



Caltrans Division of Research,  
Innovation and System Information

# Research

# Results

Design

APRIL 2020

**Project Title:**

Developing a Strategic Roadmap for Caltrans Implementation of Virtual Design Construction/Civil Integrated Management

**Task Number:** 3178

**Start Date:** April 1, 2018

**Completion Date:** February 29, 2020

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## Developing a Strategic Roadmap for Caltrans Implementation of Virtual Design Construction/Civil Integrated Management

This research evaluated the state of Caltrans VDC/CIM, collected VDC/CIM known best practices, and provided guidance on bridging the gaps at Caltrans.

### WHAT WAS THE NEED?

California Department of Transportation (Caltrans) is continually looking for ways to better deliver transportation improvement projects and improve its operations making them more efficient, measurable, and accountable. Emerging technologies in Virtual Design and Construction (VDC) combined with Civil Integrated Management (CIM) have provided an opportunity for potential digitization of the entire life cycle of civil project delivery, operation, and maintenance that can improve efficiency, time to delivery, quality, and safety of transportation projects. Although some levels of these emerging technologies were being used at Caltrans, there was a lack of coordinated effort to understand the gaps and develop a comprehensive plan of integration of these technologies within the organization. Several state Departments of Transportation (DoTs) have reported clear savings by implementation of some of the components of the VDC/CIM technologies.

### WHAT WAS OUR GOAL?

The goal of this research was to evaluate gaps in Caltrans' use of VDC and CIM solutions and identify ways to further incorporate and integrate these solutions to close the gaps in Caltrans use of the VDC/CIM technologies. Given the gaps a strategic high-level roadmap could be generated to provide guidance on closing any gaps found.



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## WHAT DID WE DO?

Caltrans current state of VDC/CIM practice was evaluated using a two-pronged approach involving a high-level internal survey of the state of VDC/CIM practice and solutions within Caltrans, and a detailed assessment of the state of the art of VDC/CIM technologies. The state of the art assessment was conducted using a detailed literatures review combined with attending webinars, presentations, and workshops as well as conducting phone interviews with industry experts.

The internal survey provided information about the state of the use of VDC/CIM solutions within Caltrans. The literature survey and interviews with subject matter experts provided information on the known best practices, lessons learned, and benefits gained in implementation of VDC/CIM technology.

The results were used to identify gaps in use of VDC/CIM technologies within Caltrans and synthesized to develop a roadmap and identify steps to close the gaps and bring Caltrans state of the technology to be consistent with the state of the art.

## WHAT WAS THE OUTCOME?

This research synthesized gaps between Caltrans state of practice and the known best practices. Strategic level tables were generated to summarize the state of VDC/CIM, the gaps, and the recommendations for Environmental, Surveying, Design, Construction, Maintenance and Asset Management. Within these tables technologies that will require an enterprise effort or significant IT involvement were identified.

A visual roadmap was also created to help understand the complexities and the interconnectedness of the different areas. It is recommended that Caltrans can move forward from here by implementing a VDC/CIM organizational level task force. The task force can work with the relevant groups at Caltrans and help them through closing the gaps that were identified in their respective areas. It is also recommended that pilot projects be undertaken in specific areas in order to help develop workflows and implementation plans unique to Caltrans.

## WHAT IS THE BENEFIT?

This work can act as baseline knowledge and guidance for future efforts that intend to increase the integration and implementation of VDC/CIM within Caltrans improving efficiency stewardship and safety of Caltrans operation by digital transformation of some of the operations.

The baseline guidance allows any future implementation efforts to focus on specific areas that are decided to be most beneficial to the organization based on availability of resources within each budget cycle. It is envisioned that when VDC/CIM is fully implemented and savings are realized, it will help towards meeting the efficiency measures mandated by the California Transportation Commission for the Accountability and Reform Measures specified by Senate Bill 1 (SB1) of 2017.

## IMAGES

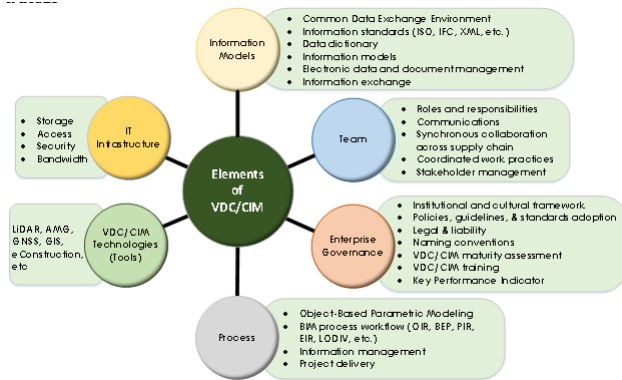


Image 1: Elements of VDC/CIM adapted from [1-3]

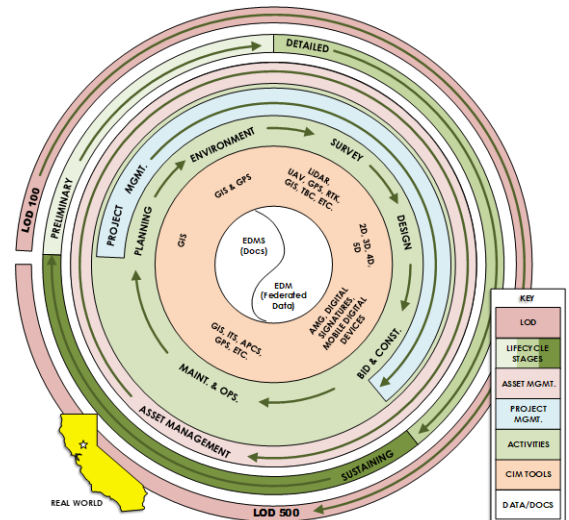


Image 2: Strategic Workflow Showing Level of Development

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