With Virtual Design & Construction (VDC), Royal HaskoningDHV is offering a unique method of applying integrated design to construction related projects such as roads, buildings, and civil structures. As the commissioning party or client, you work simultaneously with all the stakeholders on a virtual model. The added value of VDC is not only the virtual model (the product) that takes shape, but also the clearly defined roles, responsibilities (the organisation), agreements and planning (the process).

Optimal and fast decision making
Because of the interactive method of all relevant parties involved during joint work sessions, you can immediately make adjustments related to the organisation, design and process. The results are integrated decisions which are taken quicker with the support of everyone participating. This leads to an optimisation of time, costs and cooperation. Our experience shows that failure costs can be reduced by up to 50%, and the lead time of design by 35%.
**Integrated design**
In the past, most work involved a single-discipline approach. Separate design activities took place in isolation and were then brought together for coordination and integration later in the process. An integrated design using the VDC method enables all disciplines to work on the same virtual model simultaneously and in real-time. This is made possible through the use of Building Information Modelling (BIM). Each member of the design team can see directly how the various other disciplines are interrelated. This reduces and can in some cases prevent failure costs and schedule overruns in the downstream execution phases of the project.

**Life cycle approach**
At Royal HaskoningDHV we place a high premium on Sustainable and Green design. Sustainable and Green design focuses on the savings generated from the longevity of the products and the energy efficiency of the facility or structure. Sustainable designs might cost more, but over the life cycle of the materials, equipment, products or buildings, the operating expenses and maintenance pays for itself and saves the owner or client more than the initial capital investment. The life cycle approach entails taking into account the maintenance and operational aspects in the design stage already and more important still, in virtual space. This way, the design team can control the design and optimize the cost of not only the manufacturing or construction phases but also the operational and facilities management components before actual expenses are incurred. Life cycle costs are an important element of the life cycle approach and support the related objectives of sustainability and safety. The life cycle approach is in keeping with the development of integrated contracts, where design, execution, maintenance and operations are integrated into a single contract.

**Using VDC offers clear benefits:**
- **It supports the entire process, due to specific and clear-cut process agreements**
- **It limits client and project risks of delays and failure costs**
- **It optimizes communication through active stakeholder management and involvement, including the client as the prime stakeholder in the project**
- **It provides a clear view and controls life cycle costs.**

Royal HaskoningDHV has set up a number of Integration Rooms (iRooms), where we utilize the VDC method through the use of Integrated Concurrent Engineering (ICE) sessions. ICE is an interactive workshop with all key project stakeholders and decision makers present. A mobile iRoom (M-iRoom) is available to make it happen in your own board room.

**VDC method**

**Product**
The product is a virtual data model that is created in cooperation with each of the involved parties. The purpose of the model is to shape the product (facility, building or structure) in an integrated, simultaneous manner in order to discover, and rectify if necessary, any areas of difficulty and conflict at an early stage. The availability and exchangeability of data from the model enhance the transparency and efficiency of the work process.

**Organisation**
An analysis of the stakeholders takes place during each project phase in which they are allocated responsibility for their role in the project. Involving the right stakeholders with the right authority and decision making power helps generate support and eases the decision-making process throughout the entire project.

**Process**
Who does what, and when? Based on the stakeholder analysis, the parties are asked to model the design together and to commit themselves to agreements that are made, for example in relation to time planning, software applications, and data management. This makes the process of working together more efficient.
Sharq Crossing, Doha Bay Qatar
A 12 kilometer iconic bridge-tunnel connection. TEC, the permanent joint venture between Royal HaskoningDHV and Witteveen+Bos, prepared the validated Concept Design for the tunnels as sub consultant of Santiago Calatrava, architect of the Sharq Crossing. With the use of iRoom sessions, BIM and a controlled process, we were able to deliver in just 5 months time and on budget.

Viracopos Airport, Brazil
Brazil’s Viracopos–Campinas International Airport is bursting at the seams. A new 28 gate terminal urgently needs to be built to absorb the massive increase in passenger numbers due to the FIFA World Cup 2014. VDC enabled us to produce the provisional design for the terminal and the masterplan for the entire airport for the coming thirty years.

Dammam Public Transport, Saudi Arabia
Light rail and bus rapid transit. In multidisciplinary iRoom sessions designs for alignment and stations have been prepared, evaluating the impact on commercial speed, rail alignment, passenger access, traffic and urban integration.

University Hospital Aalborg, Denmark
Working and communicating directly from our local project office, efficient decision-making was further increased by 24/7 availability of all real-time data to design team, client and stakeholders. Combined with an intelligent process and BIM data management, we reduced the time spent in the design phase by 20%.
A Building Information Model (BIM) is a 3D and dynamic digital model. It forms an important element of VDC. In combination, they enable the design team to work simultaneously and effectively on the product, in an integrated manner (BIM), supported and driven by the processes that make it possible. VDC triggers the option of enhancing the BIM model with relevant information in relation to buildings, roads, or civil structures. The BIM model comprises of geometry (in 2D or 3D) of the object and the parameters of the components, such as dimensions and materials. It is also possible to link mathematical and calculation software to the model and extract time and costs (4D and 5D).

VDC based on concept from Stanford University
Research by Stanford University (2007) suggests that design teams spend most of their time on managing their design. Using this insight as their starting point, Stanford University devised the VDC method. The basis for the method is that not only the design, but also the process and the organisation are modelled before the start of the project. Royal HaskoningDHV has developed VDC into an integrated design method that can be used in practice, together with the most up-to-date means of communication.
Royal HaskoningDHV is an independent, international engineering and project management consultancy with more than 130 years of experience. Its head office is in the Netherlands, other principal offices are in the United Kingdom, South Africa, India and Southeast Asia.

Backed by the expertise and experience of 6,500 colleagues all over the world, our professionals combine global expertise with local knowledge to deliver a multidisciplinary range of professional engineering and project management consultancy services for the entire living environment from 100 offices in 35 countries.

By showing leadership in sustainable development and innovation, together with our clients, we are working to become part of the solution to a more sustainable society now and into the future.