National Defence / Défense nationale

Chief Review Services Chef - Service d'examen

CRS / CS Ex

Analysis of Capital Equipment Projects

September 2010

7050-9-4-12 (CRS)



Canada

Caveat

The analysis conclusions do not have the weight of an audit or formal evaluation. While sufficient to enable the development of recommendations for consideration by management, the assessments provided and conclusions rendered are not based on the rigorous inquiry or evidence required of an audit. Accordingly, this report represents a low level of assurance.

Table of Contents

Reviewed by CRS in accordance with the *Access to Information Act* (AIA). Information UNCLASSIFIED.

Acronyms and Abbreviations

ADM(IM)	Assistant Deputy Minister (Information Management)
CEMS	Clothing and Equipment Millennium Standard
CF	Canadian Forces
CID	Capability Investment Database
C/S	Cost/Schedule
CRS	Chief Review Services
CSE	Communications Security Establishment
Def	Definition
DMGHR	Director Materiel Group Human Resources
DND	Department of National Defence
FOC	Full Operational Capability
IOC	Initial Operational Capability
ID	Identification
Imp	Implementation
IRB	Industrial and Regional Benefit
ITAR	International Traffic in Arms Regulation
LAV	Light Armoured Vehicle
LF ISTAR	Land Force Intelligence, Surveillance, Target Acquisition, Reconnaissance
OA	Options Analysis
OAG	Office of the Auditor General
OTS	Off-the-Shelf
PAG	Project Approval Guide
PCRA	Project Complexity and Risk Assessment
PWGSC	Public Works and Government Services Canada
SCR	Strategic Capability Roadmap
SRB	Senior Review Board
TBS	Treasury Board Secretariat
VCDS	Vice Chief of the Defence Staff

Introduction

Background

The Treasury Board Secretariat (TBS) Internal Audit Policy dictates that Chief Audit Executives ensure that the internal audit plan be based on a risk assessment of the department.[1] Since the capital equipment acquisition program is of such significance not only with respect to materiality ($92 billion),[2] but to the objectives of the Canadian Forces (CF), Chief Review Services (CRS) has developed a risk-based methodology in selecting projects for audit. This approach gathers data from numerous sources of project information into one consolidated analysis to help identify projects that exhibit indicators that could contribute to higher costs or delayed capability.

By examining lessons learned and findings from past audits and risk analyses,[3] CRS has developed criteria and a scoring methodology to help focus limited audit resources on projects that may warrant follow-up. Since projects that score highly in the mandated TBS Project Complexity and Risk Assessment (PCRA) process are naturally subjected to a higher level of scrutiny, CRS is seeking to develop a methodology that will not necessarily target those projects with high PCRA scores. The CRS criteria are designed to highlight some of the most objective attributes of projects, incorporating several of the PCRA criteria and adding quantitative indicators to strengthen this goal of objectivity. This methodology can also be used to enhance the ongoing performance monitoring capability of the Assistant Deputy Minister (Materiel) capital program.

Objective

To conduct an analysis of capital equipment projects to select some projects for internal audit and highlight those that may benefit from additional challenge or oversight.

Scope

One hundred and eighty-seven capital equipment projects worth $89 billion were extracted from the Capability Investment Database (CID) in March 2010. Capital information management, infrastructure and communications security projects were excluded, since separate analyses for these types of projects have been conducted, and will continue to be required.

[1] TBS Guidelines on the Responsibilities of Chief Audit Executive, Internal Audit Policy, Section 3.1.3 (http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=12352&section=text#cha1).
[2] Current value of Capital Equipment Projects in Options Analysis, Definition, and Implementation phases, Capability Investment Database (CID) Standard Report Excel Cashline, March 2010.
[3] Risk Analysis of Capital Projects (http://www.crs-csex.forces.gc.ca/reports-rapports/2007/pdf/114P0714-eng.pdf), April 2007.

Methodology and Results

Sources of Data. The main sources of data were as follows:

- **Primary:** The CID was a Vice Chief of the Defence Staff (VCDS) initiative first established in November 2002 to support Department of National Defence (DND) capability-based planning to improve project data aggregation and oversight of project performance and milestone management.[4]
- **Secondary:** Investment Plan, PCRA; and Strategic Capability Roadmap (SCR)

CRS Analysis Process of Capital Equipment Projects

After an initial filtering of the population, a two-step process was followed to assign scores to projects based on various criteria. The results of each step are summarized in Table 1. A detailed description of the methodology is provided at Annex A.

Initial Filtering (289 to 187 Projects). The initial 289 projects (worth $92 billion) were active, capital equipment projects in options analysis (OA), definition (Def), or implementation (Imp) phases. After removing projects with a value of less than $30 million, and those that were information management, and communications security, 187 projects remained.

Step	No. of Projects	Project Value	Project Value Unspent
Initial Filter	187	$89B	$70B
Step 1	20	$51B	$50.6B
Step 2	20	$51B	$50.6B

Table 1. Risk Analysis Steps. Although the analysis focused on 20 projects (11 percent of project total) worth $51 billion, this represented 57 percent of the total dollar value.

[4] VCDS memo 3136-1(DFPPC6-2) 25 October 2004. Although the CID is the departmental source, the key sources for ADM(Mat) decision making are the Major Crown Project—Integrated Oversight Committee and the Look Ahead reports. Projects that were near closure or closed but still had an active status in CID were scored as lower risk in the Step 1 criteria (Annex B) "expenditures to date" and "strategic priority."

Step 1 (Scoring 187 Projects). Projects were scored against seven criteria (Annex B) to select 20 projects for further analysis.

Step 1 Results. Project scores ranged from a low of 1 to a high of 13 (out of a possible 14). It was noted that the actual dates for project approval milestones were, on average, 537 days later than the forecasted dates. Although some of these delays may be attributable to other government agencies that are responsible for funding approval, contract award and industrial regional benefits (IRB), these factors should also be considered in forecasting realistic milestones.[5] The 20 highest-scoring, auditable projects were ultimately selected for further analysis, as depicted at Annex C.[6]

Step 2 (New Scoring for 20 Projects). The remaining 14 criteria (Annex D) required more time-intensive file review and, therefore, were only applied to the 20 projects selected in Step 1. This provided a more refined re-ranking of the 20 projects to guide CRS in choosing audit priorities.

Step 2 Results. Scores ranged from 4 to 20 (out of a possible 28). The final "Top 20" highest scoring projects after Step 2 are provided at Annex E.

As a comparison to the TBS PRCA, 12 of the projects in the Top 20 had a PCRA score of "3-Evolutionary" or lower[7] demonstrating that the CRS methodology targets projects not necessarily subject to TBS oversight. PCRAs place a heavy weighting on project value. However, only 1 of the 21 CRS criteria used in Step 1 and 2 included project value. Therefore, the results were not simply skewed to the Department's highest-value projects, since 8 of the 20 projects have values of less than $200 million.

[5] There are numerous external factors that affect schedule risk, and those with accessible data were considered in Step 2 criteria (Annex D): Sourcing strategy and IRBs.
[6] The highest-scoring 36 projects from Step 1 were reviewed for relevance to produce a list of 20 for Step 2.
[7] There are four possible scores in PCRA: 1-Sustaining, 2-Tactical, 3-Evolutionary, 4-Transformational. DND has been given the authority to approve funding for projects of scores 3 or less (but TBS still reserves the right to oversee any project).

Annex A—Analysis Methodology

As shown in Figure 1, an initial list of 289 capital equipment projects (worth $92 billion) included active, capital equipment projects in OA, Def, or Imp phases from the CID. Those in the identification (ID) phase were not included since they do not have a project cost estimate until the OA phase is complete. Two further attributes were examined to add relevance and focus to the analysis: materiality, and project implementor.

Materiality. Sixty-one projects with values of less than $30 million[8] were scoped out, reducing the list by 21 percent. However, the population dollar value was only reduced by one percent ($831 million), thereby retaining significant coverage of the capital equipment program.

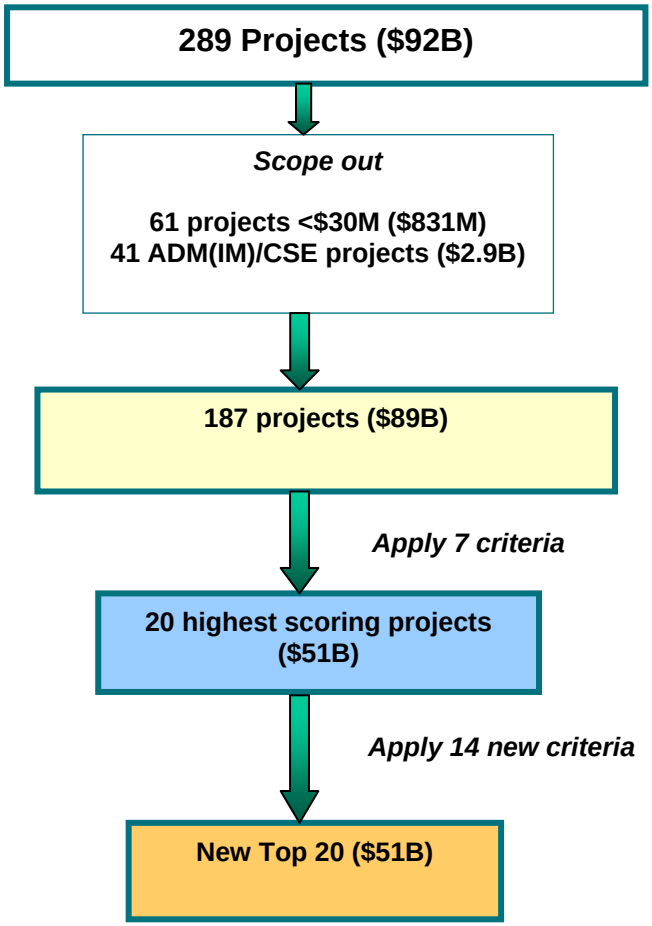


Figure 1. Risk Analysis Methodology. Use of 21 criteria enabled the identification of 20 projects that could warrant review or audit.

[8] However, "Child" projects were not scoped out since they are part of a higher-value omnibus project.

Annex A

Project Implementor. Forty-one projects worth $2.9 billion were deemed out of scope since they were implemented by either the Assistant Deputy Minister (Information Management) (ADM(IM)), the Assistant Deputy Minister (Infrastructure and Environment) or the Communications Security Establishment (CSE).

Step 1 (7 Criteria). The application of seven criteria in this step resulted in 20 projects for further analysis. These initial criteria were selected based on available electronic "data fields" in CID, enabling the use of automated scoring to narrow the list. Annex B explains the criteria and Annex C shows how the 20 projects were selected for further analysis.

Step 2 (14 New Criteria). Fourteen new criteria were applied to re-sort the 20 projects in order of follow-up priority. These criteria offer a greater level of refinement to demonstrating indicators of risk. Annexes D and E explain the criteria, and the 20 highest-scoring projects after Step 2, respectively.

Annex B—Explanation of Step 1 Criteria

#	Criterion (and Source)	Thresholds	Score	No. of Projects	Rationale for Criterion
1	**Project Materiality** (CID Standard Report)[9]	>= $30M <= $100M	0	114	Higher-value projects have a greater financial impact on the Department if risks are realised. Project value thresholds were determined by stratifying the population and incorporating the Minister's threshold of $30M. The median project value was $68M.
		> $100M <= $500M	1	47	
		> $500M	2	26	
2	**Number of Interdependent Projects** (CID Interdependencies Report)	< Median	0	34	If interdependent projects fall behind schedule or have integration issues, it will have an adverse impact on the associated capital projects. The median number of project interdependencies was 3, while the average was 5.
		Median range (3-5)	1	121	
		> Median range	2	32	
3	**Adherence to Milestones** (CID Milestone Report)	< Median	0	24	When a project does not meet its milestones, it is an indicator of delayed acquisition of a capability and higher project management costs. In the sample of 187 projects the average number of calendar days slipped was 537, and the median was 413, although most of these were pre-implementation milestones.
		Median range (413 to 537)	1	84	
		> Median range	2	79	
4	**Overall Risk Level** (CID project documents or Project Profile and Risk Assessment)	Low	0	94	The cost, schedule and technical risk levels associated with a project cannot be ignored as criteria in a risk-based approach.
		Medium or No Data	1	88	
		High	2	5	

[9] DND/CF CID Reports.

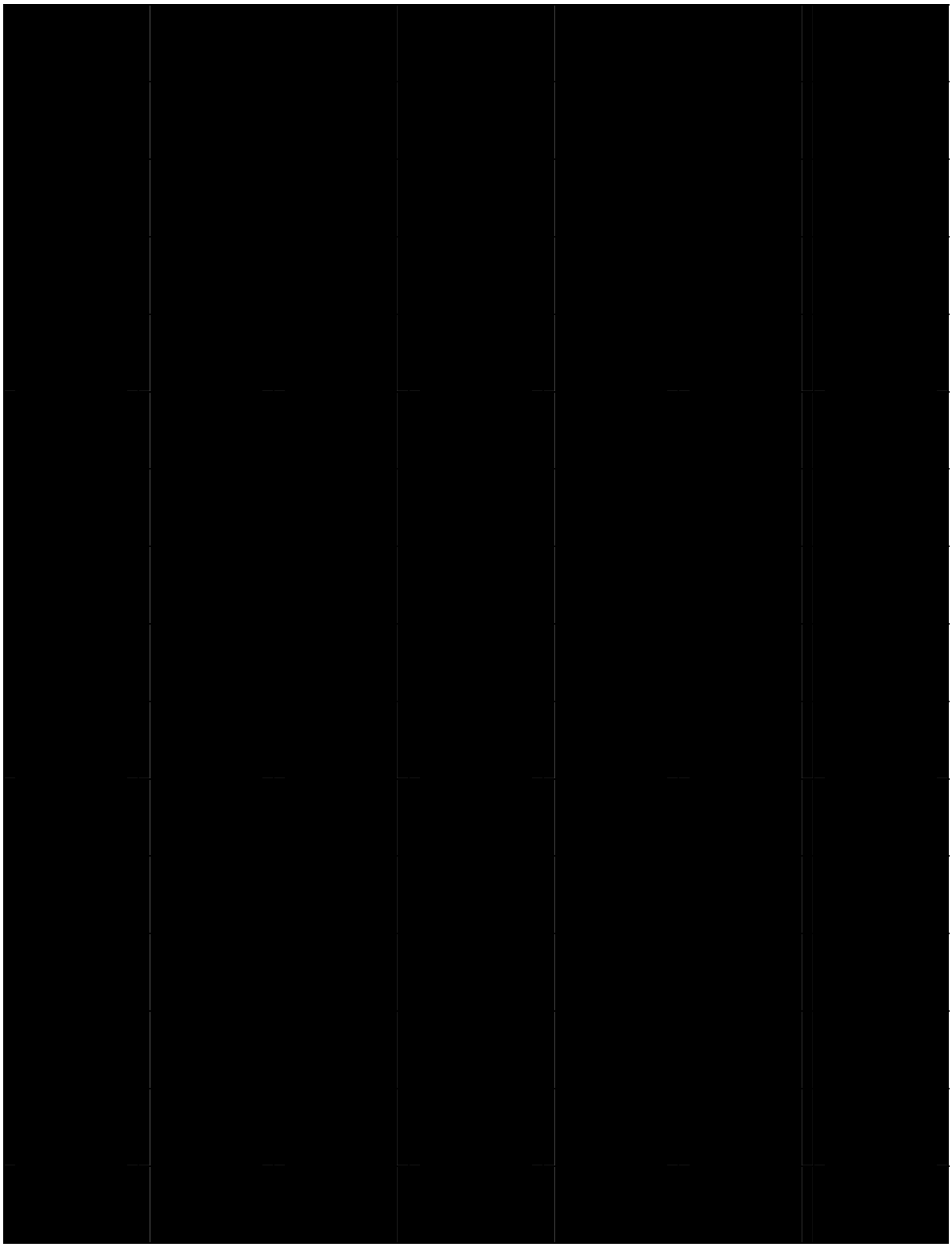
Annex B

#	Criterion (and Source)	Thresholds	Score	No. of Projects	Rationale for Criterion
5	**Senior Review Board (SRB) Frequency** (CID SRB Health Report)	On Schedule	0	113	If projects are overdue for their yearly SRB briefings or secretarial approvals (as per the Project Approval Guide (PAG)), the project may not have sufficient oversight by senior managers and corporate stakeholders.[10]
		No Data	1	9	
		Overdue	2	65	
6	**Vote 5 Expenditures to date** (CID Standard Report)	>50% spent	0	84	The scoring targeted projects with lower spending since an audit of a project early in its life can provide preventative recommendations vs. lessons learned. The average percentage spent for the 187 projects was 48%, compared to the Top 20 average of 14% spent.
		25-50% spent	1	22	
		<25% spent	2	81	
7	**Strategic Priority** (SCR Implementation Schedule v.1)[11]	Lower Priority 150+	0	97	The scoring targeted projects that are of higher priority to the success of the CF over the next 20 years. The impact of a high-priority capital project not delivering on time or to cost is more significant.
		Medium Priority 51-150	1	64	
		Highest Priority 1-50	2	26	

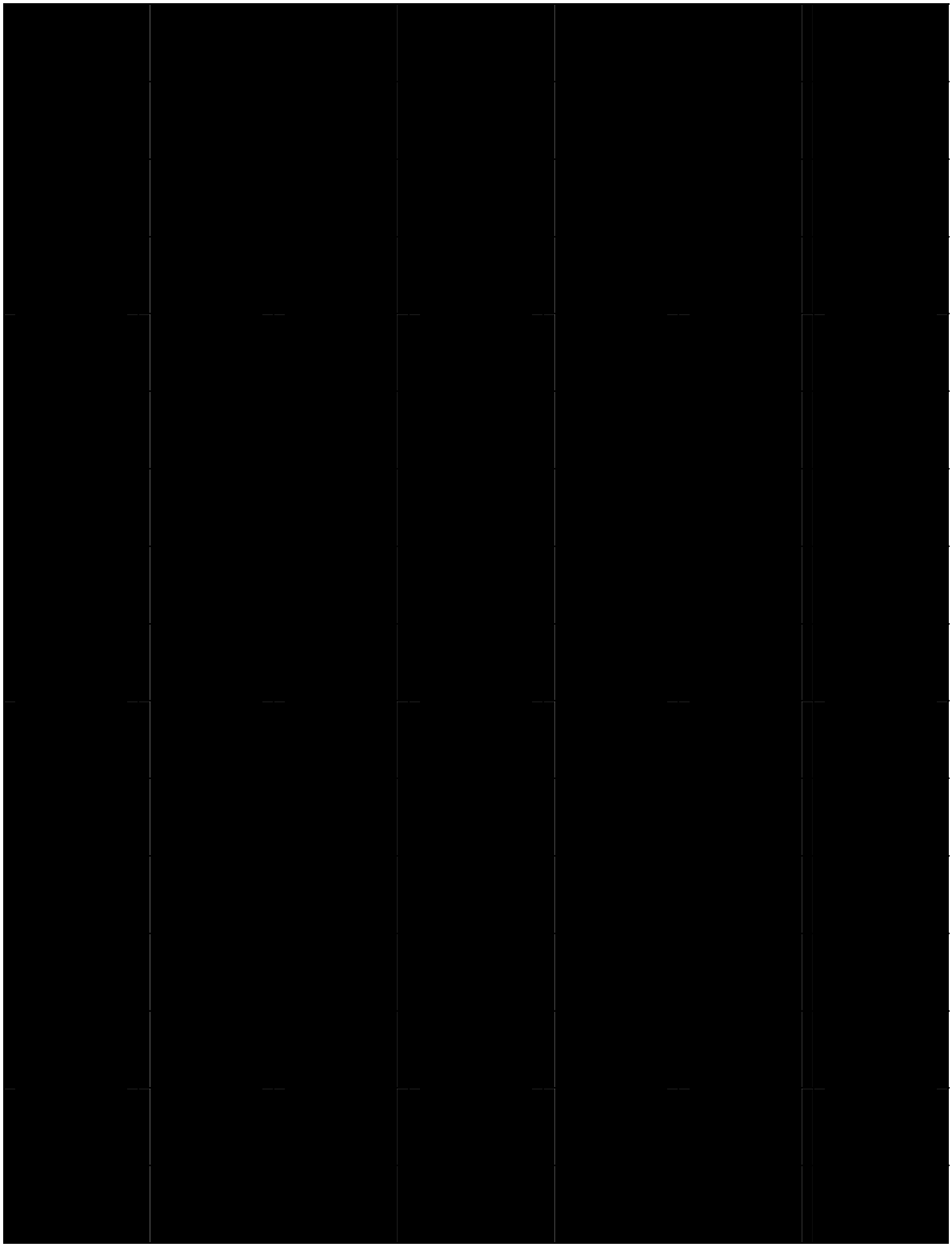
Table 2. Explanation of Step 1 Criteria. Step 1 criteria were applied to 187 projects.

[10] The PAG is being amended to allow SRB members to individually endorse complex and sensitive projects where convening a meeting is not practical.
[11] DND/CF SCR Implementation Schedule v. 1.

Annex C—Highest Scoring Projects after Step 1

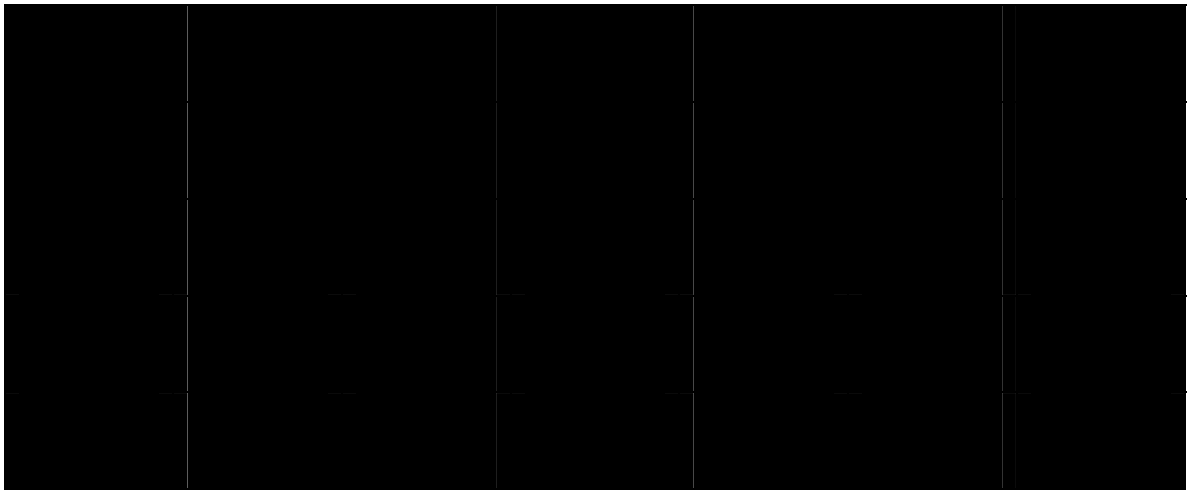


Annex C



Reviewed by CRS in accordance with the *Access to Information Act* (AIA). Information UNCLASSIFIED.

Annex C



Annex D—Explanation of Step 2 Criteria

Criterion (and Source)	Thresholds	Score	No. of projects	Rationale for Criterion
Percentage of Project Management Office Positions Filled (DMGHR or PCRA question #34)	100% or PCRA answer 1	0	6	If a project office does not have the required number of personnel, there is a risk of schedule delay and possible cost overruns. 40% of projects were not fully staffed.
	No data	1	6	
	<100% or PCRA answer 5	2	8	
Project Risk Trend (CID: Early vs. later project documents)	Same/decrease	0	9	It is expected that a project's risk level will decrease or remain stable over time. If it is increasing, this may indicate that appropriate risk mitigation strategies are not being employed.
	Increase 1 level	1	9	
	Increase 2 levels	2	2	
Interoperability with Other Systems or Allies (CID: Project docs, incl. SOR)	Stand alone	0	11	Complications can arise when two systems must be interoperable, therefore increasing risk of technical delays or higher costs.
	Interface	1	5	
	Interface + Allies	2	4	
Project Leader Rank Compared to Project Risk and Value (CID: Project Organization, and CRS developed risk-value matrix)	Proper rank	0	11	A matrix that combines project value and risk was developed by CRS to analyse whether the project leader is of proper rank. Although ADM(Mat) has oversight of 258 equipment projects, higher-risk projects could benefit from a higher-ranked Project Leader.
	Over-ranked	1	3	
	Under-ranked	2	6	
Time Elapsed to Project Charter Sign-off (CID: Date of first project document versus Project Charter date)	Below average range	0	11	If a project does not have a signed Project Charter in a reasonable amount of time, it is proceeding without formal direction and guidance. The PAG directs "as soon as possible." On average, project charters were approved over 1.5 years into the OA phase.
	In average range (19-22 months)	1	3	
	Above average range	2	6	
Reason for Cost or Schedule (C/S) Change (CID: Uploaded project documents)	C/S change links to scope	0	7	The scoring targeted projects that have experienced a cost or schedule change, with no associated scope change. 50% of the projects' C/S changed for reasons not related to scope.
	C/S no change/scope decrease	1	3	
	C/S change, no scope change	2	10	

Annex D

Criterion (and Source)	Thresholds	Score	No. of projects	Rationale for Criterion
Acquisition Type (CID: Progress report)	Military or Commercial Off-the-Shelf (OTS)	0	7	OTS purchases are somewhat straightforward, but project risk is added when having to either modify OTS to CF specifications (subject to re-certification, test and evaluation, etc.) or when pursuing a capability that requires development.
	OTS + development, or no data	1	11	
	Development	2	2	
Sourcing Strategy (CID: Progress report)	Foreign Military Sales	0	1	Project value for money is more difficult to achieve with a sole-sourcing strategy, and competitive tenders can result in procurement challenges.
	Competitive or no data	1	17	
	Sole source	2	1	
Alignment with Departmental Outcomes (PCRA question #19)	Yes (PCRA answer of 2 or lower)	0	14	Projects that do not have clear alignment with the overall departmental outcomes may not always receive the required resources due to being a lower priority, adding risk to project success.
	Somewhat (PCRA answer 3)	1	4	
	No (PCRA answer > 3)	2	2	
Impact of Project on Rest of Department (PCRA question #39)	Sustainment capability (PCRA answer 1)	0	10	Projects that provide a new capability will have a significant impact on the rest of the organization and may need some early challenge function to ensure that all costs are captured. There is also increased schedule risk as the project must rely on structural changes to ensure it proceeds smoothly.
	Mix of new and old (PCRA answer 3)	1	6	
	New capability (PCRA answer 5)	2	4	
PWGSC Engagement (PCRA question #33)	Engaged (Score 1 PCRA)	0	16	Projects that have not formally engaged PWGSC early in the project life to support the procurement process increase the risk of contracting issues.
	Low involvement (Score 3 or 5 PCRA)	2	4	
Project Team Knowledge and Experience (PCRA question #37 and #38)	Combined PCRA answer 2	0	7	An inexperienced project team provides an inherent risk to the project. The team includes the Project Manager, Project Director, Deputies, Procurement/Finance staff, subject-matter experts, etc.
	Combined PCRA answer 3-5	1	8	
	Combined PCRA answer 6-10	2	5	

Annex D

Criterion (and Source)	Thresholds	Score	No. of projects	Rationale for Criterion
Existence of International Traffic in Arms Regulations (ITARs) and IRBs (CID: Uploaded project documents and Industry Canada website)	Do not apply	0	3	Projects subject to ITARs are at higher risk of experiencing complications in negotiations with the United States. IRB targets for Canadian content can result in schedule challenges for vendors outside of Canada in preparing contract bids.
	ITARs or IRBs	1	12	
	ITARs and IRBs	2	5	
Date since CID last updated (CID: Project start page)	<1 month	0	11	Although projects do provide regular updates for decision-making purposes, not updating the CID could indicate a potential staff shortfall.
	1 to 3 months	1	4	
	>3 months	2	5	

Table 4. Explanation of Step 2 Criteria. 14 criteria were applied to 20 projects.

Annex E—Top 20 Projects in New Order of Priority

[redacted]