

Canadian  
Forces  
College

Collège  
des  
Forces  
Canadiennes



## MANAGING EFFECTIVE CHANGE: A LEARNING TECHNOLOGY FRAMEWORK FOR THE ROYAL CANADIAN AIR FORCE (RCAF)

LCdr James Cantafio

**JCSP 43 DL**

***Exercise Solo Flight***

### **Disclaimer**

Opinions expressed remain those of the author and do not represent Department of National Defence or Canadian Forces policy. This paper may not be used without written permission.

© Her Majesty the Queen in Right of Canada, as represented by the Minister of National Defence, 2018.

**PCEMI 43 AD**

***Exercice Solo Flight***

### **Avertissement**

Les opinions exprimées n'engagent que leurs auteurs et ne reflètent aucunement des politiques du Ministère de la Défense nationale ou des Forces canadiennes. Ce papier ne peut être reproduit sans autorisation écrite.

© Sa Majesté la Reine du Chef du Canada, représentée par le ministre de la Défense nationale, 2018.

CANADIAN FORCES COLLEGE – COLLÈGE DES FORCES CANADIENNES  
JCSP 43 DL – PCEMI 43 AD  
2017 – 2018

EXERCISE *SOLO FLIGHT* – EXERCICE *SOLO FLIGHT*

**MANAGING EFFECTIVE CHANGE: A LEARNING TECHNOLOGY  
FRAMEWORK FOR THE ROYAL CANADIAN AIR FORCE (RCAF)**

LCdr James Cantafio

*“This paper was written by a student attending the Canadian Forces College in fulfilment of one of the requirements of the Course of Studies. The paper is a scholastic document, and thus contains facts and opinions, which the author alone considered appropriate and correct for the subject. It does not necessarily reflect the policy or the opinion of any agency, including the Government of Canada and the Canadian Department of National Defence. This paper may not be released, quoted or copied, except with the express permission of the Canadian Department of National Defence.”*

Word Count: 2991

*“La présente étude a été rédigée par un stagiaire du Collège des Forces canadiennes pour satisfaire à l'une des exigences du cours. L'étude est un document qui se rapporte au cours et contient donc des faits et des opinions que seul l'auteur considère appropriés et convenables au sujet. Elle ne reflète pas nécessairement la politique ou l'opinion d'un organisme quelconque, y compris le gouvernement du Canada et le ministère de la Défense nationale du Canada. Il est défendu de diffuser, de citer ou de reproduire cette étude sans la permission expresse du ministère de la Défense nationale.”*

Compte de mots: 2991

# MANAGING EFFECTIVE CHANGE: A LEARNING TECHNOLOGY FRAMEWORK FOR THE ROYAL CANADIAN AIR FORCE (RCAF)

## INTRODUCTION

This paper is about the integration of learning, technology, evaluation, and policy within the military context. To ensure the successful integration and application of learning technology within an organization, clear direction and guidance is required to succeed. This essay will argue that the Royal Canadian Air Force (RCAF) requires a learning technology framework. This is needed to align long-term vision, guiding principles, policy direction, and desired outcomes. Specifically, after defining learning technology and presenting a brief overview of the growing importance of learning technologies for the RCAF, a learning technology framework or model will be presented. Adapted from *Kirkpatrick's Four-Level Training Evaluation Model*, critical success factors or indicators will be applied to measure the value or effectiveness of learning technology towards meeting RCAF operational needs.

## Learning Technology

Learning technology, or instructional technology, is defined as “the application of technology for the enhancement of teaching, learning and assessment”.<sup>1</sup> Specifically,

---

<sup>1</sup> Roger Rist and Sue Hewer. “What is Learning Technology? - Some Definitions”. *Learning Technology Dissemination Initiative*. Last accessed on March 5, 2018, <http://www.icbl.hw.ac.uk/ltdi/implementing-it/what-def.htm>

learning technology includes computer-based learning (CBL), digital multimedia materials, computer networks and communications systems that support learning. Traditional synonyms for learning technology include Computer Aided Instruction (CAI), Computer Aided Learning (CAL), CBL, and Computer Based Training (CBT).<sup>2</sup> In more recent times, learning technology includes the use of simulation, synthetic or virtual environments, and augmented reality for the purposes of training, education, or learning support. Examples of specific learning technologies include Learning Management Systems (LMS), simulators, virtual trainers, digital scanners and cameras, mobile learning devices, laptop applications, learning software, and virtual tutors.<sup>3</sup>

## **RCAF & Learning Technologies**

Technology, including learning technologies, constitutes a significant portion of investment for the future of the RCAF. According to the current Canadian defence policy, *Strong Secure, Engaged*, there is an imminent need to “keep pace with the rapid evolution of technology to ensure continued operational relevance”.<sup>4</sup> Technology, including those that support training and education, is required to effectively operate, maintain, manage, and administer the RCAF. From advanced combat systems, to flying and targeting simulators, procedural trainers, to professional development, the RCAF has invested a significant amount of resources in training, education, and support

---

<sup>2</sup> Ibid.

<sup>3</sup> Oregon Department of Education, “Instructional Technology Ideas and Resources for Oregon Teachers”. Last accessed on March 5, 2018, <http://www.ode.state.or.us/teachlearn/subjects/technology/instrtec.pdf>

<sup>4</sup> National Defence, “Strong, Secure, Engaged: Canada’s Defence Policy”. Last accessed February 22, 2018, <http://dgpaapp.forces.gc.ca/en/canada-defence-policy/docs/canada-defence-policy-report.pdf>

systems to remain current.<sup>5</sup> Arguably, the successful integration of learning technology remains critical to the overall success and performance of the RCAF. Precisely, learning technologies provide the means to train RCAF personnel employed to meet current and future operational requirements within the air force environment.

### *RCAF Major Projects & Learning Technologies*

Learning technologies are associated with a number of upcoming major defence capital acquisition projects. According to the Government of Canada, the RCAF will receive “\$46.4 billion on an accrual basis (\$64.4 billion on a cash basis) to fund equipment projects for the Royal Canadian Air Force over the next 20 years”.<sup>6</sup> This represents a significant amount of financial, capital, and human resources over the next few decades in major RCAF capital defence related procurement projects. The following section will highlight some of the major capital projects currently in progress that include a significant investment in learning technologies.

First, the RCAF intends to invest in advanced training approaches, methods, and advanced learning technologies. For example, the Future Pilot Training (FPT) program is a multi-billion dollar programme designed to train future RCAF pilots. The FPT will include acquiring both advanced simulators and new aircraft for pilot training.<sup>7</sup>

According to Pugliese (2018), RCAF intends to spend CAN\$4 billion (US\$3.2 billion)

---

<sup>5</sup> Sonia, Connock. “Embracing the future: RCAF finds solutions in innovative training technologies”. March 25, 2014. Royal Canadian Air Force. Last modified November 30, 2014, [www.rcaf-arc.forces.gc.ca/en/article-template-standard.page?doc=embracing-the-future-rcaf-finds-solutions-in-innovative-training-technologies/ht8s3wor](http://www.rcaf-arc.forces.gc.ca/en/article-template-standard.page?doc=embracing-the-future-rcaf-finds-solutions-in-innovative-training-technologies/ht8s3wor)

<sup>6</sup> Government of Canada, “Investments in the Royal Canadian Air Force (RCAF)”. Last modified June 7, 2017, <http://dgpaapp.forces.gc.ca/en/canada-defence-policy/news/investments-royal-canadian-air-force.asp>

<sup>7</sup> David, Pugliese. “Training for the future RCAF”. *Esprit de Corps*. Last modified January 2, 2018, <http://espritdecorps.ca/feature/training-for-the-future-rcaf>

over the next five years. The FPT contract is set to be implemented by 2021 and represents a 20-year investment and commitment for the RCAF.

Second, the RCAF intends to invest and make use of simulation and Virtual Training Environments (VTE). Where there is economic, training, and operational merit, the use of training simulation and other virtual technologies over the use of actual aircraft is part of the greater RCAF strategy. Savings, on fuel, wear and tear on aircraft frames, are partially of the drive for increased use of learning technologies such as modeling and simulation for the RCAF.<sup>8</sup> Furthermore, according to Pugliese (2015), “simulation and other training aids to teach personnel will free up more aircraft for operations and reduce instruction time”.<sup>9</sup>

As part of the long-term *RCAF Simulation Strategy 2025*, the RCAF intends to invest in a “simulation-focused training system which skilfully leverages live, virtual, and constructive (LVC) domains within a networked common synthetic environment”.<sup>10</sup> For instance, the *RCAF Simulation Implementation Project*, which will exploit the LVC, includes “an integrated, distributed simulation-based training system for the RCAF consisting of a common distributed training network with a centralized exercise control and debrief capability Distributed Mission Operations Centre (DMOC)”, representing a CAN\$250 million to CAN\$499 million investment in learning technology.<sup>11</sup>

---

<sup>8</sup> David, Pugliese. “Canadian AF Establishes Simulation Strategy”. Last modified March 21, 2015, <https://www.defensenews.com/training-sim/2015/03/21/canadian-af-establishes-simulation-strategy/>

<sup>9</sup> Ibid.

<sup>10</sup> Government of Canada, “Executive summary: RCAF Simulation Strategy 2025”. Last modified December 2, 2016, <http://www.rcaf-arc.forces.gc.ca/en/article-template-standard.page?doc=executive-summary-rcaf-simulation-strategy-2025/i6mj0r6z>

<sup>11</sup> Ibid.

Finally, there are many new major acquisition projects in the works associated with the Space domain. Space is now under the jurisdiction of the RCAF. New strategies, capabilities, and training solutions have already been identified. For instance, RCAF Space related projects include the *Defence - Enhanced Surveillance from Space Project*, the *Enhanced Satellite Communications Project - Polar*, the *Surveillance of Space 2*, and the *Tactical Narrowband Satellite*. Learning technologies will be associated with supporting these new space capabilities. These Space training related projects are expected to cost millions of dollars.<sup>12</sup>

### *RCAF Training Establishments & Learning Technologies*

RCAF Training Establishments (TE) continue to invest in learning technologies. Advanced CBL learning technologies are required to support modern training and education, and to provide learning support services. The following section will highlight some of the key learning technologies associated with existing TE across the RCAF.

First, RCAF continues to invest in the Defence Learning Network (DLN). The DLN is the formal LMS for the RCAF. In general, the DLN serves as a portal or gateway to access educational and training courses. A greater number of military and DND courses are offered by online, or Distance Learning (DL), through the DLN.<sup>13</sup> The investment in the DLN is seen as a means of rationalizing of training capacity by optimising courses through innovative techniques, alternative service delivery, and

---

<sup>12</sup> Government of Canada, "Backgrounder: Investments in the Royal Canadian Air Force (RCAF)". Last modified June 7, 2017, <http://dgpaapp.forces.gc.ca/en/canada-defence-policy/news/investments-royal-canadian-air-force.asp>

<sup>13</sup> Government of Canada, "Defence Learning Network". Last modified November 17, 2014, <http://www.forces.gc.ca/en/training-elearning/dln.page>

distance learning.<sup>14</sup> In essence, the DLN represents a long-term investment in training delivery and management to support both traditional or residential learning institutions and DL for the RCAF.

Second, learning technologies are well integrated into the RCAF training system. The RCAF has invested and continues to invest in a multitude of modern flight trainers, simulators, and electronic based training aides. These sophisticated and complex technological systems are located at multiple TE across Canada. For instance, 402 Squadron in Winnipeg, Manitoba has an advanced Tactical Mission Trainer (TMT), while 426 Squadron in Trenton, Ontario makes use of complex Hercules aircraft trainers and simulators.<sup>15</sup>

Finally, the RCAF has recently established a Learning Support Centre (LSC) in Borden. The purpose of the LSC is to provide “consultancy services, support services, and learning development services to continuously improve support to over 40 RCAF Training Establishments (TE) in Canada”.<sup>16</sup> The RCAF continues to invest a significant amount of resources in learning technologies, needed to achieve its training, education, and learning support mandate. In short, the LSC exists in order to use and support learning technology across the RCAF.

---

<sup>14</sup> Government of Canada, “2016-2017 Report on Plans and Priorities”. Last accessed May 13, 2018, [http://www.forces.gc.ca/en/about-reports-pubs-report-plan-priorities/2016-section-ii-analysis-of-programs-by-strategic-outcomes.page#p6\\_4](http://www.forces.gc.ca/en/about-reports-pubs-report-plan-priorities/2016-section-ii-analysis-of-programs-by-strategic-outcomes.page#p6_4). Section II: Analysis of Programs by Strategic Outcomes 4.1.16

<sup>15</sup> Government of Canada, “402 Squadron”. Last modified May 3, 2017, [www.rcaf-arc.forces.gc.ca/en/2-cdn-air-div/402-squadron.page](http://www.rcaf-arc.forces.gc.ca/en/2-cdn-air-div/402-squadron.page)

<sup>16</sup> Government of Canada, “Development of Learning Services (W6570-17SP03/A)”. Last accessed May 12, 2018, <https://buyandsell.gc.ca/procurement-data/tender-notice/PW-WPG-209-10415>

## Existing Policy

The RCAF currently does not have an integrated approach or framework when it comes to learning technology. First, applicable to the Department of National Defence (DND) and Canadian Armed Forces (CAF), a Defence Administrative Order and Direction (DAOD) exists concerning Individual Training and Education (IT&E) governance.<sup>17</sup> However, it does not address learning technology. Second, the Canadian Forces Training and Education System (CFITES) provides general guidance on the analysis, design, development, conduct, evaluation and validation of training and education.<sup>18</sup> CFITES discusses the selection of learning technology. However, it does not address the management and evaluation of systems within the CAF.<sup>19</sup> Third, within the RCAF environment, the Air Force Training and Education Management System (AFTEMS) provides training and education policy required to effectively manage and administer training and education at the operational and tactical level.<sup>20</sup> Currently, AFTEMS and CFITES are under review.<sup>21</sup> Finally, a DND-wide technology policy framework exists for Information and information technology management from a technology perspective. Conversely, it focuses solely on governance, accountability,

---

<sup>17</sup> Government of Canada, “DAOD 5031-2, Individual Training and Education System Strategic Framework”. Last modified June 27, 2017, <http://www.forces.gc.ca/en/about-policies-standards-defence-admin-orders-directives-5000/5031-2.page>

<sup>18</sup> National Defence, “A-P9-050-000/PT-001, (CFITES), Manual of Individual Training and Education, Volume 1, Introduction/Description”, Last accessed March 2, 2018, <https://www.scribd.com/document/37800317/CFITES-Vol-1-e>

<sup>19</sup> National Defence, “A-P9-050-000/PT-004, (CFITES), Manual of Individual Training and Education, Volume 4, Design of Instructional Programmes”. Last accessed March 18, 2018, <https://www.scribd.com/document/37800660/CFITES-Vol-4-e>

<sup>20</sup> Royal Canadian Air Force, “AFO 5007-2, Royal Canadian Air Force Individual Training and Education”. Last modified March 27, 2012, <http://rcaf.mil.ca/en/c-air-force-staff/afo-5007-2.page>

<sup>21</sup> Julie, Maillé and Louise, Baillargeon. “A Doctrine for Individual Training and Education”. Canadian Military Journal, Autumn (2016): 71. Last accessed March 2, 2018, <http://www.journal.forces.gc.ca/vol16/no4/PDF/CMJ164Ep68.pdf> , 71

and responsibly.<sup>22</sup> In summary, although the RCAF has strong leadership and supports learning technology, there is no roadmap or overall framework to serve as a policy development guide to help the institution effectively and efficiently integrate learning technology.

## Learning Technology Frameworks

A learning technology framework presents a consolidated structure that aligns governance, policy, and requirements concerning learning technologies within a specific operating environment.<sup>23</sup> Specifically, such a framework provides a structure through which planning, goal-setting, and assessment of learning technology can occur. Additionally, a framework enables effective decision-making needed to address learning and technology policies, practices, and outcomes. It can serve as a common foundation towards evaluating and reporting progress toward achieving desired outcomes.<sup>24</sup> There are many modern examples of medium and large institutions that operate within a learning technology framework, including the Government of Alberta, Charles Sturt University, and Stanford University.<sup>25, 26</sup> In other words, a learning technology framework serves as a practical tool, structure, and model to formalize strategic and

---

<sup>22</sup> Government of Canada, "DAOD 1000-6, Policy Framework for Information and Information Technology Management". Last updated March 30, 2017, <http://www.forces.gc.ca/en/about-policies-standards-defence-admin-orders-directives-1000/1000-6.page>

<sup>23</sup> Charles Sturt University, CSU Learning Technologies Framework. Last modified May 3, 2017, [http://www.csu.edu.au/\\_\\_data/assets/pdf\\_file/0003/2171604/csulearningtechnologiesframework.pdf](http://www.csu.edu.au/__data/assets/pdf_file/0003/2171604/csulearningtechnologiesframework.pdf)

<sup>24</sup> Brian Callaghan and Edna Dach. "Learning and Technology Policy Framework". Last modified July, 2014, [http://www.asba.ab.ca/wp-content/uploads/2014/07/sgm16\\_learning\\_technology.pdf](http://www.asba.ab.ca/wp-content/uploads/2014/07/sgm16_learning_technology.pdf)

<sup>25</sup> Youngblood P., and Dev P. "A Framework for Evaluating New Learning Technologies in Medicine". *AMIA Annual Symposium Proceedings*, (2005): 1163.

<sup>26</sup> 2013: *Learning and Technology Policy Framework*. Last modified September 23, 2015, <https://education.alberta.ca/learning-with-technology/overview/?searchMode=3>

operational guidance concerning the effective management and use of technology within an organization.<sup>27</sup>

A general learning technology framework may include a number of different elements or components. A vision statement presents a long-term view as to how learning technology will be incorporated or institutionalized into the organization. While policy direction may change in the short-term, the vision reflects the steady, medium, and/or long-term aspirations of an organization.<sup>28</sup> The vision is amplified or based upon underlying key values and principles. An example of key value may include the belief that technology is seen as an enabler to learning and serves as a tool towards achieving operational success. Principles amplify how learning technology is expected to be used within the organization. Examples of principles may include the need for an organization to demonstrate continuous improvement, learning, and learning support. The need for performance improvement, alignment, innovation, and modernization within an organization are examples of key drivers for the integration of learning technologies.<sup>29</sup> Other components of a learning technology framework may include details concerning governance, policy direction, and performance assessment.

## **A Learning Technology Framework for the RCAF**

There are a number of reasons why a learning technology framework is needed for the RCAF.

---

<sup>27</sup> Charles Sturt University, CSU Learning Technologies Framework...

<sup>28</sup> "Vision Statement". Definition. Last accessed March 19, 2018, [www.businessdictionary.com/definition/vision-statement.html](http://www.businessdictionary.com/definition/vision-statement.html)

<sup>29</sup> Charles Sturt University, CSU Learning Technologies Framework. Version 5...

First, the RCAF needs to ensure that learning technologies actually contribute to learning. Given limited resources, the RCAF needs to ensure that it is making the most of the technology that supports learning. For instance, to what extent do RCAF students react effectively to training where learning technologies are involved? Do certain learning technologies actually contribute towards modifying behaviour, or adding value to the learning experience? In other words, the RCAF continues to invest in learning technologies in projects and in TE, but it is not clear how well they contribute towards improving actual performance, or if they add value to the overall mission. Most importantly, a learning technology framework would outline the performance assessment criteria requirements to evaluate, measure, and compare the actual value that individual technologies contribute to the RCAF.<sup>30</sup>

Second, the RCAF needs to ensure that there is focus and alignment across strategic, operational, and tactical levels when it comes to the management and planning of learning technologies. A framework would serve as an overarching construct. It would present a shared vision of how learning technology fits within the mandate, goals, and objectives of the RCAF. In other words, it would answer the question as to expressing the value of instructional technology contribution towards the effective administration, management, and performance of the organization. At the strategic level, a learning technology framework would clearly articulate the long-term vision, governance, oversight, key values, and guiding principles. Policy direction and performance assessment metrics would be amplified at the operational level. At the tactical level, a learning framework would provide a common, focused, and shared

---

<sup>30</sup> Elsabe' van Niekerk, Piet Ankiewicz, Estelle de Swardt. "A process-based assessment framework for technology education: a case study". *Int J Technol Des Educ*, (2010): 194.

conceptual structure needed for staff to be use and managed learning technologies at the unit or squadron level.<sup>31</sup>

Finally, the RCAF needs to ensure responsibility and accountability when it comes to the effective oversight, management, and administration of learning technologies. In addition to providing details on governance, features of a learning framework include clear expectations concerning goals, performance assessment, and performance management details.<sup>32</sup> The RCAF needs to be able to account for the return on investment associated with procuring learning technologies. Simply put, such a document provides a practical means to identify who is responsible for what when it comes to the integration and management of learning technologies across the RCAF.

### **Critical Success Factors**

In general, a Critical Success Factor (CSF) is defined as a high-level goal that is critical for an organization to achieve its mission. In order to be effective, a CSF must be vital to the success and interest of the organization and directly linked with the business strategy.<sup>33</sup> CSF are not measurements of success. However, they are measured to confirm if goals and objectives are being achieved.<sup>34</sup> According to Hassam (2007), CSF

---

<sup>31</sup> Andrew, Quinn and Dale, Fitch. "A Conceptual Framework for Contextualizing Information Technology Competencies". *Journal of Technology in Human Services*, (2014): 1

<sup>32</sup> Australian Public Service Commission, "Building capability: A framework for managing learning and development in the APS". Last modified October 3, 2013, <http://www.apsc.gov.au/publications-and-media/current-publications/building-capability>

<sup>33</sup> Reilly, M. "How To Determine Critical Success Factors For Your Business". Clearpoint Strategy. Last modified on June 20, 2016, <https://www.clearpointstrategy.com/how-to-determine-critical-success-factors-for-your-business>

<sup>34</sup> John, Spacey. "12 Examples of Critical Success Factors". *Simplicable Business Guide*. Last modified January 22, 2017, <https://simplicable.com/new/critical-success-factors>

need to be considered while developing or implementing learning technology.<sup>35</sup>

Examples of CSF of interest to the air force may include cost reduction as measured by improving design and efficiency, reliability engineering as assessed through resilient and reliable design, risk management as evaluated through risk awareness and mitigation, and sustainability as measured by cost effectiveness and customer satisfaction.<sup>36</sup>

### **Kirkpatrick Four Level's Model**

The factors or levels associated with *Kirkpatrick's Four-Level Training Evaluation Model* could be adapted to serve as CSF to measure the effectiveness of learning technology.<sup>37</sup> In brief, the model suggests that there are four factors that measure the effectiveness of training. These factors may be represented as different levels of effectiveness. The four levels include, reaction, learning, behaviour, and results or Return on Investment (ROI).<sup>38</sup> In short, the four levels can also serve as CSF.<sup>39</sup>

---

<sup>35</sup> Hassan M. Selim. "Critical success factors for e-learning acceptance: Confirmatory factor models". *Computers & Education* 49 (2007): 1

<sup>36</sup> Ibid.

<sup>37</sup> Mind Tools, "Kirkpatrick's Four-Level Training Evaluation Model: Analyzing Training Effectiveness". Last accessed March 4, 2018, <https://www.mindtools.com/pages/article/kirkpatrick.htm>

<sup>38</sup> Barbara, Camm. "Training Evaluation: Kirkpatrick Model for the 21st Century". Dashe and Thomson. Last modified on December 6, 2012, <https://www.dashe.com/blog/instructional-design/how-to-evaluate-learning-kirkpatrick-model-for-the-21st-century-a-revision/>

<sup>39</sup> Barbara, Camm. "Training Evaluation: Kirkpatrick Model for the 21st Century" ...



**Figure 1. Kirkpatrick's Four Levels of training evaluation.**

Source: *Kirkpatrick's Four-Level Training Evaluation Model*.

It is possible to measure the value that learning technologies contribute towards the learning process, learning outcomes, or job performance by using these four factors as key indicators.<sup>40, 41</sup> For instance, increased reaction in favour of the learning experience, demonstration of acquiring intended knowledge, skills, and attitudes through learning, application of learning; and achievement of desired results would be indicative of high value or effective training and performance. As an applied example, a

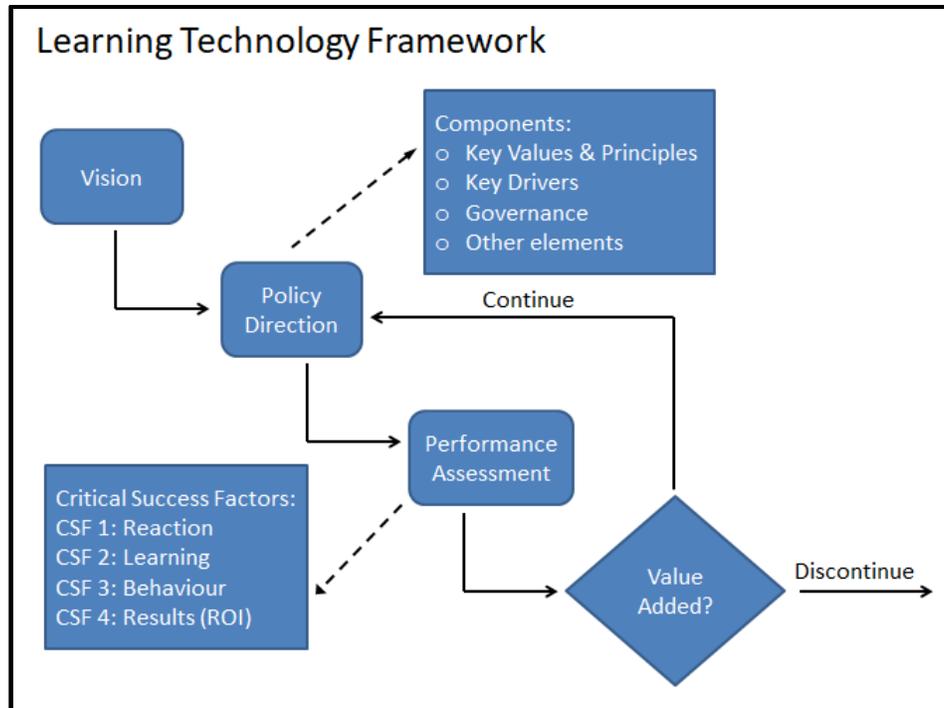
<sup>40</sup> Donald L. Kirkpatrick and James D. Kirkpatrick. *Evaluating Training Programs* (Excerpt). Third Edition. Berrett-Koehler. Last accessed on March 6, 2018, [https://www.bkconnection.com/static/Evaluating\\_Training\\_Programs\\_EXCERPT.pdf](https://www.bkconnection.com/static/Evaluating_Training_Programs_EXCERPT.pdf)

<sup>41</sup> Judith Strother, "An Assessment of the Effectiveness of e-learning in Corporate Training Programs". *International Review of Research in Open and Distance Learning*. Vol. 3, No. 1 (April, 2002). Last accessed on May 13, 2018, <http://www.irrodl.org/index.php/irrodl/article/view/83/160>

learning aid such as an advanced flight simulator that scores high CSF, would be deemed a valuable investment for the RCAF. Conversely, decreased reaction or enthusiasm, impartial demonstration of knowledge, skills and attitudes, and poor operational performance would be indicative of low value or ineffective training and performance. Therefore, a flight simulator that students and staff find difficult to use and has a low CSF, would be deemed a low investment.

### **Applying a RCAF Learning Technology Framework**

The RCAF should apply a Learning Technological framework that uses the Critical Success Factors (CSF) of reaction, learning, behaviour, and results or Return on Investment (ROI) to effectively manage and access the value that learning technology adds the RCAF.



**Figure 2. Model for applying CSF within a learning technology framework.**

Source: Adapted from 2013: *Learning and Technology Policy Framework*, Government of Alberta. p.7, and N.A. *CSU Learning Technologies Framework*. Version 5. Charles Sturt University.

First, the framework would present a common, established, and shared vision for the RCAF. The vision needs to be set top-down, but shared by all. From a leadership and systems perspective, the vision should be set at the strategic level, and supported at the operational and tactical level. It is more than a traditional business vision statement. The vision serves as a reflection of the commanders' intent, similar to that presented in the Operational Planning Process.<sup>42</sup> For instance, the vision statement from the *RCAF Simulation Strategy 2025* policy document could be adapted to create a

<sup>42</sup> Government of Canada, B-GJ-005-500/FP-000, *Canadian Forces Joint Publication 5.0 (CFJP 5.0)*. Last accessed May 11, 2018. [http://publications.gc.ca/collections/collection\\_2010/forces/D2-252-500-2008-eng.pdf](http://publications.gc.ca/collections/collection_2010/forces/D2-252-500-2008-eng.pdf), 3-10

learning technology framework vision. A proposed vision could be to “optimize the means by which RCAF aviators achieve and maintain readiness, fully exploiting advances in both technology and training methodologies, to deliver world-class capabilities for the full spectrum of operations”.<sup>43</sup>

Second, policy direction and guidance should be provided at the operational level and based upon set RCAF doctrine. *Air Force Vectors* doctrine could be adapted and expanded to include learning technologies that are relevant, responsive, and effective as key values and principles articulated in.<sup>44</sup> Key drivers could include the need for RCAF learning technologies to be agile or flexible, integrated or compatible, reach or capable, and power or impact on training and operations. Governance for a learning technology could be established by 2 Canadian Air Division as the lead organization responsible for the oversight of RCAF individual education and training, in conjunction with 1 CAD, other CAF, and DND stakeholders.

Finally, a learning framework could assist with assessment of training and education programme to demonstrate how learning technology contributes towards organizational objectives and goals. When applied from a performance assessment perspective, the framework can be used to measure the effectiveness of learning technology by measuring the CSF of reaction, learning, behaviour, and results. Based upon a stated measurement of success, or established point of diminishing returns, performance results could result in a modification of policy and direction. Decisions to either continue or discontinue with certain learning technologies would then be based

---

<sup>43</sup> Government of Canada, “Executive summary: RCAF Simulation Strategy 2025” ...

<sup>44</sup> Government of Canada, “Air Force Vectors”, Last accessed May 12, 2018, [http://publications.gc.ca/collections/collection\\_2014/mdn-dnd/D2-300-2014-eng.pdf](http://publications.gc.ca/collections/collection_2014/mdn-dnd/D2-300-2014-eng.pdf), 25

upon performance. For instance, if specific learning technologies are deemed to add value, then they should continue to be used, invested, and supported. If not, select learning technologies should be not used, and eliminated. Furthermore, performance results could be used to gain important information on how to improve future technology based training programs and solutions.<sup>45</sup>

## **CONCLUSION**

The RCAF continues to invest in technologies, required to meet current and future operational needs. Learning technologies constitute a large portion of this investment. The RCAF should apply a Learning Technological framework that uses the Critical Success Factors (CSF) of reaction, learning, behaviour, and results or Return on Investment (ROI) to effectively manage and access the value that learning technology adds the RCAF. By applying such a framework, it would be possible to effectively align long-term vision, guiding principles, policy direction, and desired outcomes in support of meeting operational requirements.

---

<sup>45</sup> Donald L. Kirkpatrick and James D. Kirkpatrick. Evaluating Training Programs (Excerpt). Third Edition. Berrett-Koehler. Last accessed March 6, 2018, [https://www.bkconnection.com/static/Evaluating\\_Training\\_Programs\\_EXCERPT.pdf](https://www.bkconnection.com/static/Evaluating_Training_Programs_EXCERPT.pdf)

## BIBLIOGRAPHY

- Australian Public Service Commission. "Building capability: A framework for managing learning and development in the APS". Last modified October 3, 2013.  
<http://www.apsc.gov.au/publications-and-media/current-publications/building-capability>.
- Business Directory. "Vision Statement". Definition. Last accessed March 19, 2018.  
[www.businessdictionary.com/definition/vision-statement.html](http://www.businessdictionary.com/definition/vision-statement.html).
- Callaghan, Brian and Dach, Edna. *Learning and Technology Policy Framework*. Alberta School Boards Association. Last modified July, 2014, [http://www.asba.ab.ca/wp-content/uploads/2014/07/sgm16\\_learning\\_technology.pdf](http://www.asba.ab.ca/wp-content/uploads/2014/07/sgm16_learning_technology.pdf).
- Camm, Barbara. "Training Evaluation: Kirkpatrick Model for the 21st Century". Dashe and Thomson. Last modified December 6, 2012,  
<https://www.dashe.com/blog/instructional-design/how-to-evaluate-learning-kirkpatrick-model-for-the-21st-century-a-revision/>.
- Charles Sturt University. "CSU Learning Technologies Framework". Version 5. Last modified May 3, 2017,  
[http://www.csu.edu.au/\\_\\_data/assets/pdf\\_file/0003/2171604/csulearningtechnologiesframework.pdf](http://www.csu.edu.au/__data/assets/pdf_file/0003/2171604/csulearningtechnologiesframework.pdf).
- Connock, Sonia. "Embracing the future: RCAF finds solutions in innovative training technologies". March 25, 2014. Royal Canadian Air Force. Last modified November 30, 2014, [www.rcaf-arc.forces.gc.ca/en/article-template-standard.page?doc=embracing-the-future-rcaf-finds-solutions-in-innovative-training-technologies/ht8s3wor](http://www.rcaf-arc.forces.gc.ca/en/article-template-standard.page?doc=embracing-the-future-rcaf-finds-solutions-in-innovative-training-technologies/ht8s3wor).
- Government of Alberta. "*2013: Learning and Technology Policy Framework*". Last modified September 23, 2015, <https://education.alberta.ca/learning-with-technology/overview/?searchMode=3>.
- Government of Canada. *Air Force Vectors*. Director General Air Force Development. 2014. Last accessed May 12, 2018,  
[http://publications.gc.ca/collections/collection\\_2014/mdn-dnd/D2-300-2014-eng.pdf](http://publications.gc.ca/collections/collection_2014/mdn-dnd/D2-300-2014-eng.pdf), 25
- Government of Canada. *2016-2017 Report on Plans and Priorities*. National Defence and the Canadian Armed Forces. Last accessed on May 15, 2018,  
[http://www.forces.gc.ca/en/about-reports-pubs-report-plan-priorities/2016-section-ii-analysis-of-programs-by-strategic-outcomes.page#p6\\_4](http://www.forces.gc.ca/en/about-reports-pubs-report-plan-priorities/2016-section-ii-analysis-of-programs-by-strategic-outcomes.page#p6_4). Section II: Analysis of Programs by Strategic Outcomes 4.1.16

- Government of Canada. *402 Squadron*. Department of National Defence and the Canadian Armed Forces. Last modified May 3, 2017, [www.rcaf-arc.forces.gc.ca/en/2-cdn-air-div/402-squadron.page](http://www.rcaf-arc.forces.gc.ca/en/2-cdn-air-div/402-squadron.page).
- Government of Canada. DAOD 1000-6, *Policy Framework for Information and Information Technology Management*. National Defence and the Canadian Armed Forces. Last updated March 30, 2017, <http://www.forces.gc.ca/en/about-policies-standards-defence-admin-orders-directives-1000/1000-6.page>.
- Government of Canada. DAOD 5031-2, *Individual Training and Education System Strategic Framework*. National Defence and the Canadian Armed Force. Last modified June 27, 2017, <http://www.forces.gc.ca/en/about-policies-standards-defence-admin-orders-directives-5000/5031-2.page>.
- Government of Canada. *Backgrounder: Investments in the Royal Canadian Air Force (RCAF)*. Last modified June 7, 2017, <http://dgpaapp.forces.gc.ca/en/canada-defence-policy/news/investments-royal-canadian-air-force.asp>.
- Government of Canada. *Canadian Forces Joint Publication 5.0 (CFJP 5.0). Canadian Forces Operational Planning Process (OPP)*. Last accessed May 11, 2018, [http://publications.gc.ca/collections/collection\\_2010/forces/D2-252-500-2008-eng.pdf](http://publications.gc.ca/collections/collection_2010/forces/D2-252-500-2008-eng.pdf).
- Government of Canada. *Defence Learning Network*. Department of National Defence and the Canadian Armed Forces. Last modified November 17, 2014, <http://www.forces.gc.ca/en/training-elearning/dln.page>.
- Government of Canada. *Executive summary: RCAF Simulation Strategy 2025*. Royal Canadian Air Force. Last modified December 2, 2016, <http://www.rcaf-arc.forces.gc.ca/en/article-template-standard.page?doc=executive-summary-rcaf-simulation-strategy-2025/i6mj0r6z>.
- Government of Canada. *Development of Learning Services (W6570-17SP03/A)*. BuyandSell.gc.ca. Last accessed May 12, 2018, <https://buyandsell.gc.ca/procurement-data/tender-notice/PW-WPG-209-10415>.
- Kirkpatrick, Donald, and Kirkpatrick, James. *Evaluating Training Programs (Excerpt)*. Third Edition. Berrett-Koehler. Last accessed March 6, 2018, [https://www.bkconnection.com/static/Evaluating\\_Training\\_Programs\\_EXCERPT.pdf](https://www.bkconnection.com/static/Evaluating_Training_Programs_EXCERPT.pdf).
- Maillé, Julie and Baillargeon, Louise. "A Doctrine for Individual Training and Education". *Canadian Military Journal*, Vol. 16, No. 4. (Autumn 2016). Last accessed March 2, 2018, <http://www.journal.forces.gc.ca/vol16/no4/PDF/CMJ164Ep68.pdf>.

Mind Tools. "Kirkpatrick's Four-Level Training Evaluation Model: Analyzing Training Effectiveness". Last accessed March 4, 2018, <https://www.mindtools.com/pages/article/kirkpatrick.htm>.

Oregon Department of Education. "Instructional Technology Ideas and Resources for Oregon Teachers". Winter 2002. Last accessed March 5, 2018, <http://www.ode.state.or.us/teachlearn/subjects/technology/instrtec.pdf>

National Defence. A-P9-050-000/PT-001, (CFITES), *Manual of Individual Training and Education, Volume 1, Introduction/Description*. Government of Canada. Last accessed March 2, 2018, <https://www.scribd.com/document/37800317/CFITES-Vol-1-e>

National Defence. A-P9-050-000/PT-004, (CFITES), *Manual of Individual Training and Education, Volume 4, Design of Instructional Programmes*. Government of Canada. Last accessed March 18, 2018, <https://www.scribd.com/document/37800660/CFITES-Vol-4-e>

National Defence. *Strong, Secure, Engaged: Canada's Defence Policy*. Retrieved from <http://dgpaapp.forces.gc.ca/en/canada-defence-policy/docs/canada-defence-policy-report.pdf>. Last accessed on February 22, 2018.

Pugliese, David. "Canadian AF Establishes Simulation Strategy". *Defence News*. Last modified March 21, 2015, <https://www.defensenews.com/training-sim/2015/03/21/canadian-af-establishes-simulation-strategy/>

Pugliese, David. "Training for the future RCAF". Last modified January, 2, 2018, <http://espritdecorps.ca/feature/training-for-the-future-rcaf>. Esprit de Corps.

Quinn, Andrew and Fitch, Dale. "A Conceptual Framework for Contextualizing Information Technology Competencies". *Journal of Technology in Human Services*, 32:133–148, 2014. DOI: 10.1080/15228835.2013.860367

Reilly, Moira. "How To Determine Critical Success Factors For Your Business". Clearpoint Strategy. <https://www.clearpointstrategy.com/how-to-determine-critical-success-factors-for-your-business>. Last modified on June 20, 2016.

Rist, Roger and Hewer, Sue. "What is Learning Technology? - Some Definitions". *Learning Technology Dissemination initiative*. Last accessed March 5, 2018, <http://www.icbl.hw.ac.uk/ltdi/implementing-it/what-def.htm>.

Royal Canadian Air Force. *AFO 5007-2, Royal Canadian Air Force Individual Training and Education*. National Defence and the Canadian Armed Forces. Last modified March 27, 2012, <http://rcaf.mil.ca/en/c-air-force-staff/afo-5007-2.page>.

Selim, Hassam. "Critical success factors for e-learning acceptance: Confirmatory factor models". *Computers & Education*, 49 (2007): 396–413

Spacey, John. "12 Examples of Critical Success Factors". *Simplifiable Business Guide*. Last modified January 22, 2017, <https://simplifiable.com/new/critical-success-factors>.

Strother, Judith. "An Assessment of the Effectiveness of e-learning in Corporate Training Programs". *International Review of Research in Open and Distance Learning*. ISSN: 1492-3831. Vol. 3, No. 1 (April, 2002). Last accessed May 13, 2018, <http://www.irrodl.org/index.php/irrodl/article/view/83/160>.

Van Niekerk, E., Ankiewicz, P. De Swardt, E. "A process-based assessment framework for technology education: a case study". *Int J Technol Des Educ* (2010) 20:191–215. 194. DOI 10.1007/s10798-008-9070-8

Youngblood P., Dev P. "A Framework for Evaluating New Learning Technologies in Medicine". *AMIA Annual Symposium Proceedings*. 2005, 1163.