

REPORT ON:

Information Technology Change Management – Phase II

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Executive Summary and Overall Conclusion

The Government of British Columbia increasingly relies on its information technology (IT) environment to provide services to British Columbians. To minimize the risk that technical changes trigger service disruptions, formal processes must be followed.

In 2017, the Information, Innovation and Technology Division (Division) at the Ministry of Environment and Climate Change Strategy established the Technical Change and Release Management (TCRM) process. This process has since been maturing and expanding to include most applications and infrastructure systems used by the natural resource ministries.¹ The Division has been revising the process since September 2019 (Revised Process).

The TCRM process tracks changes from the creation of a Request for Change (RFC) in the change management application, Jira, to their deployment in the production environment. The TCRM Process Guide defines roles to manage an RFC, including the requestor who submits the change and the change manager who authorizes the change deployments. The TCRM Process Guide permits the same person to perform both roles. In the Revised Process, a dedicated team will perform the change manager role for all RFCs, providing a consistent review on changes. The TCRM Process Guide also defines two committees (i.e. Change Advisory Board and TCRM Committee) to provide oversight on changes and the TCRM process.

Change requestors log their RFCs in a system called Jira for review and approval. The RFCs include the detailed procedures to deploy changes and document the impact of not conducting the change. The TCRM Process Guide also recommends providing information about communication, production verification testing and rollback plans. We found that this information is not consistently provided in the RFCs. The Revised Process will define a more comprehensive risk and impact assessment and require rollback plans in the RFCs. The Division can further enhance its process by requiring change requestors to document their communication and production verification test plans in the RFCs. This information is useful to coordinate change deployments and assess risks and impacts.

The TCRM Process Guide does not require the RFC to include information about the test plan of technical changes and the test results. The Division is considering connecting Jira with the test management application in the future. The Division will benefit from asking for a summary of the test plan and results in the RFC. This will help approvers determine the risk level of changes before their deployment in the production environment.

¹ The five natural resource ministries are: Ministry of Environment and Climate Change Strategy; Ministry of Agriculture; Ministry of Energy, Mines and Petroleum Resources; Ministry of Forests, Lands, Natural Resource Operations and Rural Development; Ministry of Indigenous Relations and Reconciliation.

Change managers must ensure that required approvals have been provided before changes are deployed. We found that the Change Advisory Board keeps notes of the reviewed RFCs but does not document its approvals. Program areas must also approve changes, but we found that their approvals are not always reported in the RFCs or documented outside of Jira. To demonstrate the acceptance of technical and business risks, the Division should enhance the documentation of change approvals.

Once changes are deployed in the production environment, production verification testing must be performed to confirm that the IT systems are ready to be used. We found that requestors do not consistently report the outcome of this testing in the RFCs, and therefore RFCs are not consistently closed. In the Revised Process, the Change and Release Management Team will ensure the completion of changes prior to closing the RFCs. Post-implementation reviews are generally performed by change stakeholders (e.g. program areas, developers, project managers) to determine whether the change has met their expectations. We found that such reviews are not consistently performed as part of the change management process. Therefore, the Division should define the criteria to determine when a post-implementation review is required as part of the change management process.

The Division uses Jira as its change management application. Its flexibility allows users to create tickets and customize workflows. Some limitations were identified in the implementation of the TCRM process in Jira. To ensure that staff do not bypass requirements, it will be important that key controls be implemented in Jira, including obtaining approvals and ensuring the required information is collected before a change can be deployed.

The Information, Innovation and Technology Division has established an IT change management process and a procedure for changes impacting the applications and infrastructure systems used by the five natural resource ministries. While these align with best practices,² the Division has identified some areas of improvements and has developed a plan to address them. There are still some opportunities that the Division can take to further enhance the maturity of the process and its compliance, such as reporting more information in the RFC and enhancing the approval process.

We would like to thank the management and staff at the Ministry of Environment and Climate Change Strategy and other natural resource ministries, who participated in and contributed to this review, for their cooperation and assistance.



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Internal Audit & Advisory Services
Ministry of Finance

² COBIT 2019 Framework

Introduction

The Government of British Columbia (Government) increasingly relies on its information technology (IT) environment to provide services to British Columbians. To keep the pace with the evolution of technologies, regulations and the expectations of British Columbians for digital services, the Government's IT environment must continuously adapt.

To minimize the risk that technical changes made to the Government's IT environment trigger service disruptions or decreased quality, formal change management processes must be followed. Technical changes should be appropriately assessed, planned, tested and approved before they are implemented. These controls provide key stakeholders (e.g. technical teams, program areas) with the visibility and the information they need to oversee technical changes.

The Information, Innovation and Technology Division (Division) at the Ministry of Environment and Climate Change Strategy (Ministry) delivers the IT systems that are used by the five natural resource ministries.³ The Ministry relies on the Government's shared infrastructure (i.e. network, data centre, enterprise architecture and security services) that is managed by the Office of the Chief Information Officer to operate its own IT environment (e.g. business applications).

Changes to the majority of the natural resource ministries' applications and infrastructure systems are managed through the Division's Technical Change and Release Management (TCRM) process that was established in 2017. Since September 2019, the Division has been revising its TCRM process to streamline and align it to the Division's current needs and organizational structure, and to encourage compliance.

³ The five natural resource ministries are: Ministry of Environment and Climate Change Strategy; Ministry of Agriculture; Ministry of Energy, Mines and Petroleum Resources; Ministry of Forests, Lands, Natural Resource Operations and Rural Development; Ministry of Indigenous Relations and Reconciliation.

Purpose, Scope and Approach

The purpose of this review was to assess the adequacy of the processes followed by the Ministry for managing changes to the IT systems that the natural resource ministries rely on to fulfil their mandates.

The review evaluated and, as appropriate, made recommendations relating to the following:

- whether the TCRM and related processes are adequate and appropriate for managing technical changes; and
- how the revised version of the TCRM process will enhance the Division's current practices.

Our approach included:

- reviewing process-related documentation;
- conducting interviews with key management and staff; and
- reviewing a selection of six technical changes created between July and November 2019.

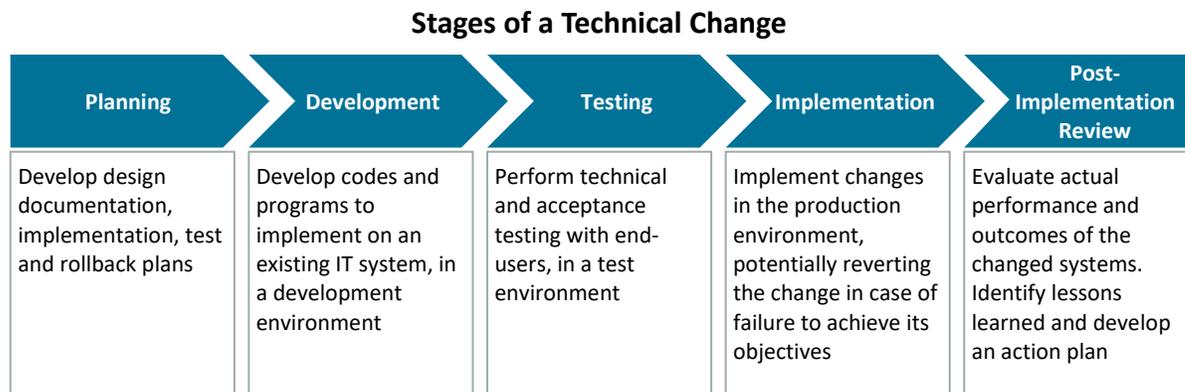
The review was conducted by Internal Audit & Advisory Services (IAAS), Ministry of Finance, and fieldwork was completed in May 2020.

1.0 IT Change Management

The Information, Innovation and Technology Division (Division) at the Ministry of Environment and Climate Change Strategy (Ministry) manages technical changes to over 400 applications and infrastructure systems used by the five natural resource ministries.⁴ Technical changes to Information Technology (IT) systems are needed for many reasons including: the evolution in technology, business needs and adverse incidents.

1.1 Technical Changes

Before being implemented into a production environment, technical changes are generally prepared and moved between stages and environments, as follows:



Source: IAAS, adapted from COBIT 2019 framework

Several groups within the natural resource ministries are currently involved in the stages of a technical change, as follows:

- program areas identify changes needed to meet their business needs, take part in user acceptance testing and approve the changes;
- development teams include contractors and the Division's staff, who work with the program areas to plan, develop and test changes to applications; and
- the Application Infrastructure Group includes the Division's staff and contractors, to manage changes to infrastructure systems and deploy changes to applications.

⁴ The five natural resource ministries are: Ministry of Environment and Climate Change Strategy; Ministry of Agriculture; Ministry of Energy, Mines and Petroleum Resources; Ministry of Forests, Lands, Natural Resource Operations and Rural Development; Ministry of Indigenous Relations and Reconciliation.

1.2 Technical Change and Release Management

The purpose of IT change management is to enable fast, reliable and coordinated delivery of technical changes in the various IT environments (e.g. test or production). A good IT change management process will help mitigate the risk that technical changes negatively impact the stability and integrity of existing technical and business services.

The Division established the Technical Change and Release Management (TCRM) process and its related application, Jira, in 2017. This process was designed to manage the technical changes made to a new group of 27 integrated applications that were implemented through a multi-year project common to the five natural resource ministries. Given their level of integration, a change to one of these systems can impact other systems and disrupt multiple program areas if it is not managed adequately.

Since 2017, the scope of the TCRM process has been extended to most of the applications and infrastructure systems used by the natural resource ministries to enhance the Division's IT change management processes. The Division has also hired dedicated staff, the Change and Release Management Team, to administer the TCRM process and coordinate the deployments of technical changes. The team has been promoting the implementation of additional requirements.

The Division has identified the need to improve its current TCRM process (Revised Process), align it to the Division's organizational structure, and encourage compliance. For example, the Revised Process:

- redefines key roles and responsibilities;
- revises the information to be reported in the Requests for Change (RFC);
- streamlines the approval process and determines levels of approval based on change risk;
- requires the review to identify root causes of failed deployments; and
- defines performance indicators.

The documentation of the Revised Process covers key areas and some details remain to be finalized.

2.0 Governance

Governance defines the IT change management process and ensures that the process meets management's performance expectations. Effective governance relies on documented procedures and defined roles with clear accountability to enforce the process.

2.1 Procedure

Documented procedures allow for a clear and consistent process to managing technical changes by providing the users of the IT change management process with the requirements that minimize risks and enable management review. The Division has documented its IT change management procedure in the TCRM Process Guide (Process Guide). The Process Guide focuses on:

- tracking technical changes from the creation of the RFC in Jira through review and approval, until final implementation of the changes in the production environment;
- providing information in the RFCs for change approvers to assess change risk and dependencies; and
- coordinating the deployment of technical changes between the development teams and the Application Infrastructure Group.

The responsibility to define the detailed requirements for preparing changes and moving them between their successive stages mostly remains on the change requestors (i.e. development teams or the Application Infrastructure Group). We found that these groups have limited documentation to describe their detailed requirements, which has led to some inconsistencies in the way they document changes as reported in later sections. The Division is currently updating its technical standards and processes, and this will provide change requestors with updated guidance and requirements on the stages of technical changes.

2.2 Roles and Responsibilities

Defining roles and responsibilities and setting up committees to oversee technical changes and monitor the performance of the process are other elements of effective IT change management. The Process Guide defines several roles that must be assigned for each RFC, as follows:

- the requestor creates an RFC in Jira before it is reviewed and approved; and
- the change manager reviews the RFC to assess risk. Change managers approve RFCs that do not require the approval of the Change Advisory Board (CAB) and report the CAB's decision in Jira for the RFCs that require the CAB's approval.

The Process Guide does not define criteria to consistently assign the change manager role and it permits the same person to perform both roles. Since change managers must assess change risks across the IT environment, dedicating staff to be change managers would strengthen the segregation of duties and enable a consistent review of RFCs. In the Revised Process, the Change and Release Management Team will be the change manager.

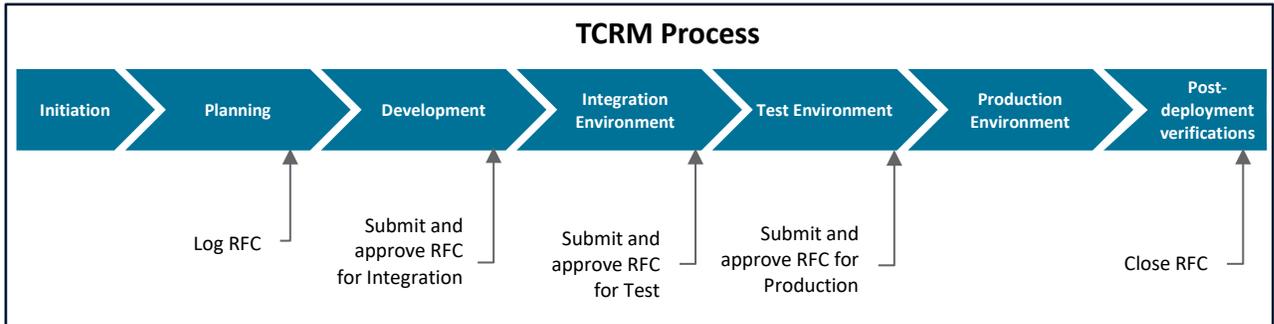
The Process Guide also defines two committees to oversee the TCRM process:

- The CAB reviews technical changes prior to their deployments. It must approve or reject RFCs based on an assessment of the risks and impacts to the IT environment. Its weekly meetings are chaired by the Change and Release Management Team.
- The TCRM Committee meets monthly and provides oversight for the management and improvement of the TCRM process. It also handles issues and changes escalated by the CAB.

Both committees are established through the terms of reference, which defines their membership and decision process. Collectively, these committees include an appropriate range of technical expertise from the Division.

3.0 IT Change Management Process

The TCRM process enables change requestors to log their RFCs in Jira and provides approvals to deploy changes in the multiple IT environments. The following chart presents the milestones of a technical change and its related RFC in the TCRM process.



Source: TCRM Process Guide

An effective IT change management process ensures that technical changes are:

- planned and assessed to enable appropriate review and approval based on priority, risk and benefit through the submission of an RFC;
- developed, tested and approved before implementation; and
- implemented according to plans or **rolled back** if necessary, to limit any negative impact on services.

Rolling back a change is the process of restoring an IT system to a previous state, typically to recover from an error.

3.1 Planning

Change requestors log their RFCs in Jira for review and approval before each deployment. The Change and Release Management Team requires change requestors to provide in their RFCs:

- the proposed dates for the deployments of the changes in each IT environment;
- the step-by-step procedures to deploy the changes in each IT environment; and
- a description of the impact of not conducting the change and, for medium and high-risk changes, a description of other impacts.

We found that change requestors document the impact of not conducting the change in their RFCs. When requestors provide additional information (e.g. time the IT system is unavailable, dependencies with other IT systems), it is generally presented in various components of the RFC. Without a more comprehensive assessment and consistent reporting of impacts and risks, change approvers may not fully understand the known or potential impacts and risks of technical changes on the IT services and program areas.

As additional IT systems have been joining the scope of the TCRM process, requestors have been documenting the detailed deployment procedures in Jira. The Process Guide also recommends that requestors provide information about communication, **production verification testing** and rollback plans. We found that change requestors do not consistently provide this information in the RFC and documentation outside of Jira is not always available.

Production verification testing is performed to confirm that the deployments of technical changes are successful before end-users can resume using the IT system.

For the Revised Process, the Technical Change and Release Management Team has developed a more consistent risk and impact assessment approach. Change requestors will report on the business value of the changes, the estimated downtime, and a list of dependent systems in their RFCs. Requestors will also determine the risk levels, answer risk-related questions and provide their rollback plans in their RFCs. The Division can further enhance its process by requiring requestors to document their communication and production verification test plans in the RFC. This information is useful for the various stakeholders to coordinate the deployment of technical changes and for change approvers to perform their review.

Recommendation:

- (1) **The Information, Innovation and Technology Division should require change requestors to document their communication and production verification test plans in the Request for Change.**

3.2 Testing

The Process Guide requires changes to be tested and **user acceptance testing** to be signed off by the program areas before changes are deployed into the production environment. We found that the maturity of the testing and its documentation varies depending on the changes and the program areas. In 2019, the Division established a quality assurance team to provide testing support across the natural resource ministries. The team is promoting the use of a single test management application to consistently document and manage testing activities.

User acceptance testing consists of verifying that end-users' requirements for a new or changed IT system are met.

The Process Guide does not require change requestors to report information about testing in their RFCs. The Technical Change and Release Management Team is considering linking the RFC to the test management application and adding a user acceptance testing sign-off into Jira in future iterations of the TCRM process. Before these enhancements are implemented, the Division can ask requestors for a summary of their test plan and test results in the RFC. This information will help approvers determine whether business requirements and effectiveness of system controls have been confirmed before the deployment of changes in the production environment.

Recommendation:

- (2) **The Information, Innovation and Technology Division should require change requestors to provide a summary of their change test plan and test results in the Request for Change.**

3.3 Review and Approval

Once technical changes are ready for deployment in the next environment, change requestors submit their RFCs for review and approval. Change managers must ensure that required approvals have been provided before authorizing the RFCs in Jira. After review and approval, the Application Infrastructure Team can deploy the change in the target environment, according to schedule.

The CAB meets weekly to discuss deployments scheduled for the next two weeks. Discussions relate to infrastructure systems and to the group of highly integrated applications. The CAB keeps notes of the RFCs it reviews but we found that it does not document approval or rejection of RFCs. As a result, change managers may authorize a change prior to receiving approval from the CAB. In early 2020, the CAB's scope was extended to include most of the IT systems used by the natural resource ministries.

The Process Guide requires program areas to approve changes before their deployments and the Change and Release Management Team recommends program areas' approval be reported in the RFCs. We found that requestors and change managers do not always report these approvals in the RFCs and do not always keep evidence outside of Jira. As the CAB focuses on the risks and impacts to the IT environments, the responsibility for determining the impacts and risks to the natural resource ministries' services is the responsibility of both requestors and program areas. Therefore, the Division should enhance the documentation of the CAB's and program areas' decisions over technical changes and make them available to stakeholders. This information will demonstrate that technical and business risks have been accepted.

Our review of a sample of RFCs showed that the Division has not consistently enforced its process. For instance, we found that some changes were deployed into the production environment without the CAB's mandatory review or without the change managers' authorizations in Jira. The Division advises that it has since enforced the process to ensure that required reviews and approvals are performed before the deployment of changes.

In the Revised Process, the Change and Release Management Team will review RFCs submitted by requestors for risk and impact, directing higher risk changes to the CAB. To streamline the process, approved RFCs will not require further approvals once past their first deployment. However, the CAB will continue tracking deployments during its weekly meetings. The Change and Release Management Team is also considering requiring a second review and approval if the technical scope of the change has evolved since its approval.

Recommendation:

- (3) **The Information, Innovation and Technology Division should document the Change Advisory Board's and program areas' decisions over technical changes and make them available to technical and business stakeholders.**

3.4 Implementation Reviews

Once changes are deployed in the production environment, the Process Guide requires that production verification testing be performed. If issues are detected (e.g. key functions of the IT system do not resume), rolling back the change will be considered by the change stakeholders (e.g. program areas, developers, project managers). We found that requestors do not consistently report the outcome of this testing in the RFC. Therefore, some RFCs are left open, providing an inaccurate view on the status of changes and preventing the Change and Release Team from effectively monitoring the performance of the process. In the Revised Process, the Change and Release Management Team will ensure the completion of changes prior to closing the RFCs.

When change deployment issues are identified, the Change and Release Management Team can be requested to perform a review to identify the root causes of the issue. In the Revised Process, such reviews will be mandatory for failed deployments. The Change and Release Management Team has defined a template to be used ahead of the implementation of the Revised Process.

Post-implementation reviews are generally performed by change stakeholders once a new or changed IT system has been operational for some time to determine whether the change has met its stakeholders' expectations and identify lessons learned. We found that such reviews are not consistently performed as part of the change management process. Therefore, the Division should define criteria to determine when a post-implementation review is required as part of the change management process.

Recommendation:

- (4) **The Information, Innovation and Technology Division should define the criteria to determine when a post-implementation review is required as part of the change management process.**

4.0 Application and Performance Monitoring

Change management applications support change logging, assessment, review and approvals. They are also essential for monitoring the performance of the IT change management processes.

4.1 Application

Jira was originally designed as an issue tracking system and not as a change management application. However, Jira allows users to create tickets as RFCs, customize workflows and enable connections between other processes using the Jira platform (e.g. service ticket, project and test management). Some limitations were identified in the implementation of the TCRM process in Jira. For instance, staff can declare a deployment completed without the RFC being authorized and edit the data entered in the RFC after the RFC has been formally closed.

If business rules are not enforced in Jira, staff can bypass the requirements of the TCRM process and lead the Change and Release Management Team to an inaccurate view of the change activity. The Division advises that it has already identified additional rules to implement in Jira with the Revised Process, including rules to prevent:

- an individual who is not assigned to a specific task from performing the task; and
- an RFC from being closed when other underlying records are not completed.

It would be beneficial for the Division to ensure that controls are implemented in Jira to enforce the key requirements of the Revised Process, including obtaining approvals and ensuring required information is collected before a change can be deployed.

Recommendation:

- (5) **The Information, Innovation and Technology Division should ensure that controls are implemented in Jira to enforce the key requirements of the Revised Process, including obtaining approvals and ensuring required information is collected.**

4.2 Performance Monitoring

The purpose of process monitoring is to assess the performance and maturity of processes, typically against a set of performance targets. The results of monitoring activities are used to support decision-making, accountability and oversight.

The Division does not currently monitor the performance of the TCRM process. This creates a risk that the TCRM process does not operate as expected. In the Revised Process, the CAB will evaluate the effectiveness and efficiency of the process quarterly. In addition, the Change and Release Management Team has drafted a list of key performance indicators, which includes: number of failed deployments, number of incidents triggered by an RFC, and client satisfaction. The Change and Release Management Team has not yet defined how it will monitor these indicators but is considering having the Division's management review them and make the results available to its stakeholders. The Division should develop and implement a process to monitor the performance of the TCRM process and compliance.

Recommendation:

- (6) The Information, Innovation and Technology Division should develop and implement a process to monitor the performance of the Technical Change and Release Management process and compliance.**

Appendix 1- Summary of Recommendations

1	The Information, Innovation and Technology Division should require change requestors to document their communication and production verification test plans in the Request for Change.
2	The Information, Innovation and Technology Division should require change requestors to provide a summary of their change test plan and test results in the Request for Change.
3	The Information, Innovation and Technology Division should document the Change Advisory Board's and program areas' decisions over technical changes and make them available to technical and business stakeholders.
4	The Information, Innovation and Technology Division should define the criteria to determine when a post-implementation review is required as part of the change management process.
5	The Information, Innovation and Technology Division should ensure that controls are implemented in Jira to enforce the key requirements of the Revised Process, including obtaining approvals and ensuring required information is collected.
6	The Information, Innovation and Technology Division should develop and implement a process to monitor the performance of the Technical Change and Release Management process and compliance.

Appendix 2- Abbreviations

CAB	Change Advisory Board
Division	Information, Innovation and Technology Division, Ministry of Environment and Climate Change Strategy
Government	Government of British Columbia
IT	Information Technology
Ministry	Ministry of Environment and Climate Change Strategy
Process Guide	TCRM Process Guide
RFC	Request for Change
TCRM	Technical Change and Release Management