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| Personalisation of Learning, a Scoping Study: Final Technical Report |
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# Administration Page

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Executive Summary

### Background

The Future Workforce and Human Performance Programme (FWaHP) has a requirement to improve understanding of the implications of introducing personalisation of learning (PL) across Defence Training and Education (T&E). This research study will provide guidance as to the types of personalised learning approaches which the Defence Enterprise will be ready to exploit within the next 10 years, helping to shape Defence aspirations for PL and driving the debate and decision-making for PL in Defence T&E which will be developed across the next 10-15 years. The focus of this project is military training and education, but consideration is given to the Whole Force (e.g. Reservists, Civil Service), for example, where an improved understanding of the learning and development ecosystem could enable efficiency in the Defence Enterprise. PL in a team/collective training context was not in scope for this project.

### Aim and Objectives

The main aims for the outputs of this research are to establish the state of the art with regards to PL and to understand and shape Defence aspirations for PL. The three research objectives for this scoping study are: to identify existing evidence of novel and/or disruptive methods and approaches to PL; the implications of these techniques for Defence; and, to report ways to measure their impact. The findings of the first research objective are presented in detail in an interim report (Mundy and Deighton, 2019). This report summarises those findings and then presents and discusses the findings of the second and third research objectives regarding the implications of implementing PL approaches within the Defence learning and development ecosystem, setting out conclusions and recommendations for next steps.

### Technical Approach

In the first phase of the study, data were gathered through a Rapid Evidence Assessment (REA) of recent literature on PL which identified definitions, models, theories and state of the art approaches. Consultation with 17 Defence and Single Service stakeholders at training directorate level identified Defence perspectives and aspirations for PL, and current or planned innovations in training. This included a sample of eight Defence cases where PL approaches were already being implemented. A thematic analysis and team-based workshops were conducted to establish a working definition and model of PL; broad themes were also identified regarding what may need to be put in place to support the effective deployment and sustainability of different PL approaches in a Defence context. In the second phase of the study, these themes were explored in more depth in three of the identified Defence cases and developed and refined during a one- day stakeholder workshop. The findings were organised as a set of eight key influences on PL and these were developed further into a framework that can be used by Defence to inform decision-making relating to the deployment and sustainability of PL initiatives.

### Key Findings

Based on a review of the range of PL definitions and descriptions found in the REA and subsequent consultation with Defence stakeholders, the study concluded that PL should be defined as a process, rather than as a product or state, and that it should be directly linked to one or more of the following organisational goals:

* Training efficiency (e.g. reductions in time to competence, training costs, skill fade).
* Operational effectiveness (e.g. retention and learning transfer; increased competence in role; agility in role).
* Learner achievement (e.g. increased student knowledge, skills, competence).
* Learner engagement (e.g. increased student enrolment, attendance, completion).
* Learning culture (e.g. inclusion, lifelong learning, self-regulated learning).

The following definition of PL was developed and applied in this study:

*Personalisation of learning (PL) is the orchestration of a customised learning experience that is tailored for and/or adapted to the requirements of the individual learner, in order to optimise learning outcomes in line with the organisational goal(s).*



*Main Components of the PL model*

In the PL model shown in the diagram on the left, the learner is the constant, while the variables of environment, teacher and technology may be orchestrated in a wide range of ways to achieve the customised learning experience.

Each PL approach is characterised by a different combination of ‘learner variables’ (i.e. the personal factors considered, e.g. learner preferences, aptitude, previous experience) and ‘learning variables’ (i.e. what was personalised, e.g. learning content, aims/objectives, pace/duration).

These are influenced by the organisational goal(s) to be achieved and they influence, in turn, the way in which the variable components of the PL model are combined.

Underpinning this PL model are educational and psychological theories which situate the learner at the centre, but which also emphasise the role of the three variable PL components in supporting an effective learning experience.

The role of the learner in self-regulating their learning was seen as an overarching concept for PL, but this was strongly caveated by the need for scaffolding to support the development of these self-regulatory skills.

Assessment for learning (AFL) was also identified as a fundamental element for any PL approach. This not only informed the teacher and/or the technology of learner progress and needs, but also supported development of the learner’s cognition, metacognition and motivation, all of which underpin self-regulation of learning (SRL).

The importance of learning analytics in PL was a strong theme, which was linked in some literature to competency-based learning theories. In these cases, competency frameworks provided ways of collecting, measuring and sharing data across various technology platforms in order to manage individual performance data and provide learners with a way of visualising progress towards their career objectives.

The PL examples identified from the REA and Defence cases demonstrated a broad range of approaches linked to differing organisational goals. Seven categories of PL approaches were identified, of which two were evident in the Defence cases; these were:

* + Blended Learning Environments - an environment which connects Learner, Teacher and Technology to enable a range of teaching and learning strategies, including PL; and,
  + Teacher Strategies – where the teacher employs a range of strategies to identify and target individual learning needs and preferences, e.g. AFL, differentiation, coaching.

The remaining five PL categories, identified from the REA, were technology-based and were at the prototype or early-adopter stage; these were:

* + Learning Ecosystems – which bring together the PL model components of Learner, Environment, Teacher and Technology as a mutually supporting system within an organisation which enables PL pathways, addressing development, performance, talent management and career progression;
  + Personal Learning Assistants (PLA) – embodied pedagogical virtual agents, which act as a guide, with a library of curated learning resources focused either on teaching or refreshing a specific subject, or on providing advice and guidance on a career topic;
  + Intelligent Tutoring Systems (ITS) – adaptive, personalised instructional systems designed to mimic one-on-one human tutoring;
  + Adaptive Learning Systems (ALS) – learning technologies which monitor student progress, using data to modify instruction at any time; and,
  + Brain-Computer Interface (BCI) – interface devices which acquire and transform neural signals into actions intended by the user.

While there was some anecdotal evidence with regard to those approaches at the prototype stage for benefits to be realised, there was insufficient empirical evidence at this time to show that the level of benefit achieved would outweigh the time, cost and resource required to develop them at scale.

Other approaches were more established and offered a greater insight into the known benefits and challenges of implementing PL on a larger scale. For PL examples which exploited novel technologies, a key theme relating to potential benefits was amplification of subject matter expertise (SME). ITS were found to be highly effective for delivering complex subjects such as Science, Technology, Engineering and Mathematics (STEM) and had the potential to capture specific human SME knowledge and skills, delivering these in a one-to-one tutoring context on a much larger scale and in a more consistent way than would otherwise be possible with human tutors. PLA hosted on mobile devices also had the potential to allow similar amplification of SME, for example, by giving large-scale access to mentor advice and guidance on career options. The main challenge for achieving this benefit was the amount of developer and SME time required to develop these systems and to tune their complex adaptive models through iterative empirical testing. There was strong consensus across the literature that further research was needed to fully understand the implications of implementing these PL approaches at scale.

Reduction in training time was another strong benefit theme which emerged from both the REA and Defence cases. Examples of innovative technologies included both ITS prototypes and complex ALS systems, but there were also examples in Defence cases of more established learning technologies achieving similar benefits ( for example, using Computer Assisted Instruction to adjust the pace of learning (e.g. Fixed Mastery, Variable Time (FMVT)) and initial diagnostic assessment to adjust the learning content of a course based on prior knowledge (e.g. Set Your Own Agenda (SYOA)). The main challenges here were identified specifically by Defence stakeholders and included: the nature of the training pipeline, i.e. the need in some cases to manage learners who completed training early; and, the potential risks involved in allowing learners to ‘skip’ training objectives based solely on technology-based diagnostic assessment (e.g. SYOA).

Increased learner engagement was also identified as a benefit of using ALS and ITS; learning content could be adapted to a slower pace to suit learners who needed more time, while those who grasped concepts more quickly would experience less frustration if they were able to move through learning at a faster pace. Again, more established examples such as FMVT and SYOA

highlighted similar benefits for their learners, but in these cases the PL model included a (human) Teacher component for those who needed additional support and scaffolding. In the novel approaches such as ALS and ITS, designers anticipated that the technology would be smart enough to provide this scaffolding and support.

Increased learner achievement and retention of learning was identified as a benefit in most of the PL examples and was linked to a number of factors including the scaffolding/learner support provided by the PL approach and improved learner engagement and motivation, e.g. by allowing self-paced learning. Challenges included ensuring that teachers/trainers had the right knowledge and skills to support the implementation of PL approaches, e.g. facilitation and coaching skills; understanding of AFL and differentiation techniques.

From a Defence perspective, the requirement is for a capable, motivated, balanced and sustainable workforce that is agile, adaptable and affordable through a Whole Force Approach. The key drivers for PL are therefore human capability and operational effectiveness, aiming for a ‘people capability framework’. The development and implementation of such a framework was considered by Defence stakeholders to be in progress, linked to specific single Service and Defence projects1. The opportunities for training efficiencies and for increased training effectiveness enabled by PL were recognised; this was evident in the priorities for education and training and in the aspirations of the single Service and Defence projects as identified in stakeholder consultation. The current innovations identified in Defence tended to include PL models with a greater focus on the trainer, e.g. coaching programmes in Phase 1 training using a tailored AFL model (Target Learning Model) or coaching in conjunction with learning technology, e.g. the FMVT approach used in Phase 2 training at the Royal Military School of Engineering (RSME). In these cases, there was an emphasis on preparing trainers to adopt a more facilitative approach, so that they were able to conduct effective AFL, scaffolding the learner where necessary while encouraging the development of SRL skills. A strong theme in terms of challenges across all the examples was that the right conditions (e.g. culture, infrastructure, resource) needed to be in place for effective implementation of PL to happen.

Based on these findings, a prototype 8-step process is offered to support Defence decision- making relating to the implementation and sustainability of PL. Early steps in this process include an identification of organisational goals, measures of success and relevant ‘learner variables’ and ‘learning variables’. This is followed by the selection of relevant PL components (i.e. learner, teacher, environment, technology); and a description of the candidate PL approach (drawing on existing case examples). Final steps include a systematic assessment of what might influence the implementation of the PL concept within the organisation, a consideration of the maturity of the organisation (i.e. a simple gap analysis), and concluding with the requirement to develop an implementation plan. The process is supported by an influence matrix which provides a set of 36 statements (or elements) relating to what needs to be put in place within an organisation to enable PL.

Conclusions and next steps relate to the following seven key areas:

1 Programme Castle (Army); Project Selborne (Royal Navy); Programme Socrates (Royal Air Force).

1. Identify strategic drivers for PL and undertake ‘horizon scanning’ activities to ensure that Defence is provided with an on-going understanding of future developments and potential benefits and challenges relating to PL.
2. Collect evidence relating to PL through experimentation and longitudinal studies. Such trials may be conducted within controlled environments to investigate specific ‘learner variables’ or ‘learning variables’, or undertaken collaboratively with Defence learning establishments.
3. Develop a suite of measures and metrics that may be applied for differing purposes ranging from an assessment of business outcomes and PL-related benefits, to the influences represented by the 36 PL elements; and improvements in learning and the learner experience.
4. Investigate AFL regimes. This may include a review of current practices that are applied to assess the knowledge, skills, behaviours, experience and other attributes which are relevant to deciding on an individual’s subsequent learning requirement(s) and pathway.
5. Investigate alternative approaches to media and methods analysis. The implementation of PL brings with it a need to ‘strengthen’ particular types of learning approaches to implement (more widely) modern learning methods along with the requirement for learning analytics and new and emerging technology-based approaches. Ways to ensure that such approaches are integrated appropriately and are relevant and valid given the learning requirement are required.
6. Develop understanding of the risks associated with the adoption of a PL approach. A range of challenges and benefits associated with PL have been identified. There is a need to collate and develop this information to inform a set of exemplar risk statements that may be used to inform early stages in future learning needs analysis processes.
7. Mature the PL Decision Support Process. The scoping study has offered a prototype eight-step process and supporting ‘PL Influence matrix’ to inform decision-making relating to the adoption of PL approaches. A next step is to ‘test’ and mature this process.

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# Introduction

### Background

* + 1. In the last decade, the capability of learning technologies to deliver a more personalised approach to learning has increased significantly and this has influenced training and learning strategies, not only in education but also in the wider industry and public sectors. Drivers for personalisation of learning (PL) in the UK education sector are geared to the development of a strong national skills base, through inclusion and academic achievement. As the capabilities of technology have developed, drivers linked to recruitment, retention and performance/talent management have also begun to emerge for both public and private sector organisations.
    2. The Dstl Future Workforce and Human Performance Programme (FWaHP) has a requirement to improve understanding of the implications of introducing PL across Defence Training and Education (T&E). This research study will provide guidance as to the types of PL approaches which the Defence Enterprise will be ready to exploit within the next 10 years, helping to shape Defence aspirations for PL and driving the debate and decision- making for PL in Defence T&E which will be developed across the next 10-15 years.
    3. The focus for this project is military T&E, but consideration is given to the Whole Force (e.g. Reservists, Civil Service), for example, where an improved understanding of the learning and development ecosystem could enable efficiency in the Defence Enterprise. PL in a team/collective training context was not in scope for this project.
    4. The research reported is the product of a 6-month scoping study, conducted during the period January to July 2019. The work comprised:
       - A Rapid Evidence Assessment (REA) of approximately 80 academic papers including 30 PL case studies, of which nine included examples of controlled studies of PL approaches; the remainder were either uncontrolled studies or prototype design projects (see Appendix [A.2.2](#_bookmark62));
       - The development of a definition and model of PL, based on the findings of the REA and consultation with Defence stakeholders (see sub-sections [2.2](#_bookmark14) - [2.3](#_bookmark16));
       - Structured engagement with stakeholders across Defence and single Service training directorates and a sample of Defence training establishments. A total of 14 engagements, involving 17 participants, were achieved over a 2-month period from February to March 2019 (see Appendix [A.2.3.4](#_bookmark65));
       - An identification and description of eight example Defence cases where PL initiatives are in place, or being considered, and a detailed description of three of these cases (see Appendix [E](#_bookmark87));
       - A stakeholder workshop, involving 12 participants, to consolidate findings and to determine factors influencing the implementation and sustainability of PL initiatives (see Appendix [C](#_bookmark73)); and,
       - Thematic analysis of qualitative information to inform the development of a PL Decision Support Process and Influence Matrix (see sub-section [4](#_bookmark41)).

### Aim and Objectives

* + 1. The project aims were to establish the state of the art with regards to PL, and to understand and shape Defence aspirations for PL. The three research objectives were to identify:
       - existing evidence of novel and/or disruptive methods and approaches to PL (in defence and non-defence domains);
       - the implications of these techniques for Defence (including impact on training policy, process and protocols, and potential benefits/risks); and,
       - ways to measure their impact.
    2. The findings of the first research objective are presented in detail in an interim report (Mundy and Deighton, 2019). This final report summarises the findings of the interim report and then presents and discusses the findings of the second and third research objectives regarding the implications of implementing PL approaches within the Defence learning and development ecosystem. The purpose of this report is to draw together the findings for all three research objectives, setting out conclusions and recommendations to inform next steps for Defence.

### Technical Approach

[Figure 1-1](#_bookmark9) summarises the four Work Packages (WP) involved in this project. A full description of the technical approach is set out in Appendix [A](#_bookmark58).



*Figure 1-1: Summary of Technical Approach*

### Research Assets

* + 1. Research assets are the particular products of the research which have the potential to be reused by other related research activities (e.g. a literature review, definitions, research questionnaires) and/or exploited into policy, processes or working practices. Assets may be planned as an explicit output of the research requirement, or emergent given the

constraints, or opportunities arising when conducting the research. This scoping research generated the following assets:

* + - * A Rapid Evidence Assessment (REA) of the literature on the topic of PL, including a review of c80 papers and articles on the topic (see interim report – Mundy and Deighton, 2019);
      * A working definition of PL, a PL model, and description of strategic objectives (see sub-section [2.1](#_bookmark13));
      * A table summarising seven main PL approaches informed by the findings of the literature review, and a summary of key benefits and challenges of PL (sub-section [2.5](#_bookmark25));
      * Defence perspectives relating to PL based on stakeholder engagement (see Section [3](#_bookmark29));
      * A table presenting the benefits and challenges of PL in example Defence cases (see Appendix [D](#_bookmark85));
      * A prototype influence matrix identifying eight key factors (and 36 elements) with the potential to influence the effective implementation and sustainability of PL (see Appendix [F](#_bookmark100));
      * A prototype PL Decision Support Process underpinned by the evidence gathered as a result of the research (see sub-section [4.3](#_bookmark45)); and,
      * A set of conclusions and next steps, including stakeholder areas of interest, informing decision-making relating to the follow-on research requirement (see Section [5](#_bookmark49)).

### Report Structure

* + 1. Following the Executive Summary and this Introduction, the remainder of this report is structured as follows:
       - Section [2](#_bookmark12) summarises the characteristics and influences relating to the PL model.
       - Section [3](#_bookmark29) presents the Defence perspective on implementing PL and measuring its success.
       - Section [4](#_bookmark41) presents a decision-making framework for implementing PL in a Defence context for short term impact and longer term investment.
       - Section [5](#_bookmark49) draws conclusions from the scoping study work and looks forward to next steps in the investigation of PL.
    2. The Appendices to this report provide supporting qualitative data and analyses from stakeholder consultation and from the REA. The reader is referred to the Interim report for a detailed description of the outputs of WPs 1 and 2.

# PL Characteristics

### Overview

* + 1. The concept of PL is not a new one and there is considerable literature on the topic from the 1980s onwards. The defined purposes, processes and products of PL found in the REA were quite varied and so a working definition was developed for this study, based on a review of 15 definitions2 taken from the literature, including education policy documents from the UK and United States (US). This working definition was then reviewed and refined in consultation with Defence stakeholders, in order to provide a clear baseline from which to develop an understanding of PL and its implications for Defence T&E.
    2. The findings of the REA also highlighted that while there were many different perspectives and approaches to PL, there were a number of common drivers and variables, and supporting educational and psychological theories, which influenced the design and implementation of PL. This enabled the development in this study of high-level models and concepts which could be used to identify and/or describe PL approaches in a more consistent way, underpinning the development of a more detailed PL Decision Support tool (see section [4](#_bookmark41)).
    3. This section first sets out the definition of PL that was established by the scoping study and then describes a model from which all PL approaches can be described at the highest level. The section then goes on to identify the organisational goals which drive the decision to implement PL, and the variable factors and learning theories which influence the design of different PL approaches. A more detailed description of the analyses behind these findings is set out in the interim report (Mundy and Deighton, 2019).

### Definition

* + 1. Based on the findings of this scoping study, PL is defined as a process which is directly linked to one or more of the following organisational goals3:
       - Training efficiency (e.g. reductions in time to competence, training costs, skill fade).
       - Operational effectiveness (e.g. retention and learning transfer; increased competence in role; agility in role).
       - Learner achievement (e.g. increased student knowledge, skills, competence).
       - Learner engagement (e.g. increased student enrolment, attendance, completion).
       - Learning culture (e.g. inclusion, lifelong learning, self-regulated learning).
    2. The definition of PL that has been developed and applied to this study is:

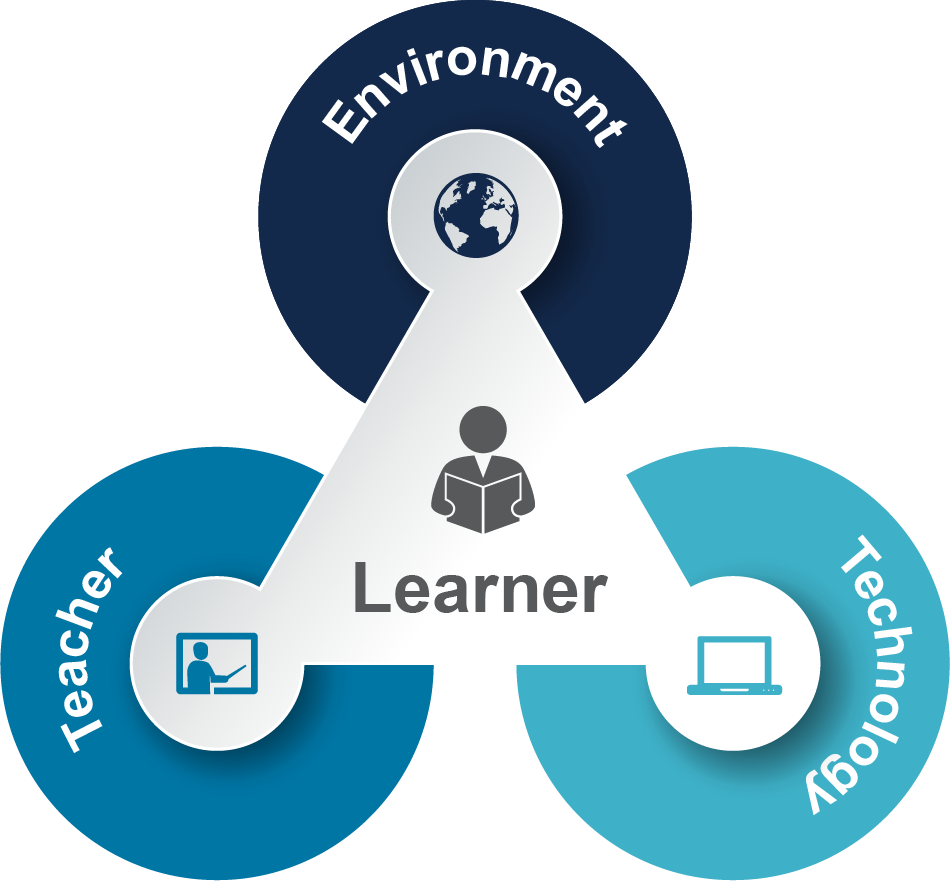
*“…the orchestration of a customised learning experience that is tailored for and/or adapted to the requirements of the individual learner, in order to optimise learning outcomes in line with the organisational goal(s).”*

2 These included definitions of: personalised learning, PL, adaptive training, differentiation, and accelerated learning.

3 This list is considered to be exhaustive, based on thorough review of the REA and stakeholder engagement, including workshops.

### The PL Model

* + 1. At its highest level of definition, the PL model (see [Figure 2-1](#_bookmark17)) includes four main components; the Learner is a constant at the centre of the model, while the variables of Environment, Teacher and Technology are combined and orchestrated in a wide range of ways to achieve the customised learning experience. Note that while advances in learning technology have strongly influenced more recent PL approaches, not all versions of PL include technology as a variable; in some cases PL may be the interaction solely between the learner and the teacher, or the learner and their environment.



*Figure 2-1: Main Components of the PL Model*

* + 1. The evidence from the REA and from consultation with Defence stakeholders illustrated the many different dimensions and perspectives of PL that exist. However, the underpinning principle in all cases was that the learner exercised greater control and ownership over the learning experience. The defining factor for the PL approach in each case was the organisational goal(s) (see sub-section [2.2.1](#_bookmark15)), which then influenced how different ‘learner variables’ (i.e. the personal factors considered) and ‘learning variables’ (i.e. what was personalised) were combined and how the PL process was orchestrated. [Table 2-1](#_bookmark18) sets out examples of the main ‘learner variables’ and ‘learning variables’, and [Table 2-2](#_bookmark19) shows simplified examples of PL design based on organisational goals.

*Table 2-1: Examples of ‘Learner Variables’ and ‘Learning Variables’*

|  |  |
| --- | --- |
| **‘Learner Variables’ (personal factors considered)** | **‘Learning Variables’ (what was personalised)** |
| Learning needs | Aims/objectives of learning |
| Learning styles/preferences | Learning content |
| Interests/goals | Timing of learning |
| Previous experience | Pace/duration of learning |
| Aptitude | Place of learning |
| Current skills/knowledge | Learning/teaching strategy |

*Table 2-2: Examples of PL Based on the Organisational Goals*

|  |  |
| --- | --- |
| **Organisational Goal** | **Personalisation Strategy** |
| **Training Efficiency**: e.g. all students must reach the target level of required competence in the fastest time possible and/or with the least resource. | Tailor learning content according to individual learner knowledge and experience. This may involve adapting delivery method, pace, or duration based on how quickly the learner absorbs knowledge, grasps concepts and acquires skills.  Learner is directed to complete learning when competence level is reached. |
| **Operational Effectiveness**:  e.g. maintain highest standards of competence and compliance in the workforce. | Tailor learning content according to individual roles, responsibilities and levels of competence and confidence. Adapt place of learning and teaching strategies to fit individual workflows, timing learning for moments of need. Learner is ‘nudged’/supported to complete learning on a ‘just in time’ basis to develop and maintain required standards. |
| **Learner Achievement**: e.g. ensure students reach their full potential in each learning intervention. | Adapt learning content according to learner progress, providing progressively higher goals as knowledge and skills are demonstrated and competence increases. Focus on encouraging mastery (doing the best I can). |
| **Learner Engagement**: e.g. ensure as many students as possible qualify in a particular capability area. | Adapt learning strategy/pace of learning according to individual learner needs and preferences. Adapt duration of learning based on how quickly the learner absorbs knowledge, grasps concepts and acquires skills. Learner is encouraged and supported to complete learning in their own way. |

|  |  |
| --- | --- |
| **Organisational Goal** | **Personalisation Strategy** |
| **Learning Culture**: e.g. talent manage and develop workforce through-career to reach their full potential. | Tailor aims/objectives of learning according to learner interests and personal goals. Tailor learning environment to suit learner preferences; adapt as required to develop self-regulatory skills and to respond to learning needs/opportunities and any changes in preferences and goals. Learner chooses when to engage with and complete learning. |

### Considerations for PL Design

* + 1. In addition to the organisational goals and the ‘learner/learning variables’ described in sub- section [2.3](#_bookmark16), a number of educational and psychological theories were identified from the REA that can have an influence on the design of PL approaches. These are summarised in this sub-section and described in more detail in the interim report (Mundy and Deighton, 2019).
    2. Catering for individual learning preferences was a key design factor in the PL examples identified from the REA and Defence cases, which required that the learner should have choice in how the learning was presented, including media, method and pace. Many of the PL examples gave even greater learner control by personalising learning content and learning pathways to acknowledge prior learning, experience and/or levels of aptitude. In some examples from the REA, learners were supported to develop their own highly personalised learning networks, exploiting social media technologies to provide ubiquitous access to ideas, resources and communities, allowing them to self-direct their learning, finding and applying knowledge when and where it was needed. This aligns with the relatively recent Connectivist4 pedagogical theory.
    3. This emphasis on learner autonomy and control drives the actions and processes of self- regulated learning (SRL) and requires a certain level of self-awareness, self-motivation and behavioural skill from the learner. SRL shifts responsibilities from the teacher to the learner, meaning that learners need to be able to reflect on their own learning, make sense of what they have learned and understand how they learn best. Metacognition (the ways in which learners monitor and purposefully direct their learning) is central to SRL, but metacognitive processes are dependent on the self-regulatory skills5 possessed by the learner and on their levels of motivation (e.g. self-efficacy, engagement).
    4. In the PL examples from the REA and the Defence cases, ‘scaffolding’6 for SRL was a common factor influencing design of PL approaches, to ensure that learners were

4 Connectivist approaches to teaching and learning assume that learners have ubiquitous access to networked technologies and focus on building and maintaining networked connections that are relevant, current and flexible enough to support student-centred learning (McLoughlin, 2013).

5 For example, goal setting, monitoring progress, time management, self-evaluating, and adapting method (Zimmerman, 2002).

6 Instructional scaffolding refers to the successive levels of temporary support which assist students to reach higher levels of comprehension and skill acquisition. These supportive strategies are incrementally removed when they are no longer needed, and increasingly greater responsibility over the learning process is shifted to the student.

adequately supported both to complete their learning and to further develop their self- regulatory skills. Findings from the consultation with Defence stakeholders also indicated a perceived correlation between rank/career stage and learners’ readiness for SRL. Officers and more senior non-commissioned officers (NCOs) were assumed to possess better self-regulatory skills and motivation (see also sub-section [3.3.2.4](#_bookmark36)), therefore needing less scaffolding in PL approaches.

* + 1. Feedback based on assessment is a key factor in developing metacognition and motivation to learn. AFL7 was an essential element of scaffolding in the PL examples, which allowed the teacher/technology to adapt the delivery to suit the learner’s progress while helping the learner to self-assess and thus further develop their self-regulatory skills. The accuracy of feedback and the way in which it is presented to the learner is critical for developing these skills and for increasing learner motivation. This ability to measure progress and achievement and deliver effective feedback is an important skill for teachers, but presents an even greater challenge as learning becomes more personalised and moves away from the classroom. There has been a growing focus across all sectors on measuring learning and learning analytics8, which aims to monitor the learning process in order to support students, but also to predict their future performance and adapt learning interventions accordingly. This might be as simple as tracking learner activity and progress during an online learning module, or as complex as collecting data on formal and informal learning over an extended period of time, to monitor career progress and experience levels of individuals. Several of the PL examples from the REA described systems which used xAPI9 (or Experience API) as part of a PL approach to collect long term data on individuals’ learning experiences, both online and offline. These data are held in a Learning Record Store (LRS) to support the assessment and tailoring of learning (see also sub-sections

[3.3.5.3](#_bookmark38) and [3.3.6.3](#_bookmark39)), but are also available to be leveraged within Big Data analytics to discover trends over time.

* + 1. In order to manage individual performance data and provide learners with a way of visualising progress towards their career objectives, it is important that the data can be collected and shared in a meaningful way across various technology platforms. PL examples from the REA and in Defence cases identified the need to agree upon standardised competencies with defined stages of learning which allowed learner experience and performance to be accurately and efficiently captured. The assessment of critical job competencies and current proficiency levels across a continuum (e.g. entry level to mastery) was seen to offer significant long-term advantages in maximising training budgets and developing skill mastery through career. Sharing this information across different databases and instructional technologies allowed performance needs to be identified and training to be individually targeted at identified deficiencies, but also had the potential to inform a better understanding of operational capability at any given time (see also sub-section [3.3.4.4](#_bookmark37)).

7 AFL can include initial, diagnostic and formative assessments (e.g. teacher feedback, self- assessment and peer assessment) as opposed to assessment of learning which refers to summative testing.

8 Learning analytics are defined as “the measurement, collection, analysis and reporting of data about learners and their contexts for purposes of understanding and optimising learning and the environments in which it occurs.” (Sclater et al, 2016: p. 14)

9 xAPI is an eLearning specification that makes it possible to collect data about the wide range of experiences a person has within online and offline training activities - <https://xapi.com/>.

### PL Approaches Identified

* + 1. There were a wide range of examples of PL approaches in the literature and in Defence cases which claimed to achieve a variety of benefits; the main themes were organised under seven headings, these are listed in [Table 2-3](#_bookmark26) and described in more detail in the interim report (Mundy and Deighton, 2019).

*Table 2-3: Summary of Main Themes for PL Approaches Identified*

|  |  |
| --- | --- |
| **PL Approach** | **Description** |
| Learning Ecosystem | Brings together the PL model components of Learner, Environment, Teacher and Technology as a mutually supporting system within an organisation which enables PL pathways, addressing development, performance, talent management and career progression (Driesen, 2019). |
| Blended Learning Environment | An environment which connects Learner, Teacher and Technology to enable a range of teaching and learning strategies, including PL (Price, 2015). |
| Teacher Support Strategies | Teacher employs a range of strategies to identify and target individual learning needs and preferences, e.g. assessment for learning (AFL), differentiation, coaching (Petty, 2019). |
| Personal Learning Assistant (PLA) | An embodied pedagogical virtual agent, often on a mobile device, that acts as a guide, with a library of curated learning resources which focus either on teaching or refreshing a specific subject, or on providing advice and guidance on a career topic (Nye et al, 2017). |
| Intelligent Tutoring System (ITS) | Adaptive, personalised instructional systems designed to mimic one-on-one human tutoring. ITS support ‘learning by doing’, offering guidance and explanations, pointing out errors and tailoring the curriculum as students work on computer-based problems or simulations of real world tasks (Holmes et al, 2018). |
| Adaptive Learning Systems (ALS) | Learning platforms which dynamically adjust to the level or type of course content based on an individual learner’s abilities or skill attainment, in ways that accelerate the learner’s performance (Adams Becker et al, 2018). |
| Brain-Computer Interface (BCI) | Devices which establish a direct communication pathway with the brain to acquire and transform neural signals into actions intended by the user (Governale, 2017). |

### Benefits and Challenges of PL Approaches

* + 1. Intended outcomes for the examples in [Table 2-3](#_bookmark26) focused on both training efficiency and effectiveness, but also acknowledged the benefit of learners developing self-regulated learning skills. Some of the technology-based approaches were being tested at prototype stage and so, while there was some anecdotal evidence of the potential for benefits to be realised, there was insufficient empirical evidence to show that the level of benefit achieved would outweigh the time, cost and resource required to develop them at scale. Other approaches were more established and offered a greater insight into the known benefits and challenges of implementing PL on a larger scale. Examples of these cases are shown in Appendix [D,](#_bookmark85) [Table D-1](#_bookmark86) and a summary of the main themes (not in any prioritised order) relating to benefits and associated challenges is provided in the following sub-sections.
    2. **Amplification of subject matter expertise**: For PL examples which exploited novel technologies, a key theme in the literature relating to potential benefits was amplification of subject matter expertise10. Authors reflected on the importance of this benefit given the limited availability of Subject Matter Experts (SME) to act as tutors, teachers and mentors specifically for highly technical or niche subjects. Defence stakeholders similarly reflected on the need to retain their best SMEs for operational roles, meaning that they could not always be exploited to share their experience and expertise in a training role. ITS (see [Table 2-3](#_bookmark26)) were found to be highly effective for delivering complex subjects such as Science, Technology, Engineering and Mathematics (STEM). Research examples demonstrated the potential to capture specific human SME knowledge and skills, delivering these in a one-to-one tutoring context on a much larger scale and in a more consistent way than would otherwise be possible with human tutors. There were examples of PLA ([Table 2-3](#_bookmark26)) hosted on mobile devices which had the potential to allow similar amplification of SME by giving large-scale access to mentor advice and guidance on career options, e.g. in trailblazer situations, to support recruitment programmes. The main challenge for achieving this benefit was the amount of developer and SME time required to develop these systems and to tune their complex adaptive models through iterative empirical testing. Authors of some of the research examples from the REA argued that this cost would be outweighed by efficiency benefits in the longer term. However, there was no empirical evidence of this in the literature and cost benefit analysis was highlighted by stakeholders involved in these research examples as a desirable research outcome.
    3. **Reduction in training time** was another strong benefit theme which emerged from both the REA and Defence cases. This was particularly relevant in defence-related cases, where organisations looked to maintain training effectiveness while reducing training costs. Examples included both knowledge-based and skills-based learning; one ITS prototype for teaching information technology to US Navy ratings achieved a reduction in training from

35 to 16 weeks with improved learner outcomes (Fletcher et al, 2014). Another ITS prototype for delivering gunnery crew training saw a reduction in training time on average of 40% with comparable learner outcomes to other training approaches (Long et al, 2015). There were several examples in the literature of complex Adaptive Learning Systems (ALS; see [Table 2-3](#_bookmark26)) which personalised learning content and media throughout the learning process to match learner progress and allow learners to complete modules at their own pace, particularly in higher education. There were also examples in UK Defence cases of more established learning technologies achieving similar benefits, for example, using Computer Assisted Instruction (CAI) to adjust the pace of learning (e.g. Fixed Mastery, Variable Time (FMVT)) and initial diagnostic assessment to adjust the learning content of a course based on prior knowledge (e.g. Set Your Own Agenda (SYOA)). The main

10 I.e. providing virtual access to human SME knowledge and expertise across a much wider audience.

challenges here were identified specifically by Defence stakeholders and included: the nature of the training pipeline (i.e. the need in some cases to manage learners who completed training early; and, the potential risks involved in allowing learners to ‘skip’ training objectives based solely on technology-based diagnostic assessment (e.g. SYOA).

* + 1. **Increased learner engagement** was also identified as a benefit of using ALS and ITS; learning content could be adapted to a slower pace to suit learners who needed more time, while those who grasped concepts more quickly would experience less frustration if they were able to move through learning at a faster pace. It was suggested that this could improve attraction and retention for training courses, with one university in the US claiming that their adaptive learning platform had contributed to an increase in student retention from 86% to 95% (see [Table D-1](#_bookmark86), Example 3). Again, more established examples such as FMVT and SYOA highlighted similar benefits for their learners, but in these cases the PL model included a (human) Teacher component for those who needed additional support and scaffolding. In the novel approaches such as ALS and ITS, designers anticipated that the technology would be smart enough to provide this scaffolding and support.
    2. **Increased learner achievement and retention of learning** was identified as a benefit in several of the PL examples (see Appendix [D,](#_bookmark85) [Table D-1](#_bookmark86)) and was linked to a number of factors including the scaffolding/learner support provided by the PL approach and improved learner engagement and motivation, e.g. by allowing self-paced learning. In the PL models where Learner and Teacher were the only components, the focus of the benefits was primarily on increasing learner motivation and engagement in order to optimise achievement. Challenges included ensuring that teachers/trainers had the right knowledge and skills to support the implementation of PL approaches, e.g.: facilitation and coaching skills; understanding of AFL and differentiation techniques.
    3. **Develop the skills and motivation necessary for SRL**: Higher education organisations in particular saw a lack of SRL skills in students as a challenge to implementing more flexible approaches to learning, potentially leading to lower performance and higher rates of dropout (Pogorskiy et al, 2018). The use of scaffolding in PL approaches was seen as helping to develop the skills and motivation necessary for SRL; again, the challenge was in ensuring that the Teacher and/or Technology were able to assess levels of SRL and respond appropriately to compensate but also to improve SRL skills as part of the learning process.
    4. A strong theme in terms of challenges across all the examples was that the right conditions (e.g. culture, infrastructure, resource) needed to be in place for effective implementation of PL to happen. For example, Defence stakeholders highlighted the lack of ‘headroom’ available to spend time developing trainers to support PL approaches. Inadequate, inflexible or unreliable technical infrastructure was also identified from the REA and in Defence cases as a potential barrier to implementing PL effectively. One of the main challenges highlighted in the literature for implementation of PL was the learning culture of the organisation, i.e. the teachers’/trainers’ readiness for change, the learners’ readiness for SRL and the policies in place which supported or constrained changes to training approaches, e.g. IT security policy. Digital literacy was seen as part of this challenge; both teachers and learners needed to be confident in their abilities to fully exploit the capabilities of technology within their own organisational learning ecosystem while operating within a blended or online learning setting in a safe, appropriate and responsible way.

# Defence Perspectives on PL

### Summary

* + 1. This section provides a snapshot of Defence perspectives on PL based on the findings of: a desktop review of existing and draft Defence policy and strategy documents11; previous Defence-related research reports; and, qualitative interviews conducted with 14 Defence stakeholder organisations, including eight defence cases where PL had been deployed. These cases varied in terms of training phase and the presence of the key components of the PL model (see [Figure 2-1](#_bookmark17)) and are described in more detail in the interim report (Mundy and Deighton, 2019). Three of the cases were subsequently explored in detail, these are outlined in Appendix [E](#_bookmark87).

### Defence Vision and Programmes

* + 1. From a Defence perspective, human capability and operational effectiveness were identified as the key drivers for PL. People are seen as central to Defence’s priorities; the requirement is for a capable, motivated, balanced and sustainable workforce that is agile, adaptable and affordable through a Whole Force Approach (MOD publication, 2016). People Strategic Objective (PSO) 2 of the Defence People Strategy is ‘Skilled and Capable’, which is achieved through activities including: “a training system that delivers the right number of people to cost, quality and time, to meet Defence outputs,” and, “develop and support a culture of personal development.” (MOD publication, 2016: p 4).
    2. The vision is for agile, co-ordinated training pipelines and flexible, personalised through- career learning pathways which manage the flow of trained personnel to meet Defence capability requirements while reflecting individual talent, aspirations and needs12 (MOD, 2018a; MOD, 2018b). The development and implementation of these pathways is in progress and is linked to specific single Service13 and Defence14 projects. The aim is to integrate T&E systems with the human resource (HR) system, providing a people capability framework which supports a Whole Force by Design (MOD, 2016). This is in line with current international trends for learning technology across both public and private sectors, in which leaders are “addressing performance, learning and career together.” (Johnson, 2019).
    3. Defence recognises the training efficiencies enabled by PL in targeting individual learning needs, optimising limited training resource and managing competence acquisition and retention (MOD, 2018a; Kirby et al, 2014; Cahillane et al, 2013; Kirby et al, 2013; Sen Gupta et al, 2013). There is also recognition of the increased training effectiveness PL approaches may offer by developing self-regulated learning skills, critical thinking and intellectual flexibility (MOD, 2018a; McKeown et al, 2014; Cahillane et al, 2013; Lister et al, 2013). Realisation of these potential benefits is reflected in the aspirations of the current single Service and Defence projects[13](#_bookmark32)[,14](#_bookmark33) and was also evident in the priorities for T&E

11 Provided as GFI by Defence stakeholders interviewed during the study.

12 This might include physical as well as learning needs, such as domestic and geographic stability (Kirby et al, 2014).

13 Programme Castle (Army); Project Selborne (Royal Navy); Programme Socrates (Royal Air Force).

14 Defence Education Pathway Initiative (DEPI).

identified by Defence stakeholders during consultation. These priorities are outlined in further detail in this section.

### Current State of Play – Influences and Challenges

* + 1. **Organisational Culture, Design and Goals**
       1. Stakeholders made frequent reference to the need for a ‘cultural change’ to enable the adoption and sustainability of PL. The importance of developing the mindset that learning occurs ‘all of the time’ and that you do not need to ‘go on a course’ was also emphasised. Stakeholders highlighted the importance of being clear on the benefits of PL, for both the individual and the organisation:

“Individualisation/Personalised Learning has a dubious history – it was seen as a means of saving money rather than making training better and it has usually failed because of cultural issues” (Army HQ).

* + - 1. The implementation of capability to enable PL and the observation of business benefits in turn drives cultural change. With respect to the latter, several stakeholders referred to the modern learning environment (or learning ecosystem) that has been established at the Defence College for Technical Training (DCTT) and the benefits to training efficiency (i.e. savings in training days) that have been achieved by the introduction of FMVT approaches at RSME (see Appendix [D](#_bookmark85), [Table D-1](#_bookmark86), Example 1). Learning from other organisations in terms of the benefits and challenges relating to PL and having the time and resource to ‘think through’ how to deploy PL in their context and ‘where to start’ was a key message. In some cases, stakeholders referred to the procurement of capability without a firm implementation plan in place.
      2. Cultural change is closely coupled with the design and development of an organisation and putting in place the necessary resources and people to make PL ‘business as usual’ was underlined. One stakeholder noted that plans were in place within their organisation to resource a specialist and constant ‘in-house’ capability to support on-going and future learning initiatives. Broader reference to the criticality of resourcing Suitably Qualified and Experienced Personnel (SQEP) to lead the modernisation of Defence Learning was also made.

### People - Learners and Trainers

“Defence training and education is delivered at the pace of the ‘slowest’ learner… those with the aptitude and/or prior relevant experience have the potential to be fast tracked.” (TESRR).

* + - 1. The effective assessment and accreditation of prior learning and experience among learners was raised by a number of stakeholders. Defence College of Healthcare Education and Training (DCHET) delivers 90+ courses and it was noted that the extent to which prior experience is taken into consideration varies across courses. Moreover, there is little flexibility in the courses as they are not designed currently to allow tailoring for prior learning. For example, civilian-qualified paramedics are required to undergo full paramedic training with the school, despite previous qualifications and experience. It is also noted that the military paramedic qualification achieved is at a lower level than the civilian equivalent. In comparison, qualified physiotherapists are only taken in as qualified with ‘military’ training overlaid by the School.
      2. The important role of the ‘career manager’ in identifying what additional learning may be required by individuals joining as lateral entrants between services, or as a reservist, was also noted. The effect of ‘getting this wrong’ can stay with the individual during their career and impact career progression and self-confidence in role. It is also noted that self- awareness by the individual of their own capability and areas for development is highly relevant.
      3. Closely aligned and of critical importance is the need to ‘consider the new types of skills that are needed by the learner to ensure that they can learn outside of the classroom’ (see sub-section [2.4.3](#_bookmark22)). There was a recognition that learners may not have these skills and an assumption that such skills are in place for those individuals who come from an ‘academic’ background.

“Main challenge for Education is that individuals don’t know where they are and what they have achieved in terms of education, so it is difficult for them to self- regulate learning in an informed way. ‘…aim to mitigate this through career conversations and appraisal.” (RN).

* + - 1. The need to develop the ‘correct attitude towards learning’ early in an individual’s career was indicated and this may take place at Phase 1 training, or before.

“Incentivisation to undertake personalised learning is a key issue. The carrot is to undertake personalised learning to reduce time required away from operational duties or home to undertake a course in a formal learning environment. The stick is if do not undertake then cannot attend the course.” (TESRR).

* + - 1. The importance of upskilling and extending the experience of training-related staff was emphasised and this need is influenced by emerging learning technology, pedagogy and the expectations of the learner (see sub-section [2.6.5](#_bookmark28)). The need for the training-related staff to develop new ways of thinking and strong facilitation skills was also emphasised.
      2. The role of experience among learning delivery staff was emphasised and considered fundamental to ensuring the flexibility needed to deliver PL. The need to move away from the use of highly structured and prescriptive learning materials which could be delivered by ‘anyone’ was also noted.

“For personalisation (at the cohort level) it is important to allow the training staff to exercise flexibility given the needs of the group. Trust training delivery staff to execute effectively.” (22Gp).

* + - 1. The over-riding message was to professionalise the training role and to put in place ways to ensure that SQEP are responsible for the management and delivery of PL.

### Learning – Stage, Requirement and Pipeline

* + - 1. PL was regarded as of lesser value at Phase 1 in comparison to Phase 2 (development of trade-related skills) and mid to later training Phases where Defence personnel tend to diversify more. It is argued that:

“Phase 1 training is about attitudinal change, orientation, learning to function as a group and that individuals need time to adjust to a military environment, unlearn and re-learn values and norms. As such a compressed delivery, through whatever means within this environment would not be effective, given the assumption that the latter takes time. Similarly, physical training requires time and adjustment to avoid short and longer term injury.” (TESRR)

An additional perspective is that the ability to use modularisation in training is an enabler to PL and is feasible in a Phase 2 (trade training) context, but not at Phase 1.

* + - 1. Where the driving goal of PL is learner engagement and achievement (rather than compressed timeframes), then PL is relevant at Phase 1. This is highlighted by the application of the Target Learning Model (TLM) by Defence Trainers. This methodology which is delivered as an addition to the Defence Train the Trainer course enables trainers to assess the specific needs of learners and to select and implement appropriate interventions (see Appendix [D,](#_bookmark85) [Table D-1](#_bookmark86), Example 5).
      2. In addition to training phases, the potential benefits of PL to the retention and refresh of skills and knowledge was noted with a stakeholder highlighting that “more traction for the benefits of personalised learning might be gained by targeting PL at the periods between formal courses” (TESRR).
      3. An alternate perspective on PL was offered in which learning is delivered to a cohort of students in a variety of different ways by the trainer, with the responsibility placed on the individual learner to select the delivery style which is most appealing given their own preferences and aptitude – i.e. ‘self-personalisation’. In such circumstances, the experience of the training-related staff and their ability to adapt their delivery style is critical along with the students’ self-awareness of their own particular ‘learning requirements’ (see sub-section [2.4.3](#_bookmark22) – self-regulation of learning and metacognition).
      4. Finally, it was emphasised that PL should be considered as part of a learning pipeline with the benefits being considered in relation to the overall pipeline, rather than individual courses. The ‘personalisation of the journey’ was coined by one stakeholder in which individuals work their way through a “smorgasbord of interventions” in “a way that’s appropriate to them” (DefAc). This perspective underlines the learner-centric approach that is at the heart of PL.

### Learning – Design, Delivery and Assessment

* + - 1. Advances in the design and delivery of learning are exemplified by the learning environment that has been established at DCTT at MOD Lyneham. Capability includes:
         * An area for trainers to develop, change and edit training content (i.e. LIVE-D).
         * A suite of presenter / teaching tools which allows for controlling a classroom, recording a class and handing control to others over a virtual teaching space (WEB- EX).
         * Access to training materials outside of the traditional learning environment (e.g. within messes).
         * Provision for peer-to-peer learning (e.g. syndicate work forums, skype messaging through Facebook).
         * Use of 3D representations to support visualisation during learning (e.g. component disassembly).
         * Increased access to learning information (e.g. Quick Response (QR) codes15 located throughout the learning environment).
         * Trainer access to student records and activity (LEARN platform).
      2. Learner achievement is actively managed allowing trainers to identify and accelerate those students who are exceeding (e.g. by unhiding additional ‘higher level’ materials). There is also the capability for trainers to intervene to provide additional support.
      3. Stakeholders outside of the Lyneham exemplar noted how the Defence learning culture is ‘didactic’ with a ‘pass/fail’ tick approach to assessment and a firm course start and end date. It is a requirement that records are retained relating to training and education and competence achieved. Concerns relating to a ‘computer’ signing-off an individual were expressed; this would not be acceptable, given that the evaluation could be undertaken by another individual.
      4. The issue of competence management was also raised along with the requirement to ‘define the competences that we want people to have and what stage we want them to have it’. There was a recognition that a lot of learning will be experiential and ways to capture and record ‘experience’ is required (see also sub-section [2.4.5](#_bookmark23)). The challenge of matching prior learning and experience to a competency framework was highlighted. This is heightened by the reflection from one stakeholder that ‘not all learning can have strictly defined outcomes that can be usefully reduced into Training Objectives and Key Points’.
      5. The importance of generating a learning environment that is supportive of peer-to-peer interaction was noted by several stakeholders and accords with modern learning pedagogy (see sub-section [2.4.2](#_bookmark21)). The development of a learning environment that supports interactions between students (at different stages of learning and across rank structures) and with training-related staff within and outside of the traditional learning environment is part of the Programme Portal vision. Again the issue of culture and the organisational design and development to enable such interactions to take place as ‘business as usual’, was regarded as key (see sub-section [3.3.1](#_bookmark35)).
      6. The potential negative impact of approaches to PL on opportunities for peer-to-peer learning was highlighted. For example, one organisation indicated that consideration had been given to varying the time for training according to aptitude (i.e. streaming high performers), but that there were concerns that this would reduce the potential for peer-to- peer support, which is a key aspect of team development in Phase 1 training. As indicated in sub-section [2.6](#_bookmark27), the benefits and challenges relating to the implementation of PL approaches must be considered in relation to the organisational goal.
      7. Finally, the requirement to put in place effective ways to support the selection and blend of learning methods and media, taking into consideration modern learning approaches and PL was emphasised. One of the organisations consulted indicated that their courses are reviewed every 5 years and this provides an opportunity to consider new approaches (e.g. Technology Enhanced Learning (TEL)). The requirement to understand the benefits of particular types of emerging methods and media in relation to the learning requirement and the organisational environment was indicated. For example, one stakeholder highlighted that current Defence media and methods analysis tools were inadequate to support effective decision making.

15 QR Codes are black and white barcodes which provide a physical link that can be scanned by smartphones or tablets to give access to mobile learning content.

### Technology and Infrastructure

* + - 1. The importance of capturing learning data and its use to support PL was a key theme. Learning analytics was acknowledged as important to the delivery of learning that is meaningful and engaging and also providing establishments with the means to assess the impact of introducing particular multimedia solutions. Accordingly, benefits at the level of the organisation and learner are evident. The use of learning analytics at DCTT has already been indicated as part of the capability in place at MOD Lyneham. Stakeholders also noted that this capability is in use on the Advanced Command and Staff Course (ACSC), for example to “personalise learning for those who are struggling or to encourage higher achievers” (DefAc).
      2. Aspirations relating to the use of learning analytics to personalise learning for submariners was also voiced:

“Submariners need to be able to do training at sea that is properly captured and recorded, so when the platform is alongside, you just plug in and download that data to the Learning Management System within the school and then when you go to the school, your training is personalised to what you have done. So they know before you arrive where your areas of strength and weakness are…also enables you to go back at any point and refresh your learning.” (RN).

* + - 1. The near-term delivery of capability to support the storage of learning records and individual e-portfolios was noted. This reflects the defence need to provide an accurate and up-to- date record to enable the planning of future learning and career management. Specific plans for how these capabilities will be used have not yet been developed, but this will be reviewed in the mid-term. Culturally, it is recognised that the receptiveness of defence personnel to the use of e-portfolio systems is likely to vary and the benefits to particular user groups needs to be understood:

‘In academia students have a vested interest in keeping their learning records up to date – we need to figure out how soldiers will want to use it’ (DefAc).

* + - 1. Significant interest in the capability in place at MOD Lyneham was noted and for one Defence school this related to the following:
         * The provision of a system that was not based on MODNET and thus allowing ease of access to other resources such as YouTube.
         * The ability to use own iPads or those supplied by the facility.
         * The use of QR codes within the context of the vehicle and around the establishment to support continuous learning (within and outside the establishment).
      2. The challenge of knowing how to harness the significant capability that is available to Defence was raised. For example, one stakeholder noted that technology exists which can “export Joint Personnel Administration (JPA) data so that individuals and career managers can look at the skills/career path and engage with the learning they need” (DefAc).
      3. Specific technology challenges were also raised relating to the constraints associated with the use of cloud-based servers (some ITS, etc. may use these) and the size of databases needed for systems with ‘voices’.
      4. The provision of a flexible learning environment is a key factor influencing the delivery of a learner-centric approach to learning. Infrastructure including, for example, the provision of

secure networks, access to resources 24/7, and availability of personal electronic devices, are all important elements. Whilst technology may become a focus for PL, it is evident that PL is also enabled through the design of buildings, fixture and fittings. An example provided in relation to Programme Portal was the requirement for the provision of spaces and movable / removable furniture which could be laid out according to the preferences of the learner.

### Policy, Processes, Resources and Stakeholder Interests

* + - 1. The need to consider the validity of the Defence Systems Approach to Training (DSAT) and Joint Services Publication (JSP) 822 was acknowledged, given the drive for a learner- centric approach. It was considered that DSAT is too ‘stovepiped’ and designed around a group approach to training with common standards and outputs and a focus on the lowest common denominator. Stakeholder points have already been made relating to the need to:
         1. move away from the development of highly prescriptive instructional specifications; and
         2. how not all learning can be compartmentalised as training objectives with measurable outcomes (see sub-section [2.4.6](#_bookmark24)).
      2. The drive towards bringing together training and human resource management systems was discussed at sub-section [3.2](#_bookmark31). The benefits of doing so have been reflected by those stakeholders engaged by the research. This is critical to the deployment and sustainability of PL approaches. As an example, a number of stakeholders highlighted the benefits of FMVT approaches but expressed concerns regarding the lack of flexibility in the system to allow personnel to progress to their units early. The example of holding officers having to wait to enter pilot training following successfully passing out from Cranwell was also noted.
      3. Within the Defence context, the challenge of putting in place necessary resources to investigate, design and implement relevant PL approaches is likely to prevail. This was reflected in comments relating to having the ‘headroom’ to consider opportunities and challenges arising, knowing where to start; and procuring capability (e.g. e-portfolio and learning records systems) without having put in place detailed implementation plans.

### Areas of interest for Defence

* + 1. The value of research to support decision making relating to PL was acknowledged. Nine areas for future research emerged in consultation with stakeholders as follows:
       1. PL Measures of Effectiveness – ways to assess the effectiveness of PL which take into consideration the approaches employed across the related disciplines of Training, Learning, Human Resource Management and Human Factors.
       2. Evidence from Academic case studies – capturing the academically robust evidence that is required to inform the business case for investment in Personalisation of Learning.
       3. Management of risk – ways to understand the risk carried given the adoption of PL for those jobs and functions that are deemed to be safety critical.
       4. Methods and Media tools – ensuring that tools to support the selection of relevant methods and media are current and take into consideration advances in learning science and emerging capability.
       5. Accreditation of prior learning experience – ways to improve the capability of those personnel (e.g. careers officers) to identify and assess the relevance of prior learning; and for the individual to self-evaluate and communicate own learning requirements.
       6. Learner skills development – ways to develop the skills required by learners to ensure that the learner benefits of PL initiatives are maximised.
       7. Training-related staff skills development – identification of the skills required by training-related staff to ensure the effective deployment and sustainability of PL initiatives.
       8. Learning Technologies – awareness among key roles of emerging technologies and opportunities afforded to PL within the broader ecosystem.
       9. Learning Pipeline – ways to determine how the adoption of PL approaches impact the learning and career pipeline for particular types of roles.

# Support to Defence Decision Making on PL

### Overview

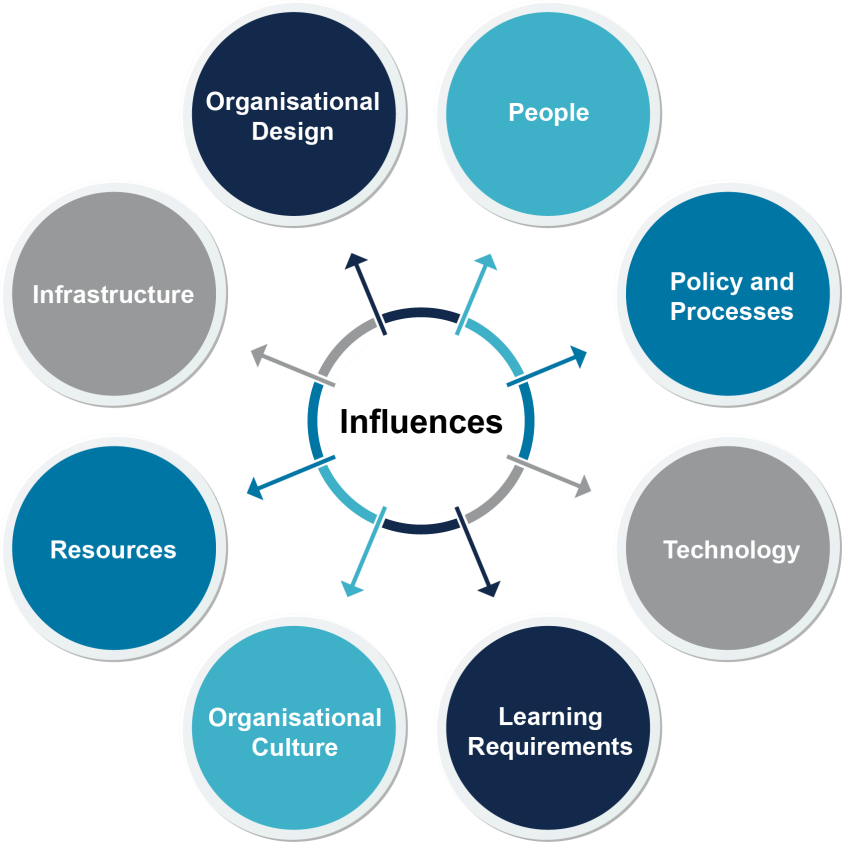
* + 1. This section outlines how the evidence gathered during the course of the research was organised to inform the development of a decision support process to inform decision- making relating to the implementation and sustainability of PL within an organisation. The PL Decision Support Process offered provides the means to identify:
       - whether PL is right for the organisation in a particular context and at a given time;
       - where the organisation is right now;
       - where the organisation needs to be in order to implement a particular PL approach effectively; and,
       - information that could support the development of a business case.

### PL Influences and Elements list

* + 1. During the course of this scoping study, a broad body of evidence relating to the topic of PL was gathered, involving:
       - A REA of the academic literature (see Appendix [A.2.2](#_bookmark62));
       - Structured engagement with stakeholders across a sample of UK defence training establishments (see Appendix [B](#_bookmark71));
       - An identification and description of example cases where PL initiatives are in place, or being considered (see Appendix [E](#_bookmark87)); and,
       - A stakeholder workshop to consolidate findings and to determine factors influencing the implementation and sustainability of PL initiatives (see Appendix [A.3](#_bookmark68)).
    2. An on-going thematic analysis of the evidence gathered indicated that there are broadly eight key areas influencing the implementation and sustainability of PL within a defence context [(Figure 4-1](#_bookmark44)). Evidence collected, particularly in relation to significant Defence transformation programmes, suggests that these eight areas of influence are relevant both today and in the future, with some areas being more or less important depending on key Defence, technological, social and political drivers.
    3. It is advocated that these eight areas constitute a framework within which to highlight what may need to be put in place to support the effective deployment and sustainability of PL in any organisation. These eight areas, which going forward are referred to as the ‘Eight Areas of Influence on PL Decision Making’, are complementary to the key components of the PL model [(Figure 2-1](#_bookmark17)).
    4. A further, more detailed analysis of evidence collated in relation to the eight areas of influence informed the development of a set of 36 elements. These elements are listed at [Table F-1](#_bookmark101), (columns A-C). Together the eight areas and 36 elements formed an influence matrix (see section [4.3.5](#_bookmark48) – step 5 of the PL Decision Support Process).
    5. A PL element is a statement of what might influence the implementation and sustainability of a PL approach. In the following examples and in [Table F-1](#_bookmark101), these statements are

constructed to follow-on from the phrase, “To enable PL there is a need for…”: For example:

* + - * Leadership which sets a vision and strategy that is consistent with the development of a learning environment and which supports continuous improvement;
      * Processes to ensure the PL approach is ‘interoperable’ with other systems;
      * Learning to be tailored to one or more ‘learner variables’;
      * Learners to have acquired the skills needed to benefit from PL;
      * Training staff (analysts, designers, trainers, SMEs) with the skills, knowledge and experience required to realise the PL approach; or,
      * A physical environment that has been purposefully designed and fitted to support PL methods and media.
    1. The list of PL elements was reviewed and confirmed during an internal team working session which involved the application of the PL elements within the context of the example PL Decision process (sub-section [4.3](#_bookmark45)). The latter process is outlined in further detail in the following sub-sections.



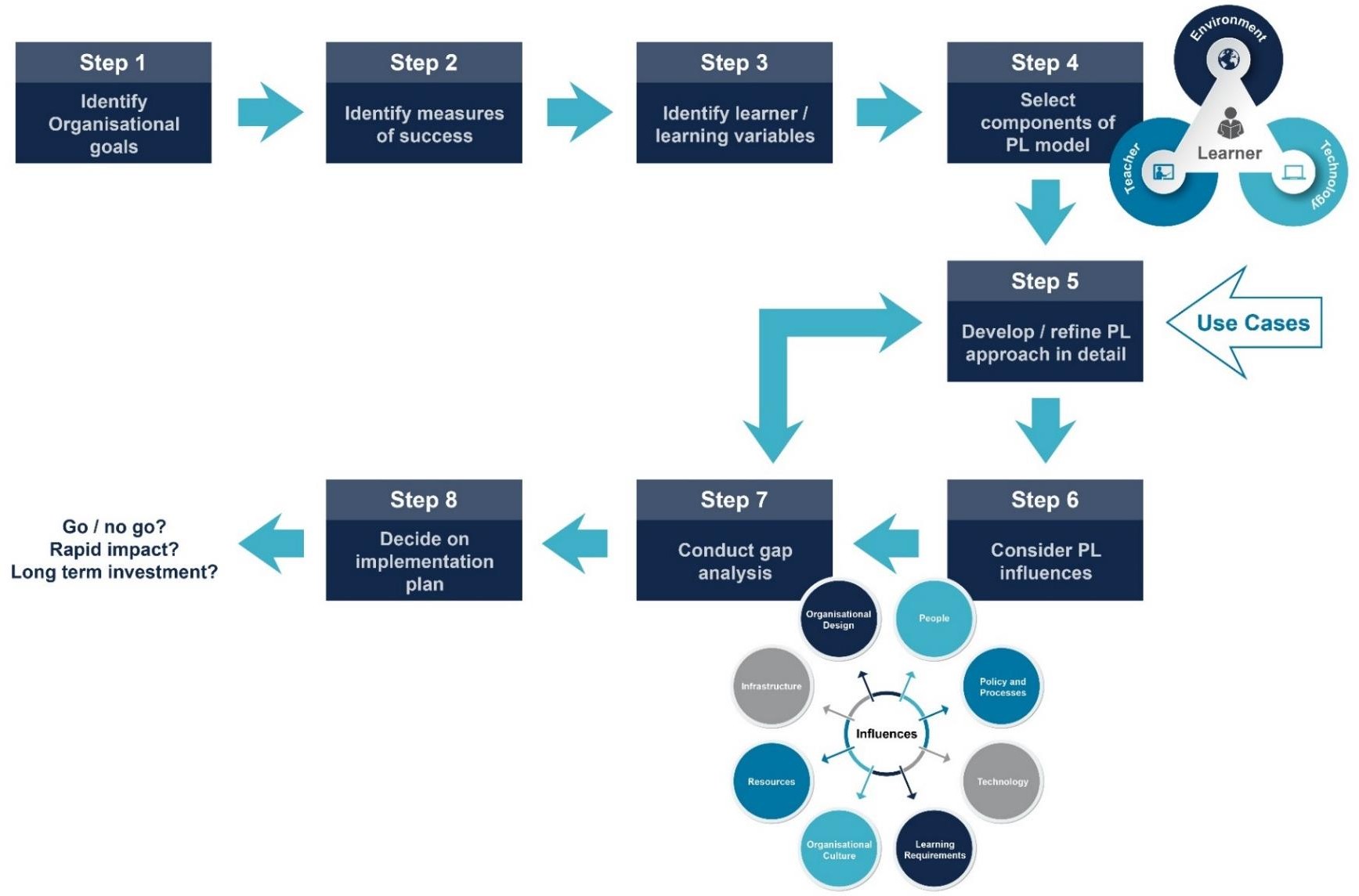
*Figure 4-1: The Eight Areas of Influence on PL Decision Making*

### PL Decision Support Process

The outputs of analysis from all WPs were applied to develop a decision support process which comprised eight steps, starting with defining the desired organisational outcomes for PL and concluding with an implementation plan. This process is illustrated in [Figure 4-2](#_bookmark46) with each step described in more detail in the following sub-sections. [Table 4-1](#_bookmark47) also shows a worked example of the first four steps of the process which draws on the Naval Engineering Strategy 2017 (MOD, 2017b). An example of step 6 (using two known Defence

PL cases as the output of step 5) is at Appendix [F](#_bookmark100), [Table F-1](#_bookmark101); no exemplars are given for steps 7 and 8, which are very much specific to organisational context.

*Figure 4-2: The PL Decision Process*



### Step 1 - Identify Organisational Goals

4.3.1.1 PL approaches are defined by the organisational outcome(s) that they seek to achieve (see sub-section [2.2](#_bookmark14)). Therefore, the first step in the PL decision support process is to clearly identify the expected benefit(s) of PL in the context of the organisation’s strategic vision and objectives by completing the statement “*PL will help us to…”* (see [Table 4-1](#_bookmark47), Column 1 – 2). This enables organisational goals to be set in terms of Return on Investment (ROI) and Return on Expectations (ROE).

### Step 2 - Identify Measures of Success

* + - 1. In this step, the measures and observations are identified which will indicate that the PL approach is making progress towards the desired organisational goals. This clarifies the focus of the PL approach and informs the next step, i.e. the ‘learner variables’ and ‘learning variables’ which are to be targeted.
      2. As shown in [Table 4-1](#_bookmark47), it is helpful at this stage to identify not only the measures of success but also the metrics and data that will need to be captured to support this measurement and provide empirical evidence of progress.

### Step 3 - Identify ‘Learner Variables’/’Learning Variables’

4.3.3.1 Based on an understanding of the goals and measures of success, this step identifies the ‘learner variables’ and ‘learning variables’ (see [Table 2-1](#_bookmark18)) that will be addressed in this PL approach. In the example in [Table 4-1](#_bookmark47), the PL approach targets the individual learner’s previous knowledge/experience and aptitude (‘learner variables’), aiming to adapt the learning content, pace and duration (‘learning variables’) in order to reduce training time and costs. However, the PL approach also targets the learner’s preferences for learning (‘learner variable’) to ensure training effectiveness, and the location of the learning (‘learning variable’) to sustain learning over time by providing performance support.

### Step 4 - Select Components of the PL Model

* + - 1. Once the ‘learner variables’ and ‘learning variables’ have been identified, the components of the PL model can be selected. In some cases, this decision will be intuitive, e.g. if the aim is to adapt content, pace and duration then it is likely that the Technology component will be the most efficient way of achieving this. However, decisions at this stage will also be informed by an understanding of the target audience and the training content. For example, PL approaches for Phase 1 trainees may consider the Teacher component to be essential, while approaches to annual mandatory training may focus on the Technology component adapting learning for a wide, diverse audience, also significantly reducing the burden on trainer time.
      2. It is useful for this step and for step 5 to examine similar, existing PL use cases which can offer empirical evidence of the expected benefits and likely challenges associated with implementation of a particular PL approach. As an example, Appendix [D](#_bookmark85), [Table D-1](#_bookmark86) presents a set of nine use cases, along with a description of related challenges and benefits.

*Table 4-1: Example of PL Decision Support Process Steps 1 – 4*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Strategic Drivers** | **Step 1 – Identify PL outcomes/ goals** | **Step 2 – Identify measures of success** | | **Step 3 – Identify ‘learner/learning variables’** | **Step 4 – Select components of PL model** | |
| **“***PL will help us to…”* | | **Measure** | **Metrics/Data** | **Evidence from use cases** | **PL components selected** |
| **Naval Engineering Strategy 2017** (MOD, 2017b: p42):   1. *Deliver Activity Based Training …at a volume to recover the Branch…* 2. *Deliver Fast Track schemes…* 3. *Introduce Accelerated Apprenticeship schemes….* 4. *Review and optimise pre-joining training…* 5. *Enable further development of engineering skills at the waterfront…* | **Training efficiency**   * Deliver effective engineering training at scale. * Manage training content, duration and pace to suit varied entry standards. * Deliver individuals into role in shortest time possible.   **Operational effectiveness**   * Develop and support individuals in role to maintain high levels of competence. | * Sufficient numbers trained. * Optimised use of trainer time. * Competence level reached in shortest time possible by each individual. * Robust competence standards achieved. * Competence level sustained and developed over time. | * Pipeline data for employment role,   e.g. engineering posts vacant.   * Trainer/trainee contact time. * Average time to training completion. * First attempt pass rates. * Learning content omitted from training (based on prior skills/ knowledge) * Competence levels before and after training. * Workplace data,   e.g. incident logs; time to complete routine tasks. | **Learner**:   * Previous knowledge and experience/ qualifications. * Aptitude. * Learning preferences. * Learning needs.   **Learning**:   * Content. * Pace, duration. * Access, location. | * ITS is effective in delivering STEM subjects and amplification of SME. * Blended learning environment can free up Teacher time for trainees who need more support. * PLA as Digital Tutor (ITS) has potential to provide effective performance support. | **Teacher:**   * Facilitation for activity-based and collaborative learning. * Support role for trainees who require.   **Technology:**   * Learning platform to deliver adaptive pre- joining training. * Digital Tutor for adaptive learning - accessible on mobile device for performance support. |

### Step 5 - Develop and Refine the PL Approach

4.3.5.1 Once the components of the PL model have been selected, these are developed into an initial PL approach, e.g. what type of technology will be used, how Teacher and Technology will interact. This step (and step 4) may be revisited in iterative fashion after PL influences have been considered in the next two steps, to refine the PL approach to achieve the organisational goals in the most efficient and effective manner for the organisational context.

### Step 6 - Apply Influence Matrix

4.3.6.1 The purpose of the influence matrix is to support decision making relating to *what* needs to be in place, to support the implementation and sustainability of a PL approach. This involves a review of the importance of each PL element given the key features of the PL approach (as described at process step 5, see sub-section [4.3.5](#_bookmark48)). At this step the assessment is undertaken solely in relation to the *features* of the PL approach, rather than the maturity of the organisation (see step 7 - Conduct Gap Analysis).

**An example:**

In Appendix [F](#_bookmark100), [Table F-1](#_bookmark101), the influence matrix has been applied for three cases, each representing different components of the PL model, i.e. Learner-Teacher; Learner- Technology; and all components. A simple 4-point rating of importance (i.e. Critical, High, Medium, Low) is applied for each case with the option to return a response of ‘Not Applicable’. A column to record explanatory notes, justifying the rating(s) made is also provided. As shown in this example, a number of PL approaches or options may be considered together, or alternatively a single option may be assessed. As part of the development of the Influence Matrix, consideration was also given to whether or not a PL element was important to the sustainability of a PL approach (see [Table F-1](#_bookmark101), Column E). For demonstration purposes, this judgement was made by the research team with a simple Yes / No response being returned. This was guided by the team’s SME experience and ‘what-if’ argument.

### Step 7 - Conduct Gap Analysis

* + - 1. The next step in the process considers the ‘distance’ of the organisation in relation to the subset of PL elements which were judged as important. The organisation may decide to set an initial threshold which includes only those enablers which achieved an importance rating of ‘Critical’ or ‘High’.
      2. An initial gap analysis may be rapid and undertaken using a simple rating scale format, or traffic light type system (Red, Amber, Green or RAG) to grade the extent of the gap between ‘where the organisation is and where it needs to be’ to ensure that important PL enablers are in place. The outcome of this rapid and initial assessment might conclude that the particular PL approach is or is not feasible given the maturity of the organisation. Where feasibility is judged as positive, then further detailed analysis of PL enablers, in relation to the PL option, may be justified. A decision to take forward the option for further analysis but with some modification or to gather further evidence (e.g. from other institutions who have experience of implementing the PL approach) might also be concluded.

### Step 8 - Decide on Implementation Plan

4.3.8.1 A decision to take forward the PL approach requires the construction of an implementation plan that is valid given the characteristics of the learning organisation and which is cognisant of existing and other planned initiatives.

# Conclusions and Next Steps

### Identify strategic drivers for PL and conduct ‘horizon scanning’

* + 1. The importance of identifying clear organisational outcomes for PL, linked to strategic drivers, has been highlighted in this study. While PL could simply be acknowledged as good practice in a learner-centric training strategy, the evidence shows that it comes with cost and effort, and therefore requires a business case which clearly identifies anticipated RoI and/or RoE.
    2. Understanding the potential benefits of PL and how these support the organisation’s strategic drivers is an important step in developing the business case. There is a limited number of existing use cases identified by this study which provide empirical evidence on the benefits associated with PL approaches. Horizon scanning and monitoring of use cases will be an important part of next steps to expand the breadth and depth of evidence available to Defence when developing PL business cases.

### Collect evidence through experimentation and longitudinal studies

* + 1. The potential to undertake experimental trials within a controlled environment, to deliver the evidence required to support decision making relating to the implementation of PL is also a consideration. Such trials may be constructed to compare a current and modified approach to the delivery of learning which manipulates one or more PL learner (e.g. learner previous experience) or learning (e.g. pace and content) variables or PL model components (e.g. Learner-Technology interaction(s)). For example, this might test the relationship between learner motivation/engagement and a particular PL approach.
    2. Opportunities to collaborate with Defence Learning establishments that are planning to investigate PL-related approaches would also be relevant. Whilst lesser control of data and information capture is likely, opportunities for longitudinal studies may be supported, for example, the potential to investigate the benefits/outcomes of PL between learning stages (e.g. transference between modules within a course or transference between a course and the workplace environment). The potential to investigate PL as a strategy in the management of skills retention is also relevant and this may be supported through the conduct of longitudinal research.

### Developing measures and metrics

* + 1. In all of the above, it will be important to develop a suite of measures and metrics that may be applied for differing purposes ranging from the assessment of business outcomes and benefits to the influences represented by the 36 PL elements, and improvements in learning and the learner experience. This will require the adoption of a broader perspective which takes into consideration existing and novel thinking that draws upon, at least, the disciplines of learning and talent development, human resource management, learning analytics, and human factors.

### Defence Policy and Processes

* + 1. **Investigating AFL regimes**
       1. The research highlighted that a clear understanding of the capabilities of the individual learner is an important pre-requisite to the personalisation of an individual’s learning pathway. AFL regimes that are valid, reliable and fit-for-purpose are clearly required.
       2. Next steps may include a deeper review and evaluation of current practices that are applied to assess prior learning experience and this should include ways to capture and assess the knowledge, skills, behaviours, experience and other attributes which are relevant to deciding on an individual’s subsequent learning requirement. Evidence from both within and outside of Defence (e.g. healthcare and policing and security services) could be investigated. Innovative ways (i.e. technology and non-technology enabled approaches) should also be investigated. Finally, consideration should be given to ways to support and incentivise the individual in making a valid self-assessment of their own capability and to take responsibility for the management of their own learning pathway.

### Alternative approaches to media and methods analysis

5.4.2.1 The scoping study research has identified a range of ‘learner variables’ and ‘learning variables’ that are relevant to the PL approach. The implementation of PL brings with it a need to ‘strengthen’ particular types of learning approaches (e.g. connectivism), to implement (more widely) modern learning methods (e.g. flipped classroom approach, BYOD), along with the requirement for learning analytics and new and emerging technology based approaches (e.g. ITS). In all cases, the training analyst requires a systematic way to decide, based on the requirement, the most effective way to enable learning. This has been achieved typically through a combination of the experience of the analyst and decision support tools (e.g. Media and Methods Selection Technique (MMST)). An assessment of ‘what is needed’ to inform decision-making relating to the implementation and sustainability of a learning ecosystem, that is valid and relevant to the learning need, is a next step. It may be that current Training Needs Analysis (TNA) approaches which include the use of MMST are insufficient and that alternative thinking in this area is required. This may include the up-skilling of personnel responsible for the analysis, design and delivery of learning.

### Understanding the risks associated with the adoption of a PL approach

5.4.3.1 A range of challenges and benefits associated with PL were identified during the conduct of the research. The need to develop a way to assess and manage typical risks relating to the adoption of a PL approach is a next step. In the first instance, this may involve re- visiting the qualitative information gathered during the scoping study and drafting a set of ‘generic’, or exemplar risk statements in terms that can be used to inform early analyses undertaken as part of the scoping stage of the TNA process. A further step would be providing advice and guidance on how to manage PL-related risks.

### Maturing the PL Decision Support Process

* + 1. This scoping study research has outlined an eight-step process to inform decision-making relating to the adoption of PL approaches. This was offered as an immediate response to stakeholders’ needs to better understand ‘where to start’ when considering PL. Early steps in the process include an identification of organisational goals, measures of success and relevant ‘learner variables’ and ‘learning variables’. This is followed by the selection of relevant PL components (i.e. learner, teachers, environment, technology), and a

description of the candidate PL approach (drawing on existing case examples). Final steps include a systematic assessment of what might influence the implementation of the PL concept within the organisation, a consideration of the maturity of the organisation (i.e. a simple gap analysis); and concluding with the requirement to develop an implementation plan.

* + 1. The construction of the PL Decision Support Process, including the influence matrix, was based on the research team’s analysis of qualitative information and evidence gathered in the course of the scoping study. A next step is to ‘test’ and mature this process. This should be a planned activity involving engagement with Defence learning establishments who may or may not yet have explored the potential of PL. The research indicated that some Defence establishments had fostered effective working relationships with external Higher Education (HE) and Further Education (FE) establishments to support the sharing and development of good practice. The potential to engage with such organisations, when evaluating the process should also be considered.

# Acknowledgements

6.1.1 The authors would like to acknowledge the significant contributions of the stakeholders listed in Appendix [B](#_bookmark71) who gave their time and valuable insights in support of data collection and analysis. They would also like to acknowledge the expertise of the following QinetiQ personnel and their collaboration in the execution of this research project: Dr Helen Dudfield (Chief Scientist for Training and Human Performance, QinetiQ) who has provided technical direction and support; and, Vicki Kallmeier-Hatch and Daran Crush (QinetiQ) who supported the design and facilitation of the stakeholder workshop.

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# List of Abbreviations

|  |  |
| --- | --- |
| ACSC | Advanced Command and Staff Course |
| AFL | Assessment for Learning |
| AH | Assistant Head |
| ALS | Adaptive Learning Systems |
| API | Application Programming Interface |
| APM | Association for Project Management |
| ARITC | Army Recruiting and Initial Training Command |
| ARTD | Army Recruiting and Training Division |
| AT | Adaptive Training |
| BCI | Brain-Computer Interface |
| BYOD | Bring Your Own Device |
| CAI | Computer Aided Instruction |
| Cert Ed | Certificate in Education |
| CLM | Command, Leadership and Management |
| COS | Chief of Staff |
| COTS | Commercial off the Shelf |
| CPD | Continuing Professional Development |
| DARPA | Defense Advanced Research Projects Agency |
| DCHET | Defence College of HealthCare Education and Training |
| DCTT | Defence College of Technical Training |
| DefAc | Defence Academy |
| DEPI | Defence Education Pathway Initiative |
| DfES | Department for Education and Skills |
| DII | Defence Information Infrastructure |
| DIMP | Defence Information Management Passport |
| DLE | Defence Learning Environment |
| DLMC | Defence Learning Management Capability |
| DoE | Department of Education |
| DOTC(M | Defence Operational Training Capability (Maritime) |
| DSAT | Defence Systems Approach to Training |
| DSEME | Defence School of Electrical and Mechanical Engineering |
| DSMarE | Defence School of Maritime Engineering |
| DTS | Defence Trainer Supervisor |
| DTTT V2 | Defence Train the Trainer Version 2 |

|  |  |
| --- | --- |
| ELE | Enhanced Learning Environment |
| EO | Enabling Objective |
| ETF | Education and Training Foundation |
| FE | Further Education |
| FMVT | Fixed Mastery, Variable Time |
| FOST | Flag Officer Sea Training |
| FWaHP | Future Workforce and Human Performance Programme |
| GFI | Government Furnished Information |
| HE | Higher Education |
| HF | Human Factors |
| HMS | Her Majesty’s Ship |
| HQ | Headquarters |
| HR | Human Resource |
| I/ITSEC | Interservice/Industry Training Systems and Education Conference |
| ICSC | Intermediate Command and Staff Course |
| ICT | Information Communications Technology |
| IFPT | Initial Force Protection Training |
| ILM | Institute of Leadership and Management |
| IOT | Initial Officer Training |
| IT | Information Technology |
| ITS | Intelligent Tutoring Systems |
| JPA | Joint Personnel Administration |
| JSP | Joint Services Publication |
| KLP | Key Learning Point |
| LRS | Learning Record Store |
| LSO | Learning Support Officer |
| LWC | Land Warfare Centre |
| MA | Master of Arts |
| MMST | Methods and Media Selection Tool |
| MOD | Ministry of Defence |
| NCO | Non-Commissioned Officer |
| NCOA | Non-Commissioned Officer Academy |
| NMC | New Media Consortium |
| Ofsted | Office for Standards in Education, Children’s Services and Skills |
| PL | Personalisation of learning |
| PLA | Personal Learning Assistants |

|  |  |
| --- | --- |
| PSO | People Strategic Objective |
| Q&A | Question and Answer |
| QR | Quick Response |
| RAF | Royal Air Force |
| RAG | Red, Amber, Green |
| REA | Rapid Evidence Assessment |
| REGI | Report Every Good Idea |
| REME | Royal Electrical and Mechanical Engineers |
| RN | Royal Navy |
| RNAESS | Royal Naval Air Engineering and Survival School |
| ROE | Return on Expectations |
| ROI | Return on Investment |
| RSME | Royal School of Military Engineering |
| SASE | Similar Abstract Search Engine |
| SCORM | Shareable Content Object Reference Model |
| SD | Standard Deviation |
| SEND | Special Educational Needs and Disabilities |
| SET | Society for Education and Training |
| SME | Subject Matter Expert |
| SpLD | Specific Learning Difficulty |
| SQEP | Suitably Qualified and Experienced Personnel |
| SRL | Self-regulated Learning |
| STEM | Science, Technology, Engineering and Mathematics |
| SYOA | Set Your Own Agenda |
| T&E | Training and Education |
| TCT | Training Commonwealth Trainees |
| TEL | Technology Enhanced Learning |
| TESRR | Training Education Skills Recruiting and Resettlement |
| TILT | Training International Learners and Trainees |
| TLM | Target Learning Model |
| TNA | Training Needs Analysis |
| TO | Training Objective |
| U.S | United States |
| USC | University of Southern California |
| VfM | Value for Money |
| VLE | Virtual Learning Environment |

|  |  |
| --- | --- |
| WP | Work Package |
| xAPI | Experience API |

1. Technical Approach

### Overview

* + 1. The project was delivered in two phases through four work packages (WP) which are summarised in [Figure A-1](#_bookmark60). WP1 and 2 comprised the first phase of the study and WP3 and 4 the second phase.



*Figure A-1: Summary of Technical Approach*

### WP 1 and 2

* + 1. In the first phase of the study, WP1 aimed to establish what is known about state-of-the - art PL and to develop a better understanding of the potential benefits and challenges associated with its implementation in a Defence context. WP2 aimed to identify where PL was already being used within Defence learning, where it could be rapidly deployed, and possibilities for longer term areas of investment. WP1 gathered evidence from existing research through an REA. The objectives of WP 1 and 2 were also investigated through a series of structured interviews with key Defence stakeholders and training design and delivery staff at Defence schools. These interviews were conducted concurrently for WP1 and WP2 in order to minimise the time required from stakeholders and to avoid duplication of effort in data collection. An interim report (Mundy and Deighton, 2019) was submitted at the end of the first phase.

### Rapid Evidence Assessment (REA)

* + - 1. The findings of the REA are set out in the interim report for this study (Mundy and Deighton, 2019). This gathered evidence from relevant empirical research studies in order to address the main question: ‘What is known about the benefits and challenges associated with PL?’ Supplementary questions for the REA included a working definition of PL, associated learning theories, and the range of methods and approaches used in its implementation.
      2. In addition to proprietary research and Government Furnished Information (GFI), search engines used and databases searched are presented in [Table A-1](#_bookmark63). As part of the REA, one

author attended the Learning Technologies Conference in January 2019 to review the most current thinking and the latest innovations relating to PL in industry and education.

*Table A-1: REA Sources*

|  |  |
| --- | --- |
| Source | Description |
| Google Scholar  [www.scholar.google.com](http://www.scholar.google.com/) | Google’s search engine covering peer-reviewed papers, theses, books, abstracts, and other scholarly  literature from all broad areas of research. |
| ResearchGate <https://www.researchgate.net/> | ResearchGate`s internal Literature search engine gives access to seven major databases and over 1,000 Open Access databases simultaneously. The Similar Abstract Search Engine (SASE) performs semantic analysis of an entire abstract to find related articles.  Journals accessed:   * International Journal Artificial Intelligence in Education * International Journal of Virtual and Personal Learning Environments * Journal of Educational Innovation, Partnership and Change * Instructional Science * Review of Educational Research * Educational Psychologist |
| ScienceDirect Open Access [https://www.sciencedirect.com/](https://www.sciencedirect.com/#open-access) [#open-access](https://www.sciencedirect.com/#open-access) | Database with over 3,800 journals and more than 37,000 books — over 250,000 of which are open access.  Journals accessed:   * Internet and Higher Education * Computers & Education |
| Springer Open <https://www.springeropen.com/> | Database of over 200 peer-reviewed, fully open access journals and hundreds of open access books covering all areas of science, technology, medicine, the humanities and social sciences.  Journals accessed:   * International Journal of Science, Technology, Engineering and Mathematics (STEM) Education * Smart Learning Environments |
| Interservice/Industry Training, Simulation and Education Conference (I/ITSEC) Papers Portal  <http://www.iitsecdocs.com/> | Online repository of all papers from the InterService/Industry Training, Simulation and Education Conference from 1966 – 2018. Papers were accessed from 2015 onwards. |
| Educause Library <https://library.educause.edu/> | Repository of topics and research supporting the use and management of technology in higher education. Aggregates over 21,000 resources.  Journals accessed:   * New Media Consortium (NMC) Horizon reports for 2017 and 2018 |

* + - 1. The search terms used to identify appropriate research are set out in [Table A-2](#_bookmark64)16. Abstracts were reviewed after each search to determine the relevance of each article. Inclusion criteria were that the source should be published no earlier than 2008, and ideally no earlier than 2015, and relate to adult (post-16) education or training. Where available, sources were selected that were based on rigorously conducted (e.g. controlled studies, meta- analyses) and peer-reviewed research. 30 case studies were identified of which nine included examples of controlled studies of PL approaches; the remainder were either uncontrolled studies or prototype design projects. These case studies are described in the interim report to this study (Mundy and Deighton, 2019).

*Table A-2: Search Terms for REA*

|  |  |  |
| --- | --- | --- |
| Search Terms | | |
| Personal\* | AND | Learn\* |
| OR | OR |
| Individual\* | Train\* |
| OR | OR |
| Adapt\* | Education |
| OR | OR |
| Tailor\* | Teach\* |
|  | OR |
|  | Instruct\* |

* + - 1. In order to develop a working definition for the study, key themes were identified from the REA regarding the various definitions associated with PL. Case studies identified from the literature were then grouped into themes by approach and reviewed to identify common, underpinning educational and psychological theories and the main findings and conclusions with regard to benefits and challenges. Snowballing17 was used to identify further information relating to theories, benefits and challenges relating to PL. Outputs of the REA included a working definition and a high-level model of the main components of PL, and a summary of the benefits and challenges associated with implementing PL in an adult learning context. Findings also informed the development of eight broad themes to support further work in WP2 and WP3.

### Stakeholder Consultation

* + - 1. Interviews were conducted with stakeholders from Defence and Service-level training directorates to gather qualitative data on Defence perspectives regarding PL. Additional data were gathered from GFI provided by stakeholders and from previous Defence-related research studies. A detailed stakeholder engagement list is at Appendix [B](#_bookmark71), including details of GFI provided.
      2. Two questionnaires were developed, the first to gather qualitative information on high-level perspectives and aspirations regarding PL, focusing in particular on perceived

16 Asterisk (\*) in Table A-2 denotes a truncation symbol, i.e. searches for any variation on the search term.

17 Snowballing involves searching cited articles in the literature for new or supporting information.

opportunities and challenges. The second aimed to inform a deeper understanding of the characteristics of identified PL cases. Copies of these questionnaires are provided in the interim report (Mundy and Deighton, 2019).

* + - 1. The stakeholder organisations and key points of contact to be consulted were identified in consultation with Dstl and a stakeholder register maintained. Engagement was facilitated by the provision of a Dstl letter of introduction explaining the origin, purpose and use of the research outputs. This letter was issued to the candidate organisations by either the Dstl Technical Partner or members of the research team. Where the original point of contact was not appropriate or available, then alternative names were requested. Interviews were conducted either by telephone and/or face-to-face, mostly at the stakeholders’ location. Interviews were undertaken typically by one member of the team and the approach was flexible to allow for the attendance of one or more participants. Interview durations ranged from 30 minutes to 2 hours.
      2. A total of 14 engagements, involving 17 participants were achieved over a two month period (February to March 2019). [Table A-3](#_bookmark66) lists the stakeholder organisations consulted and the breadth of engagement achieved.

*Table A-3: The 14 Stakeholder Engagements*

|  |  |  |  |
| --- | --- | --- | --- |
| Id | Stakeholder Organisation / Area | Id | Stakeholder Organisation / Area |
| **1** | Training, Education, Skills, Recruitment and Resettlement  (Force Development) | **8** | Training, Education, Skills, Recruitment and Resettlement (Training Policy) |
| **2** | Defence College of HealthCare Education and Training (DCHET) | **9** | Royal Navy (Individual Training Policy/Strategy, Lifelong Learning) |
| **3** | ‘View of a Reservist’ | **10** | Royal Navy (New Capabilities –  Submarines) |
| **4** | Royal School of Military Engineering | **11** | Royal Navy (New Capabilities – Above Water) |
| **5** | 22 Gp (Programme Portal) | **12** | Army Headquarters (HQ) (Learning and Development Personnel Policy) |
| **6** | Defence Academy (Education and Training, Education Pathway and Technology Enhanced  Learning Teams) | **13** | Army HQ (Defence Learning Management Capability) |
| **7** | Army Recruitment and Individual Training Command | **14** | Army (Project Castle) |

### Information Collation and Analysis

* + - 1. Meeting notes were compiled following each stakeholder interview and shared among the research team. Emerging themes relating to PL and the comprehensiveness of the research approach was discussed weekly between the research team members and Dstl Technical Partner. On completion of all interviews, a thematic analysis of information reported within the stakeholder meeting notes was undertaken. This involved copying

information from the stakeholder notes into an Excel worksheet with each row containing a ‘segment of qualitative information’18.

* + - 1. The initial set of thematic codes was compiled with reference to the findings of the REA and then matured, iteratively, to reflect the subject matter of the qualitative information collated from the stakeholder interviews. The final set of primary and secondary thematic codes is provided at [Table A-4](#_bookmark67).
      2. Each ‘segment of information’ contained within the Excel spreadsheet was coded against one of the primary and secondary codes. Where evidence reflected more than one code then the ‘piece of evidence’ was divided to form an additional row and then coded.

*Table A-4: Thematic Analysis Codes Applied to the Qualitative Interview Information*

|  |  |  |
| --- | --- | --- |
| Id | Thematic Codes - Primary | Thematic Codes - Secondary |
| 1 | Defence Vision | Chief Defence Personnel, Defence Learning Management Capability, Defence Education Pathway, Integrated Approach, Learner-centric, Operational Effectiveness, Maritime Training Strategy, Defence Education Pathway, Education Strategy 2016, Implementation, Joint Service Publication (JSP) 822. |
| 2 | Defence Programmes | Portal, Socrates, Mercury, Castle, Selborne, DLMC, Defence Operational Training Capability (Maritime) (DOTC(M)). |
| 3 | The Organisation | Culture (Value, Readiness), Organisational Design, (Leadership, Specialist Teams), Business as usual, Benefits (Measurement), PL Deployment (Change, Sustainability). |
| 4 | Organisational Goals | Operational Effectiveness, Learner Engagement, Learner Achievement, Learning Culture, Comparators, Training Efficiency. |
| 5 | People | Learner, Persona Groups, Trainers, Suitably Qualified and Experience Personnel. |
| 6 | Learning | Pipeline, Stage, Requirement, Functional Skills, Competency Framework, Design, Delivery, Achievement, Outcome, Refresh, Human-to-Human Interaction, Target Learning Model, Feedback, Self-Regulation of Learning. |
| 7 | Policy and Processes | JSP 822, DSAT, Career Pathways, Learning Pathways. |
| 8 | Resources | People, Availability, Priorities. |

18 Notes collected by third party (i.e. a member of the research team and the Dstl Technical Partner) reflecting observations from a visit to MOD Lyneham were incorporated within the analysis. This visit was undertaken prior to the start of the research activity.

|  |  |  |
| --- | --- | --- |
| Id | Thematic Codes - Primary | Thematic Codes - Secondary |
| 9 | Technology | Aspirations, Technology Enhanced Learning, E-Portfolio / Record, Learning Analytics, Capability, Data Size and Storage, Virtual Learning Environment, Virtual, Live. |
| 10 | Infrastructure | Learn, Physical, Security, Migration, Services, Accessibility. |
| 11 | Defence Stakeholders | PL Areas of interest, PL Definition. |
| 12 | Defence PL Cases | Title, Description. |

* + - 1. In Section [3](#_bookmark29), Defence perspectives of relevance to the deployment and sustainability of PL are discussed with reference to the information gathered from the stakeholder consultations (see [Table A-4](#_bookmark67), Themes 1-12), the findings of the REA and key GFI.

### WP 3

* + - 1. WP3 had two key aims: firstly, to develop a deeper understanding of the current provision of PL at three Defence establishments: DCTT, Defence Business Skills College and the ARITC, and secondly, to develop a structured list of PL elements that may be used to inform decision-making relating to the implementation and sustainability of PL initiatives.
      2. The research approach included establishment visits followed by a one-day stakeholder workshop (see Appendix [C](#_bookmark73)). Information collected during the establishment visits was guided by a semi-structured interview proforma, developed at WP2 and included engagement with c12 stakeholders representing training analysis, design, delivery, and management functions.
      3. The one-day workshop was attended by eight stakeholders from across the Defence Academy, 22 Group, DCTT, LWC and Dstl, representing primarily Training Management and Policy functions. A description of the three detailed Defence cases and information gathered as a result of the one-day workshop is reported at Appendix [E](#_bookmark87) and [C](#_bookmark73) respectively. The analysis of information to develop a structured list of 36 PL elements is reported at sub-section [4.1](#_bookmark42)).

### WP 4

* + 1. In this WP, the findings from WP 1 – 3 were brought together to develop an implementation decision support process for PL, to support informed decisions on whether a PL approach was:
* Suitable for implementation in a given organisational context;
* Able to realise desired outcomes in the short term; or,
* An opportunity for longer term investment.
  + 1. Process steps were identified in a whole team workshop and tested against two known Defence PL cases using the Defence People Strategy (MOD, 2016) as a basis for identifying strategic vision and desired organisational outcomes. The process included an

influence matrix which assessed the selected PL approach in context against the eight PL influences identified in WP3 to inform an implementation plan in terms of the main areas of risk and constraint, and prioritisation of these.

### Deliverables

* + 1. Findings from WP1 and 2 were described in detail in an interim report (Mundy and Deighton, 2019) and also presented to the Customer in summary in a slide presentation and a two page Interim Summary Report.
    2. This final Technical Report brings together the findings from all WPs, focusing primarily on the outputs of WP4 and referencing data in the Interim Report as appropriate. Other deliverables include a two page Final Summary Report, and a short video log (VLOG) and slide presentation summarising key findings.

# Stakeholder Engagement List

[Table B-1](#_bookmark72) shows a list of stakeholders who were interviewed for the purposes of data collection during the study, with details of any GFI provided from the interview.

*Table B-1: List of Stakeholder Interviews*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Serial** | **Organisation** | **Stakeholder Appointment** | **Date of Interview** | **Purpose of Interview/Visit** | **GFI Received** |
| 1 | Royal Navy – Flag Officer Sea Training (FOST) | SO2 Education, Lifelong Learning & Resettlement; SO2 Training Capability | 4 Mar 19 | Royal Navy (RN) high-level perspectives regarding PL | 2018 Maritime Training  Strategy Part 1 and 2 |
| 2 | SO1 New Capabilities SM | 8 Mar 19 | None |
| 3 | SO1 New Capabilities AW | 12 Mar 19 | None |
| 4 | Defence Academy | Head of Education and Training Strategy; SO1 Technology Enhanced Learning (TEL) Team; SO1 Defence Education Pathway | 21 Feb 19 | Defence high level perspectives regarding PL; background information on Defence Learning Management Capability (DLMC) programme | Draft TEL Strategy 2019 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Serial** | **Organisation** | **Stakeholder Appointment** | **Date of Interview** | **Purpose of Interview/Visit** | **GFI Received** |
| 5 | Training Education Skills Recruiting and Resettlement (TESRR) | SO1 Training Capability & Force Development | 8 Feb 19 | Defence high level perspectives regarding PL | None |
| 6 | SO1 Training Policy | 22 Feb 19 | Joint Service Publication (JSP) 822 review paper |
| 7 | Army – Directorate Personnel/Policy | Assistant Head (AH) Learning & Development | 8 Mar 19 | Army high level perspectives regarding PL | None |
| 8 | SO1 Lead User for DLMC | 13 Mar 19 | Background information on DLMC programme with regard to PL | None |
| 9 | SO2 Programme Castle | 11 Mar 19 | Background information on Programme Castle with regard to PL | None |
| 10 | Air Command – Headquarters (HQ) Air 22  Group | SO1 Strategy Programmes 1 | 7 Mar 19 | Royal Air Force (RAF) high level perspectives regarding PL | Project Faraday, Cogs Model (Extract) (supplied by 22Gp). |
| 11 | DCHET | Chief of Staff (COS) DCHET | 14 Feb 19 | Defence level perspective on PL | Link to schedule of courses delivered by DCHET.  [https://modgovuk.sharepoint.c](https://modgovuk.sharepoint.com/sites/defnet/JFC/Pages/Surgeon-General-.aspx) [om/sites/defnet/JFC/Pages/Su](https://modgovuk.sharepoint.com/sites/defnet/JFC/Pages/Surgeon-General-.aspx) [rgeon-General-.aspx](https://modgovuk.sharepoint.com/sites/defnet/JFC/Pages/Surgeon-General-.aspx) |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Serial** | **Organisation** | **Stakeholder Appointment** | **Date of Interview** | **Purpose of Interview/Visit** | **GFI Received** |
| 12 | Army Recruiting and Initial Training Command (ARITC) | SO2 Learning Development Advisor | 25 Feb 19 | Service-level perspectives on PL and example of Army current innovation in training | Army Recruiting and Training Division (ARTD) Leadership Reader; Target Learner Model; ‘Mission Success = Training, Trainers, Trainees’ (PPT slides) |
| 13 | Babcock International Group (Marine) | Army Reservist (OF2) | 15 Feb 19 | Reservist perspectives on PL | None |
| 14 | Army - RSME | Head of Training Design | 5 Mar 19 | Examples of Army current innovation in training | None |
| 15 | Defence Academy – Business Skills College (BSC) | BSC e-learning Team Leader | 25 Apr 19 | Case study example – Set Your Own Agenda (SYOA) Acquisition Online | Slides showing screenshots of the SYOA courseware |
| 16 | Defence College of Technical Training (DCTT)  – RAF Cosford | SO2 Force Development Training Squadron | 26 Apr 19 | Case study example – DCTT Blended Learning | None |
| 17 | DCTT – HMS  Sultan | Key training policy/delivery stakeholders | 29 Apr 19 | Case study example – DCTT Blended Learning | None |
| 18 | DCTT – MOD  Lyneham | Key training policy/design/ delivery stakeholders | 14 May 19 | Case study example – DCTT Blended Learning | None |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Serial** | **Organisation** | **Stakeholder Appointment** | **Date of Interview** | **Purpose of Interview/Visit** | **GFI Received** |
| 19 | Defence/Single Services | Key training policy stakeholders - Defence Academy, 22 Group, DCTT (DSMarE), LWC  and Dstl. | 23 May 19 | Stakeholder workshop - consider the impact of PL on defence policy and processes. | None |

# Stakeholder Workshop

### Overview

* + - 1. A one-day workshop was held on 23 May 2019 at QinetiQ Farnborough and attended by eight19 stakeholders from the Defence Academy, 22 Group, DCTT (DSMarE), LWC and Dstl. The majority of attendees (with the exception of LWC) had been engaged previously by the research team (see Appendix [B](#_bookmark71)). An invitation to attend the workshop was issued by Dstl Technical Partner – this was followed later by an introductory briefing on the topic of PL to confirmed attendees.
      2. The broad aim of the workshop was to explore the impact of PL on Defence policy and processes – in essence what needs to change or remain in place to ensure the effective deployment and sustainability of PL in the near and longer term. Additionally, the workshop provided an opportunity to: brief stakeholders on the research findings to date; better understand the relevance of PL to their particular contexts; and, investigate ways to plan for and evaluate the impact of PL interventions within a Defence context.

### Approach

* + - 1. The workshop was divided into four main sessions, each guided by a PowerPoint presentation and lead facilitator. The first session involved the full group of participants and presented the working definition of PL that had been developed by the research and the key components of the PL model; theories associated with PL; and macro and micro approaches. This was followed by an ‘ice-breaker’ session in which stakeholders were invited to consider the current provision of PL within their organisations and future aspirations. The remainder of this session included the presentation of five PL cases which were selected to represent the breadth of PL, entitled:
         * Case 1 – Set Your Own Agenda;
         * Case 2 – Target Learning Model;
         * Case 3 – DARPA Digital Tutor;
         * Case 4 – Cogbooks Adaptive Courseware; and,
         * Case 5 –Blended Learning Environment.
      2. A ‘one-slide’ common format was constructed to communicate relevant information for each case (see [Figure C-1](#_bookmark77)) with slide content sourced from the findings of the REA (Mundy and Deighton, 2019) and previous stakeholder engagement (see Section [3](#_bookmark29)).

19 A total of 19 Stakeholders (excluding Dstl personnel) were invited to the event. The opportunity to send a substitute was offered to those Stakeholders who were unable to attend.



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|  |  |
| --- | --- |
| **Case Study 1: Set Your Own Agenda** | |
| **Summary Description**   * E-Learning packages delivered by the Business Skills College (Defence Academy) via ‘Acquisition Online’. Business topics including, for example: commercial, integrated logistics support, systems safety and project management. External accreditation of some courses provided by professional institutions (e.g. Association for Project Management). * Includes a simple computer based pre-test (multiple choice questions) to identify an individual’s current understanding of a particular topic. An ‘I know nothing’ response option is included allowing learners to skip the pre-test. * Learner provided with feedback on their question responses (see Figure 1). * A menu is presented listing the full set of topics included in the module. Topics in white are where mastery was achieved in the pre-test, ‘blue’ are to be studied and red can only be accessed when pre-requisite topics have been completed (see Figure 2). * The results of the pre-test therefore “rewards” the learner’s prior experience, preventing them from having to study material they already know which helps to focus their attention on new material. A post-test, again presented in a multiple-choice format, is administered following the completion of the module and feedback on those topics passed and those that require further revision is provided to the learner. * The learner may decide to study all topics, even those for which the pre-test has indicated that they have sufficient mastery. * A ‘search and learn’ function allows learners to use the e-learning materials as a reference, or to refresh learning following their initial completion of the course. * The course sponsor decides on whether the ‘SYOA’ approach can be applied for a given module. This is based on the judged criticality of a given module. There is no specific, or repeatable process for assessing criticality. The pass rate for a given topic and the module may also reflect criticality. * Some E-learning packages are delivered as part of a blended learning approach with face-to-face classroom time. There is some help desk support, however, no function to support social learning.   17 Personalised Learning | May 2019 | © QinetiQ Ltd 2019 QINETIQ PROPRIETAR OFFICIAL | **Career Stage / Service**   * Phase 3, accessible to all MOD personnel |
| **PL Model Components**   * Technology, Teacher & Learner |
| **Features**   * Topic criticality assessment * External accreditation * Assessment of prior Learning * Self-regulation of learning * Refresh learning & ‘Just-in-time’ learning * E-Learning * Blended learning |
| **Benefits**   * Savings in learner time calculated from 40 courses over a 12 year period, reporting a saving of 260,000 hours, representing a reduction in 40% of learner hours. * Less learner frustration in having to complete unnecessary learning (however, no empirical evidence gathered) and increased retention (i.e. number of learners completing the course).   Y |

*Figure C-1: The Five Example PL Case Studies Were Presented in a Common Format*

* + - 1. Sessions 2 to 4 split the attendees into two separate groups, with each group including a mix of Service representation and interests (e.g. learning technology). Each group was facilitated by a member of the research team who also recorded stakeholder comments. Membership of each group remained the same throughout the workshop.
      2. The objective of session 2, was to better understand stakeholders’ interests and aspirations in relation to PL (see [Figure C-1](#_bookmark77)). This was facilitated by an exercise which required each group to discuss and then construct their own ‘real’ or ‘fictitious’ PL case and to document the case using the structure that had been used by the research team (see [Figure C-2](#_bookmark78)).



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Session 2: Creating your PL Case

* Divide into your two groups
* Individually, take five minutes to reflect on the case examples, your interests (planned or in place), and aspirations for PL in your organisation
* Discuss and, as a group, construct a new case (20 minutes)
* The case may be a composite of the interests of your group
* As a group, record your case using the template provided
* Group member to brief back to the other group (5 minutes per group)
* *We will return to your group PL cases during Session 4 when we consider how to assess the effectiveness of PL*
* [Coffee available]

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*Figure C-2: Session 2: Creating Your PL Case*

* + - 1. The objective of session 3, was to understand those factors influencing (i.e. enabling or inhibiting) the implementation of PL. This was facilitated by an exercise which required participants, within the same two groups, to consider each of the five PL case examples (briefed in session 1) and to then decide on the relevance of each example to their particular context (see [Figure C-3](#_bookmark79)). Further consideration was then given to the reasons why particular cases may, or may not be relevant.



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Session 3: Relevance of PL to your context

* Divide into your two groups
* Work on your own or in pairs (5 minutes)
* Take each of the five PL case examples briefed and consider, at a ‘top level’, relevance to your specific context(s) (now and in the future)
* Your facilitator will then support a discussion (35 minutes) to identify:
  + Reasons why particular PL case examples may not be relevant to your contexts
  + What needs to be put in place to support implementation of a PL initiative (‘enablers’) and what needs ‘to go’ (‘blockers’)
  + Which factors are key in supporting the ‘roll-out’ and/or sustainability of a PL initiative
* Facilitator to brief back to the other group (5 minutes per group)

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*Figure C-3: Relevance of PL to Your Context*

* + - 1. The objective of the final session was to identify ways to assess the effectiveness of PL interventions within a Defence context. This was facilitated first with reference to the five example PL cases briefed at session 1 (see [Figure C-4](#_bookmark80)) and then followed by a specific consideration of the group’s case that was constructed at session 1 (see [Figure C-5](#_bookmark81)).

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Session 4: Assessing the effectiveness of a PL initiative (1)

* Session is divided into two parts – broad and then focused
* Again, divide into your two groups
* First, spend 10 minutes discussing how you have assessed, or plan to assess, the effectiveness of any PL initiatives within your organisations
* To prompt your thinking, consider again the five PL case examples
* This is an ‘ideas generation’ part of the session
* Then, return to your group case study that you developed at the beginning of the day…. refresh your understanding
* Leg stretch…

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*Figure C-4: Assessing the Effectiveness of a PL Initiative (1)*

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Session 4: Assessing the effectiveness of a PL initiative (2)

* Consider how you might assess the effectiveness of your group PL case
* First, think about how you might measure success (use template provided)
* Second, taking everything into consideration that we’ve talked about today, which PL initiative(s) would you be most interested in knowing more about?
* Spend 30 minutes on this exercise
* Facilitators to brief back on your findings (10 minutes per group)

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*Figure C-5: Assessing the Effectiveness of a PL Initiative (2)*



### Findings

* + 1. **The draft PL Definition**
       1. During session 1, stakeholders were invited to provide feedback on the working definition of PL. An initial observation was that the definition, when presented along with the five organisational goals, might suggest that the benefit of PL was purely at the organisational level. However, further discussion suggested that stakeholders would “question a definition of PL that did not show a link to the organisational outcome”. Further explanation of the PL- related organisational goals highlighted the intrinsic consideration of the individual (e.g. learner engagement). A further comment related to why the definition did not link to team and collective levels. This is recognised as a point for consideration when investigating the benefits and challenges of PL.

### Relevance of PL to your context

* + - 1. A summary of findings relating to the relevance of each case to those ‘learning-related’ contexts, represented by workshop attendees, is provided in the following sections:
         * Case 1 – Set Your Own Agenda. The features offered by this case were considered of relevance to Phase 3 (Command, Leadership and Management (CLM)), both today and in the future. Whilst the case reflected an e-learning application, the potential to apply this feature to other courses was noted.
         * Case 2 – Target Learning Model. This case was considered of relevance to Phase 1 (Initial Force Protection Training (IFPT)), both today and in the future. It was commented by one participant that of the five case examples, this PL approach was of most interest and that “every course should consider this approach” (with particular application to long courses).
         * Case 3 – DARPA Digital Tutor. The type of capability offered by this case was considered of potential relevance to Phase 1 (Initial Officer Training (IOT)) and Phase 3 (CLM), both today and in the future. One participant noted that there were no obvious examples of where this capability was being used within the defence context, but that the capability was relevant and had future potential.
         * Case 4 – Cogbooks Adaptive Courseware. The features of this case were considered of relevance to Phase 1 and Phase 3 (CLM), both today and in the future. Similar to case 3, it was noted that this PL approach had potential.
         * Case 5 – LEARN (Blended Learning Environment. Similar to Case 4, the blended learning environment was considered of relevance to Phase 1 and Phase 3 (CLM), both today and in the future. It was remarked that blended learning is used “extensively across Defence schools and is growing all of the time” and that this is probably of most relevance today.

### Constructing a PL case example

* + - 1. Two example cases were constructed, entitled: “The Human as an ‘Intelligent’ Tutor and “Set Your Own Agenda (SYOA) for Mandated Training.”
         * The Human as an ‘Intelligent’ Tutor. This case reflected many features of the TLM (see Appendix [E.3](#_bookmark96)) including the capability to systematically assess the specific needs of the learner and to then develop and implement appropriate interventions. In this case, the upskilling of the tutor was emphasised and their role in supporting individual learners’ deeper understanding of course content and contextualising to the individual’s specific environment. In this case, the tutors may be external to the organisation and, as such, there is not a reliance on the capability of trainers within the organisation. Access to the tutor may be ‘online’ and outside of ‘office hours’. It was considered that learners attending Phase 3, modular career courses (e.g. Intermediate Command and Staff Course (ICSC) Navy/RAF/Army) would benefit from this approach. The benefits to individuals entering the workplace were also noted (e.g. transition to ship). The potential to purposefully blend this approach with a Digital Tutoring approach was considered relevant. The key message was the need for consistency in the provision of the approach.
         * SYOA for Mandated Training. This case reflected the features of the Business Skills College training package ‘Acquisition Online’ (Defence Academy, 2019), using a learner + technology model ([Figure 2-1](#_bookmark17)). This online e-learning package would use initial diagnostic assessment to confirm prior knowledge and skills, given that learners should be familiar with the subjects addressed annually in mandated training, e.g. Defence Information Management Passport (DIMP). The system would identify the modules for which learners had already demonstrated competence in the diagnostic assessment, enabling the learner to choose from a recommended menu of learning content which avoided unnecessary repetition and saved training time. The group reflected that while this example case might be an efficient way of delivering the training in terms of training hours saved, e-learning was not necessarily the most effective way to ensure retention and transfer of learning. It was suggested that there should be both formative and summative assessment in the training and that this should be contextualised to assess the application of learning in the individual learner’s role. It was also highlighted that learners would need to be motivated to engage with this type of topic, and that including elements of peer-peer learning or a virtual tutor interface into the model could improve this. Benefits would then combine efficiency (training hours saved, accessibility to learning) and effectiveness (increased learner engagement, retention of learning).

### Factors influencing implementation of PL

* + - 1. [Table C-1](#_bookmark83) presents a consolidated set of the enablers and blockers to PL that were identified by the two groups,relating to each of the eight PL influences (see sub-section [4.1](#_bookmark42) and Appendix [F](#_bookmark100)).

*Table C-1: Enablers and Blockers to the Implementation / Sustainability of PL (items generated)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Serial** | **Comment** | **Relevance to PL example20** | **Enablers / Blocker** | **Element Code** |
| **1** | Ability to generate high-end media | LEARN | Enabler | People |
| **2** | Provision of Virtual Learning Environment(s) | LEARN | Enabler | Technology |
| **3** | Access to Internet and in turn, enabling access to a range of resources | LEARN | Enabler | Technology |
| **4** | On-site services, accessible within accommodation block | LEARN | Enabler | Infrastructure |
| **5** | Learning enabled social interaction | LEARN | Enabler | (Environment?) |
| **6** | Learning analytics | LEARN | Enabler | Technology |
| **7** | Continuity of trainers (i.e. reduced churn) | LEARN | Enabler | People |
| **8** | Availability of resources ‘through-life’ | LEARN | Enabler | Organisation |
| **9** | Lack of processes in place to ensure that (learning) technology insertion is aligned with the provision of a trainer capability (numbers  and SQEP) | LEARN | Blocker | Policy and Processes |
| **10** | Lack of processes in place to support the capture of business intelligence to assess the effect of the intervention | LEARN | Blocker | Policy and Processes |
| **11** | Lack of processes in place to ensure that materials are used  appropriately outside of the learning environment (e.g. inappropriate use as ‘reference’ materials in the workplace, impacting safety) | LEARN | Blocker | Policy and Processes |
| **12** | Lack of processes in place to ensure that the PL approach is ‘interoperable’ with other systems (e.g. learner records, analytics) | LEARN | Blocker | Policy and Processes |

20 See Appendix [C,](#_bookmark73) sub-section [C.2.1.1](#_bookmark76) for the PL case examples.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Serial** | **Comment** | **Relevance to PL**  **example20** | **Enablers / Blocker** | **Element Code** |
| **13** | Course designer capability is in place | Adaptive  Courseware | Enabler | People |
| **14** | Artificial Intelligence, 5G21. | Adaptive Courseware | Enabler | Technology / Infrastructure |
| **15** | Rapid processing / computer power | Adaptive Courseware | Enabler | Infrastructure |
| **16** | Opportunity to ‘trial’ to establish capability of the PL approach | Adaptive Courseware | Enabler | Organisational Design |
| **17** | ‘Trust’ among learners in the capability of the approach to deliver effective learning | Adaptive Courseware | Blocker | Organisational Culture |
| **18** | ‘Trust’ among trainers in the capability of the approach to deliver effective learning | Adaptive Courseware | Blocker | Organisational Culture |
| **19** | ‘Trust’ by the organisation that the capability supports an understanding of the quality of learning achieved and ‘accountability’  (traceability) in the event of an incident | Adaptive Courseware | Blocker | Organisational Culture |
| **20** | ‘Trust’ by the organisation that the capability, developed within a commercial context is applicable to military training and learning | Adaptive Courseware | Blocker | Organisation Culture |
| **21** | Receptiveness of individual learners to undertaking learning in their  ‘own time’ | Adaptive  Courseware | Blocker | Organisational Culture |
| **22** | The validity of existing processes and supporting ‘tools’ to enable analysts to select relevant combinations of media and methods | Adaptive Courseware | Blocker | Policy and Processes |
| **23** | Time and resource to collect the student data required to populate  ‘adaptive systems’ | Adaptive  Courseware | Blocker | Resources |
| **24** | The nature of the learning requirement – relevance of the PL approach  to STEM subjects may not be relevant to learning requirements that are critical | Adaptive Courseware | Blocker | Learning Requirement |

21 5G is the fifth generation cellular network technology.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Serial** | **Comment** | **Relevance to PL**  **example20** | **Enablers / Blocker** | **Element Code** |
| **25** | The availability of data analytics capability | Digital Tutor | Enabler | Infrastructure / Technology |
| **26** | Ability of system to ‘understand’ the learner – the full range of learning preferences, levels of aptitude, etc. | Digital Tutor | Enabler | Technology |
| **26** | ‘Strategic desire’ to adopt PL approaches | Digital Tutor | Enabler | Organisational Design / Culture |
| **27** | Cultural change – permeating through all layers of the organisation | Digital Tutor | Enabler | Organisational Culture |
| **28** | Pilot trial of approach to demonstrate capability and evidence of benefits | Digital Tutor | Enabler | Organisational Design |
| **29** | Need to consider whether approach will be acceptable to external  customers when exporting training | Digital Tutor | Enabler/Blo  cker | Organisational Culture |
| **30** | Complexity of system requires significant developer and SME time for development | Digital Tutor | Blocker | Resources |
| **31** | Resistance to approach from Students - acceptability | Digital Tutor | Blocker | Organisational Culture |
| **32** | Resistance to approach from Trainers - acceptability | Digital Tutor | Blocker | Organisational Culture |
| **33** | Churn in leadership – individual(s) driving the PL initiative | Digital Tutor | Blocker | Organisational Design |
| **34** | Effective attraction, selection, and reward of trainers to ensure that trainers are intrinsically motivated to support trainees. | Target Model | Enabler | Processes/People |
| **35** | Trainer continuing professional development (CPD) and mentor support. | Target Model | Enabler | Processes/People |
| **36** | Organisation values and invests in trainer capability | Target Model | Enabler | Organisational Culture |
| **37** | Lack of evidence of strategic/financial benefits of investing in trainer capability | Target Model | Blocker | Organisational Culture |
| **38** | Different trainer attraction/selection/reward processes for different single Services | Target Model | Blocker | Processes/People |
| **39** | More sophisticated understanding of how learners interact with technology – intelligent interface. | SYOA | Enabler | Technology |
| **40** | Good self-regulated learning (SRL) readiness levels in learners, especially motivation to engage. | SYOA | Enabler | People/Learning Culture |
| **41** | Challenging to achieve a common learning culture across and within the different schools/single Services | SYOA | Blocker | Organisational Culture |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Serial** | **Comment** | **Relevance to PL**  **example20** | **Enablers / Blocker** | **Element Code** |
| **42** | Organisational attitude to training risk, i.e. accountability’ (traceability)  of training in the event of an incident | SYOA | Blocker | Organisational Culture |

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## QinetiQ Proprietary

### Identifying ways to measure PL

* + - 1. [Table C-2](#_bookmark84) shows the considerations identified by stakeholders in the ways that PL might be measured and the focus of the measurement. Themes emerging highlight that there is a need to consider measurement approaches drawn from across the training, human resources (HR) and human factors (HF) domains.

*Table C-2: Considerations in the Development of Ways to Measure PL (items generated)*

|  |  |  |
| --- | --- | --- |
| **Serial** | **Consideration** | **Focus of measurement** |
| **1** | Time in ‘residence’ on the course | Course |
| **2** | First time pass rate | Course |
| **3** | Learner baseline capability | Entry Standards / progression |
| **4** | Rate of progression within a course /  between courses | Learning Pathway |
| **5** | Number of learners who start on one course and then change to another | Course level |
| **6** | Number of learners who ‘drop out’ of  the course entirely (do not change to another course) | Course level |
| **7** | Learner engagement | HR measures/ Learner |
| **8** | Talent management – flow through system | HR measures |
| **9** | Baseline to existing system | Benchmark measures |
| **10** | Staff Churn | HR measures |
| **11** | Availability of specialisms | HR measures |
| **12** | Learner entry - prior experience, ability tests | Learner |
| **13** | Utilisation of the PL approach / service | System |
| **14** | Extension of learner capability | Learner |
| **15** | Course output standard | Learner |
| **16** | Extending the talented learner beyond the course ‘pass standard’ | Learning Pathway |
| **17** | Trainer capability | Trainer |
| **18** | Flexibility of the course design | Course design |
| **19** | Time with tutor (in blended approach) | Course |
| **20** | ‘Hours to course completion | Course |
| **21** | Levels of manning achieved | HR measures |
| **22** | Retention in service | HR measures |
| **23** | Learner self-assessment of progress (e.g. RAG (Red, Amber, Green) rating) | Learner |

# PL Benefits and Challenges

[Table D-1](#_bookmark86) shows examples of the benefits and challenges associated with cases of PL approaches identified in this study.

*Table D-1: Example Cases Showing PL Benefits and Challenges*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **PL Category** | **ID**  **No** | **System Title (Organisation)** | **PL Model Components** | **Main PL Features** | **Outcomes/Benefits** | **Challenges** |
| Blended Learning Environments | 1 | **Enhanced Learning Environment (ELE)**  (Royal School of Mechanical Engineering (RSME)) | Learner Teacher Technology Environment | * Trainer in coaching / mentoring role. * Fixed Mastery, Variable Time (FMVT) approach – self-paced learning. * Learner access to ELE. * Access to learning in the environment,   e.g. QR codes on posters. | Based on previous research report (McKeown et al, 2014):   * Training time shortened by an average of 10 days. * Trainers able to focus on trainees who need support. * Increased learner engagement.   Based on data from Defence Academy22:   * 5% higher overall first-time pass rate and increased competency. * Increased motivation of trainees. * 100% more time spent out of the classroom learning in the field. * Proven Value for Money (VfM) model for Defence (£245M saving). * Circa 21,000 man training days saved since 2013. | Based on previous research report (McKeown et al, 2014):   * Transformation of legacy course materials for FMVT is time consuming. * Some course modules require team work – self- paced learning not appropriate. * Significant investment in infrastructure and resources, including trainer development. |

22 Interview with Lead for Technology Enhanced Learning (TEL) team and access to draft TEL strategy paper.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **PL Category** | **ID**  **No** | **System Title (Organisation)** | **PL Model Components** | **Main PL Features** | **Outcomes/Benefits** | **Challenges** |
|  | 2 | **Blended Learning Environment**: (Defence College of Technical Training (DCTT)) | Learner Teacher Technology | * Differentiation through assessment for learning (diagnostic) and targeted learning support. * Learner access to Virtual Learning Environment (VLE) - LEARN. * Pilot of flipped classroom approach (self- paced learning) with trainer as facilitator. | Based on Ofsted observations 2018:   * Increased trainer engagement. * More effective learning interventions.   Based on DCTT team feedback:   * Increased learner engagement. | * Differing approaches to development of contractor and military trainers. * Media development for VLE resources – significant SME and developer time required. * Technology constraints, e.g. Defence policy on Bring Your Own Device (BYOD) |
| 3 | **Intellipath** (Colorado Technical University) | Learner Teacher Technology | * Adaptive online learning platform tailors content to match   learners’ varying levels | Based on Educause report (Johnson, 2016):   * Pass rates increased, in one example by 27%. * Course retention rates rose by approx. 9% to 95%. | * Implementation time – four years to reach 15% of total course offerings. |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **PL Category** | **ID**  **No** | **System Title (Organisation)** | **PL Model Components** | **Main PL Features** | **Outcomes/Benefits** | **Challenges** |
|  |  |  |  | of previous experience.   * Adaptive ‘learning maps’ allow students to demonstrate competencies in academic areas and earn credit for prior knowledge, through work, training, or other experience. * Learners supported by live chat sessions with tutors and peers. | * Final grade averages increased, in one example by 10%. |  |
| 4 | **Acquisition Online** (Defence Academy - Business Skills College) | Learner Teacher Technology | * Online learning courses for project management, commercial, etc. | Based on interview with Defence Academy staff:   * Savings in training time calculated from 40 courses over a 12 year period, reported a saving of 260,000 hours, representing a reduction in 40% of learner hours. | Based on interview with Defence Academy staff:   * Transfer of courses to Defence Learning Environment   (DLE) loses |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **PL Category** | **ID**  **No** | **System Title (Organisation)** | **PL Model Components** | **Main PL Features** | **Outcomes/Benefits** | **Challenges** |
|  |  |  |  | * Set Your Own Agenda (SYOA) approach using diagnostic pre- test to adapt learning content to individual’s prior knowledge and experience. * Online access to human tutor for learner support as required. | * Anecdotal evidence of less learner frustration in having to complete unnecessary learning and reduced drop-out rate on courses. | some of the PL functionality, e.g. ability to track learner activity, scaffolding approaches.   * Lack of time to develop staff digital literacy and coaching skills – particularly for military trainers. * Ability of course owners to specify clear learning objectives. * Risk associated with ‘skipping’ learning objectives. |
| Teacher Strategies | 5 | **Target Learning Model** (Army Recruiting and Individual Training Centre (ARITC)) | Learner Teacher | * Phase 1 training context. * Trainers assess individual learner needs | Based on interview with ARITC staff:   * Evaluation of the results of this initiative are not available for at least a year, when trainers have had time to apply newly learned AFL skills. | Based on interview with ARITC staff:   * Trainers require an additional day of training on Target Learning   Model to |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **PL Category** | **ID**  **No** | **System Title (Organisation)** | **PL Model Components** | **Main PL Features** | **Outcomes/Benefits** | **Challenges** |
|  |  |  |  | based on the Target Learning Model Framework (see  [Figure E-3](#_bookmark99)).   * Trainers then select relevant learning- related interventions. | * Anecdotal evidence suggests that trainee pass rates have increased since this approach was introduced in Feb 18. | supplement existing Train the Trainer course (DTTT V2). |
| Personal Learning Assistant (PLA) | 6 | **Mentor Pal** (US Navy and University of Southern California Institute for Creative Technologies (USC ICT)) | Learner Technology | * A virtual agent which emulates a question-and- answer session with US Navy STEM mentors. * Students have access to multiple mentors to inform   decisions | Anticipated benefits based on prototype testing only:   * Ability to deliver effective mentoring at scale. * Improved recruitment and retention for STEM employment roles. | * Identifying suitable mentors. * Development time is significant and requires considerable input from mentor. |

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| --- | --- | --- | --- | --- | --- | --- |
| **PL Category** | **ID**  **No** | **System Title (Organisation)** | **PL Model Components** | **Main PL Features** | **Outcomes/Benefits** | **Challenges** |
|  |  |  |  | about future career choices. |  |  |
| Intelligent Tutoring System (ITS) | 7 | **Digital Tutor** (Defense Advanced Research Projects Agency (DARPA)) | Learner Technology | * ITS delivers initial employment training on Information Systems Technology to US Navy ratings. * Using the Digital Tutor, learners interact directly with IT systems found in the Fleet. * IT systems communicate and share data with each other while the Digital Tutor dynamically observes, tracks, and models | Based on research report (Fletcher et al, 2014):   * Training time reduced from 35 weeks to 16 weeks. * Learners outperformed trainees who completed the 35-week course and qualified Navy ratings in all tests except one. with higher scores at every difficulty level, less harm to the system, and fewer unnecessary steps. | Based on research report (Fletcher et al, 2014):   * The Digital Tutor was relatively expensive to develop and is, at present, expensive to use for instruction. * Need to budget for SME who are proficient in computation, the subject matter, and tutorial techniques. * Funding to develop or apply a tutor must be spent up front. The Return on Investment comes later, gradually, and is often realised by   a different |

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| --- | --- | --- | --- | --- | --- | --- |
| **PL Category** | **ID**  **No** | **System Title (Organisation)** | **PL Model Components** | **Main PL Features** | **Outcomes/Benefits** | **Challenges** |
|  |  |  |  | learner progress.   * Learners are supported to find and assess their own solution paths to IT problems. |  | organisational entity to the one that funded the development. |
| Adaptive Learning System (ALS) | 8 | **Mobile Adaptive Training Technologies** (US Army Research Laboratory) | Learner Technology | * Automated self-directed (i.e., non- instructor led) mobile training application for a military radio. * System adapts training content and pace to suit learner knowledge, skills and aptitude. | Based on research report (Long et al, 2015b) – prototype findings only:   * Training time reduced by about 15 minutes in an approximately one- to one-and-a-half-hour training; approximately a one-SD (standard deviation) difference. * Adaptive training was found to be at least as effective as the non- adaptive training. * Learners (n=20) reported being more engaged with the learning. | None stated – further research required. |
| 9 | **Gunnery Training Simulator** (US Army Research Laboratory) | Learner Technology Teacher | * Virtual simulation training system | Based on research report (Long et al, 2015a) – prototype findings only: | None stated – further research required. |

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| --- | --- | --- | --- | --- | --- | --- |
| **PL Category** | **ID**  **No** | **System Title (Organisation)** | **PL Model Components** | **Main PL Features** | **Outcomes/Benefits** | **Challenges** |
|  |  |  |  | managed by an instructor.   * Adaptive crew training capability based on assessment of performance in firing tasks and conditions. | * Training time reduced on average by 40% with nearly 60% fewer scenarios. * Learner (n=14) achievement levels were comparable with non- adaptive training approaches. |  |

# Defence Case Studies

The thematic analysis of the outputs of the REA and information gathered from stakeholder interviews resulted in the identification of eight themes relating to PL (see [Figure 4-1](#_bookmark44)). In the following sections, three Defence cases are described in relation to these themes.

### Case Study 1 – Defence College of Technical Training

* + 1. **Overview**
       1. DCTT delivers Phase 2 technical training and educates personnel from all three Services. It has four schools covering electronic and mechanical, marine and aeronautical engineering; and communications and information systems. The Headquarters is based at MOD Lyneham along with the Defence School for Electronic and Mechanical Engineering (DSEME). This case reports the outcomes of consultations at RAF Cosford, HMS Sultan and MOD Lyneham.

### RAF Cosford

L**earning – Stage, Requirement and Pipeline**

* + - 1. DCTT, RAF Cosford accommodates a number of schools which deliver aeronautical engineering training (Advanced Apprenticeship courses); Aerosystems Engineering and Management Training (e.g. Foundation Degree programme); career courses (e.g. Phase 3, Supervisor and Junior Manager courses); and specialist training (e.g. Physical Training Instructors, through career courses).
      2. The school also delivers the following generic, non-professional training courses:
         * leadership and management;
         * change management;
         * coaching and mentoring;
         * human performance;
         * Neuro-Linguistic Programming techniques linked to instructional development;
         * applied innovation;
         * emotional intelligence; and,
         * mental health first aid and mindfulness.
      3. These personal development courses are voluntary and run from 1 to 4 days. The target audience is anyone on station who is not a trainee, ranging from clerks up to the station commander. The course is mixed (cross rank, service); participants are not required to attend in uniform and there are first name terms.

### Learning – Design, Delivery and Assessment

* + - 1. It was reported that the generic non-professional courses are regarded as highly successful; the interviewee came into post and initiated the personal development programme of courses three years ago. Today, there are 600 people on the register for the courses with delivery to 30 units across the services. Courses are not advertised formally and ‘word of mouth’ leads to interest in attendance. It was noted that an online survey has been implemented to collect evidence relating to the effectiveness of the course(s).

### People

* + - 1. For learners, Specific Learning Difficulties (SpLD) are recognised through a test at Phase 1 training, prior to the individual coming to Cosford. This information is forwarded to Cosford and relevant provision put in place at the request of the learner (this may include support from an Educational Psychologist).
      2. For trainers drafted into Cosford, there is a 3-week training package before they start at their respective schools. This package covers, for example: the subject of SpLD and the types of support that might be in place and which should be enabled by the trainer; different learning styles; and, evidence-based teaching methodology and learning methods. A range of learning methods are addressed and applied (e.g. pairwise working, quads, and flipped classroom approach, involving researching as a group outside of the formal learning environment and then delivering to peers).
      3. Overall, the trainer provides the opportunity for individual learners to learn using a variety of methods and media that best suits their learning style. The importance of ensuring that the trainer has the skills, flexibility, experience and opportunity to support a range of learning styles was acknowledged.

### Technology and Infrastructure

* + - 1. Cosford has access to the proprietary ‘LEARN’ VLE and associated infrastructure (see sub- section [E.1.3.12](#_bookmark89)) supporting access to internet-based learning resources, social and remote learning, 24/7. An example of the use of QR codes within the School of Physical Training was noted which served to capture feedback from participants attending a new type of exercise class. The reliance on individuals having their own IT resources to enable access to external internet resources was noted as a constraint.

### Policy and Processes

* + - 1. Several courses at RAF Cosford are Institute of Leadership and Management (ILM) accredited at levels 3, 4 and 5 (e.g. Coaching and Mentoring, level 5; Leadership and Management, level 4). The latter courses are targeted at Civil Service and civilian staff, given that military personnel receive this training as part of their development.

### Organisation

* + - 1. RAF Cosford is a satellite college for Wolverhampton University with opportunities for training staff to gain postgraduate qualifications (e.g. Certificate in Education (Cert Ed) and Master of Arts (MA) in Post-Compulsory Education). It is also a member of the Blended Learning Consortium23 which has c300 colleges across the UK. This enables access to learning materials that have been developed by other colleges, thus providing the opportunity for individuals to extend their understanding by exploiting such resources.

### MOD Lyneham

**Learning – Stage, Requirement and Pipeline**

* + - 1. DSEME is part of the DCTT and is located at MOD Lyneham. It is responsible for delivering technical training to soldiers, Royal Marines, airmen and officers from all three Services.

23 <http://www.blc-fe.org/>

DSEME consists of a number of units including 8 Training Battalion, Royal Electrical and Mechanical Engineers (REME) which provides technical training for all REME soldiers24.

### Learning – Design, Delivery and Assessment

* + - 1. Courses are prioritised for review and development using an internal maturity assessment approach. This is important given that high-end media can take up to 3 months to develop and involves SME resource. Examples of courses that have been subject to review include the Recovery Mechanic and the Protected Mobility course. For the Recovery Mechanic’s course, learner-guided approaches are supported by high-end media that allows the learner to view vehicle compartments and to click on panels to explore further. Limitations in the use of synthetic media are recognised, e.g. in the changing of a wheel and appreciation of ‘physical’ load. Similar media is presented on this VLE for ‘pistol’ maintenance. Here, learners are able to use synthetics to take apart and construct the pistol. In both cases, opportunities to extend learning are provided. A strong SME / media designer/developer partnership is required to ensure the development of media that is valid, with appropriate levels of fidelity. More broadly, media is used to familiarise pre-joiners with the learning environment, providing media that allows the individual to ‘walkthrough’ the hangar space and view facilities.
      2. Overall, there is strong engagement with learners in the design of online courseware (i.e. user-centred design approach). In addition, there are opportunities to ‘pilot’ changes to course design and delivery. For example, a flipped classroom approach has been piloted for IT modules which involved a classroom of trainees, all at different stages of learning, with the trainer (facilitator) observing/supporting from a corner of the room. In this case, trainees followed an interactive module using laptops both within and outside of the classroom environment with ‘stopping points’ at which a quiz-based test needed to be passed. Learners could therefore progress at a different pace and self-regulate their own learning. This method received a positive response from learners. It was noted that the pilot was undertaken with participation from an older group of learners and that a further study will be undertaken involving a comparatively younger group. This may involve hold-over trainees who are between courses, so that they can try out the courseware without any impact on their career courses.
      3. Other initiatives include a revision to the way in which maths is taught with the intent to provide greater contextualisation (e.g. meaning of mathematical principles) given different trade groups.
      4. In terms of assessment, it was noted that the Office for Standards in Education, Children’s Services and Skills (Ofsted) has had a shift to observing learners, rather than looking at the training. In response DCTT has developed a course to support their Defence Trainer Supervisors (DTS) to observe learner reactions in the classroom, rather than just looking at the structure/delivery of the training session.

### People

* + - 1. The school uses initial diagnostic questions with students to measure their prior learning experience and to set individual learning goals. This is completed by trainers with students (e.g. dexterity test) and is not automated. The potential to deliver knowledge-based questions on the VLE is recognised.

24 <https://www.army.mod.uk/who-we-are/our-schools-and-colleges/electro-mechanical-engineering/>

* + - 1. Differentiation is routine in the classroom based on trainer diagnostic observation and assessment for Special Educational Needs and Disability (SEND). A recent Ofsted report noted a significant improvement in differentiation and trainee engagement.
      2. There is a Learning Support Officer (LSO) on the team with assessment of all to determine any Specific Learning Difficulty (SPLD) requirements. This is regarded as critical to the retention of trainees. The LSO provision also supports the teaching of study skills on induction, how to use the library (referencing skills) on the VLE, academic practice and there is a pilot on research skills with the artificers’ course, aimed at courses where academic work and research projects are required. The value of extending such services to staff is also recognised.
      3. CollegeiP software25 is used at DCTT as a means for collating an understanding of the development / intervention requirements for the Trainer Cadre. Evidence of strengths and areas for development is collected through observation of trainer practice with evidence provided by trainers and the Head of Training. Trainer competences are mapped against Education and Training Foundation (ETF) professional standards which go beyond the Defence Trainer Competency Framework. Membership of an FE professional body, the Society for Education and Training (SET), is also promoted.
      4. There is recognition of the importance of capturing ‘attitudinal behaviours’ as a development need. Development interventions at the individual level may include coaching and mentoring and “collaborative interventions”, where other trainers may work with the individual in different ways to address the development need. Group interventions are also addressed where a common development need is evident, e.g. through the learning forums.
      5. Trainers receive regular and comprehensive Continuing Professional Development (CPD) on areas which enable active learning and on differentiation in the classroom. 'Lunch to Learn' sessions are held every Wednesday and are provided to learn about topics like differentiation. There are also trainer forums (one relating to the development of the active learner), with outside speakers, and this is supporting the cultural change. A key impact is the opportunity to share good practice "you know a good idea when you see it." Sharing of good practice is also at the practical level, e.g. sharing of templates and materials.

### Technology and Infrastructure

* + - 1. LEARN is the college VLE industry provided platform, hosted at Lyneham, and there are four VLE instances that are available worldwide. LIVE is the local interactive VLE that trainees can access anywhere and reach back to resources through career and LIVE - S is for sensitive course content. A VLE area is provided as a ‘sandpit’ allowing trainers to try out new initiatives (i.e. building content and materials) and to investigate methods and media. VLE-X (Exam) is the online assessment VLE that is run by the validation and accreditation team. The VLE supports access to good quality online courses (e.g. with links to Open University modules). Information security was noted as having a key impact on the adoption of modern learning methods and PL.

### Policy and Processes

* + - 1. Engagement with professional training staff viewed the DSAT steps as valid when applied to the personalisation of learning. The need was recognised for a cultural shift from

25 CollegeiP software supports professional performance review for teaching staff. <http://www.derventioeducation.com/collegeip/>

summative testing and the ‘teach to test’ philosophy to more formative assessments that support an understanding of the individual learner’s progression.

### Organisation

* + - 1. Key training functions (i.e. SMEs, analysts, designers, trainers and assurance staff) are co- located at Lyneham, supporting opportunities to ‘talk’ and share ideas. There are also several examples of individuals holding multiple skills across these functions.
      2. The organisation has a vision statement in place ‘To be the most Dynamic Whole Force Defence Learning Centre of Excellence for warfighting electro-mechanical engineers and their leaders’, and a strategy is under development. There is significant involvement of senior leadership in establishing the current and future direction of the school and this is acknowledged by staff. The ethos of ‘one school, one approach’ is acknowledged.
      3. The drivers for PL are integral to the organisation’s ‘ways of working’ with the desire to exercise best practice in learning. There is a strong drive towards continuous improvement and this is written into the contracted requirement. For example, Babcock International, who provide the contractor population of trainers, have an initiative in place called REGI (Report Every Good Idea).
      4. Operational effectiveness is key with the target to deliver “the best output soldier/technician to the field army that we can manage”. The requirement to constantly review and revise media and methods was noted, particularly for those courses where there is constant change in equipment, practices etc.. For those areas of learning which are comparatively more stable (e.g. functional skills) then these are also reviewed, but may not be changed as frequently.
      5. Links to external establishments have been developed. For example, the school is sharing information with the Land Warfare Centre (LWC) and has developed a strong partnering relationship with Wiltshire College (University Centre) to support benchmarking and to share good practice.
      6. Organisational initiatives under consideration include: ways to measure learning, rather than training activity; the strengthening of learning analytics data collection; and, the development of a ‘live’ data sheet which captures measures relating to the course in ‘real time’ (i.e. from the training authorisation document through to the lesson planning and the effectiveness of the learning). The latter will build on an initiative at Wiltshire College which includes the capture of data across the whole college (e.g. on performance of designers, trainer preparation hours, face-to-face time and course effectiveness through internal validation (Inval).

### HMS Sultan

**Learning – Stage, Requirement and Pipeline**

* + - 1. HMS Sultan is the home of the Defence School of Marine Engineering (DSMarE) and the Royal Naval Air Engineering and Survival School (RNAESS)26.

### Learning – Design, Delivery and Assessment

* + - 1. The Phase 2 training for Marine Engineers is 9 months in duration. A ‘fast-track’ Advanced Apprenticeship course has been recently introduced. Selection onto this course is on academic ability and is undertaken prior to joining the RN. The latter course offers an enhanced package starting as a Leading Hand and this is to fill a known gap in RN Engineers at mid-seniority level. This is a bespoke course and is personalised at the group level, i.e. with differentiation at a ‘persona level’ based on academic ability. It was noted that there are several different tracks; there is little difference between the slow and fast tracks; and that learners are still scheduled to attend functional skills training.
      2. Deceleration of learning is also offered for those who have potential but need an extra half- term to complete the work. Optional additional out of hours training (e.g. maths clubs) is offered. Furthermore, there is the option of back-classing at Phase 2 every 2 weeks, for a variety of reasons including an individual’s difficulty in maintaining the required pace of learning, injury, or illness. It was considered that such strategies are not PL.
      3. In terms of place of learning, resistance to learning ‘at sea’ may arise given the resource required to support and can also present a risk to operation. The incentive to learn from home needs to be considered where this may be construed as “learning in own time”.

### People

* + - 1. A lateral entry route for those individuals who are pre-qualified in engineering related competences was indicated. Issues relating to the accreditation of prior experience related to: the complexity of the Apprenticeship framework, skill fade since acquiring particular competences, currency; the contextualisation of competences to the engineering role; and risks to safety and litigation if a decision to skip particular modules or lessons was deemed a causal factor following incident/accident investigation. There was also some evidence from experience that those who are already qualified in some engineering competences tend to form bonds at Phase 1 and want to continue that bonding development in Phase 2, so would rather duplicate training.
      2. The ability of career officers to make a valid assessment of the prior experience of individuals was also noted and that this was exacerbated by a lack of understanding of the engineering competency framework and the complexity in mapping prior experience and qualifications.
      3. Furthermore, it was noted that within the RN Phase 2 training is aligned to Phase 1 with recruitment according to the need for particular numbers of employment roles to be filled (e.g. recruit for logistics training at Phase 2 given the number of logistics roles to be filled). In addition, Phase 1 is now shorter and Phase 2 is part of ‘militarisation’ (i.e. development military ethos, supporting transition from civilian to sailor etc.). In considering the FMVT approach it was commented that: “Accelerate people through that…you are eroding mutual learning, mutual developments…that’s different to a civilian institution”.
      4. A trainer development programme is planned to teach differentiation; the teaching of active learning is not being considered at this stage as it is resource-intensive and, based on

26 [https://www.royalnavy.mod.uk/our-organisation/bases-and-stations/training-establishments/hms-](https://www.royalnavy.mod.uk/our-organisation/bases-and-stations/training-establishments/hms-sultan/defence-school-of-marine-engineering) [sultan/defence-school-of-marine-engineering](https://www.royalnavy.mod.uk/our-organisation/bases-and-stations/training-establishments/hms-sultan/defence-school-of-marine-engineering)

experience, potentially unattractive to trainers. The need for trainers to develop knowledge in technology as well as pedagogy was acknowledged.

### Technology and Infrastructure

* + - 1. Not considered specifically.

### Policy and Processes

* + - 1. See sub-section [E.1.4.11](#_bookmark90) and the importance of considering training in relation to human resource elements.

### Organisation

* + - 1. The importance of considering training in relation to HR elements (e.g. manpower modelling, promotion) was emphasised. The purpose of PL needs to be clearly understood,

i.e. higher achievement or quicker into role? The view was that there has been lots of innovation and that “we have got our training machine down to a fine art”. Unless there is evidence that operational effectiveness is not being met, then why change what we do? It was also noted that such evidence is “non-existent” given that front lines do not give proper feedback on training effectiveness. Without evidence, then differentiation is more about improving the lived experience rather than faster, better training.

* + - 1. Learning from other organisations is regarded as important, however, there is a need to recognise that Defence is not a “one size fits all” and that there are key differences across services and trades which will influence the effectiveness of PL. The cost of implementing the change must be considered and appropriate resourcing would need to be put in place.
      2. Future initiatives were highlighted to include: a consideration of the benefits of ALS (in relation to Programme Socrates); and a desire to experiment with the characteristics of the learning environment, given resource and with careful consideration of the impact on the learner.

### Summary

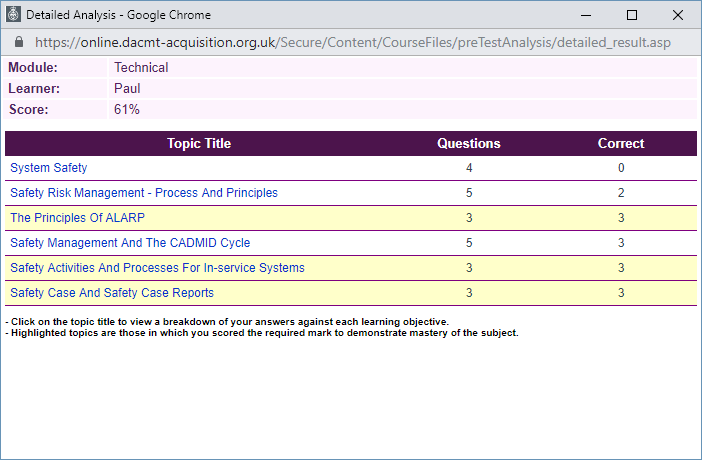
* + - 1. Three sub-cases within the DCTT have been outlined and highlight the need to take into consideration particular drivers and constraints relating to at least service and trade. Across the three examples there is evidence of learner-centric approaches being applied to varying degrees and all elements of the PL model. The MOD Lyneham case, in particular, highlights the importance of establishing the organisational design and culture to support a modern learning environment including opportunities for PL where relevant.

### Case Study 2 – Business Skills College

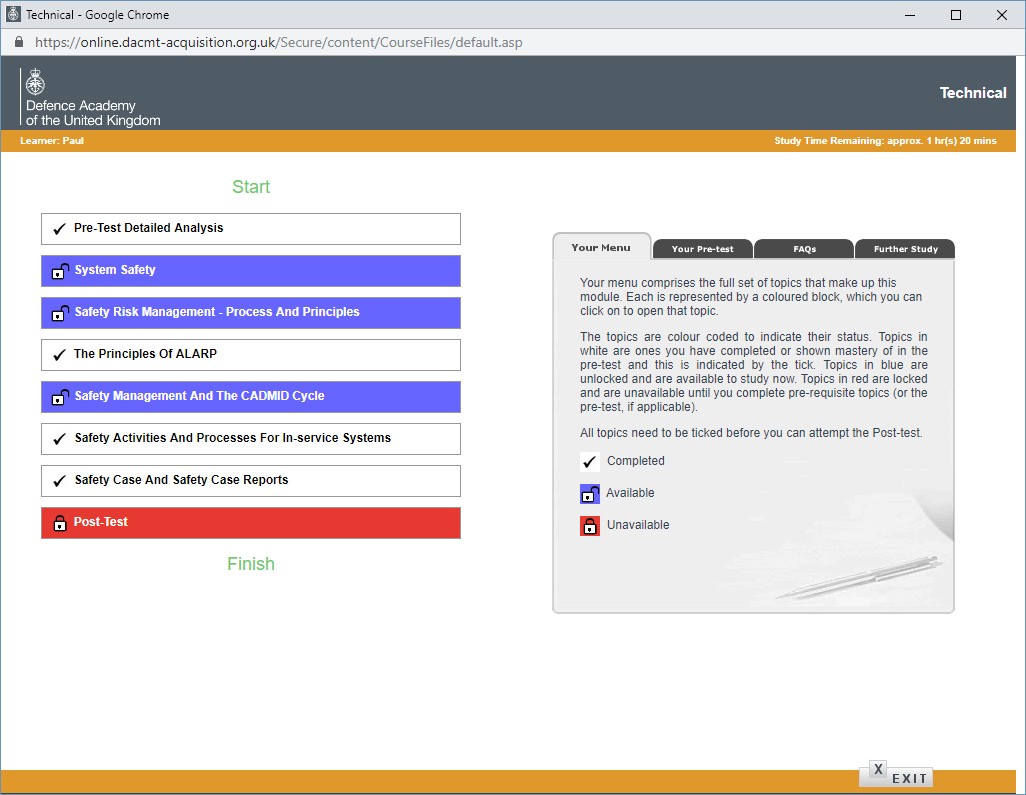
* + 1. **Background**
       1. The Defence Business Skills College, Defence Academy, Shrivenham provided learners with online access to a bespoke learning tool ‘Acquisition Online’. This E-learning capability was developed by Logica 12 years ago and at one time delivered c80 courses covering a range of business topics including: commercial, Integrated logistics support, financial, system safety and project management. A key PL feature of the capability was the ability to ‘Set Your Own Agenda’ (SYOA). Courses were accessed via the internet and Defence Information Infrastructure (DII) as required. The target audience was anyone in the MOD.
       2. Access to this capability will be withdrawn at the end of April 2019, given the migration of courses to the Defence Learning Environment (DLE). This case focusses on the capability afforded by this legacy system, lessons identified in relation to PL and any restrictions, or extension to capability afforded by the planned migration to DLE.

### Learning – Design, Delivery and Assessment

* + - 1. The e-learning packages, delivered via ‘Acquisition Online’ are based on a SYOA concept and include a simple pre-test to identify an individual’s current understanding of a particular topic. The pre-test comprises of a set of multiple choice questions, with one question associated with each learning objective. All pre-test questions are multiple choice and guessing is discouraged by the administration instructions and a response option of “don’t know”. Consideration was given to awarding a negative score to a wrong answer to further discourage guessing, however, this was not adopted. Learner feedback did result in the option for some courses to include an “I know nothing” response option, which allowed the learner to skip the pre-test and complete the full set of topics for the module. The results of the pre-test are provided to the learner, along with an indication of the specific questions that were answered incorrectly (see [Figure E-1](#_bookmark92)).
      2. Following the pre-test, a menu is presented listing the full set of topics included in the module (see [Figure E-2](#_bookmark93)). Those topics in white indicate where mastery was achieved in the pre-test, topics in blue are to be studied in any order and those in red can only be accessed when pre-requisite topics have been completed. The results of the pre-test therefore “rewards” the learner’s prior knowledge and “prevents them from having to study material they already known which helps to focus their attention on new material” (Defence Academy, 2019). In the top right hand corner of the page, the individual is provided with an indication of the study time remaining to complete the modules. In the example, provided, the estimated time required to completion shows approximately 1 hour 20 minutes, representing a reduction from the 2 hours 40 minutes shown before the pre-test removed some topics.
      3. A post-test, again presented in a multiple-choice format, is administered following the completion of the module and feedback on those topics passed and those that require further revision is provided to the learner.
      4. Whilst the outcome of the pre- and post-tests identifies those topics that are required to be studied, this does not preclude the learner from choosing to refresh their knowledge for those topics where their knowledge has been deemed sufficient. In some cases, the criticality of the knowledge associated with a given topic means that all learners are required to study a particular set of topics or a full module, irrespective of their prior learning. For example, evidence gathered from National Audit Office reports indicated a significant shortfall in commercial capability within the acquisition process. This resulted in the requirement, from the course sponsor of the Material and Financial Accounting module, for learners to complete all topics within this module irrespective of their prior knowledge. Accordingly, the design of this module was set up such that learners were not credited for their prior knowledge and the “technology” dictated the sequencing of topics to be learnt for a given module (see sub-section [E.2.6](#_bookmark95)).
      5. As noted above, the SYOA concept is not relevant for all subjects and also was not used where the subject was new (e.g. a new MOD process), or perhaps where there is a requirement for significant “contextualisation” of a learner’s prior knowledge to the Defence context. Also the SYOA is not relevant for all learners; as indicated the learner may decide that they have no knowledge of the topic or that their knowledge is “out of date” and requires refresh.
      6. The delivery of the e-learning is either standalone or blended, i.e. the learner works through the online materials and also attends face-to-face workshops. In some cases, the completion of e-learning materials is a pre-requisite to booking onto and attending the workshops, which then focus on the application of learning in practical exercises. This methodology reflects a ‘flipped classroom’ approach.
      7. In terms of assessment approaches, these differ according to the criticality and purpose of the course, some modules just require an overall score to be achieved, whilst others require critical questions to be correct.
      8. External validation of some of the courses was provided by linking course content to external standards and this was the case for the Project Management e-learning course which linked to the Association for Project Management (APM) body of knowledge.



*Figure E-1: Feedback Provided to the User Following Completion of the Module Pre-test*



*Figure E-2: Module Menu Personalised According to the Individual’s Learning Requirements*

* + - 1. The Logica e-learning platform/site is due to close completely in April 2019, but courses have already been exported to SCORM27 and migrated to DLE. Not all of the e-learning PL functionality will transfer to DLE on export. The potential to replicate the SYOA concept using an authoring tool called Captivate that supports branched scenario development has been investigated. However, this has been found to be complex and time-consuming. The ability and resource required to modify the learning content of future iterations of the course is also a consideration in terms of sustainability.
      2. Some of the SYOA features have been retained, primarily the pre-testing elements, but in this case the learner will receive recommendations rather than the technology controlling unlocking/colour coded course elements. This will mean increased learner control/choice, but less scaffolding.
      3. The DLE supports the use of forums and collaborative exercises and this will be considered for future courses. This capability was not included in the original Logica e-learning courses given DII functionality and the security issues arising when linking with external participants for social interaction.
      4. The original e-learning also had a Search and Learn function which supported self- regulated learning (and PL through Just in Time learning). By entering keyword searches, learners were able to get links to a list of nuggets of e-learning which they could then choose from. This will not transfer to DLE because of functionality, however, the DLE does allow students to look at additional topic information (provided through hyperlinks in the course content to other resources) according to their choice. This also allows the course

27 Sharable Content Object Reference Model – allows the creation of online training material that can be shared across systems.

manager to add in resources over time to provide, for example current case studies and wider reading. On DLE, these resources could include podcasts, forums, etc. The benefit is that there is not a requirement to go back to the developer to incorporate these additional resources.

### Learning – Stage, Requirement and Pipeline

* + - 1. The courses offered as part of Acquisition Online may be regarded as career or professional courses supporting learner awareness (e.g. commercial processes), or deeper professional knowledge and qualifications (e.g. project management).
      2. The set-up of the courses on Acquisition Online supported the individual’s management of their own ‘skills and knowledge refresh and retention’, i.e. through the Search and Learn function and the opportunity to return to course topics over time. Whilst this feature is not supported by the DLE (at present), learners have the opportunity to extend and strengthen their learning by searching additional resources that may be linked to the main course content. This strengthens and deepens the initial acquisition of knowledge which in turn has a positive effect on the interval over which learning is retained.

### People

* + - 1. It was recognised that particular skills are required by the learner to gain maximum benefit from the learning method (i.e. e-learning and blended learning approach). A help desk facility was provided as part of Acquisition Online and it was reported that several queries reflected a lack of digital literacy skills. More generally, differences in the ability to self- regulate learning and to manage learning time were indicated. For example, some learners attempted to complete the learning in one session, whilst others recognised the benefits of spacing their learning in ‘chunks’. In some cases, modules were designed to force the spacing of learning by limiting access to course content over time.
      2. The migration to DLE will support greater involvement of tutors in supporting e-learning elements through forums and social interactions. The need for tutors to develop their own digital literacy skills and deepen those in coaching and mentoring is recognised. Such professional development is provided to civilian staff but regarded as more difficult for military personnel given the 2-year turnover and lack of time to develop trainer skills.
      3. The ability of course owners (e.g. Head of Commercial) to specify learning objectives in terms that can be used to inform the design, delivery and assessment of learning was questioned. Course owners may not be ‘educators’ or have the skills to construct valid learning objectives. The importance of developing valid learning objectives and assessment methods is heightened by the opportunity for individual learners to ‘skip’ topics within a module. This requires increased engagement between the training analysts, course designers and owners and, in turn, HR (see sub-section [E.2.6](#_bookmark95)).

### Technology and Infrastructure

* + - 1. Changes arising from the migration of the modules from ‘Acquisition Online’ to the DLE have already been indicated and relate to:
         * The continuation of elements of the SYOA functionality (i.e. recommendations on what topics should be followed by the learner, rather than the technology guiding the learner to relevant topics for study and the sequence of learning);
         * The potential requirement for learners to deepen self-regulation of learning skills;
         * Improved opportunities for social learning (i.e. connectivist pedagogy) to be implemented as part of the DLE strengthening peer-to-peer learning and tutor engagement. Some suggestion that the e-portfolio functionality on DLE (i.e. Mahara) could enable self-regulated social interaction where learners set up their own networks, rather than engaging exclusively with the ones set up by tutors on the Moodle28 VLE. As a result learners could have greater control over their learning pathways;
         * Opportunity to add additional learner resources, without having to go back to the course designer; and,
         * Ease of access to learning ‘anytime, any place’.

### Policy and Processes

* + - 1. No formal or repeatable method for assessing the criticality of particular course modules / topics was available to the course sponsors and decisions were therefore based largely on judgement. This tended to a risk-averse decision, thus reducing the potential benefits of the SYOA concept (e.g. course time saved, learner engagement).
      2. Where module topics can be ‘skipped’ then there is a need to fully understand ‘what has been skipped’ and this requires a clear statement of learning objectives and their link to assessment approaches. Ensuring that sufficient numbers of suitably qualified and experienced personnel are in place to support the definition of learning objectives and valid assessment approaches was regarded as essential (see [E.2.4](#_bookmark94)).
      3. The pre-test administered as part of the e-learning package captures learners’ knowledge at a micro level, but does not take into consideration the learners’ experience and awareness of the application of knowledge within particular contexts. For example, project management knowledge may have been developed from working within the construction industry, rather than within a Defence acquisition context. It is recognised that ways to capture and track relevant Knowledge, Skills and Experience is key and this is of particular relevance to the development of learning pathways which may involve a combination of formal, informal and incidental learning experiences (see also sub-section [2.4.6](#_bookmark24)).

### Organisation

* + - 1. A significant funding stream was made available at the time to support the development of the ‘Acquisition Online’ e-learning capability, along with a requirement to roll-out the capability within a short timeframe. An additional driver for the online courses and PL was the need to meet the requirements of a wider audience with minimal disruption to the individual’s job.
      2. Benefits of the SYOA approach were reported as follows:
         * Pre-test score allowed:

Bypassing some or all topics;

Bypassing the post-test if score high enough;

Subsequent attempts at post-tests only included questions from failed topics;

28 Moodle is an open-source learning management system, which currently provides the VLE platform within DLE.

* + - * + Less learner frustration in having to complete unnecessary learning (however, no empirical evidence gathered) and increased retention 29 (i.e. learner completed the course); and,
        + Savings in learner time calculated from 40 courses over a 12 year period, reporting a saving of 260,000 hours, representing a reduction in 40% of learner hours.
      1. Information is also collected on learner satisfaction by the course managers and is reported as generally good, although some evidence of learners not preferring e-learning as a delivery method was noted.
      2. It was noted that it will not be possible to collect learning analytics data on DLE, as it does not have the functionality. A preference for capturing data on time spent on pages, test questions missed/taken more than once was indicated to enable an identification of improvements in course design. The aspiration is that the Learning Locker30 and xAPI functionalities (see sub-section [2.4.5](#_bookmark23)) which are available on DLE should enable the capture of improved learner data in the future, but that there is still some uncertainty over how Learning Locker is to be used. There is some suggestion that it will be an archive for previous students’ records, rather than a learning analytics tool.
      3. Looking to the future it was recognised that there is a need to raise the profile of e-learning across the college and the benefits afforded as part of a blended learning solution.
      4. Ensuring that tutors have the necessary capability and motivation to support the delivery of personalised learning (including the use of technology to support) was acknowledged. Resourcing is an on-going issue and currently the team is resourced by three personnel. Finally, the sustainability of the PL capability afforded by the migration of courses to the DLE is recognised as a key area for consideration.

### Summary

* + - 1. In this case, PL is evident in relation to the tailored pacing of learning to suit the learner’s prior knowledge and experience. The opportunity for the Learner to complete modules where knowledge has been assessed as sufficient strengthens the learner-centric approach and element of choice. The Learner and Technology components are predominant in this case. Migration of course modules to the DLE and the improvement in capability for social learning will likely increase the Environment component of the PL model.

### Case study 3 – Army Recruitment and Individual Training Command

* + 1. **Background**
       1. The Army Recruitment and Individual Training Command (ARITC) has developed an add- on to the Defence Train the Trainer (DTTT) V2 course which teaches their Defence trainers how to assess learner needs in a Phase 1 (basic recruit) training context. These approaches are built on a framework, the Target Learning Model (TLM) of four domains –

29 Caution in applying ‘retention’ rates as a measure of success were highlighted where learners use the learning content as a material reference only. For example, learners returning to the Project Management materials to refresh learning on Earned Value Management.

30 Learning Locker is an open source Learning Record Store (LRS), a type of data repository designed to store learning activity statements generated by xAPI compliant learning activities - <https://www.ht2labs.com/learning-locker/>

Technical/Tactical; Psychological; Physical and Social (MOD, 2017a). This case focuses specifically on trainer capability and their ability to assess trainee learning needs.

### Learning – Design, Delivery and Assessment

* + - 1. The one-day addition to the DTTT V2 course (implemented February 2018) is aimed specifically at upskilling training delivery staff to be able to ‘individualise’ learning with Phase 1 trainees. The approach to individualised training is based on the TLM.
      2. The TLM reflects the premise that:

“our approach to training must ensure that we develop each individual to their maximum potential to enable their success in training. This provides the best foundation for a successful career. This means our trainers need to be able to identify, plan, deliver and review individual learning/training interventions, in addition to delivering group learning/training” (MOD, 2017a: p.1).

* + - 1. The TLM course is followed by the delivery of a series of CPD courses in the workplace (see [Table E-1](#_bookmark97)). Within the workplace trainers will be supported by coaching/mentoring from Army Trainer Mentors (ATM) and supervision from Army Instructional Leaders (AIL) to ensure that the CPD is completed and that they reflect on their ability to individualise learning for their trainees.

*Table E-1: Trainer Workplace Continuing Professional Development Courses*

|  |  |  |
| --- | --- | --- |
| Leadership in Training | Learning Technology | SME Training |
| Training the 16-19 Learner | Learning Strategies | Training Design |
| Coaching Skills | Peer Mentoring | Training Commonwealth Trainees (TCT) |
| Mental Resilience Training | Training International Learners and Trainees (TILT) |  |

### Learning – Stage, Requirement and Pipeline

* + - 1. The TLM is targeted at Army trainers and delivery to Phase 1 trainees.
      2. The TLM uses a “whole person” approach to an identification of the learning needs of each trainee. This reflects the reality that Basic (Phase 1) recruits are required to:

“learn a wide range of subjects, live in a variety of environments away from home and our trainers have a broad set of Training Objectives; and they have to develop service Core Values and the affective behaviour of the individual” (MOD, 2017a: p. 2).

* + - 1. A typical intervention cycle that applies the TLM approach includes four steps:
         * Step 1: Identify individual learning need;
         * Step 2: Plan intervention;
         * Step 3: Deliver intervention; and,
         * Step 4: Review effectiveness of intervention.

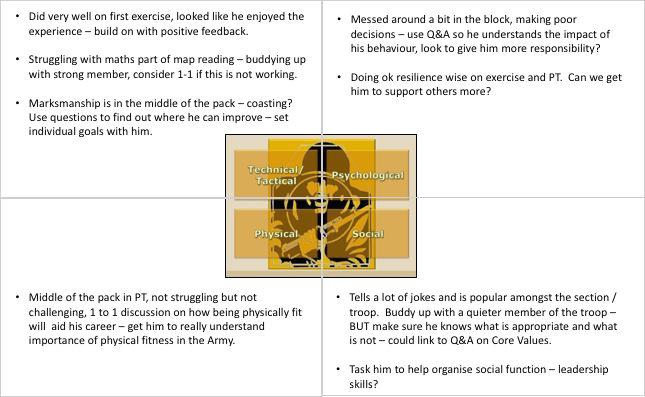
### Step 1: Identify individual learning need

* + - 1. The four components of the TLM provide a framework within which to consider individual learning requirements (see [Table E-2](#_bookmark98)).

*Table E-2: Components of the TLM, Forming a Framework for an Identification of Learning Needs*

|  |  |
| --- | --- |
| **TLM Component and Description** (MOD, 2017a: p4 - extract) | **Basic Training (Phase 1) Trainee / Learner (Typical learning needs - examples)** |
| **Technical / Tactical** – The technical training and education requirements that need to be trained and learnt. This may include the functional skills of English and Maths, but more specifically the technical  knowledge and skills required to do the job role. | * Individual military skills * Pairs / Fire team skills * Ability to read/write * Drill as an individual / team member * Life skills |
| **Physical** – The physical component of the Target Model is broader than Physical Training. It includes components such as coordination, agility and balance, and the underpinning knowledge and skills to stay physically fit for operations. | * Unused to physical training * Identifying an injury or tiredness/fatigue * Agility / balance * Gender differences * Appropriate physical aggression |
| **Psychological** – Including attention span, preferred learning method, resilience to adversity, how an individual responds to feedback or criticism, self-esteem, self- motivation and individual decision making. | * Decision making – understanding the impact of actions * Resilience under pressure * Positive attitude to challenges * Confidence in own ability * Coping with fatigue |
| **Social** – regarded as very important to Defence / Army. Relating to social interaction, understanding of social norms, teamwork, communication, leadership. | * Dealing with homesickness * Coping with new or different social norms * Supporting other trainees/learners * Acting as a peer role model for others * Cultural background/differences |

* + - 1. It is recognised that the TLM components interact; for example, within the Physical component it may be observed that a Tactical or Social learning/development need cannot be achieved given the individual’s inability in drill (coordination or upper body strength). This may in turn lead to an individual not feeling that they are ‘part of the team’.
      2. The output of this stage is an individual profile ([Figure E-3](#_bookmark99)) and it is recognised that there is benefit in discussing the needs with other training staff, prior to developing appropriate interventions.
      3. An initial analysis is undertaken for the individual and assessment undertaken periodically (no particular assessment intervals or events are identified).



*Figure E-3: Worked Example of an Individual Learning Profile and Proposed Interventions*

### Steps 2/3 – Plan and Deliver Intervention

The TLM provides a list of potential interventions as a handrail for trainers to use. Some examples are provided below:

* + - * + **Coaching / Question and Answer (Q&A)** – Using effective questions to raise awareness of an issue, generate responsibility and enable action;
        + **Self-directed / goal setting** – The individual sets their own goal and solution to the issue, guided by the trainer;
        + **Individual challenge** – Setting individual challenges;
        + **Sport development / challenge** – using sport as the development tool, such as organising an activity, acting as the Captain or trying a new individual/team sport;
        + **Functional skills support** – specific maths or English support, may require Basic Skills Tutor/Education Officer involvement;
        + **Distraction** – At times learners will put too much pressure on themselves and do too much. There may be a need to distract the learner with another activity before they return to revision;
        + **Peer support** – using peers to support, challenging a strong performer to mentor those who are struggling; and,
        + **Additional practice** – providing the learner with additional learning tasks in their own time.
      1. It is recognised that individuals with similar training needs may, or may not benefit from the same types of interventions.

### Step 4 – Review effectiveness of intervention

Ways to review the effectiveness of the intervention are identified by the TLM and include one or more of the following:

* + - * + Coaching interview using effective questions;
        + Observation of behaviour;
        + Assessment/test result;
        + Performance profile assessment;
        + CoC analysis discussion of individual performance; and,
        + Trainee/learner self-assessment of achievement.

### People

* + - 1. The extension of the TLM approach to Phase 2 and 3 learners is indicated, but has not yet been put in place. It is acknowledged that greater diversity in career paths at latter phases requires deeper expertise of trainers (i.e. senior trainers) to determine individual learning requirements and relevant interventions. It is noted in particular that pre-employment and employment training courses are often short with limited opportunity to ‘get to know the trainee/learner’.
      2. Implicit in the TLM is the requirement for individual learners to gain: an understanding of the process and the types of interventions that may be offered; and, those skills required to support a discussion of what types of interventions may, or may not be effective given their own preferences and motivations. Ensuring that such interventions are regarded by both learners and trainers as an integral part of the learning culture is also important.

### Technology and Infrastructure

* + - 1. Technology is not involved in this case study; the assessment of learner requirements and the set of interventions available do not rely on a technology solution.

### Policy and Processes

* + - 1. The TLM approach recognises that “all training has Training Objectives (TO), Enabling Objectives (EO) and Key Learning Points (KLP) which are articulated in Learning Specifications from which Trainers then design their own lesson plan to enable the training event. However learning and meeting the individual military learner’s need requires more than delivering TOs based on skills and knowledge objectives” (MOD, 2017a: p.1). Accordingly, the TLM approach is complementary to generic training analysis, design, delivery and evaluation processes.

### Organisation

* + - 1. A formal evaluation of the TLM approach has not been undertaken by ARITC. The extension to the DTTT v2 course is clearly an investment in terms of resource. Moreover, the additional resource required, to ensure the effective conduct of Trainer workplace CPD, is also acknowledged.

### Summary

* + - 1. This case reflects a learner-centric approach given the focus on identifying individual learning needs and selecting relevant learning-related interventions (e.g. individual challenge, additional physical development, peer support, one-to-one revision/learning).

This case does not include the technology or environment components of the PL model and requires strong trainer assessment skills.

# PL Influence Matrix

[Table F-1](#_bookmark101) shows an example of the analysis approach used in step 6 of the PL Decision Support Process ([Figure 4-2](#_bookmark46)) to consider the eight PL influences in relation to the selected PL approach.

*Table F-1: Example of PL Decision Support Process Step 6*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***The following prototype analysis approach has been designed to inform decision making relating to WHAT needs to be in place within an organisation to support the implementation and sustainability of a personalisation of learning approach.***  ***Rate the importance of each element (A.1 - E.4) given the predominant CHARACTERISTICS of your PL approach (i.e. LEARNER, TEACHER, TECHNOLOGY, ENVIRONMENT). At this stage DO NOT consider whether you have the capability in place or not to meet any of the elements.***  ***Return your ratings using the following importance scale: Critical, High, Medium, Low, Not Applicable. Where appropriate qualify your ratings using the column 'Assessor supporting notes / clarifications'.*** | | | | | | | | |
| **Serial** | **Elements Description**  **To enable PL there is a need for ...** | | | | **Personalisation of Learning - (PL Model) Components** | | | **Explanatory notes (where relevant):** |
| **1. Target**  **Learner Model** | **2. Set Your Own Agenda** | **3. Blended Learning**  **Environment** |
| **LEARNER**  **- TEACHER** | **LEARNER - TECHNOLOGY** | **LEARNER TEACHER TECHNOLOGY ENVIRONMENT** |
| **A** | **ORGANISATIONAL CULTURE and DESIGN** | | **Supporting Notes (where applicable)** | **Sustainability Element** |  | | | |
| A.1 | Leadership | Leadership which sets a vision and strategy that is consistent with the development of a learning environment and which supports continuous improvement. | To ensure continuous improvement there may be a requirement to build this requirement into commercial arrangements with the outsourced training partner. | Yes | C | C | C | Without effective leadership in place then the PL initiative may not be sustainable. |
| A.2 | Integration and effects | An understanding of the effect of the PL approach on existing learning regimes, human resource management and manpower planning. | For example, how might the PL approach (e.g. one which supports the acceleration of individuals through learning modules) impact the individual's career progression. | Yes | H | C | H | Comparatively higher on SYOA as this has the greater potential for accelerated learning (i.e. modules can be skipped). |
| A.3 | Organisational goals | A statement of how the PL initiative is related to the Organisation's Learning Strategy and overall Goals. | Organisational goals relating to learning include: Training efficiency, operational effectiveness, learner achievement, learner engagement, learning culture. | Yes | C | C | C | This is critical irrespective of the PL components. Highly relevant to sustainability. [Churn in leadership requires documentation to ensure continued understanding among new incumbents of why the learning initiative  was implemented]. |
| A.4 | Capacity for innovation | An organisation that is designed and resourced to support the adoption of new or alternate approaches to the design, delivery and evaluation of learning. | For example, there is the capacity ("head- room") and the opportunities within the organisation to allow training-related staff to "try-out" new ideas and innovations relating to the design and delivery of learning and more specifically PL. | No | H | H | H | Capacity for innovation is likely to support engagement, job satisfaction, retention of staff, motivation, professionalisation and cultural change relating to the adoption of modern learning approaches. It is high, rather than critical because there is potential to gain this understanding ('secondary source') through networks with external Learning Establishments (see A.8) and through sharing of  experiences with other training-related staff (see A.6). |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A.5 | Sufficient SQEP | Sufficient numbers of suitably qualified and experienced personnel to support the implementation and sustainability of PL interventions as an integral part of the learning system. | This includes an appropriate mix of civilian/military staff and the retention of personnel with specialist (scarce) skills. | Yes | C | M | C | Critical for the sustainability of those cases where the PL approach requires significant teacher resource and face-to- face engagement with the learner. |
| A.6 | Internally connected | An organisation design that enables the communication and sharing of ideas within and across functions. | For example, through the co-location of training analysts, designers, SMEs, delivery staff. | No | H | H | H | This is high irrespective of the PL approach. |
| A.7 | Sharing Good Practice | Opportunities to enable the sharing of good practice. | For example, weekly forums are held to discuss modern practices in the design and delivery of learning. The topics for discussion reflect the typical interests and learning needs of individual staff. | Yes | M | H | C | There may be an argument that there is a greater need for such forums where significant change is occurring, e.g. through technology and associated innovation. Critical where there is a need to sustain all elements of the PL model. |
| A.8 | Externally Networked | Links and "networks" to external organisations which enable the sharing of innovation and resources to support PL. | For example, relationships with other Further and Higher education academic institutions. | No | L | M | H | There may be an argument that there is a greater need for external networking where significant change is occurring.  Importance is increased where there is a need to sustain all elements of the PL model. |
| A.9 | Engagement | Personnel within the organisation who recognise the value of understanding the needs of the individual learner. | For example, the engagement of the learner in the development of new/revision(s) to the design and delivery of learning is valued and encouraged by the organisation. | Yes | C | C | C | Critical in all cases to set the culture of a learning organisation which values the potential afforded by PL approaches as an integral part of the organisation's learning strategy. |
| A.10 | Professionalism | Training-related staff who willingly adopt good practice as the "natural" ways of working - Business As Usual. | For example, leadership within the working environment promotes the adoption of good practice. Enabled by SQEP training-related staff. | No | H | H | H | Again High in all cases. |
| B | **POLICY AND PROCESSES** | | **Supporting Notes (where applicable)** |  |  | | | |
| B.1 | Flexible | Training and education policy and processes that can be tailored, or easily interpreted to inform the specification, design, analysis, evaluation and assurance of PL approaches. | For example, policy and processes to inform an assessment of what learning is critical and cannot be accredited given prior learning and experience. | Yes | M | C | C | Critical for SYOA and blended learning solutions as there is a need to put in place guidelines within policy to support analysis of whether or not learning can be personalised for particular types of tasks,  e.g. where the risk of not acquiring competence / maintaining competence outweighs the benefits afforded by accrediting prior learning and being able to accelerate the individual through a  course or learning pathway. |

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| B.2 | Security | Defence security policy and processes which enables the adoption of “modern learning” methods and media. | For example, security policy allows access to external sources (such as YouTube) to support learning using Defence supplied Portable Electronic Devices. | Yes | L | H | C | Critical where connectivity within and outside of the learning environment is integral to the PL solution including where learning is available 24/7 "anytime, any place". |
| B.3 | Accountability | Policy and processes in place to ensure accountability in the delivery of learning that is safety critical. | For example, in the event of an incident there is evidence of the learning records of the individual for relevant competences. | Yes | C | C | C | See B.1. |
| B.4 | Methods and Media Analysis | Methods and media analysis processes and decision support tools that are valid and applicable to PL related approaches. | For example, media and methods selection tools are already available to defence which acknowledge the need to consider PL as part of an overall approach to learning on a given course or as part of a learning pathway. | No | M | M | H | Increasingly important where a blend of learning methods and media are a significant feature of the PL solution. |
| B.5 | Learning Requirement | Ways to ensure that the PL approach is relevant given the learning stage and learning objectives. | For example, not all PL approaches will be relevant at Phase 1, 2 and 3. Some PL approaches may be relevant to the learning of STEM subjects, but may be less so where competences are deemed critical. | Yes | H | H | H | This is relevant across all PL approaches. |
| B.6 | Competence Management | Policy and processes to ensure the continued professional development of training-related staff. | For example, through workplace Continued Professional Development, the benchmarking of trainer competences against external standards – ETF standards for FE teachers. | Yes | C | H | H | Critical for TLM as in its form there is significant interaction between the teacher and the learner and reliance on the teacher to assess individual learning requirements and identify and monitor the implementation of PL. |
| B.7 | Learning acquisition and retention | Policy and processes to ensure that PL approaches are considered in relation to both the acquisition and retention of learning. | For example, processes that recognise the value of PL approaches to support the tailoring of refresher training according to the individual need. | No | M | M | M | Medium as this is not going to inhibit implementation of either PL approach. |

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| B.8 | Capability Perspective | Processes to ensure that (learning) technology insertion is aligned with the provision of a trainer capability (numbers and SQEP). | For example, ensuring that training- related staff remain SQEP given the planned introduction of new learning related capability. This may include, a review of competence management systems, the 'mix' of skills within the workforce, the blend of military/civilian staff and contractors; the need for new types of skills and Subject Matter Expertise. | No | L | L | H | This will depend on the role of the trainer in relation to the PL solution. It is likely to be higher for the blended solution where the trainer may be required to interface with the information provided by learning analytics technologies. |
| B.9 | Interoperability | Processes to ensure that the PL approach is 'interoperable' with other systems. | Other systems may include: learner records, learning analytics. | No | M | M | H | For this example, it is likely that this will be high for the blended learning case, with evidence of all PL components and greater solution complexity. |
| **C** | **PEOPLE** | | **Supporting Notes (where applicable)** |  |  | | | |
| C.1 | Tailoring of Learning | Learning to be tailored to one or more ‘learner variables’. | For example, previous experience, learning preferences, interests, goals, motivations, aptitude, SPLD requirements. | Yes | C | C | C | This is a key tenet of PL. |
| C.2 | Control of Learning | Learners to have responsibility for/control of one or more ‘learning variables’. | For example, aims/objectives of learning, learning content, time, duration, and pace of learning; place of learning and learning/teaching strategy. | Yes | C | C | C | This is an assumption that PL is evident. Implementation of an existing approach to a different context, may result in its tailoring and this is a reminder of those fundamental characteristics that need to be retained. |
| C.3 | Learner Skills for PL | Learners to have acquired the skills needed to benefit from PL. | For example, self-regulation of learning and digital literacy skills and the motivation to engage. | Yes | C | C | C | Failure to acquire such skills will impact the realisation of the benefits that can be afforded by PL. |
| C.4 | Training Staff Skills for PL | Training staff (analysts, designers, trainers, SMEs) with the skills, knowledge and experience required to realise the PL approach. | For example, core skills related to role with the addition of specialist skills, knowledge and experience proven to be required given the PL approach. | Yes | C | C | C | Critical to TLM given the high level of interaction required between the Learner and training-related staff. |
| C.5 | Accrediting prior Experience | SQEP to work with the Learner to assess and accredit the Learner's prior learning and experience to ensure the selection of appropriate learning courses and pathways. | For example, the application of the Target Learner Model approach to understand the needs of the individual learning; the use of 'computer-based' assessment to provide an objective assessment of an  individual's current capability (see SYOA). | Yes | C | L | H | Critical to TLM given the high level of interaction required between the Learner and training-related staff. |
| C.6 | Trust | Ways to be put in place to generate trust among Learners and training-related staff in the capability of the approach to deliver effective learning. | This is significant to the effective use of PL as an integral part of the learning ecosystem. | Yes | M | H | H | High for the SYOA case given the need to 'trust' technology and the algorithms which support decisions relating to those elements of a course module that can/cannot be skipped. High for TLM given the need to trust the judgement and  methods that are employed by training staff. |

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| **D** | **TECHNOLOGY** | | **Supporting Notes (where applicable)** |  |  | |  | |
| D.1 | Fit-for-purpose | Technology that is fit-for-purpose in delivering PL. | This should take into consideration the specific learning requirement and the stage of learning. Consideration should also be given to the organisation's Commercial off the Shelf (COTS) strategy. | No | N/A | H | H | N/A - need to ensure that the ratings are returned for the PL approach in relation to the features of the case "as is". Highlights the importance of the organisation agreeing such features. |
| D.2 | Usability | Technology that is usable by the learner and training staff without having to undergo significant training. | The benefits of the technology insertion may be outweighed by the need to source specialist skills and/or to undertake significant up-skilling to the current workforce. For example, the complexity of a system may require significant  developer and SME time. | No | N/A | H | H | High in those cases where technology is a component of the approach. |
| D.3 | Affordability | Technology that is affordable in the near and longer term with consideration given to through life costs. | Issues relating to obsolescence are relevant and ways to ensure that this does not impact the sustainability of the PL approach and critically learning need to  be put in place. | Yes | N/A | H | H | High in those cases where technology is a component of the approach. |
| D.4 | Availability | Data analytics capability of relevance to the PL approach to be available. | For example, data analytics supporting: an understanding of learner progression, where scaffolding may be required, where learning extension may be beneficial; trends in learning among groups of learners and continuous improvement. | Yes | N/A | H | H | High for those cases examined where there is a technology component.  However, not limited just to PL approaches with a technology component. The TLM case requires a significant input from Trainers and this may be partly  alleviated through the use of learning analytics capability. |
| D.5 | Lessons Identified | Opportunities to learn from other establishments who have experience of implementing the "technology". | This should form part of the decision relating to the adoption of the technology as part of the PL approach and links to Organisational Design and Culture (see A.7). | No | N/A | M | M | Whilst the TLM case does not include a technology component, learning from other organisations is still relevant. |
| D.6 | Benefits | The benefits of the technology related solution to learning to be determined from the perspective of the organisation, the individual and the training-related  staff. | An example of a benefit of a technological solution might be that it allows the delivery of the PL approach to a wider audience. | Yes | N/A | H | H |  |
| **E** | **INFRASTRUCTURE** | | **Supporting Notes (where applicable)** |  |  | |  | |
| E.1 | Availability | An environment that provides continuous opportunities for learning. | For example, the presence of Quick Reference codes positioned within formal and informal learning environments; 24/7 helpdesk / support to learning; and the infrastructure to support social learning. | No | H | L | H | High for TLM as some of the TLM interventions might be related to the learning environment. Low for SYOA as this learning (e-learning) is "self- contained". |
| E.2 | Physical environment | A physical environment that has been purposefully designed and fitted to support PL methods and media. | For examples, furnishings are moveable according to the learners' preferences. There are spaces for collaboration. | Yes | M | L | H | High where there is a need to enable the achievement of a learning environment. |
| E.3 | Learning Resources | Opportunities for Learners and training- related staff to access a broad range of learning resources to support, or extend learning. | For example, YouTube, FE shared learning resources. | No | M | M | M | Relevant across all cases. |
| E.4 | Generate and investigate ideas | Technology and infrastructure to allow training-related staff the opportunity to try out new ideas without disrupting on- going learning provision. | For example, "sandpits" to support the development and testing of new ideas relating to the design and delivery of learning. | No | M | M | H | Whilst this is relevant across the cases, it is argued that this becomes more important where there is a complex interaction between PL components.  Within this context it is important to understand how changing the features of |

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|  |  |  |  |  |  |  |  | the solution might have a 'knock-on' effect on other elements of the system. Having an environment to 'test out' new ideas is  therefore advantageous. |
| E.5 | Pipeline optimisation | Understand the pipeline and how the PL approach impacts upon it and how it can adapt for it. | For example, FMVT approaches may increase training efficiency within a course, but there is a need to consider how to occupy or manage the 'employment' of those learners who complete the course/module ahead of others. | Yes | C | C | C | It is important to develop this understanding for all types of PL solutions. |

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|  | This final report sets out findings from a 6-month scoping study on the implications of introducing personalisation of learning (PL) across Defence training and education (T&E). The study established a working definition and a high-level model for PL and identified state of the art PL approaches, based on a review of academic literature and defence-related research reports. This, combined with a snapshot view of the current Defence perspectives and aspirations with regard to PL, identified potential benefits and challenges associated with the implementation of PL on an enterprise scale. Broad themes emerging from the findings were organised as a set of eight key influences on PL and developed further into a framework that can be used by Defence to inform decision-making relating to where PL could be rapidly deployed and where longer term investment would be required to ensure the sustainability of PL initiatives. | | | | | |
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