Institution:		
Coventry University		
Unit of Assessment:		
12		
Title of case study:		
Team and Collective Training Needs Analysis (TCTNA) application in military training		
Period when the underpinning research was undertaken:		
2013 – 2020		
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:**
Dr John Huddlestone	Associate Professor	April 2013 – present
Jonathan Pike	Visiting Research Fellow	April 2013 – present
Period when the claimed impact occurred:		
2014-2020		
Is this case study continued from a case study submitted in 2014?		
No		

1. Summary of the impact (indicative maximum 100 words)

The Team and Collective Training Needs Analysis (TCTNA) methodology, developed at CU by Huddlestone and Pike, has had a direct impact on the current processes used by armed forces at home and abroad to analyse training requirements for large teams. It has been used to guide the development of collective training objectives of the Royal Navy's new Carrier Strike Group formed around HMS Queen Elizabeth, and within the Royal Air Force. On the basis of advice from the research, the training environment analysis component is now also being used to guide training system acquisition methods by the US Coast Guard.

2. Underpinning research (indicative maximum 500 words)

Training Needs Analysis (TNA) is the name given by UK MOD and NATO partners to the analysis process used to identify training requirements and identify a preferred training solution from a set of viable alternatives. The UK Ministry of Defence (MOD) identified that the extant TNA methodologies, based around individual training development, did not scale effectively to address team and collective (teams of teams) training, hence the TCTNA approach (described in R1-R3) was developed to address this critical training analysis requirement.

Initial research by Huddlestone and Pike at Coventry investigated the benefits and shortcomings of current multi-national collective training and undertook research to develop tools to support the definition and design of such training (R1). One of the key findings was that training objectives did not capture critical interaction requirements between teams, leading to training scenario designs and assessment metrics which did not address these key interactions. Research was conducted which resulted in the development of a novel team task model which was used as a framework to guide the analysis of team interaction requirements (R1). The utility of this model was validated during a workshop with staff from the NATO training Centre in Stavanger, Norway, to re-write examples of NATO training objectives.

Further developments of the TCTNA Methodology (R2) based upon the outcomes of a number of case studies involving UK armed forces in a range of contexts and interviews with military training design and training system acquisition specialists, were subsequently integrated. Two maritime training case studies were conducted to illustrate the use of the methodology and validate the approach. (R2 Appendices E and F)

A central challenge in the effective communication of the methodology was its scale and complexity, which was predicated by the complexity of the problem space. The TCTNA book (R3)

was published in 2016 to put the theoretical underpinnings and model, detailed descriptions of the methodology and illustrative case studies into the public domain as a coherent whole (R3).

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

[R1] Huddlestone, J. and Pike, J. (2013) *Risks and Opportunities in Integration of Joint, Combined and Coalition Training Activities, DHCSTC Report UC_DHCSTC_12_T_T2_001_3 2.* Yeovil: BAE Systems.*

[R2] Huddlestone and Pike (2014) TIN 2.031: *Team and Collective Training Needs Analysis (TCTNA) Methodology Update, Apr 2014, v2. UC-DHCSTC_I2_T_T2_031/004*. Yeovil: BAE Systems. *

[R3] Huddlestone, J.A. and Pike, J. (2016) *Team and Collective Training Needs Analysis – Defining Requirements and Specifying Training Systems*, Boca Ratan, London, New York: CRC Press https://www.routledge.com/Team-and-Collective-Training-Needs-Analysis-Defining-Requirements-and-Specifying/Huddlestone-Pike/p/book/9781138092150 [4 March 2021]

*   R1 and R2 were peer reviewed by MOD Defence Scientific and Technology Laboratory (dstl) Staff as part of the Defence Human Capability Science and Technology Centre technical quality assurance process for research outputs.

[G1] Defence Human Capability Science and Technology Centre (1) TIN 2.001 Task 3.2 Risks and Opportunities in Integration of Joint, Combined and Coalition Training Activities £40K awarded by Ministry of Defence (2) TIN 2.031 Team and Collective Training Needs Analysis (TCTNA) Methodology Update, £60K awarded by Ministry of Defence

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

The innovative analytical approach in the TCTNA methodology has resulted in branches of the armed services in the UK and USA adapting their analysis processes to identify new training requirements. The authors of the work have been invited to provide expert guidance in the implementation of the TCTNA method in the UK and US. In the UK, this work has been commended at the highest levels in the Royal Navy and Royal Air Force for its utility in shaping collective training specifications.

Royal Navy (RN) Impact

A maritime task group, centred on the newly commissioned HMS Queen Elizabeth, is an intensely complex system of systems, which is challenging to control and coordinate, involving over 30 separate platforms (Air, Surface and Sub-surface), utilising over 40 different sensor systems, 20 complex weapon systems and around 3,000 personnel in the task group itself. Key new capabilities are provided by HMS Queen Elizabeth and her embarked Joint Strike Fighters (Fig 1). Consequently, Commander Maritime Forces estimated that "*development of detailed formation level collective training, centred around the Carrier, is an order of magnitude more complex than our current training structure can reasonably deliver.*" (S1)

Impact case study (REF3)

a. **HMS Queen Elizabeth**

b. **JSF 35 Lightning on deck**

Figure 1

Based on awareness of the TCTNA research, RN HQ staff requested guidance on the writing of new collective training objectives for the new carrier group (S1). The TCTNA methodology was used to specify these novel training requirements unique to the new carrier group. The TCTNA methodology was essential in capturing team interactions as critical team process elements. This enabled Navy analysts to distinguish between interactions that occurred within and between different-role specific networks at the task group level and establish where those different networks intersected. Examples of such networks include the anti-air warfare network, centred on two Type 45 destroyers, the underwater warfare network, centred on two Type 23 Frigates, and the strike warfare network centred on the carrier and its embarked squadrons. The Royal Navy Fleet Commander provided a supporting letter stating that the analysis team found the team task model to be particularly valuable in guiding their work (S2). He summarised by stating:

> "In summary, TCTNA principles that you have articulated have been pivotal in guiding our work. The development of training for the task group centred on HMS Queen Elizabeth has been identified as one of the highest priorities for Defence and has my personal attention as well as that of the First and Second Sea Lords. As such, it was imperative that the analysis be conducted to the highest standards and the TCTNA guidance has played no small part in achieving that thus far". (S2)

Furthermore, Commander Maritime Forces appointed Dr Huddlestone as a specialist external advisor to the Training Advisory Group to further inform the team on the application of TCTNA methodology (S4).

Royal Air Force (RAF) Impact

A collective training needs analysis for RAF operational training was conducted during 2017-2018 by a team of contractors under the guidance of the Collective Training Policy Team commanded by the Assistant Chief of Staff Operations, 11 Group, Royal Air Force. He has reported that the TCTNA methodology (R3) was a constant source of reference (S3). Specifically, he has stated that the Team Task Model provided key insights about the criticality of identifying team interactions and that subsequently detailed analysis was conducted to ensure that they were captured in new collective training objectives. He summarises by stating:

> "..the insights provided by your book have been critical to the successful conduct of the Collective Training Needs Analysis of Royal Air Force operational collective training, and consequently, the subsequent design of and delivery of Royal Air Force operational training will benefit significantly from those insights." (S3)

It was further identified that the application of the TCTNA methodology served to specify a change in the RAF training environment:

"A further critical insight from your work was the nature of the dynamic variables which place teams under stress and serve to compound the difficulty of task execution. The factors that you identified were critical in informing the specification of the environmental conditions under which task execution should be practiced, and thus the subsequent specification of the required training environments." (S3)

US Coast Guard (USCG) Impact

Internationally, the TCTNA methodology (R3) has had an impact on US Coast Guard training specification. The Human Performance Support and Training Team Lead in the USCG Human Systems Integration Division invited Dr Huddlestone to run a workshop on TCTNA for USCG training analysts at the USCG Performance Technology Centre in Yorktown VA. Subsequently, she advised that the method has provided the foundation to develop a strategy for analysing performance support systems for team and multi-team training, and that it had provided a construct for the USCG acquisition team to develop requirements for embedded training solutions (S4).

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

[S1] Testimonial letter of support from Commander Maritime Forces and Rear Admiral Surface Ships, Royal Navy (19 November 2018)

[S2] Testimonial letter of support from Fleet Commander, Royal Navy, Royal Navy Fleet Commander (23 May 2019)

[S3] Testimonial letter of support from Assistant Chief of Staff Operations, 11 Group, Royal Air Force (27 Sep 2019)

[S4] Email from Human Performance Support and Training Team Lead, United States Coast Guard Human Systems Integration Division (24 Sep 2019)