Design and Delivery in an Era of Machine Intelligence

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Education Expertise & Judgment Registration Autonomy Compensation Common Values

From Cuff, Dana Architecture: The Story of Practice

1943 - Ayn Rand



Evolution of Tools and Technologies









Drawing

CAD

BIM

Integrated Digital Delivery

2005 - Gehry

"The way I see it, the computer puts architects back in the driver's seat, because we control all that information."

Frank Gehry – Lecture at Yale University 3.24.05



Foundation Louis Vuitton, Gehry Partners 2014



Methodology

Performance Characteristics	Parameters				
Facade expression	Geometry, dimensions, material choice				
Structural performance	Unit performance, connection, system behavior				
Weather barrier, rain screen	Connections, gaskets				
Energy barrier	U-Value, thermal transmittance Sound transmission co-efficient				
Acoustic barrier					
Daylight controller	Glass transmissivity, transparency, shading performance				
System cost	Materials, labor, market conditions, installation sequence				
Embodied carbon	Material characteristics, delivery approach, manufacturing approach				
Construction sequence	Installation strategy				



Value 1.5% Precentage of construction cost not to exceed fixed amount 1.9% Fee per square foot 10.5% 0.8% Percentage of construction cost Other 20.4% 36.1% Hourly rate (with or without Stipulated sum (fixed fee) agreed maximum) 28.7% Professional fee plus eimbursable expenses Stage of work at Design Deroduct on Birl Build Do 6 ____ Information reliability Information resolution Time Extra-mural services 0 0 4 0 4 0 Furniture Data wrangler Analys designer Production Feasibility Close-out Occupancy Concen sigr (Facilities management) (Construction support) Expanded design services origination) Typical services 2 Architect as owner (Owner) (Developer) 3 Architect as builder Traditional "waterfall" phasing Expanded design services

2 Architect as owner

3 Architect as builder

Extra-mural services



National BIM Report 2019

The definitive industry update



BIM Adoption 2019



Contractors will increasingly insist on us using BIM 61% Contractors will increasingly insist on us using BIM 61% 63% 28% 46% UK user Ireland user UK non-user Ireland non-user

Percentage of respondents who agree with the following statements about adopting BIM

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Generalitye design is the process of **defining high-level goals and constraints**. and then using th**e power of computation** to automaincally explore a wide design space and id**entify** the best design opports.



2017 -Susskind

"As we move to an internet society, then, we should ask whether there might be new ways of organizing professional work, new ways to produce and share practical expertise in society, new ways to solve the important problems that, traditionally, the professions alone have solved."

David Susskind in "The way we'll work tomorrow," RIBA Journal, July 2017







National BIM Report 2019

The definitive industry update







" (W)e are on the brink of a period of fundamental and irreversible change in the way that the expertise of specialists is made available in society. Technology will be the main driver of this change. And in the long run, we will neither need nor want professionals to work in the way that they did in the twentieth century and before."



PREDICTION BY COMPUTER



Measurement \rightarrow Simulation \rightarrow Prediction





- BUILDING SYSTEMS
- CONSTRUCTION CONTRACT
 ADMINISTRATION
- CONSTRUCTION DOCUMENTS
- DESIGN
- ENVIRONMENTAL
- LEGAL
- MATERIALS and METHODS
- OCCUPANT COMFORT
- PRE-DESIGN
- PRESERVATION

"Expecting an architect to design a safe structure is like expecting a chef to cook a safe meal: It is at once a high ethical requirement and a very low expectation...aesthetics may be the key to unlocking the real authority of architects, and therefore architecture, to shape society."

Victoria Beach in "Design Beyond Ethics" HPP 15 Chapter 1.3

A WORLD WITHOUT WOR

Technology, Automation, and How We Should Respond



The temptation is to say that because machines cannot reason like us, they will never exercise judgement; because they cannot think like us, they will never exercise creativity; because they cannot feel like us, they will never be empathetic. And all that may be right. But it fails to recognize that machines still might be able to carry out tasks that require empathy, judgement, or creativity when done by *a human being*—by doing them in some entirely other fashion. (page 73)

"If you are an architect practicing (wherever) you will be presumed to:

- Possess the required degree of learning, skills, and experience that is ordinarily possessed by similarly situated professionals in the community (that is, perform as well as other architects practicing in the...area);
- 2. Use reasonable and ordinary care and diligence in the exercise of your skill to accomplish your professional tasks; and
- 3. Use your best good professional judgment in performing your professional tasks.."

"The Architects' and Engineers' Standard of Care at http://constructionlawnc.com/2010/06/24/standard-of-care/

"Many people say, 'As an expert I use my judgement, but how can a computer system ever exercise judgement?'. We say that's asking the wrong question, the question you should ask is: '**To what problem is human judgement the solution?** Why is it that we need human beings to exercise judgement?'—that's the fundamental problem.

Our take on that is we exercise human judgement under conditions of uncertainty and we live in a world of uncertainty—the facts are often uncertain, the knowledge that's applicable is often uncertain—so we go to experts because they're the best people at handling that kind of uncertainty."

Richard Susskind in "Future of Professions," MEDIUM https://medium.com/workandlife/the-future-of-professions-5cd1eb8f6b4e



Tally ${}^{\scriptscriptstyle \mathrm{M}}$ pulls material quantities from the Revit model to create an accurate bill of goods.

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Tally[™] can be used to compare design options.





Option 1 - Corrugated Shingle Cladding

Option 2 - Translucent Panel Cladding (Selected)



Results Per Life Cycle Stage, Itemized by CSI Division

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Phillip G. Bernstein		Agency	Methodology	Value
archi practice Competency in the Era of Computation	Current State	Professional standards, defining "intent"	Iteration, intuition, fixed deliverables	Commodification, lowest first cost
ture design data				
	53 e			



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Changing the way we work

TITLE: Design and Delivery in an Era of Machine Intelligence

FOCUS: As the AEC industry normalizes building information modeling, did it really make a change in our process, or improve our results? The pandemic has posed a series of existential questions about the role of designers and buildings for society at the same time that a next generation of technologies—machine learning and artificial intelligence—are beginning to peek over the horizon. This talk will speculate on how the informational foundation of BIM might point toward new realities of process and result.