改造建筑过程:
Ideas Realized 实现梦想

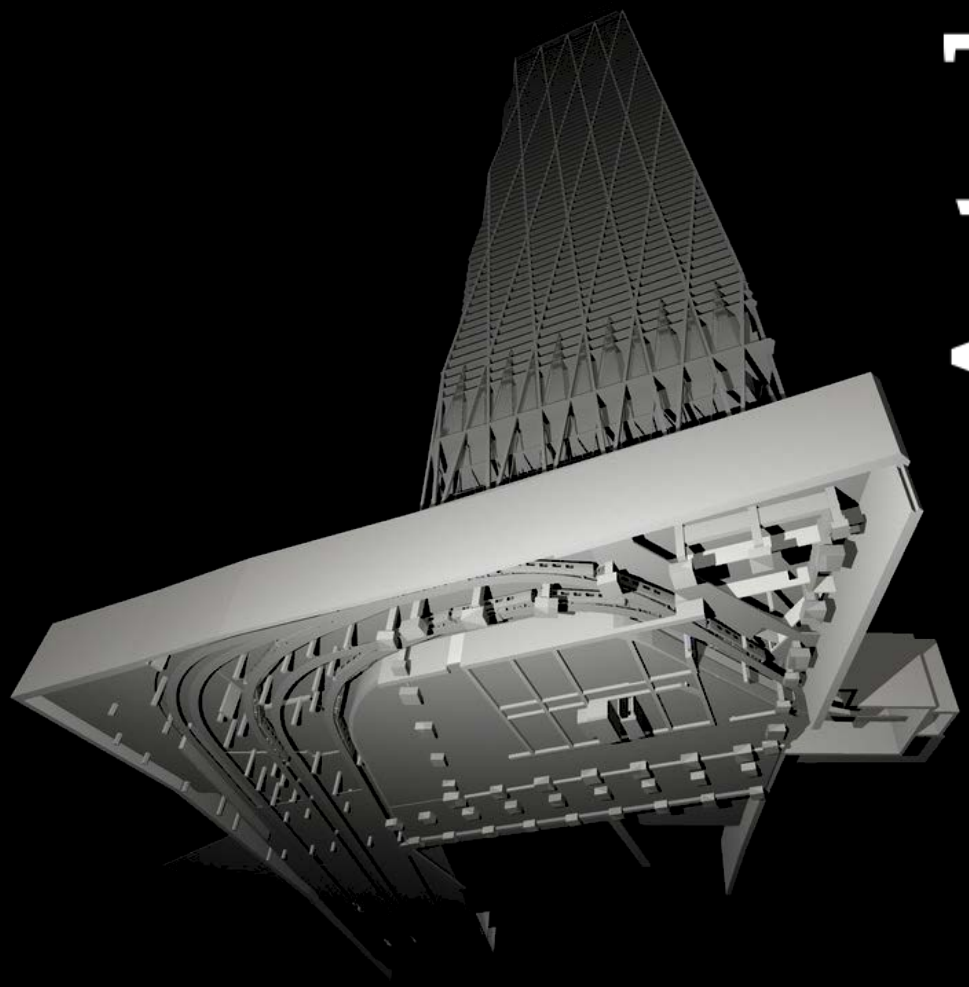
Phillip G. Bernstein
Vice President – Industry Relations + Strategy 副总裁 行业与战略
Building Solutions Division 建筑解决方案事业部

Lecturer in Professional Practice
Yale University School of Architecture 耶鲁大学建筑学院教授

Autodesk®

建筑行业

现状 与 挑战

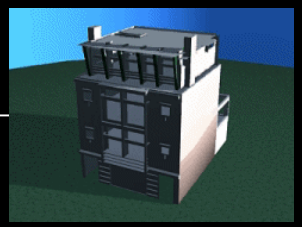


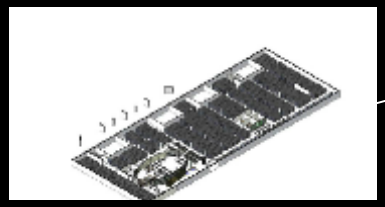
Autodesk®

市场驱动力

Near-Term

Long-Term





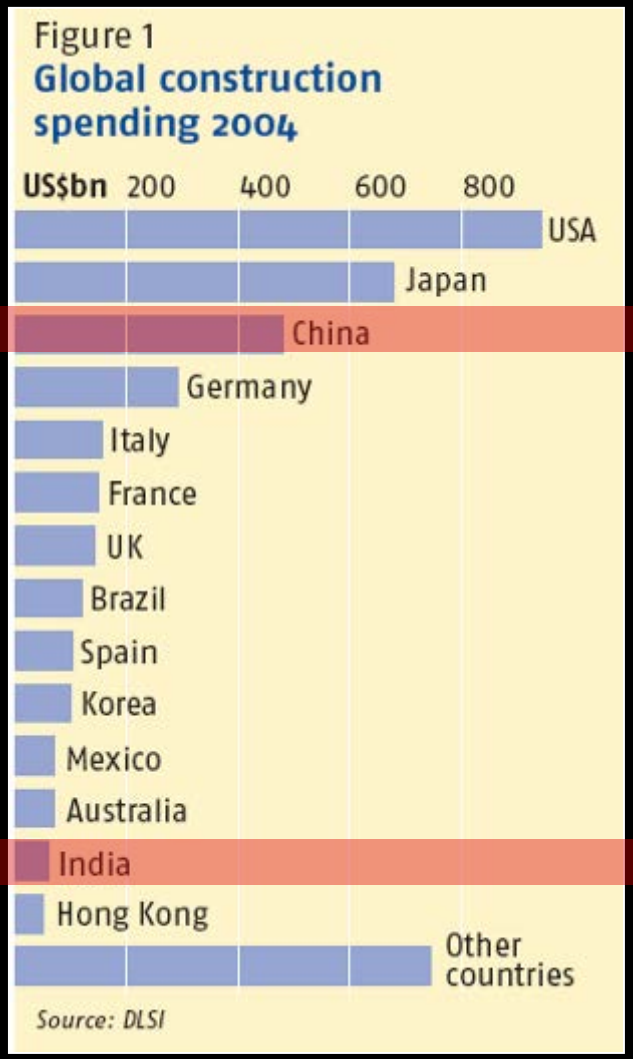
Autodesk

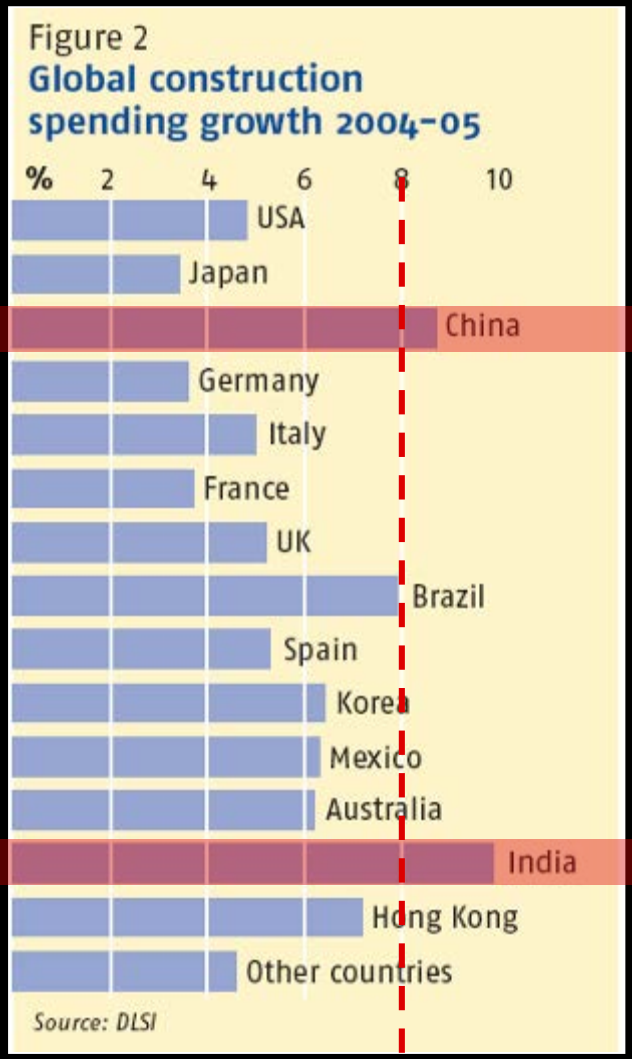
建筑行业的问题: 中国

- **7.5% GDP Growth from 2005 - 2009 per the 11th 5-year plan**
- **Manage overheating**
- **State to private housing**
- **Rapid urbanisation & fast rising income**
- **Watching over-investment, housing bubble**

Autodesk

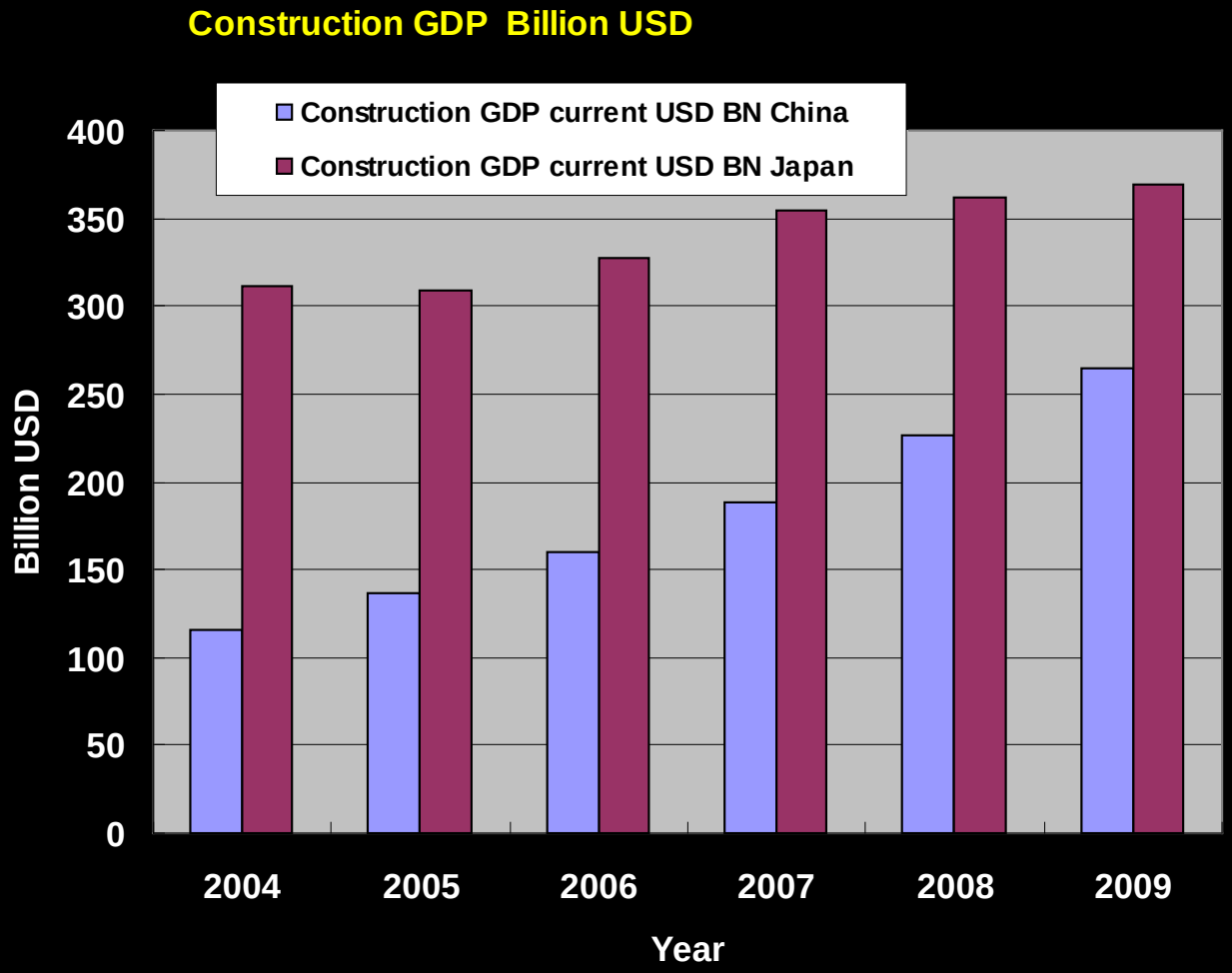
全球建筑业 及 中国的重要性





Autodesk

建筑行业总产值: 中国 与 日本

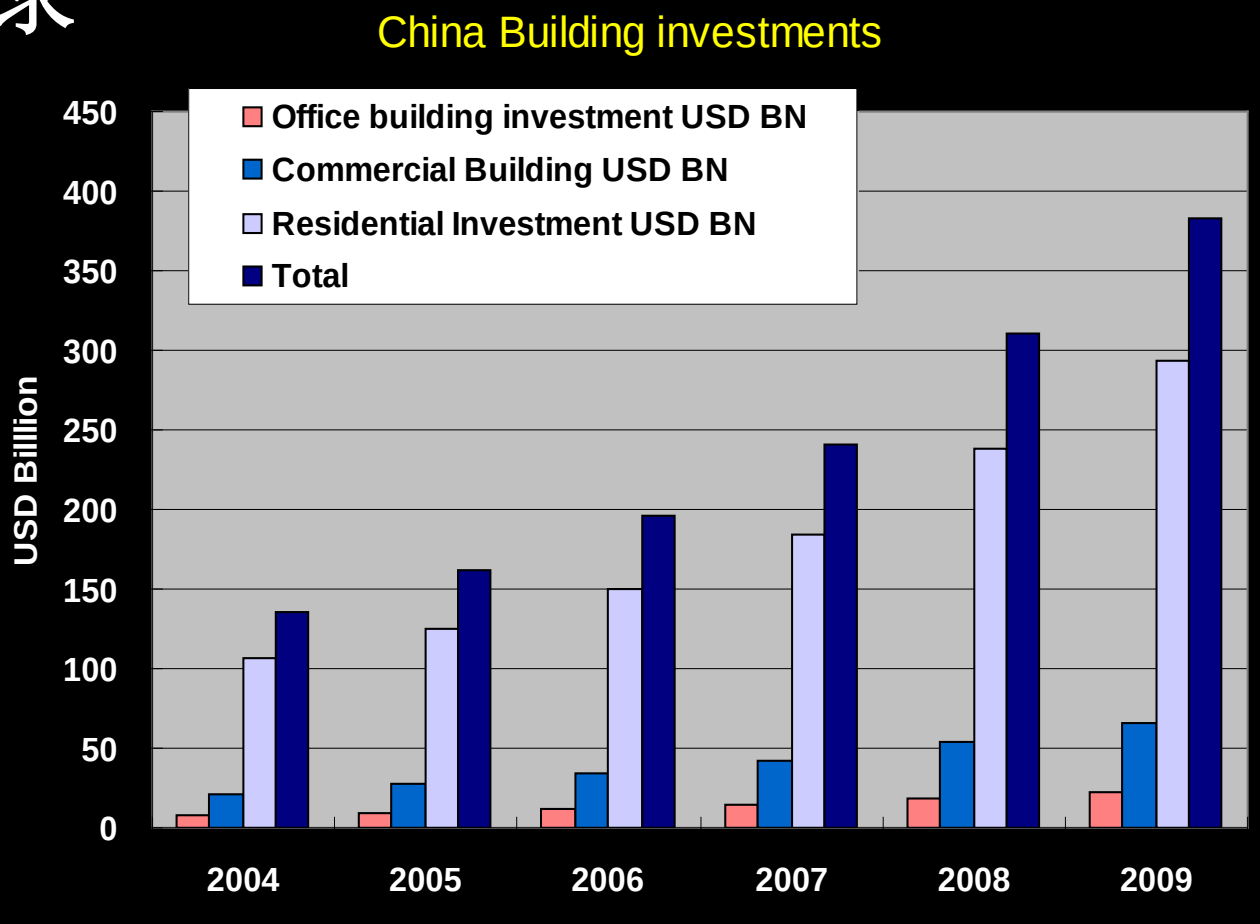


USD Billion	2004	2005	2006	2007	2008	2009
China	116	137	160	188	226	265
Japan	311	309	327	354	362	369

Data source: IMA Asia Pty Ltd Sept 2005

Autodesk

建筑市场需求

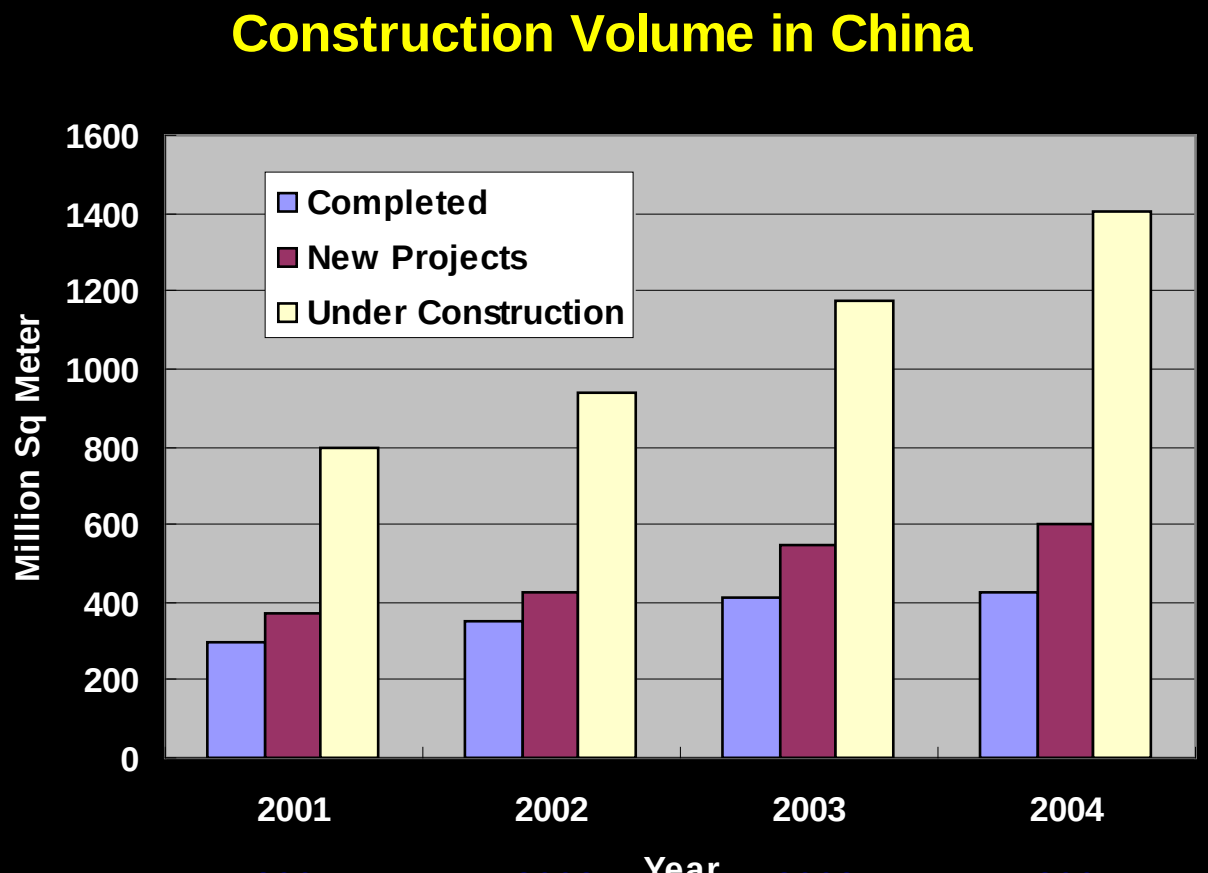


USD Billion	2004	2005	2006	2007	2008	2009
Office building Investment	8	10	12	14	18	22
Commercial Investment	21	27	35	42	54	66
Residential Investment	107	125	150	184	239	294
Total	135	162	196	241	311	382

Data source: IMA Asia Pty Ltd Sept 2005

Autodesk

建筑施工面积规模



	2001	2002	2003	2004
Completed	299	350	415	425
New Projects	374	428	547	604
Under Construction	794	941	1,175	1,405

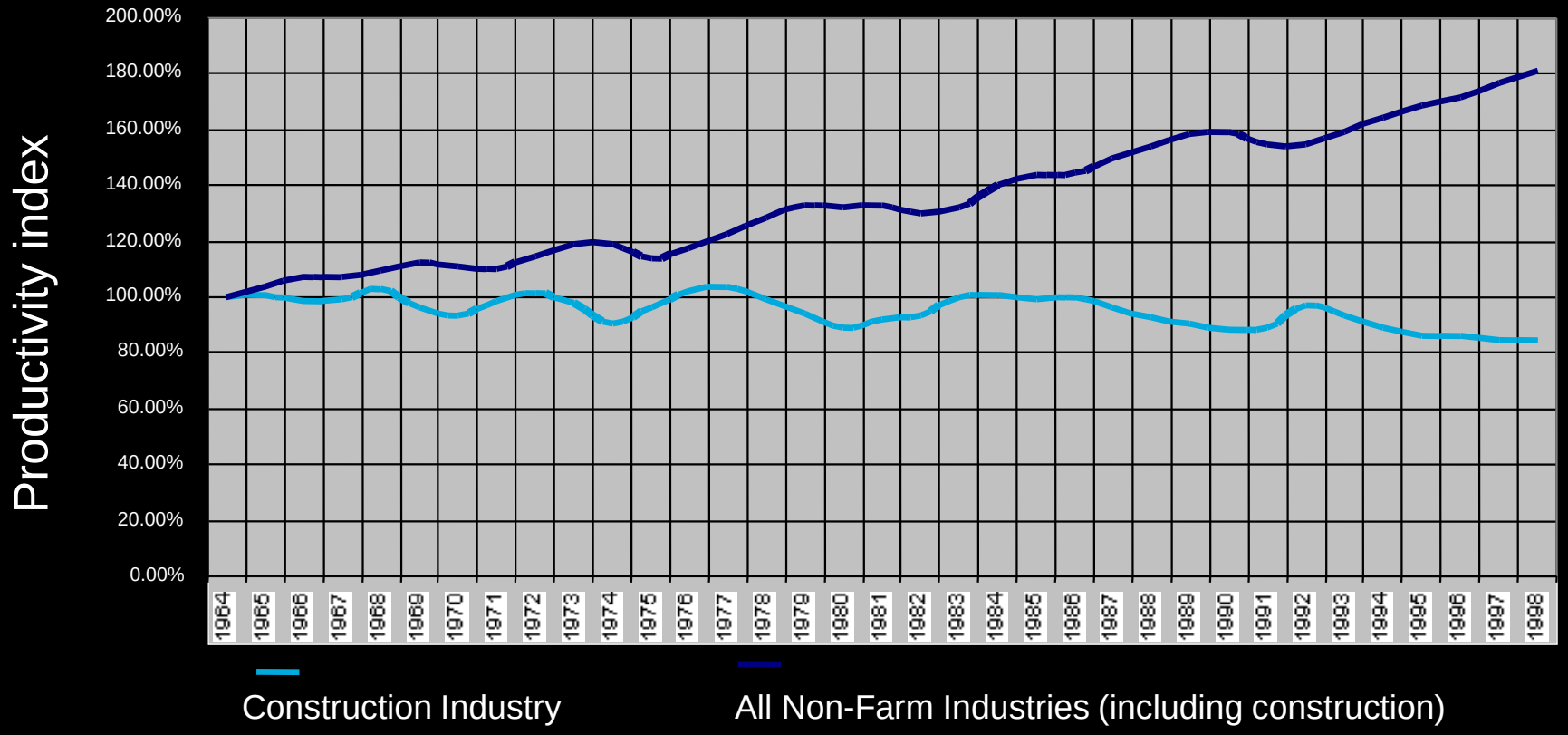
Data source: National Bureau Statistics of China

Autodesk

挑战: 行业生产效率 1964-1998

(Constant $ of contracts / work hours of hourly workers)

sources: US Bureau of Labor Statistics, US Dept. of Commerce



Courtesy: Stanford University – Center for Integrated Facility Engineering

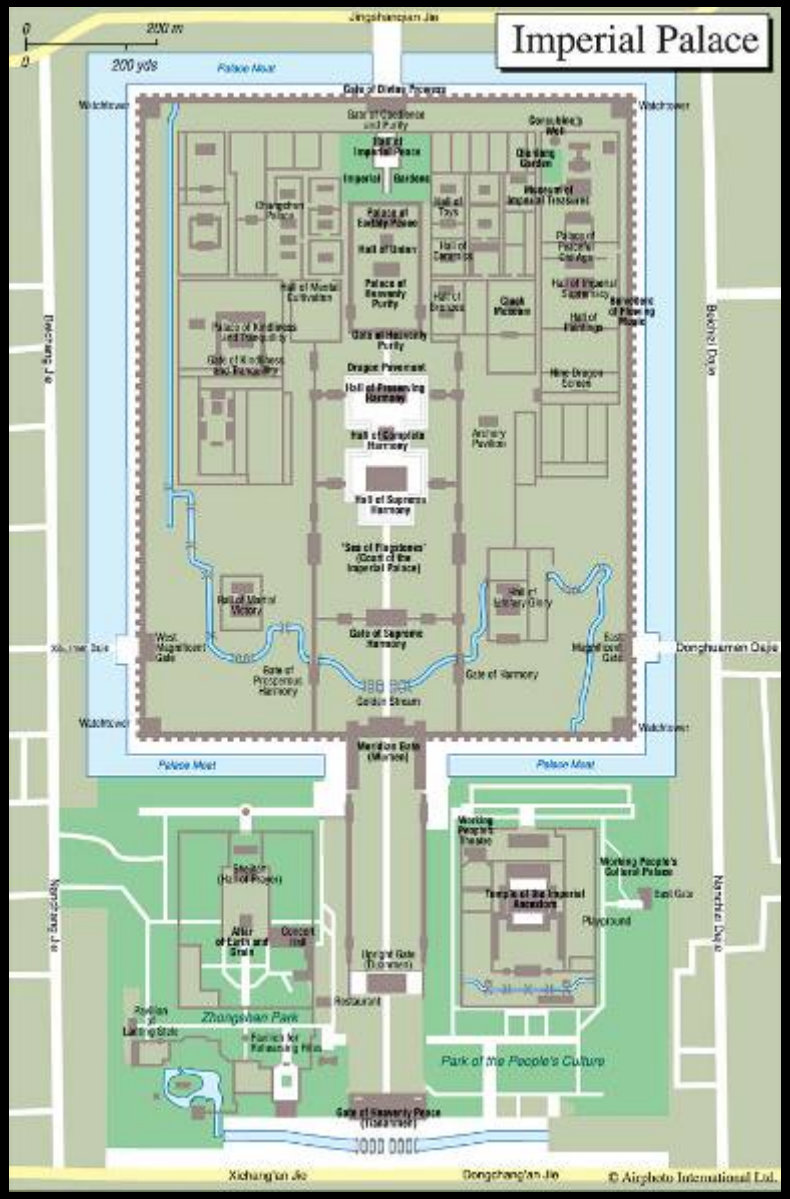
Autodesk

建筑的 昨日 与 今天：故宫

Autodesk

故宫的建造数据

- 9,999 buildings
- 720,000 sm
- 3 years construction (1417-1420)
- 1 million laborers
- 100,000 artisans



Autodesk

现代项目对比：美国联邦法院

- **60,000 SM**
- **1 building**
- **11 years construction (1995 – 2006)**
- **Two contractors**
- **25% program** cut

Autodesk

挑战：项目过程的浪费

The Economist

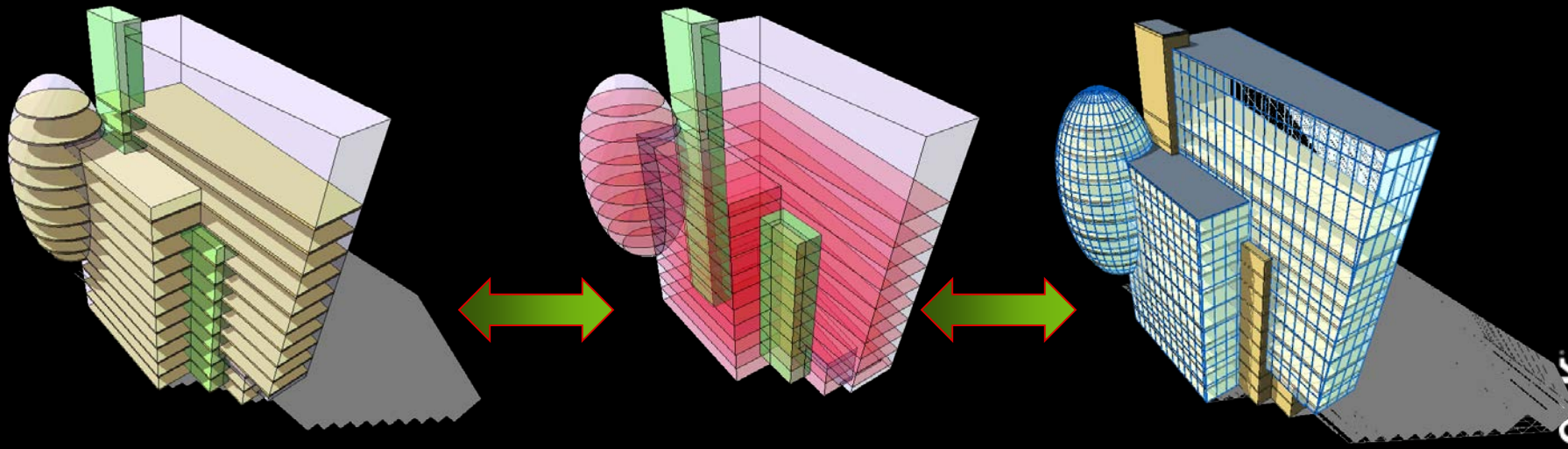
- “…inefficiencies, mistakes and delays account for $200 billion of the $650 billion spent on construction in America every year.”
- "A typical $100m building project generates 150,000 separate documents: technical drawings, legal contracts, purchase orders, RFIs and schedules.”
- “Project managers build warehouses just to store them. FedEx reputedly garnered $500m last year just shipping blueprints across America.“
- “…the process of construction is itself repeated in its essentials from project to project. Indeed, research suggests that up to 80% of inputs into buildings are repeated.” (M4i)

New wiring: Construction and the Internet: Builders go online
01/15/2000; **The Economist**

Autodesk

挑战：实现项目

- Digital information is blurring traditional relationships between design, procurement and construction, creating new opportunities for changing methods and roles in project delivery



Autodesk

挑战：可持续发展建筑

- Building energy consumption: 40% -70%
- 40% of raw materials
- 12% of fresh water
- 30% of greenhouse gases
- 136T/Y of waste
- Emerging International Standards

[1] U.S. Department of Energy, Energy Efficiency and Renewable Energy Network (EREN). Center of Excellence for Sustainable Development, 2003

Autodesk

中国的绿色建筑目标

Population growth 250M

Energy reduction:
50% (2010), 65% (2020)

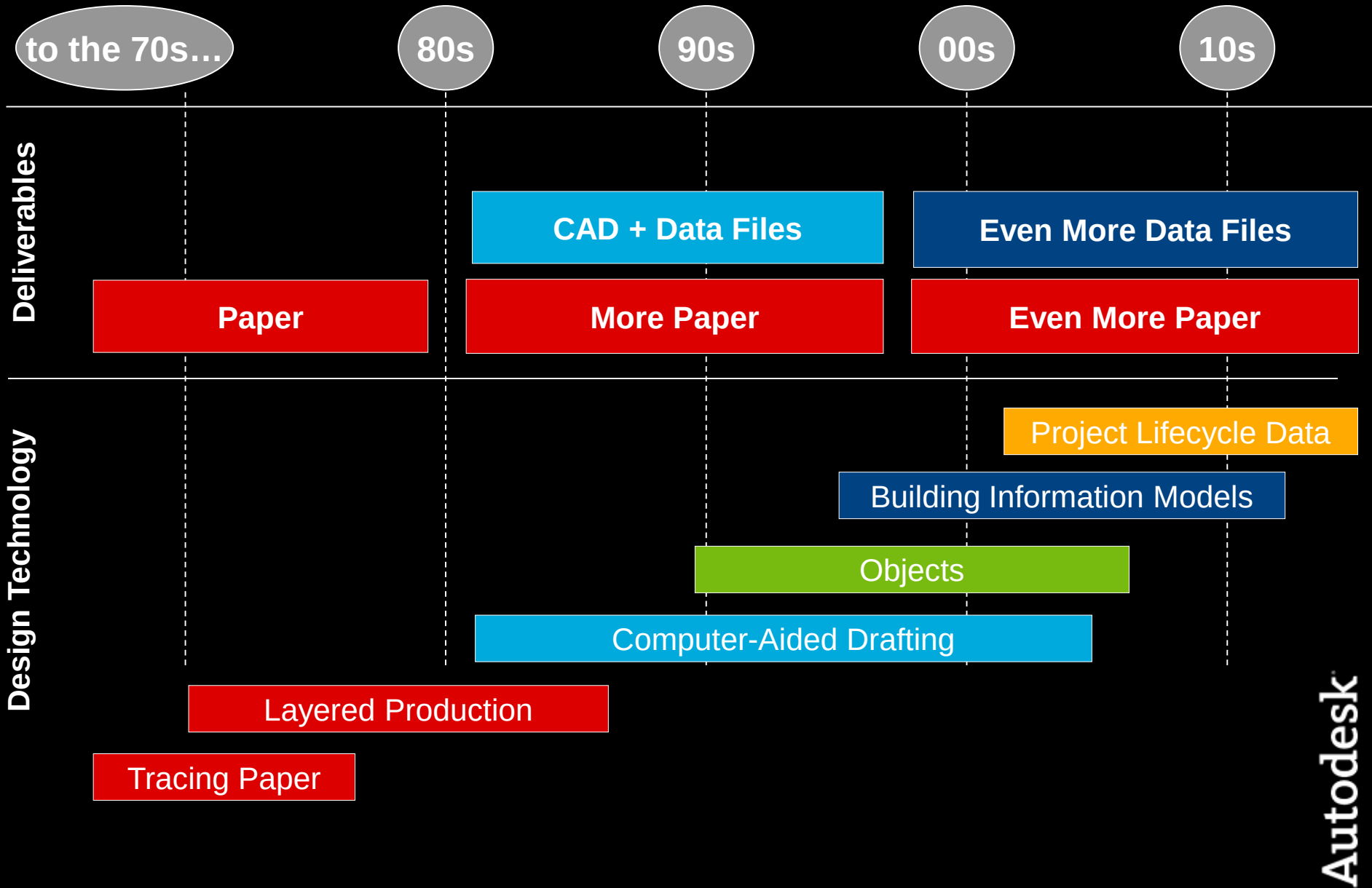
Sustainable Remodeling
(25% by 2010)

2008 Green Olympics

Green 5 Year Plan

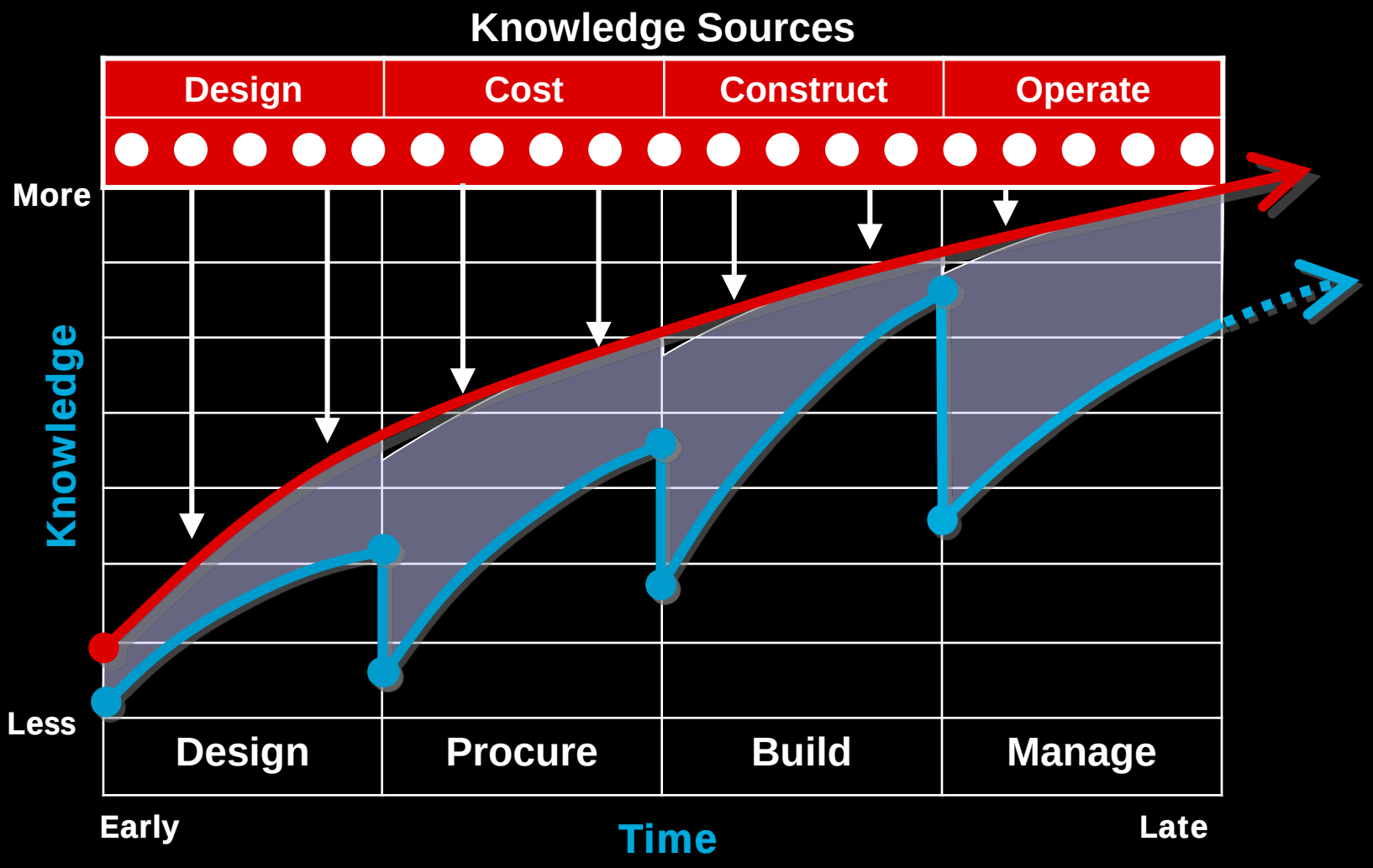
Autodesk

历史：生产 + 提交 的方法



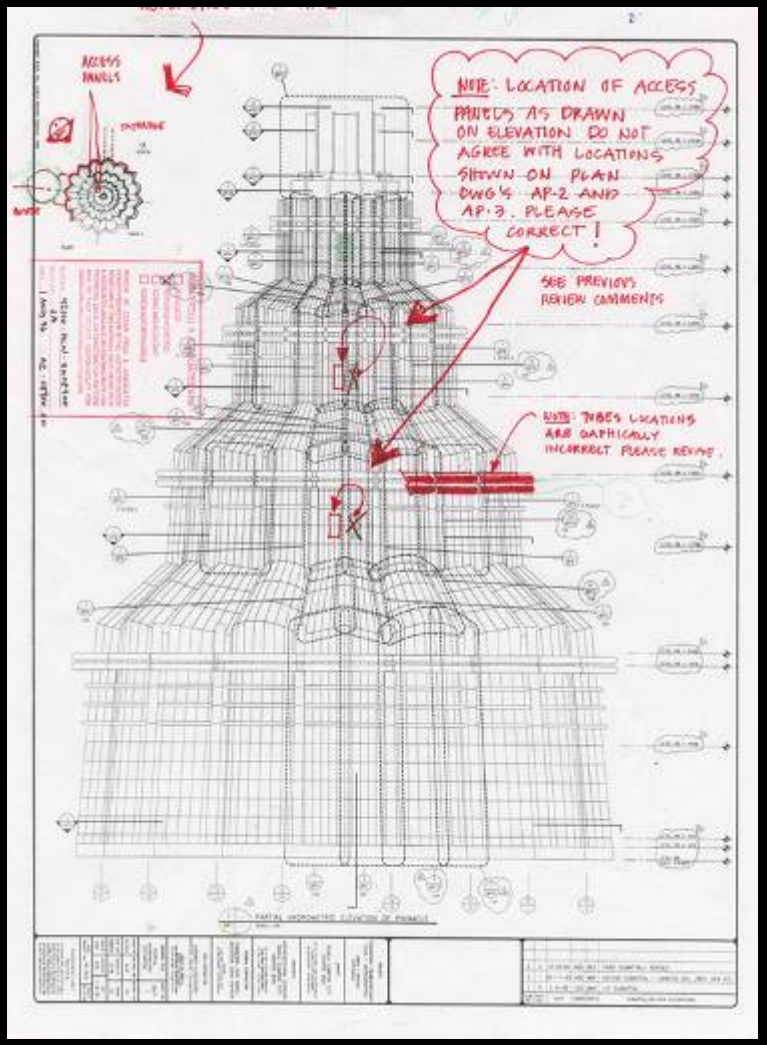
Autodesk

(反)进化: 信息“背向流动”



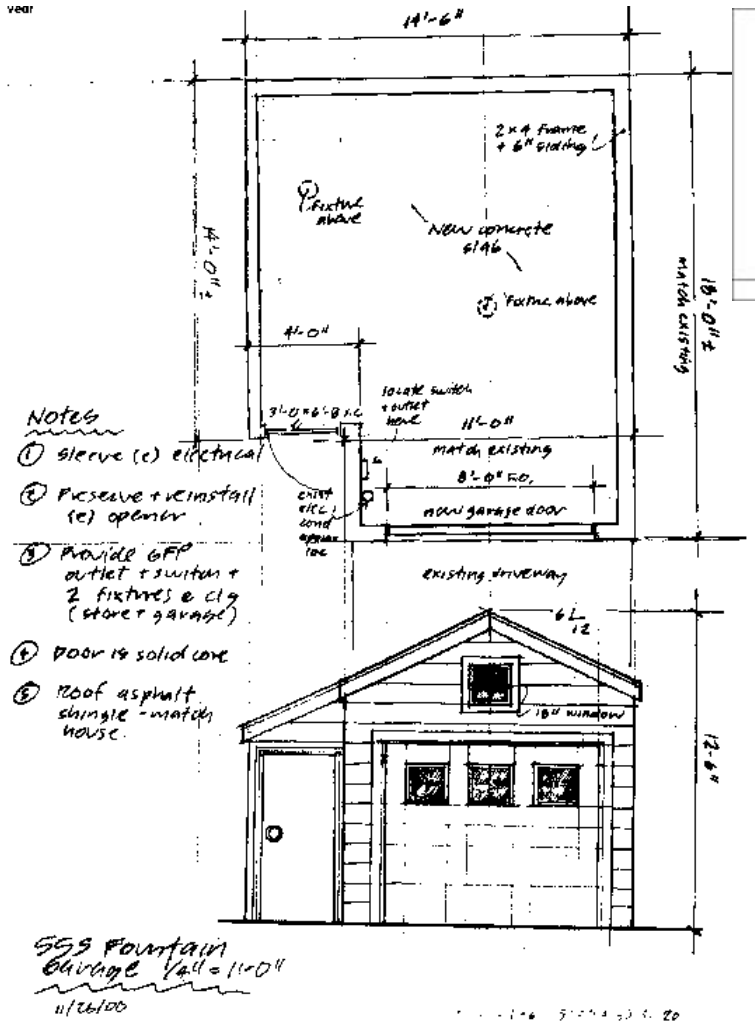
Autodesk

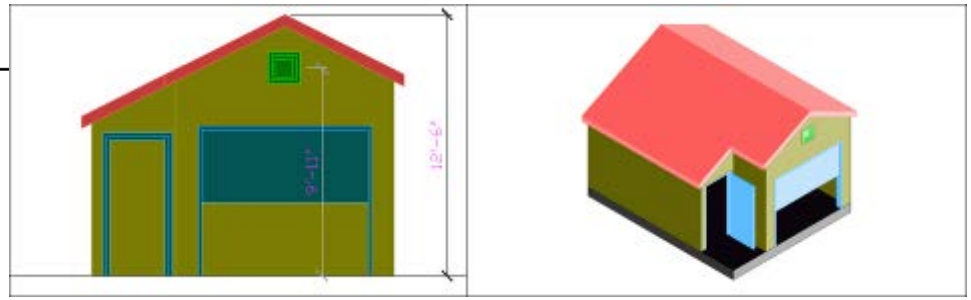
历史：纸张的世界



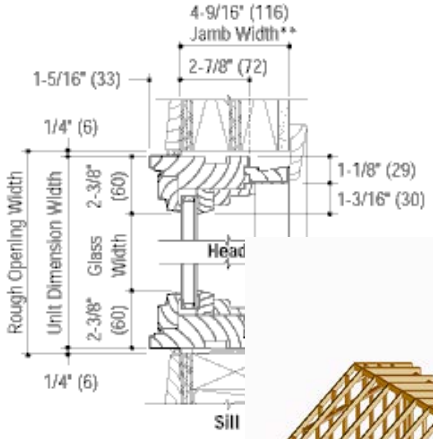
Autodesk

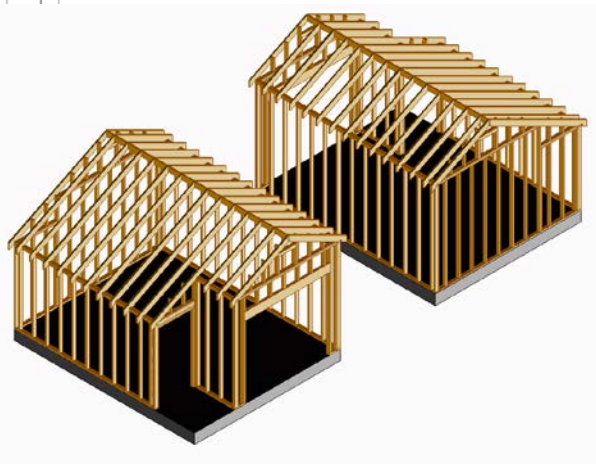
历史：图纸的有效性





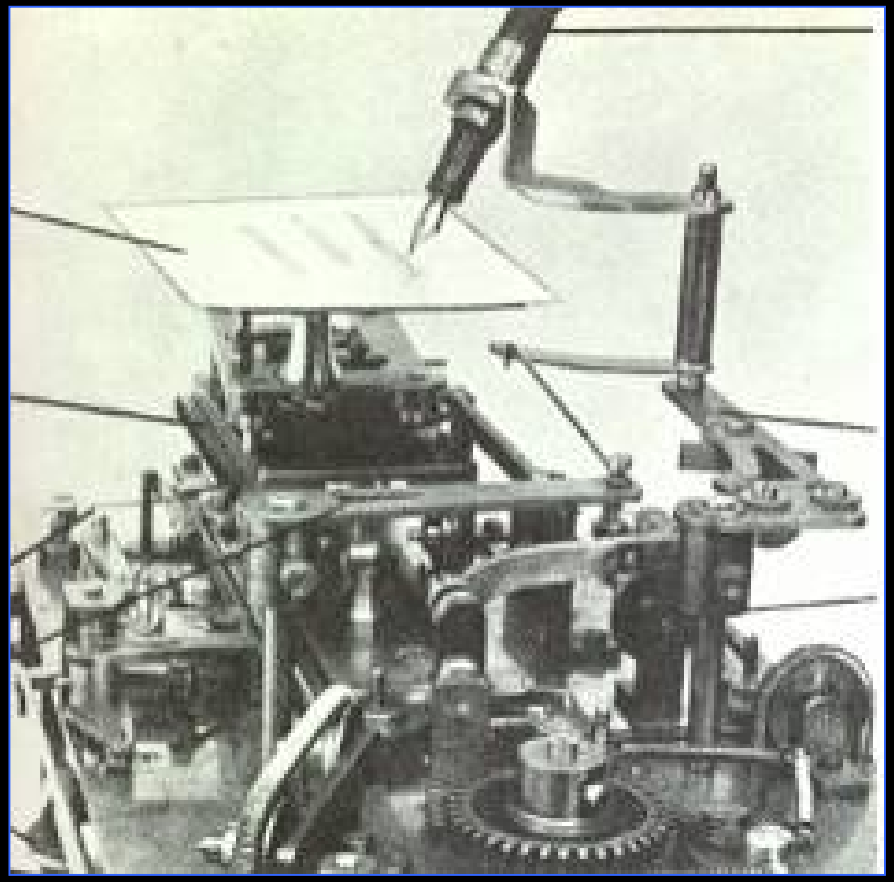
Vertical Section





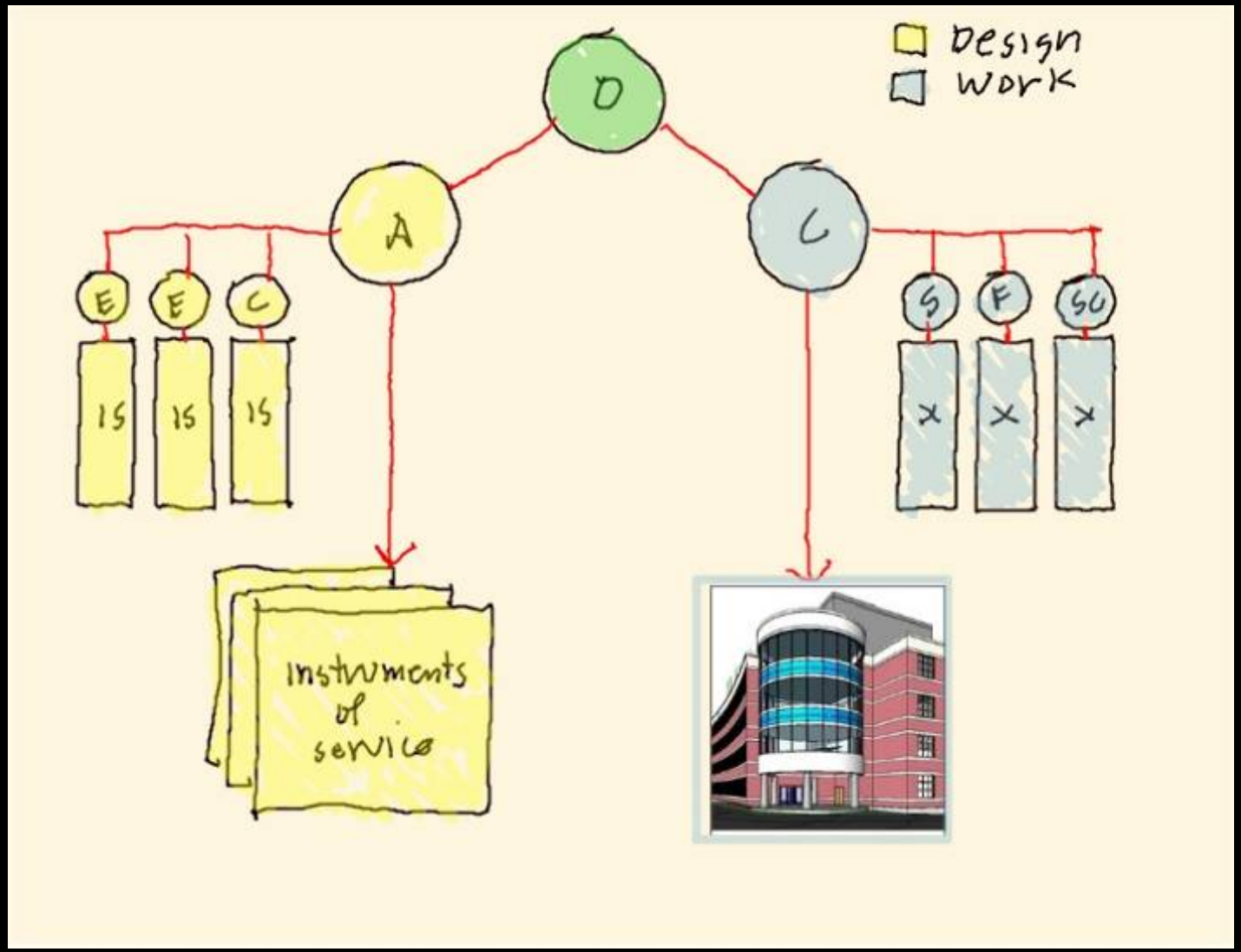
Autodesk

历史：电脑辅助绘图的世界



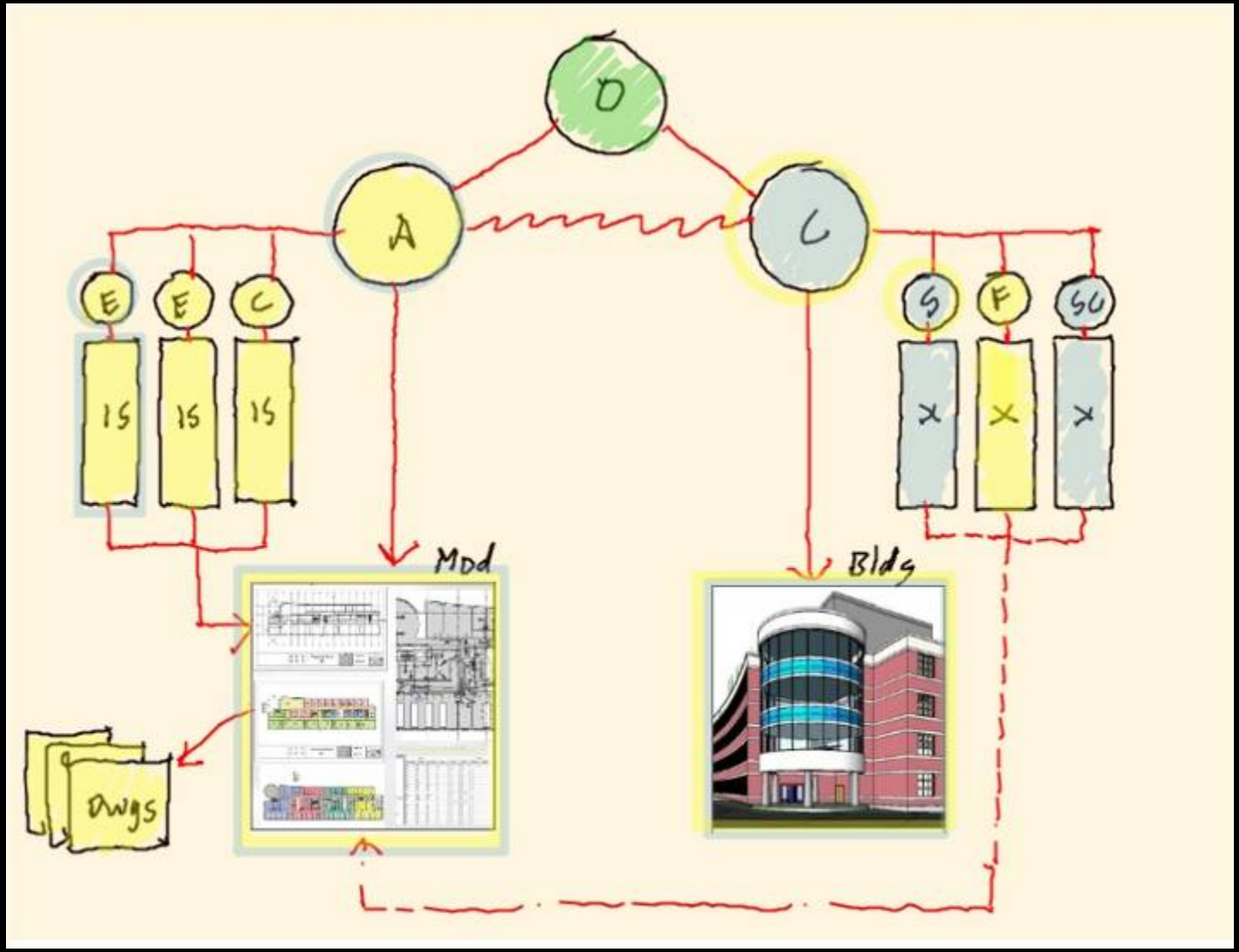
Autodesk

进化：离散 ⇔ 集成



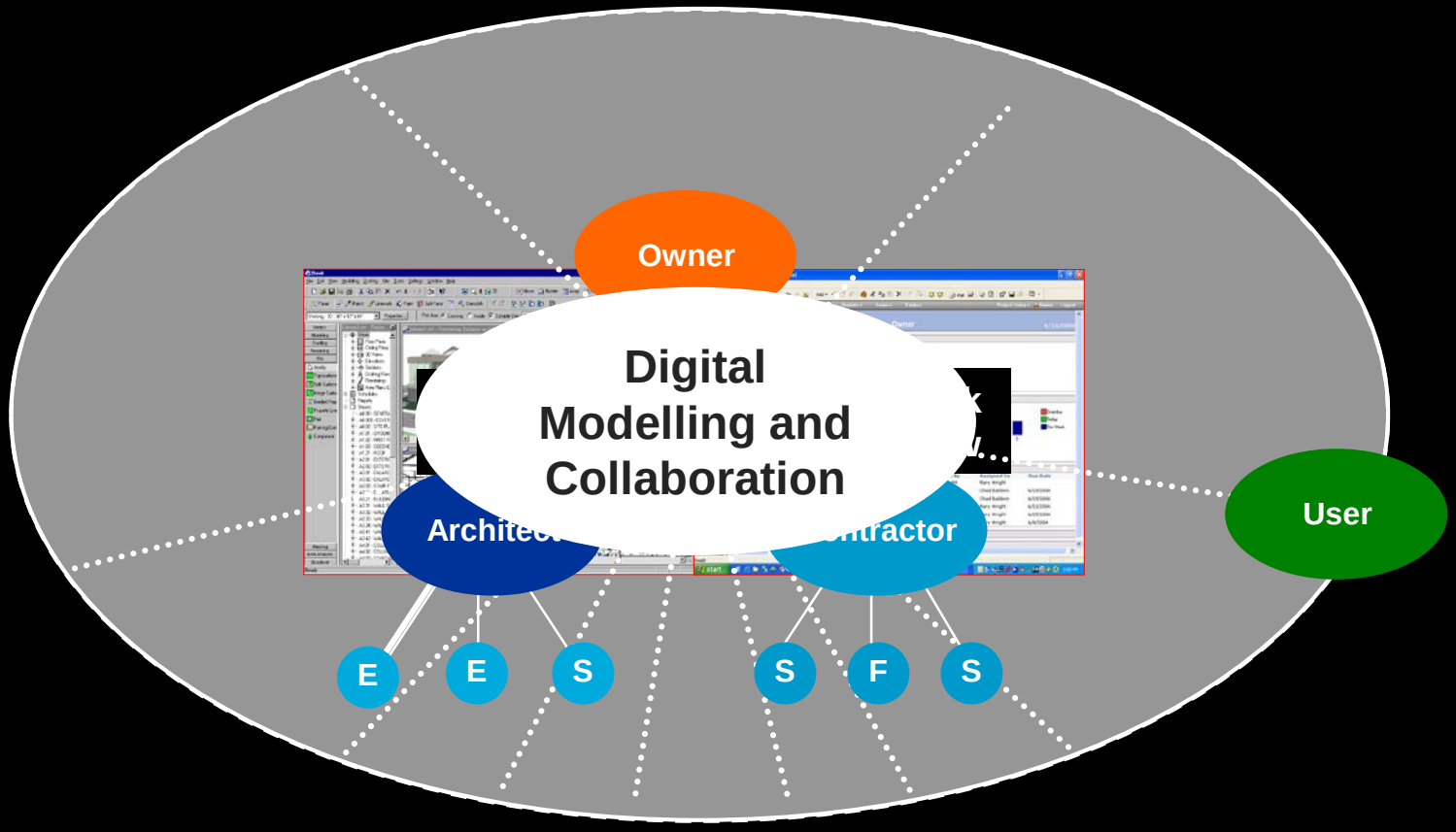
Autodesk

进化：离散 ⇔ 集成



Autodesk

项目实现过程的进化



Autodesk

建筑信息模型 The Building Information Modeling 定义

Building Information Modeling (BIM) – The creation and use of coordinated, internally consistent, computable information about a building project in design and construction.

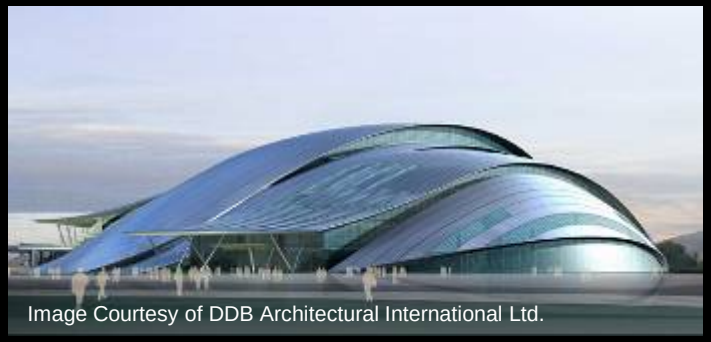
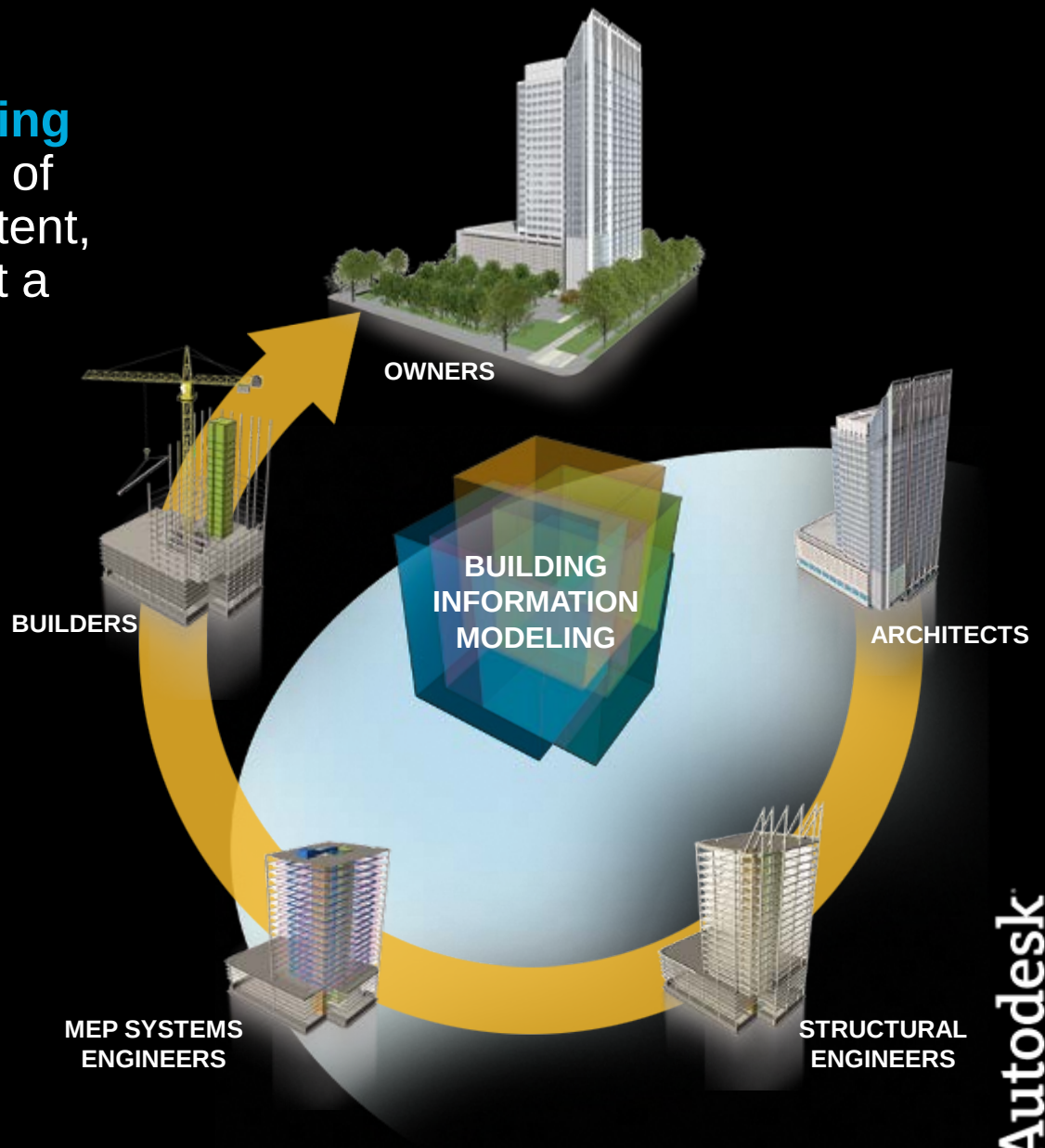
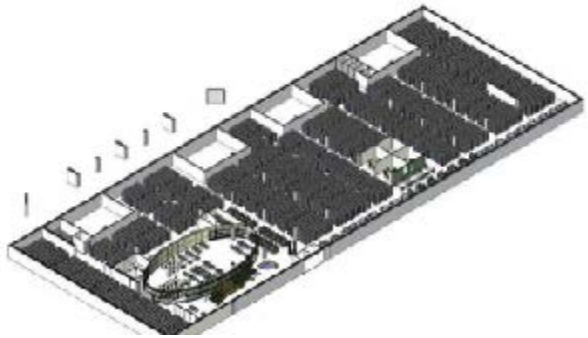


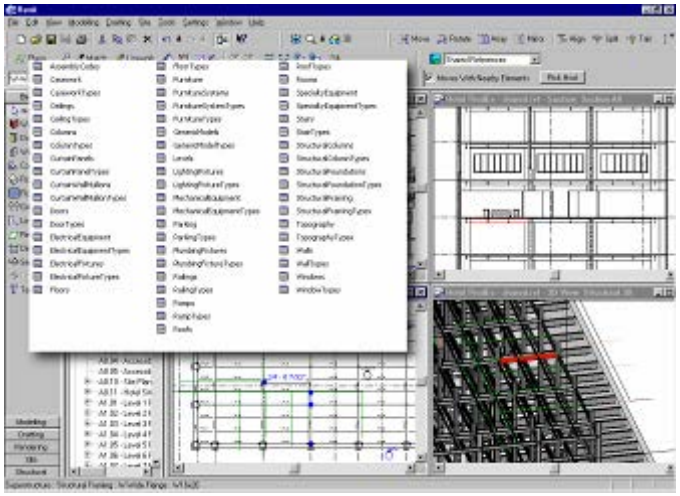
Image Courtesy of DDB Architectural International Ltd.

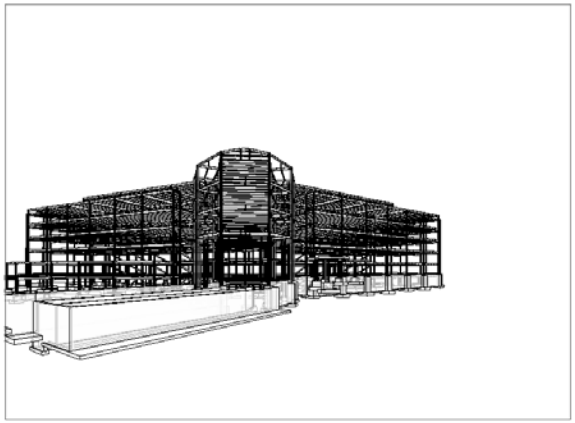


Autodesk

建筑信息模型 Building Information Modeling



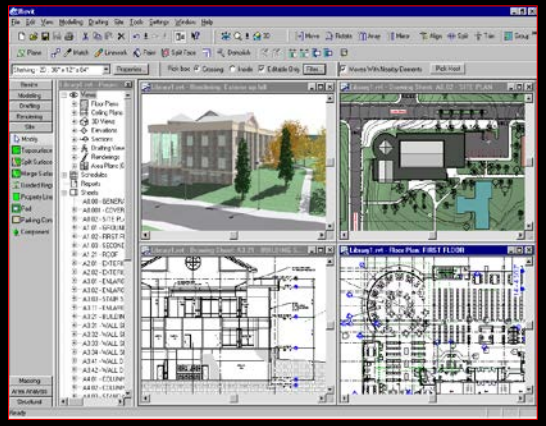




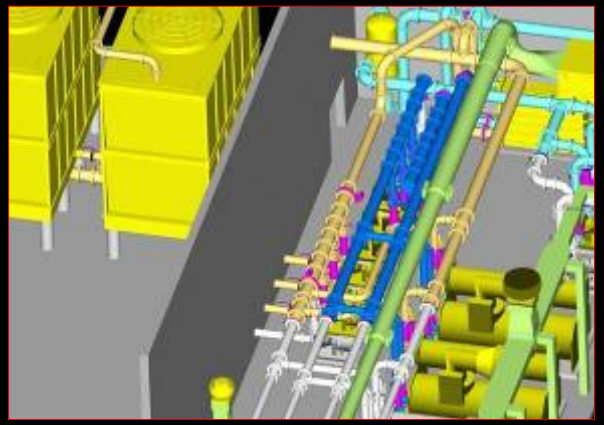
Images Courtesy of Hillier 2005

Autodesk

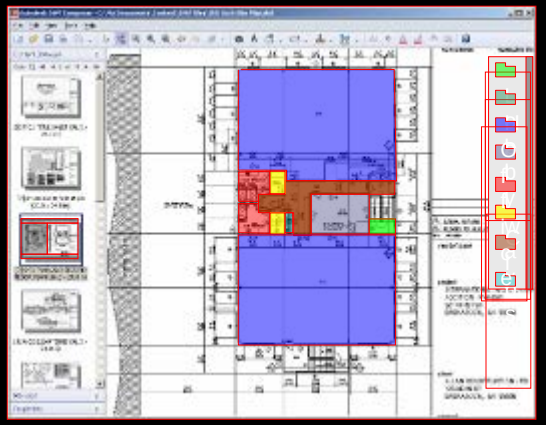
建筑信息模型(BIM) 支撑 建筑行业



Architecture

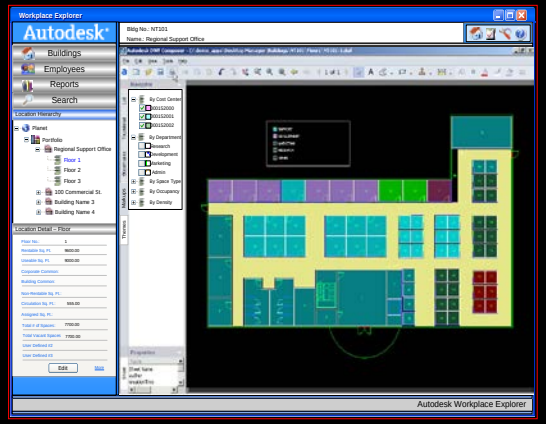


Systems

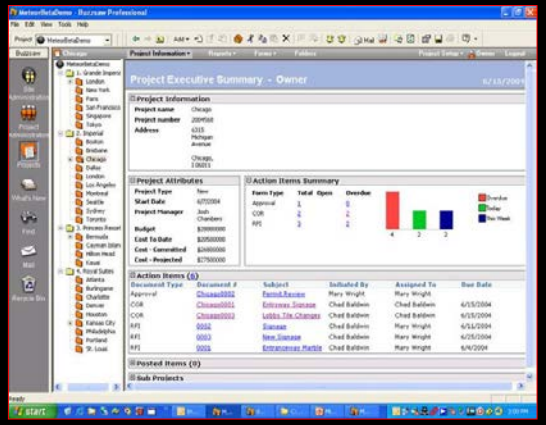


Quantity Takeoff

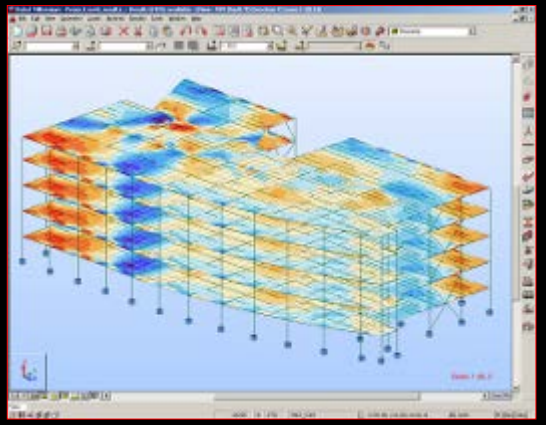
Area Management



Collaboration



Structure



Autodesk

超越技术 迈向实践

Autodesk®

超越技术 迈向实践

- **The Building Industry is undergoing change.**
- **Technology is the catalyst, and Building Information Modelling is the platform.**
- **Innovative firms are moving to innovative solutions.**

Autodesk

RTKL Associates Inc, USA & UK

Implementing BIM to Improve Delivery

- The company goal is to have each large RTKL office complete a significant project with Revit this year.

"The Autodesk Revit database concept is the future of architectural design and document software."

Bill Houston, PE. RTKL

Autodesk

Tweedle Associates, UK

Gain competitive advantage and maintain profit margins with Revit

- Small architectural and building development firm based in Bishop Auckland in County Durham

"By using Revit, the planning process for a prestige four-house development worth more than £1 million was cut by several months compared to previous similar developments."

Chris Tweddle, Tweddle Associates

Autodesk

Mestergruppen AS, Norway

Implementing BIM to Increase Profits

- Large residential builder standardised on Autodesk Revit

"Revit is far more powerful and flexible, and solves tasks faster and more elegantly than any other CAD software we've seen."

Arve Solheim, Manager at Mesterhus

Autodesk

360 Architecture

Autodesk Consulting Equals Success

Autodesk Consulting is
360 Architecture's trusted BIM partner,
from project beginning to end.

"Autodesk Consulting provided training, mentoring and support services throughout this project, from beginning to end. The results are measurable and speak for themselves: successful teams, projects and clients. Simply put, Autodesk Consulting helped us succeed. And for 360 Architecture, success is the only option."

Dave Willard, Vision Strategist, 360 Architecture

Autodesk

Manini Prefabbricati SpA

Deploying BIM Solutions in Italy

Manini Prefabbricati SpA

• One of the Italian leaders in prefabricated business developing construction systems, structural and custom built components

➢The Challenge

➢Needs to innovate its design production: reduce errors in the CDs and in technical sheets they feed their CAM production system

The Solution

AutoCAD Revit Series allows them to complete their design process by reusing the same data from Commercial Proposal to Construction Documentation

Why Revit?

• The reassurance of the Autodesk name
• A fully-integrated process for creation of model and drawings
• Can co-exist with AutoCAD ®

The Benefits

ARS enables Manini SpA to differentiate from its competitors by providing a clear and easy to understand offer: projects are presented not only as technical details or plain numbers, but with images of the new facility.

Improved productivity

With ARS Manini SpA reduces time between client request, offer and construction.

Customization

Easy to create parametric customizable elements

Autodesk

迈向未来

"…innovation isn't what innovators do; it's what customers, clients, and people adopt. Innovation isn't about crafting brilliant ideas that change minds; it's about the distribution of usable artifacts that change behavior. Innovators—their optimistic arrogance notwithstanding—don't change the world; the users of their innovations do."

Michael Schlage - "Innovation Diffusion" –MIT Technology Review, December 2004

"…we see that construction has two choices: ignore all this in the belief that construction is so unique that there are no lessons to be learned; or seek improvement through re-engineering construction, learning as much as possible from those who have done it elsewhere"

Movement for Innovation, UK (M4I)

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

Frank Gehry, FAIA – Lecture at Yale University 3.24.05

Autodesk