The importance of VDC and research

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- Director, CIFE (Center for Integrated Facility Engineering)
- Foreign Member, Royal Swedish Academy of Engineering Sciences
100% funded by industry
  - Building owners
  - Design and construction companies
  - Software and hardware vendors

1988-2000
  - Building Information Modeling (BIM)

2000-2010
  - Virtual Design and Construction (VDC)

2010+
  - Optimize Facility Performance
Integrating Project Delivery

Combines

- Many practitioners’ experience with integrated practices compiled by DPR,
- Howard Ashcraft’s experience with IPD contracts, and
- CIFE’s almost 30 years of research

Into

- a book that describes how projects should be done.
Vision –
A future I would like to make happen

Every workhour builds the right product safely and productively

Definition of Vision by Robert Burgelman, GSB, Stanford

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Other industries have figured out how to add **250% more value per workhour** over the last 50 years!

Labor Productivity for construction industry vs. all non-agricultural industries

By Paul Teicholz

Based on U.S. Department of Commerce data

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Every workhour builds the **right** product safely and productively
Buildable

Picture courtesy DPR
Usable

Picture courtesy WDI and GSA

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Operable

Example courtesy DPR
Sustainable

Example courtesy DPR

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How?
Everyone designs the product, not just the architect.

Design is **out in the open**, so everyone can see opportunities for better designs **immediately**.
Everyone designs the process, not just the scheduler
Everything fits together, everything!
Virtual Design and Construction (VDC)

- Client Objectives
- Project Objectives
- Integrated Concurrent Engineering (ICE)
- BIM
- Production Management
Every workhour builds the right product safely and productively
If we wanted we could make sure that …

Everyone is working on the right tasks at the right time all the time.

We are designing what the client wants.

The crews will be as productive as possible next week.

We are certain that everything fits.

We are sure that we are building everything safely and with the best methods.

We are installing everything fast and right the first time.

We gave the client exactly what he wanted.

We are installing everything accurately based on the latest, correct information. Paper-free.
VDC method gave the client everything he wanted

Open whole scope of hospital on budget and 30% earlier than typical

Highly reliable construction

Confirm constructability of detailed design

Combine everyone’s detailed design

Everyone works with the same plan
Emerging technologies

Mobile
• from just-in-case to just-the-right information

Cloud
• anytime (push and pull, bi-directional, "unlimited")

Parallelization
• fast

Location / dimensional measurement
• accuracy, dimensional control, off-site / on-site

Machine learning
• experience and data

Robotics, additive manufacturing
• virtual ↔ real, safety, environmental impact

Internet of Things (IoT)
• virtual ↔ real

Virtual Environments
• test!

Collaboration
• concurrent knowledge

The combination of these developments creates significant opportunities for dramatic change.
Key trends

Customer focus

Shorter time to market

Visibility / transparency

Integration of knowledge

Automation
Research

Metrics

Integrated systems

Performance prediction

Design management

Feedback loops

Corporate strategy and learning
A different mindset

• Why is something not in the “model”? Why are we printing it on paper?

• Why are we building something on site? What should we not prefabricate?

• Why are we not laying out something on site directly from the 3D model?

• Etc.
Vision

Every workhour builds the right product safely and productively