.1080/09537287.2014.926409> [Returned to REF2021]
- [R5] **Thomas, A.J.**, **Francis, M.**, Fisher, R. & Byard, P. (2016) – Implementing Lean Six Sigma to Overcome Production Challenges in Aerospace Industry, *Production Planning & Control*, 27, 7- 8, 591-603. ABS 3* DoI: <https://doi.org/10.1080/09537287.2016.1165300> [Returned to REF2021]
- [R6] **Thomas, A.J.**, **Haven-Tang, C.**, Barton, R., **Mason-Jones, R.**, **Francis, M.** & Byard, P. (2018) Smart Systems Implementation in UK Food Manufacturing Companies: A Sustainability Perspective. *Sustainability* 10, 12, 4693. DoI: <https://doi.org/10.3390/su10124693> [Returned to REF2021]

Research grants and funding

- a) UK Commission for Employment and Skills, Skills for Innovation in Manufacturing Innovative Supply Chain Project (InSCaPe) 2015 £75,000
- b) Welsh Government, Welsh Food Supply Chain Study 2016 (Phase 1), £25,000.

4. Details of the impact (indicative maximum 750 words)

The VFC has used £100k of competitively won research grant funding to leverage just under **£32 million** in economic benefit within UK aerospace, architectural, automotive, food and medical manufacturing businesses - a return on investment to the taxpayer of just under **32,000%**. The impact of VFC research is two-fold: **firstly**, it improved the effectiveness of the support provided by Make UK (Wales) – shortened henceforth to ‘Make UK’ - for manufacturing and production businesses; and **secondly**, it directly increased supply chain development and innovation-driven cost-savings, both for individual companies and entire supply chains.

1. COMPS in Manufacturing & Production Industry – Make UK

Make UK is a registered Employers’ Association with national reach through their corporate and regional advisory boards. They provide their members with advice, guidance and support on manufacturing and business improvement and lobby Government on manufacturing issues, particularly the repositioning of manufacturing as a leader in skills development and a driver of competitive advantage for the UK. Prior to the collaboration with the VFC, Make UK had focused their business performance improvement intervention strategies around short course delivery in Health & Safety and Financial Management. They initiated collaboration with the VFC in January 2015 because they recognized that the VFC’s COMPs framework afforded them the opportunity to modify and redesign their client business performance improvement intervention strategy. The COMPS approach discards traditional single-loop learning approaches in preference for a double-loop learning approach which requires a deeper examination of organisational policies and objectives. The VFC’s previous successes, including their successful application of the Drum-Buffer-Rope methodology, a ‘pull system’ for scheduling and managing operations in a manufacturing plant [R4] and introduction of Lean Six Sigma to an aerospace supplier [R5] gave Make UK confidence that the COMPS framework would deliver significant business performance improvement.

The VFC subsequently equipped Make UK consultants to deploy the COMPS business performance improvement strategy with their clients. Using the double-loop approach, Make UK developed senior company management capabilities around business performance, enabling companies to reduce manufacturing costs through increased product and process innovation, allowing the more rapid introduction of new and innovative products. They eventually used the method to develop company-specific business performance improvement strategies with **319 companies**. The gross value-added outputs of these in-company interventions were measured by applying the Department of Trade and Industry’s ‘Seven Measures of Quality, Cost and Delivery’ (QCD). Each company was benchmarked against the seven QCD measures at the start and end of the business performance improvement strategy and, where possible, up to one year after the business performance improvement strategy ended. Business performance improvement in each QCD measure was given a financial value by the CEO of each company and verified by their accountants. Using this method, Make UK calculated a gross value-added contribution by the VFC to the UK manufacturing industry of **over £30m** (E1).

2. COMPS in Supplier Development and Innovation

VFC research (E2) for the *UK Commission for Employment and Skills* (a) made a significant impact on supply chain development and enhancement. For example it was used to create a **four-tier supply chain network** of medical manufacturing businesses which had never previously worked together (E3). The businesses cooperated as an innovation-focused, self-learning partnership by developing core competencies and aligning capabilities and knowledge. They used these new capabilities to design and develop a **new product concept** for a configurable sling and a **product service system** for medical hoists. At the same time they also piloted the Unified Innovation Model as a blueprint for collaborative working across supply

chains and new product development (E4). The model demonstrates how to manage this collaborative innovation process and measure organisational learning.

Meanwhile, VFC work on Welsh food supply chains commissioned by Welsh Government (b) provided the evidence base (E5) for additional Welsh Government funding of £500k to Make UK, targeted at transforming the productive performance of food businesses in Wales. This project again applied the COMPS paradigm to increase the level of product and process innovation, this time within **41 food companies**. Work is ongoing but initial productivity improvements to April 2019, from 27 of the 41 companies involved show savings of **£1.634 million** (E6), in relation to scrap reduction, space utilization, stock turnover, reduced energy costs and reduced time to market.

In summary, the VFC research has had a significant impact on the efficiency of manufacturing businesses, supplier development and innovation across Wales

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

- [E1] Make UK (Wales) – Letter of support to evidence how Make UK has changed their business improvement intervention strategies and the gross value-added contribution derived from collaboration with the VFC.
- [E2] UK Commission for Employment and Skills CES (2015) <https://www.gov.uk/government/news/innovative-manufacturers-get-government-skills-boost> This evidences the selection of Cardiff Metropolitan University (CSM and PDR) as one of five organisations to receive competitive funding, together with a brief project summary.
- [E3] UK Commission for Employment and Skills (2016) *Tilting the Odds – Skills for Innovation in Manufacturing*. This provides a summary of the Cardiff Metropolitan University project that resulted in the Unified Innovation Model.
- [E4] UK Commission for Employment and Skills (2016) *Evaluation of UK Futures Programme: Final Report on Productions Challenge 4: Skills for Innovation in Manufacturing*. This provides a detailed evaluation of the UKCES projects on skills for innovation in manufacturing. It does not specifically attribute the projects, but the Cardiff Metropolitan University-led Unified Innovation Model project is recorded as Project 4.
- [E5] *Food Supply Chain Study: Report*: Prepared by the Value Flow Centre (January 2017) for Welsh Government – Food Division (Confidential). This report evidences the study undertaken for Welsh Government which led to further Welsh Government funding for Make UK.
- [E6] Make UK (2019) *Phase 3 – Food Productivity Challenge Programme Sector Support – Food & Drink. Brexit Ready - High Growth*. – Internal Project Report (Confidential). This report evidences the link with the previous Food Supply Chain Study and the results of the COMPS-based interventions delivered through Make UK.