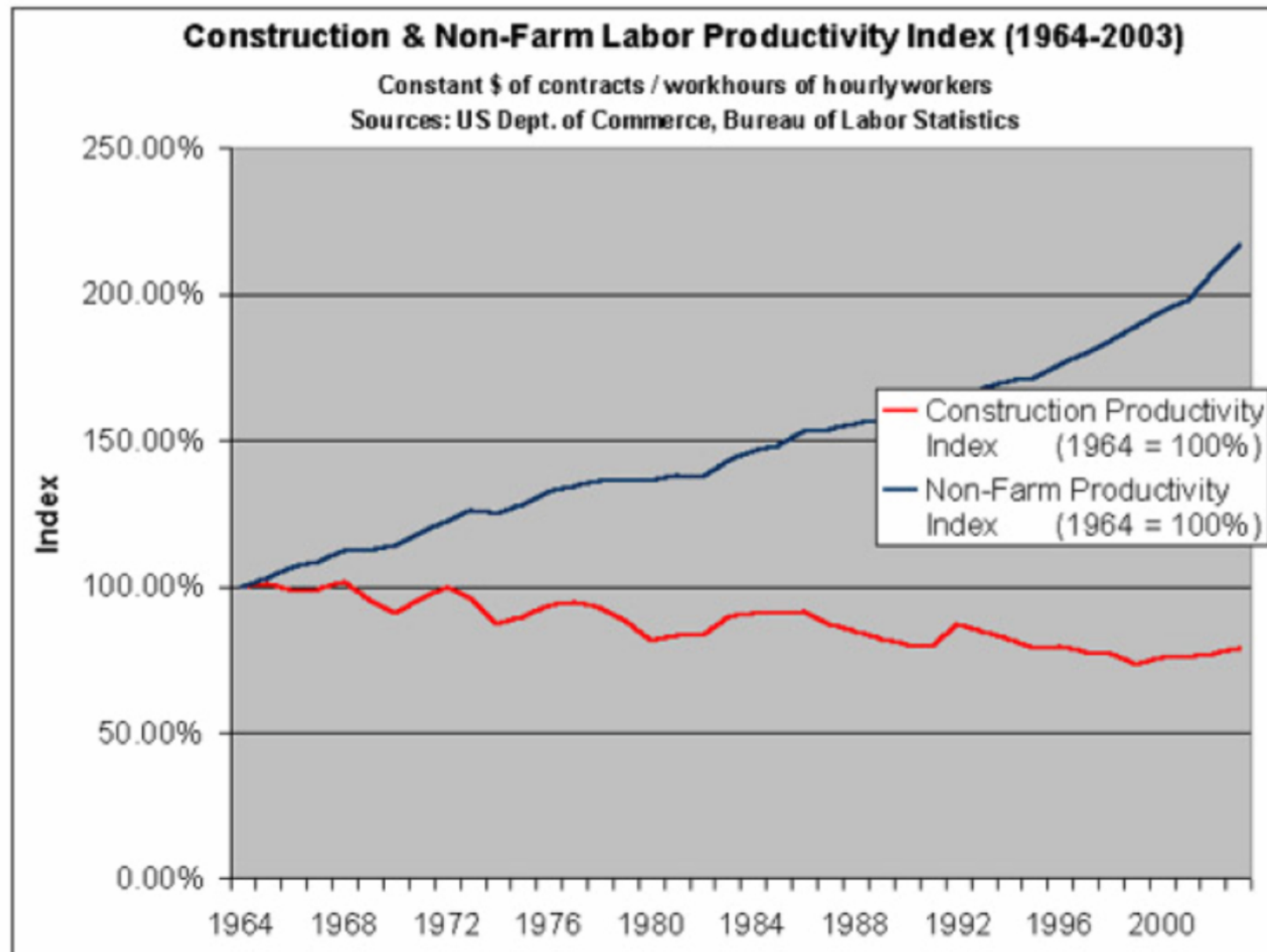


BUILDING INFORMATION MODELING
MODELOWANIE DANYCH BUDOWLANYCH

Introduction to
Building Information Modeling

Productivity of industry and construction sector.

Traditional Delivery: Decreasing Productivity



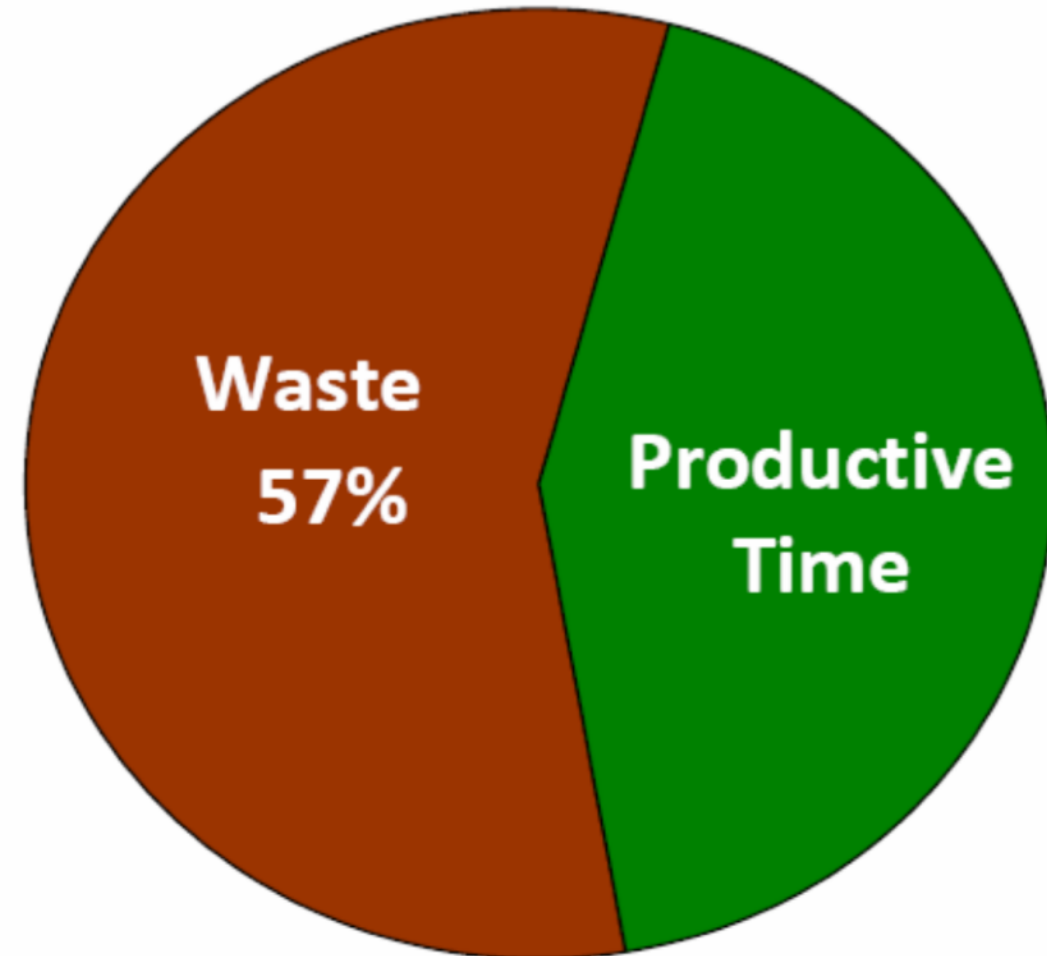


Traditional Delivery: Waste

Manufacturing



Construction



-
- **B**UILDING
 - **I**NFORMATION
 - **M**ODELing
-

-
- **BUILDING**
 - INFORMATION
 - MODELing



1.
2.
3.
4.
5.
6.
- 7. << >>**
- 8. << >>**

- **BUILDING**
- INFORMATION
- MODELing

Multi-disciplinary: industries, M E P , products, equipment

+ Architecture
+ Installation
Management
Economy
Infrastructure
Transport
Geodesy
Safety
Automation
Historical heritage



-
- design team
 - architect,**
 - structural eng,**
 - installation eng,**
 - construction eng.,
 - supervision eng.,
 - owners,
 - investors, developers,
 - inception and brief spec,
 - contractors,
 - project managers,
 - lawyers,
 - cost estimators,
 - facility managers,
 - property appraisers,
 - realtors,
 - safety, site filed safety
 - eco-environmental spec,

•BUILDING

•INFORMATION

•MODELing

- subcontractors,
 - equipment operators,
 - suppliers,
 - service staff,
 - facility end-users,
 - product manufacturers,
 - administration officials,
 - bank loans clerks,
 - risk managers,
 - insurance spec,
 - restaurators,
 - rescue brigade officers ,
 - task force officers,
 - demolition contractors
 -
-

-
- BUILDING
 - **INFORMATION**
 - MODELing



1. «message or communicate something»

- BUILDING
- **INFORMATION**
- MODELing



1. «message or communicate something»



- BUILDING
- **INFORMATION**
- MODELing



1. «message about something or communicate something »
2. «office/institution department/desk»



-
- BUILDING
 - **INFORMATION**
 - MODELing



1. «message about something or communicate something »
2. «office/institution department/desk»
3. «data processed by computer»

-
- BUILDING
 - INFORMATION**
 - MODELing



1. «message about something or communicate something »
2. «office/institution department/desk»
3. «data processed by computer»

computer IT >>> History and BIM

HISTORY and BIM

- 1943** first computer - ENIAC
- 1947** first transistor
- 1956** first cell-phone - Eriksson 40 kg case, price of a car
- 1958** first chip (integrated circuit) TI

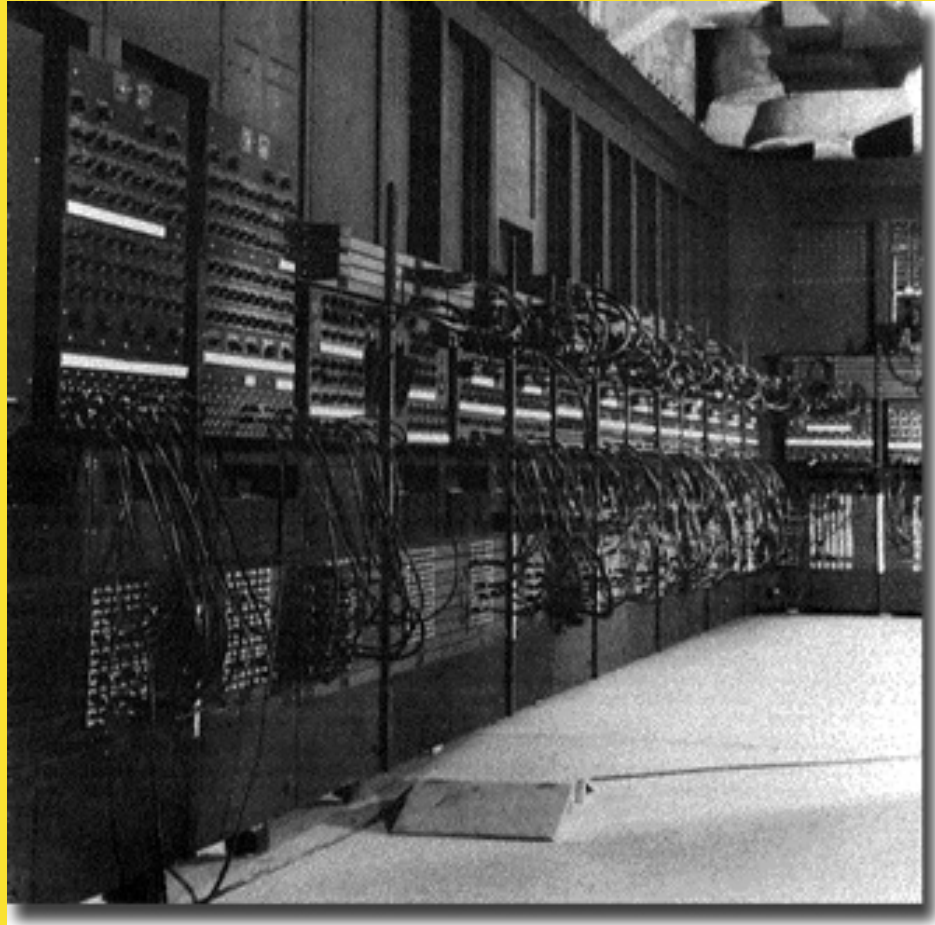
- 1963** [Sketchpad - Ivan Sutherland's first drawing computer software application](#)

- 1964** supercomputer IBM S/360 mainframe
first user graphical interface
first position manipulator - mouse

- 1969** first network ARPA-NET internet UCLA university

HISTORY and BIM

1965



COMPUTER - UNCOMMON DEVICE,
HARD TO REACH, DIFFICULT ACCESS,
write down what you want to compute,
deliver to computer center,
wait for postman to deliver results

HISTORY and BIM

1962

Reino Heinonen - IBM salesman faced a challenge: Selling computers was not easy because, as we all know, you cannot use a computer without software.

And those days, there was no ready-made software on the market for engineering offices so in case you wanted to actually use your precious computer, you needed to create your own software first. [beginning of Tekla].

Douglas C. Englebart publish article *Augmenting Human Intellect*

„The architect begins to enter a series of specifications and data a six-inch [6] slab floor, twelve-inch [12] concrete walls eight [8] feet high within the excavation, and so on ...

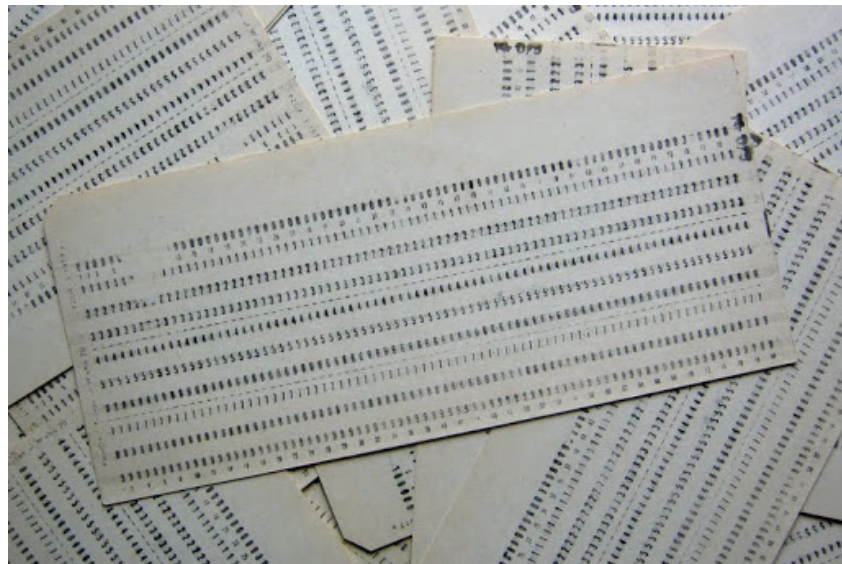
When he has finished, the revised scene appears on the screen. A structure is taking shape. He examines it, adjusts it

Lists of specifications grow into an evermore-detailed, interlinked structure, which represents the maturing thought behind the actual design”.

Suggestions beside others:
parametric modification in design,
object-oriented designing,
hierarchical data storage.

HISTORY and BIM

perforation card
1833 weaving machine
data memory
computing algorithm



Texas Instruments 57 calculator
memory of several numbers
step coding
mini-computer CompuCorp



HISTORY and BIM

- 1971** first INTEL processor, 2300 transistors
e-mail first application of notation " @ "
mobile first wireless phone telecommunication network
- 1975** first personal micro-computer Altair
- 1977** first Apple computer
- 1981** first Personal Computer IBM = IBM PC
- 1982** first version of AutoCad software - 2D drawing

HISTORY and BIM

1974 pioneer idea in UK for application of computer for designing and structural analysis

1975

Charles Eastman Berkeley, California, USA, architect design office, next university research in computer science at Carnegie Mellon University, author of Building Description System (BDS)

with database on building, construction materials and providers and graphical communication for user [HCI- Human Computer Interface],
[GUI - Graphical User Interface]

BIM development at Georgia Tech School of Architecture, Atlanta, USA.

1977 first computer software for 3D model

CATIA Computer Aided
Three Dimensional
Interactive Application

HISTORY and BIM

1981



**COMPUTER IS A PERSONAL DEVICE
ON YOUR DESK**

**YOUR LOCAL DATA, COMPUTING, RESULTS
OVERABUNDANCE MACHINE**

for PRINTING for CALCULATING for DRAFTING

HISTORY and BIM

1984

Gabor Bojar Budapest, Hungary

author of RadarCH software

(next name changed ArchiCAD)

- first BIM software for Apple personal computer.

1988

Paul Teicholz Stanford, California, USA

in educational and industrial center

Center for Integrated Facility Engineering [CIFE]

introduction of "model 4D"

HISTORY and BIM

1989

first laptop - portable device - external power supply

1990

first www site , HTML specification language

1992

first SMS delivered Finlandia, Tampere UnivTech <—> Nokia

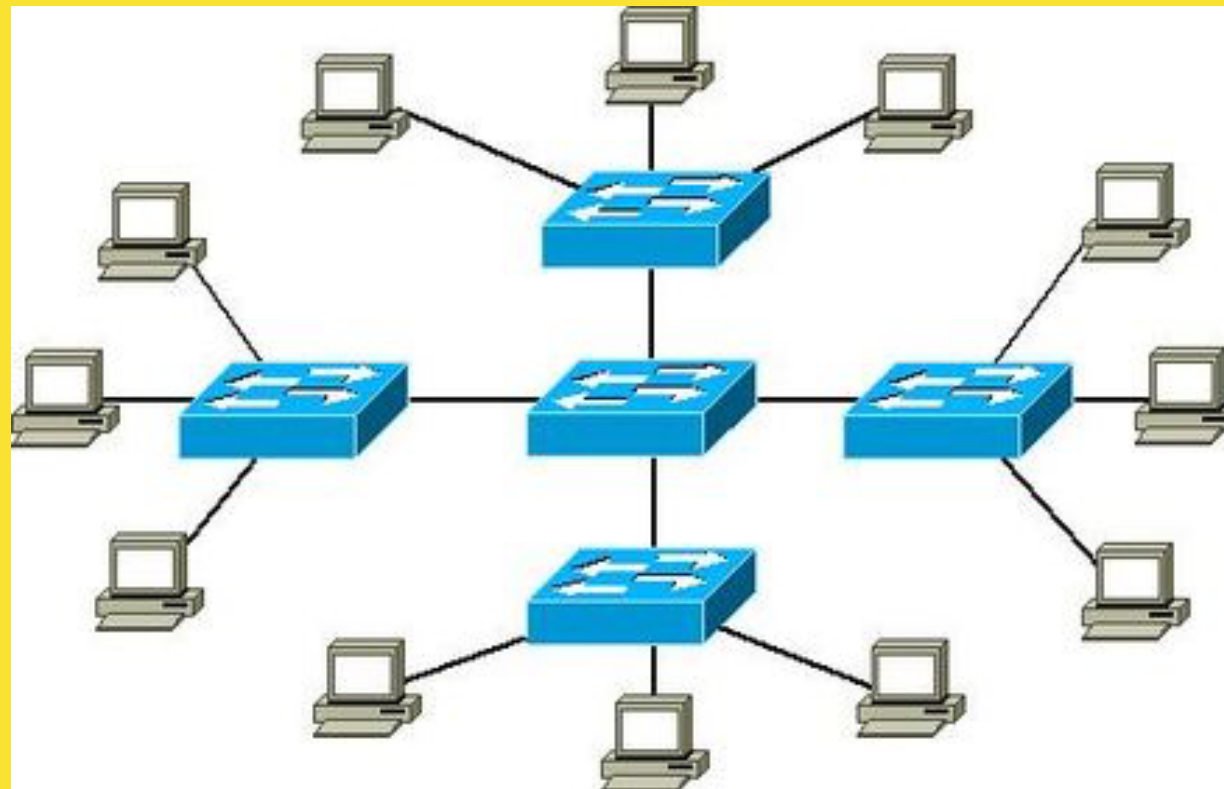
first GSM cell-phone telecommunication network
in Poland / Polkomtel

1993

first smartphone - phone + pocket computer
personal data

HISTORY and BIM

COMPUTER IS A PERSONAL DEVICE,
YOUR DATA, COMPUTING, RESULTS
CONNECTION + TRANSFER
STATIONARY + COMPUTER NETWORK



WIRE CONNECTION

NETWORK EQUIPMENT

NETWORK IS COMPUTER

HISTORY and BIM

1988

Irwin Jungreis i Leonid Raiz

coauthors of Pro/Engineer software
form Parametric Technology Cooperation

1997

Irwin Jungreis i Leonid Raiz

in Cambridge, Massachusetts, USA
start own company - Charles River Software.

2000

Irwin Jungreis i Leonid Raiz

change company name to
Revit Technology Corporation with creation of Revit software

2002

Irwin Jungreis i Leonid Raiz -

sell Revit software to AutoDesk company.

HISTORY and BIM

COMPUTER IS A PERSONAL DEVICE,
INFORMATION, COMPUTING



PORTABLE, MOBILE
COMPUTER WITH USER, WHERE USER IS
HARDWARE, COMPUTER POWER, DATA STORAGE

HISTORY and BIM

1996

International Alliance for Interoperability

alliance for fully information exchange
between building industry software partners

1998

American Institute of Architects

cooperation for integrated project delivery IPD

2001

first designation "tablet" - touch screen

2010

popular use of tablets - Apple iPad

HISTORY and BIM

2003

Society American Institute of Architects [AIA]
and US State Agency General Service Administration [GSA]
speed-up BIM standardization procedures for USA

2007

National Institute of Building Sciences [NIBS] USA
elaboration of National BIM Standard

2007

British Standard and Institution of Civil Engineers [ICE]
publish standard BS 1192: “Collaborative production
of architectural, engineering and construction
information” [AEC]

2008

BuildingSmart International
transformation of organization as home for openBIM.

HISTORY and BIM

PERSONAL DEVICE, IT TECHNOLOGY
ULTRA-PORTABLE, MOBILE
DEVICE for VOICE, IMAGE, VIDEO TRANSFER,
DATA and DOCS TRANSFER
COMUNICATION to DATA CENTER



HISTORY and BIM

2010

UK Government program of BIM implementation till 2016

2013

International Organization for Standardization
ISO 16739 BIM Standard:

IFC specification for data sharing

2013

more smartphones than mobile cell-phones

2015

European Committee for Standardization
starting KT 442 BIM → EN/ISO 16739

HISTORY and BIM

PERSONAL DEVICE

DATA and DOCS ACCESS

BIG DATA

INTERNET

CLOUD COMPUTING

WiFi



2017

more smartphones than personal computers

HISTORY and BIM

CLOUD - SUPERKOMPUTER CENTER - DATA CENTER - INTERNET



INFORMATION TECHNOLOGY

- BUILDING
- **INFORMATION**
- MODELing

1. «message about something or communicate something »
2. «office/institution department/desk»
3. «data processed by computer»

- explicit / public
- protected / internal
- confidential
- secret

- up-to-date
- complete
- clear
- available
- controlled
- easy
to modify

- text
- drawing
- photo
- video
- data
-

DIGITAL



- specify
- write
- order
- transmit
- read
- process
- present
- archive
- encrypt
- delete

-
- BUILDING
 - **INFORMATION**
 - MODELing



• BUILDING
• INFORMATION

Składniki: olej roślinny, woda, żółtko jaja kurzego (6%)*, cukier, ocet, musztarda (woda, gorczyca, ocet, cukier, sól, sól, aromat, przeciwutleniacz: sól wapniowo-disodowa EDTA, barwnik: beta-karoten. NIE ZAWIERA KONSERWANTÓW

Jedna porcja zawiera

kcal 110
6%
GDA*
dla osoby dorosłej

Jedna porcja (15 ml – łyżka stołowa) zawiera

cukry	0,5 g	tluszcz	11 g	sód	0,06 g	kw.tl.nasycone	1 g
	<1%		16%		3%		5%

WARTOŚĆ ODŻYWCZA

	100 ml	porcja 15 ml
Wartość energet.	2900kJ/700kcal	440kJ/110kcal
Białko	1 g	0,2 g
Węglowodany	3 g	0,5 g
w tym cukry	3 g	0,5 g
Tłuszcz	75 g	11 g
w tym kwasy tłuszczowe:		
nasycone	6 g	1 g
jednonienasycone	48 g	7 g
wielonienasycone	20 g	3 g
w tym omega-3	6 g	0,9 g
omega-6	14 g	2 g
Cholesterol	70 mg	11 mg
Błonnik	<0,5 g	<0,5 g
Sód	0,37 g	0,06 g

* % wskazanego dziennego spożycia osoby dorosłej określonego na podstawie diety 2000 kcal/ dzień. Potrzeby żywieniowe każdego człowieka różnią się w zależności od płci, wieku, poziomu aktywności fizycznej oraz innych czynników.
** Jaja z chowu ściółkowego.



puter>>

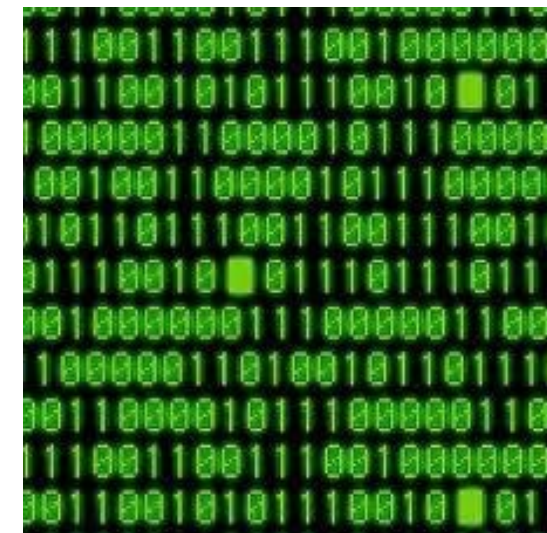
- up-to-date
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DIGITAL

- BUILDING
- INFORMATION



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DIGITAL

- BUILDING
- **INFORMATION**
- MODELing

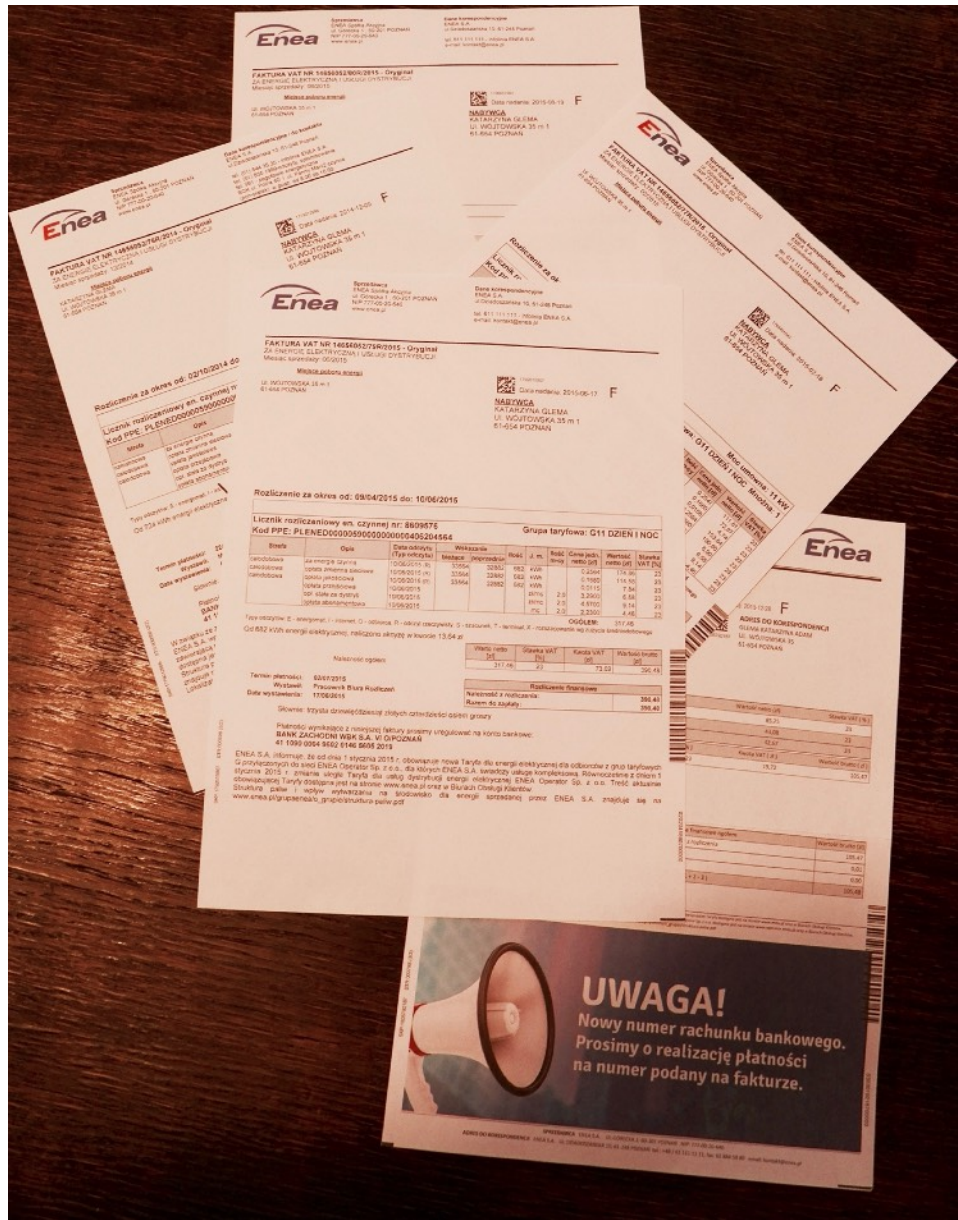


1. «message about something or con...»
2. «office/institution department/desk»
3. «data processed by computer»

- | | | |
|------------------------|--------------|-----------|
| • explicit / public | • up-to-date | • text |
| • protected / internal | • complete | • drawing |
| • confidential | • clear | • photo |
| • secret | • available | • video |
| | • controlled | • data |
| | • easy | • |
| | to modify | |

- specify
- write
- order
- transmit
- read
- process
- present
- archive
- encrypt

•BUILDING •INFORMATION



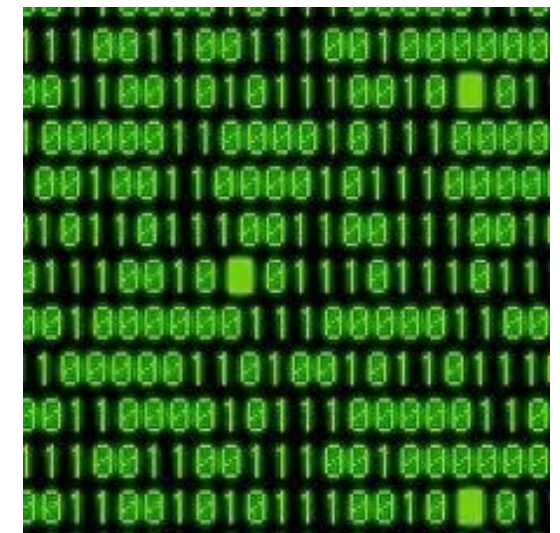
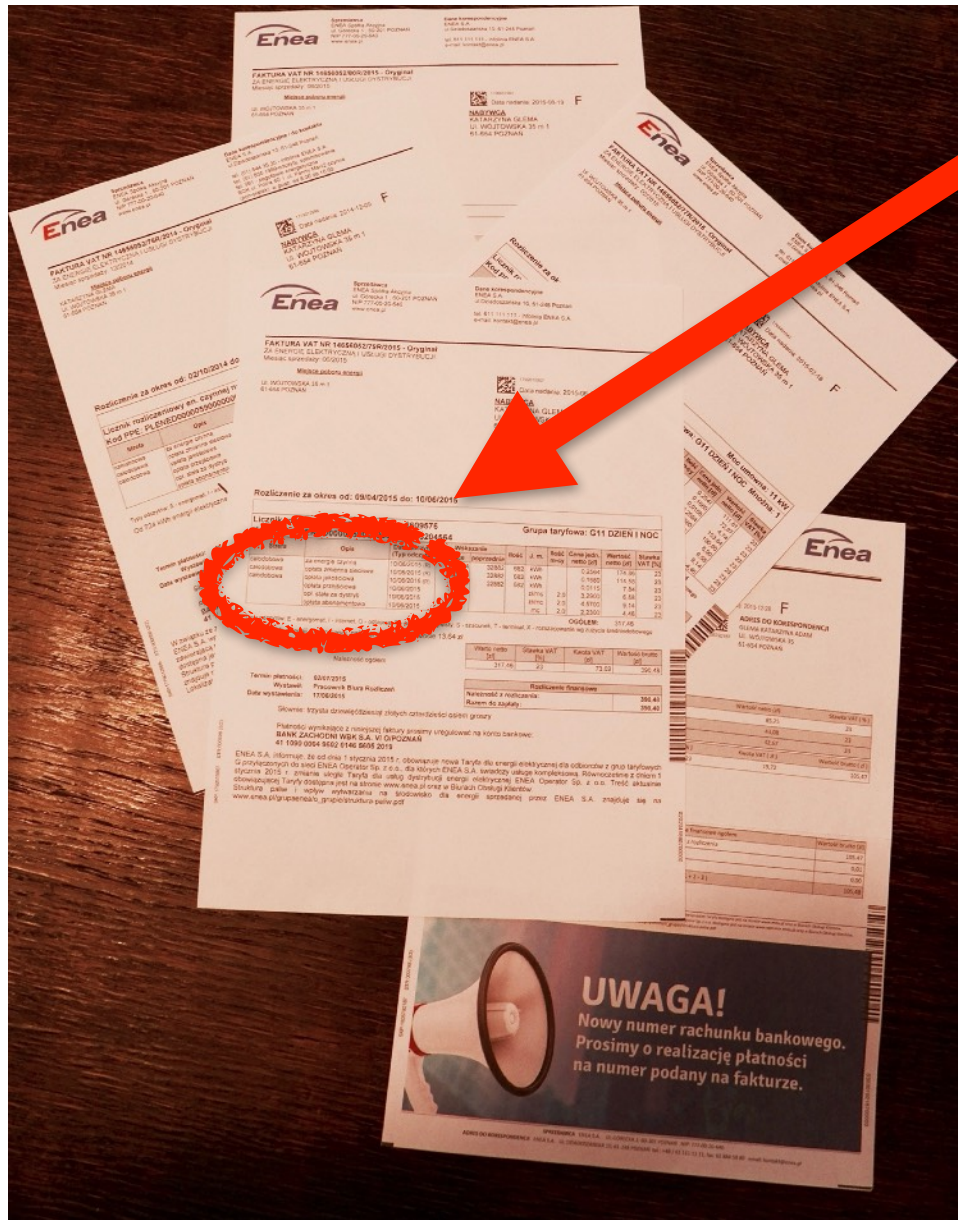
COM
t/desk
»
»
p-to-date
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- text
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-

- specify
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DIGITAL

• BUILDING
• INFORMATION



COM
t/desk
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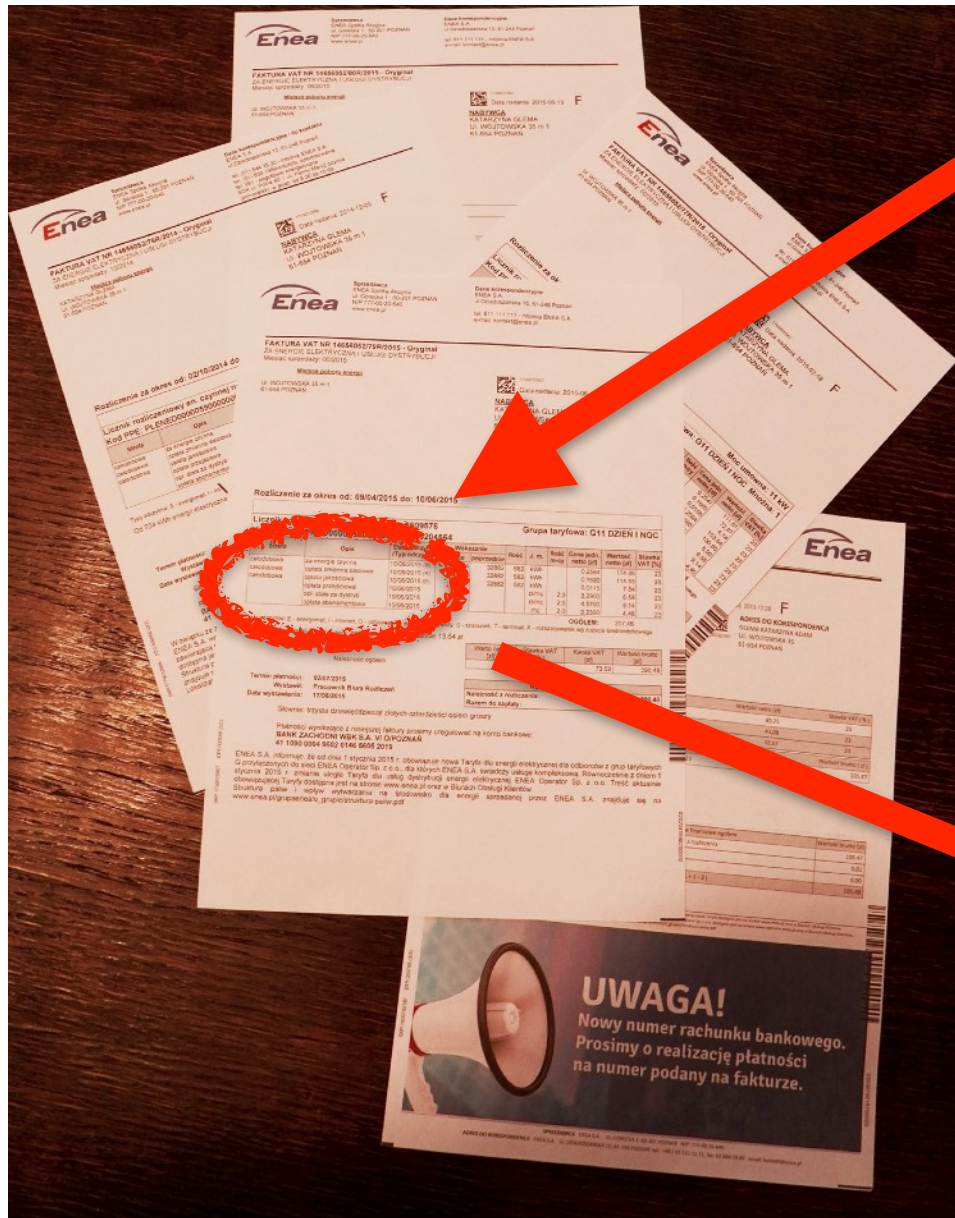
- text
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- specify
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- delete

DIGITAL

UWAGA!
Nowy numer rachunku bankowego.
Prosimy o realizację płatności
na numer podany na fakturze.

•BUILDING •INFORMATION



nu
stytucji

KOSZTY_35_rysie2007-2011

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
27	08-11-2009	32	261,10	52,22	08-02-2010	1292	2.212,03	663,61	11-12-2009	756	382,74	7766	27174	5331	181	01-05-2010	84,03 zł	18,90	700	899	05-10-2008	
28	31-12-2009	43	341,45	68,29	08-04-2010	892	1.666,88	460,76	11-02-2010	1028	518,28											
29	03-03-2010	36	309,38	61,88	10-06-2010	199	453,68	136,10	19-04-2010	881	510,66											
30	13-05-2010	48	400,91	80,18	06-08-2010	151	380,49	114,15	02-08-2010	623	294,53											
31	10-07-2010	43	354,66	70,93	01-10-2010	159	394,19	118,26	04-08-2010	711	377,9											
32	15-09-2010	67	580,81	116,16	02-12-2010	815	1.208,20	322,45	13-10-2010	790	417,96											
33	05-11-2010	32	271,14	54,23	01-02-2011	1340	2.436,27	730,58	02-12-2010	752	397,59											
34	11-01-2011	51	427,50	85,50	01-04-2011	1009	1.870,34	522,90	02-02-2011	1088	571,15											
35	08-03-2011	31	277,00	55,40	maj 2011	148	281,2	84,26	06-04-2011	909	505,90											
36	maj 2011	44	374,00	74,80	01-06-2011	194	470,07	146	maj 2011	146	81,4											
37	11-05-2011	48	420,66	84,13	02-08-2011	127	350,52	2,78	02-08-2011	670	380,09											
38	07-07-2011	35	310,02	62,00	05-10-2011	141	388,94	2,78	15-08-2011	829	463,67											
39	15-09-2011	47	412,15	82,43	01-12-2011	519	1090,27	2.11805	04-10-2011	318	163,91											
40	09-11-2011	15	139,82	27,96	01-02-2012	975	1958,19	2.11805	02-12-2011	708	369,80											
41	09-01-2012	38	339,40	67,88	03-04-2012	1015	2046,55	2.01630	04-02-2012	901	515,37											
42	05-03-2012	20	195,85	39,17	01-06-2012	154	448,78	2.01415	03-04-2012	744	441,72											
43	14-05-2012	42	403,57	80,71	01-08-2012	122	381,29	3.12532	04-08-2012	679	405,36											
44	07-07-2012	37	351,72	70,34	01-10-2012	82	296,92	3.6207	02-08-2012	570	344,41											
45	19-09-2012	48	452,58	90,52	03-12-2012	554	1.200,40	2.32924	02-10-2012	471	289,03											
46	08-11-2012	20	195,85	39,17	01-02-2013	1054	2.208,22	2.09319	04-12-2012	707	421,03											
47	09-01-2013	27	284,04	56,81	28-03-2013	935	1.805,99	1.93154	04-02-2013	884	521,25											
48	07-03-2013	25	259,18	51,84	08-04-2013	79	206,07	2.64645	03-04-2013	811	485,08											
49	09-05-2013	31	317,5	63,5	03-06-2013	225	539,32	2.39977	04-08-2013	885	518,05											
50	28-05-2013	26	280,81	56,16	02-08-2013	88	283,41	3.22058	02-08-2013	731	433,26											
51	09-09-2013	29	308,15	61,63	04-10-2013	115	333,85	2.90304	02-10-2013	778	453,35											
52	07-11-2013	31	317,50	63,50	03-12-2013	433	827,84	2.14281	03-12-2013	859	499,72											
53	10-01-2014	33	332,86	66,57	03-02-2014	1000	2.180,23	2.00248	04-02-2014	890	523,72											
54	07-03-2014	30	303,31	60,66	07-04-2014	512	1.148,96	2.24408	08-04-2014	874	488,45											
55	09-05-2014	30	303,31	60,66	09-06-2014	190	484,6	2.55052	03-08-2014	751	421,18											
56	05-07-2014	41	413,33	82,67	05-08-2014	123	348,69	2.81891	05-08-2014	801	447,71											
57	09-09-2014	52	557,28	111,46	09-10-2014	78	286,9	3.20358	02-10-2014	441	256,64											
58	07-11-2014	43	484,65	96,93	07-12-2014	456	1051,61	2.30319	02-12-2014	724	408,83											
59	15-01-2015	47	510,85	102,17	01-02-2015	981	1.945,88	2.17922	01-01-2015	439												
60	19-03-2015	52	582,90	116,58	02-04-2015	80	274,58	3.05709	02-04-2015	600	579,00											
61	07-05-2015	35	400,77	80,15	01-06-2015	2	613,00	2.42292	04-2015	713	397,05709											
62	06-07-2015	44	497,19	99,44	03-08-2015	18	58,5	3.05709	08-2015	300	48,05725											
63	07-09-2015	75	829,31	165,86	01-10-2015	107	207,00	3.55709	10-2015	350	185,578											
64																						
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Edytor wykresów

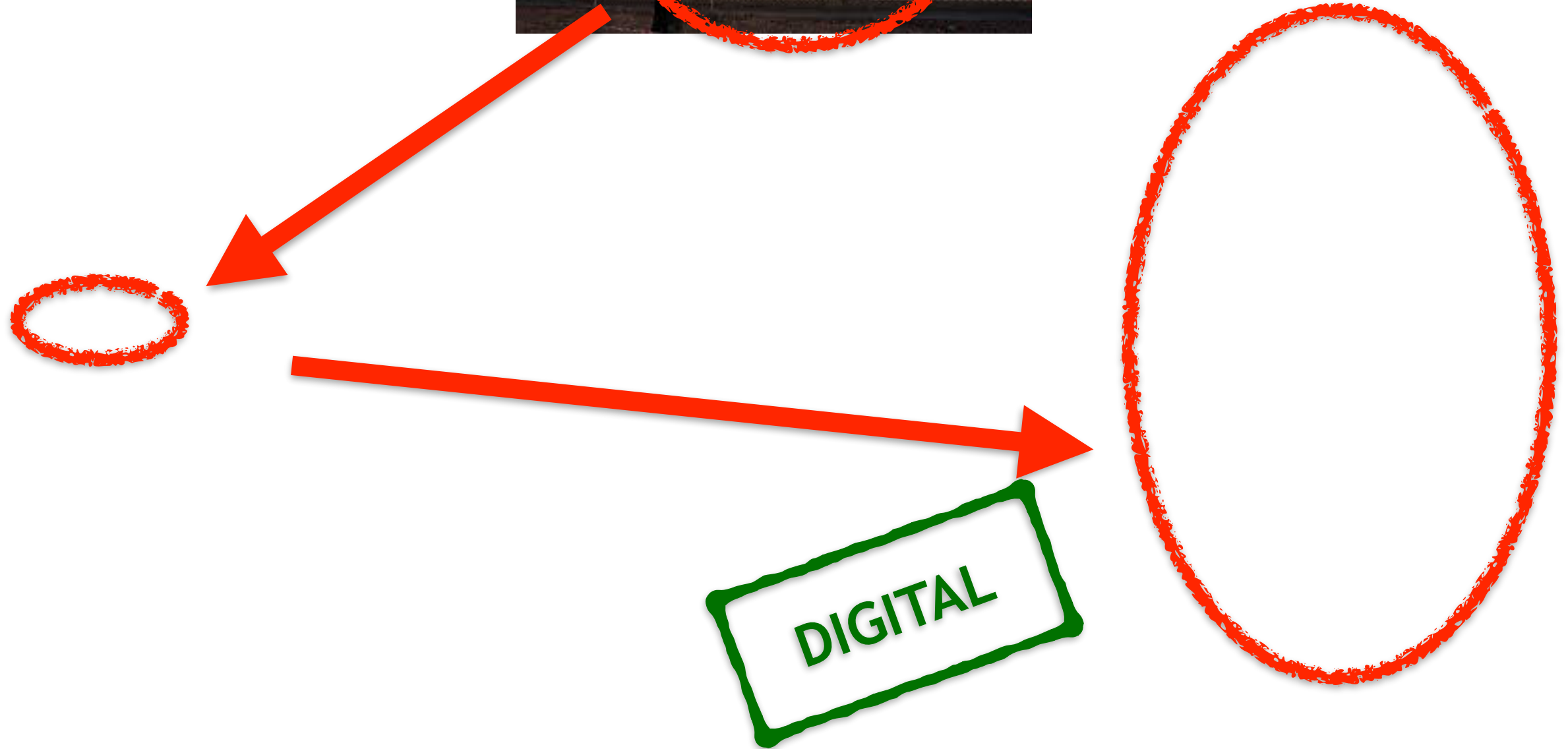
Zalecenia Typy wykresu Dostosowywanie

Rozliczenie G67:G72

UWAGA!
Nowy numer rachunku bankowego.
Prosimy o realizację płatności
na numer podany na fakturze.

DIGITAL

- BUILDING
- **INFORMATION**
- MODELing



-
- BUILDING
 - INFORMATION
 - **MODEL**



1. «type or fashion of something»
 2. «a person posing to the artist for a painting, sculptures, photos»
 3. «a man presenting clothing at fashion shows»
 4. «a person who draws attention with his behavior, clothing»
 5. «typical for a period, place or group and then imitated a way of implementing something»
-

-
- BUILDING
 - INFORMATION
 - MODEL**



1. «type or fashion of something»
 2. «a person posing to the artist for a painting, sculptures, photos»
 3. «a man presenting clothing at fashion shows»
 4. «a person who draws attention with his behavior, clothing»
 5. «typical for a period, place or group and then imitated a way of implementing something»
 6. «**a trial copy of a series of technical products**»
 7. «an object for making foundry molds»
 8. «**item being a copy of something, usually made in smaller sizes**»
-

-
- BUILDING
 - INFORMATION
 - MODEL**

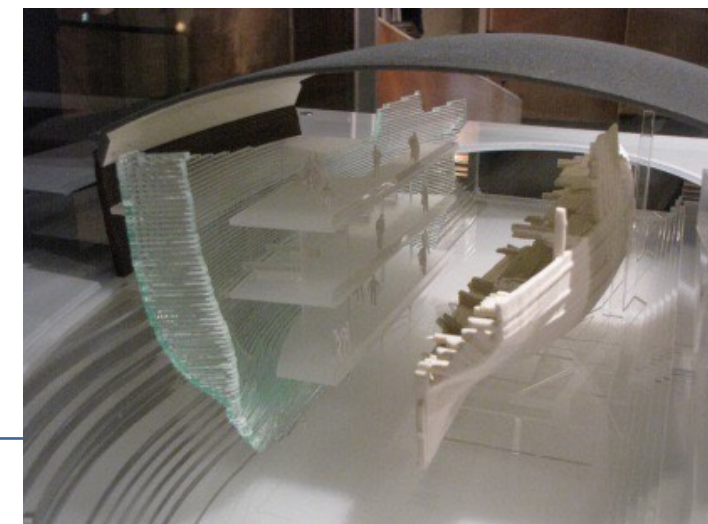


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 6. «a trial copy of a series of technical products»
 7. «an object for making foundry molds»
 8. «item being a copy of something, usually made in smaller sizes»
 9. «**structure, diagram or description showing the operation, construction, features, dependence of a phenomenon or object**»
-

-
- BUILDING
 - INFORMATION
 - MODEL**



1. «type or fashion of something»
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7. «an object for making foundry molds»
8. «item being a copy of something, usually made in smaller sizes»
9. «structure, diagram or description showing the operation, construction, features, dependence of a phenomenon or object»
10. «a pattern according to which something is or is to be made»



-
- BUILDING
 - INFORMATION
 - MODELing

1 + 2 + 3
B I M

B

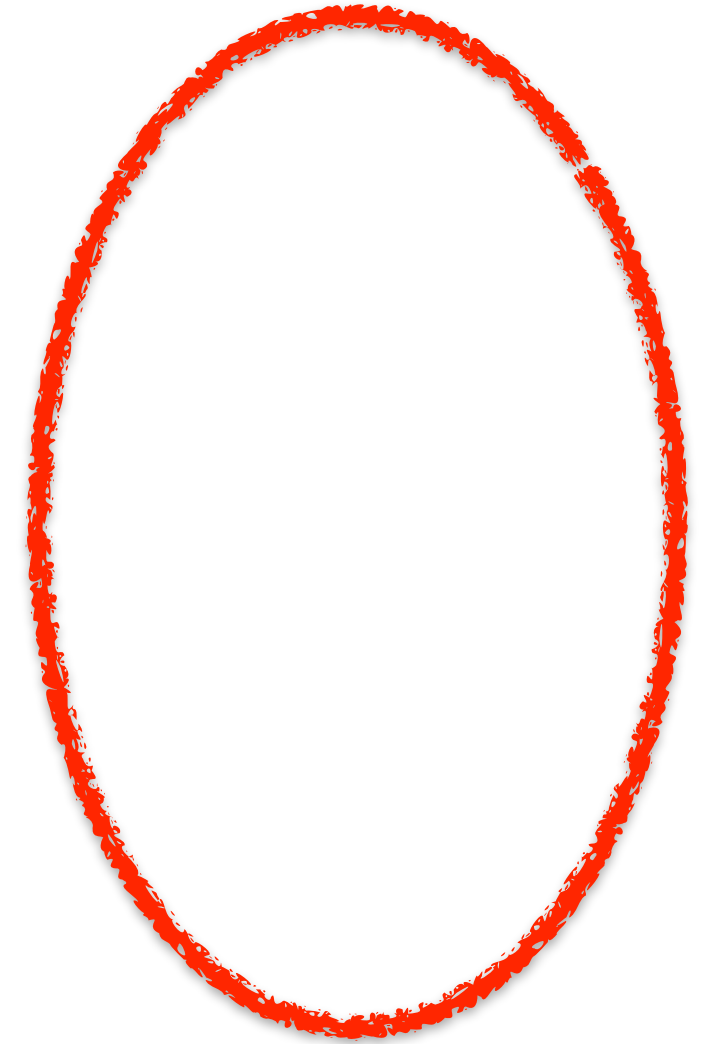
2

I

3

M

-
- BUILDING
 - INFORMATION
 - MODELing

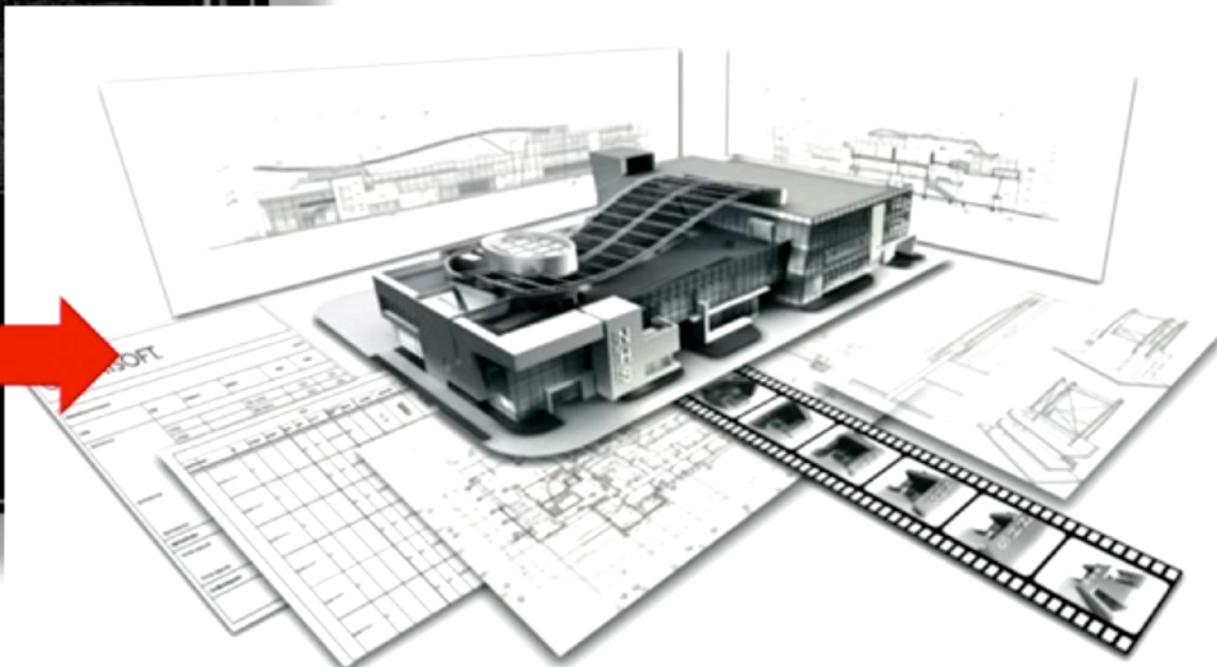




Paper



CAD



BIM

NHS OFFice Complex, paastudio, US

ATTENTION:

PAPER

PEN

LINE

INK

REVISION

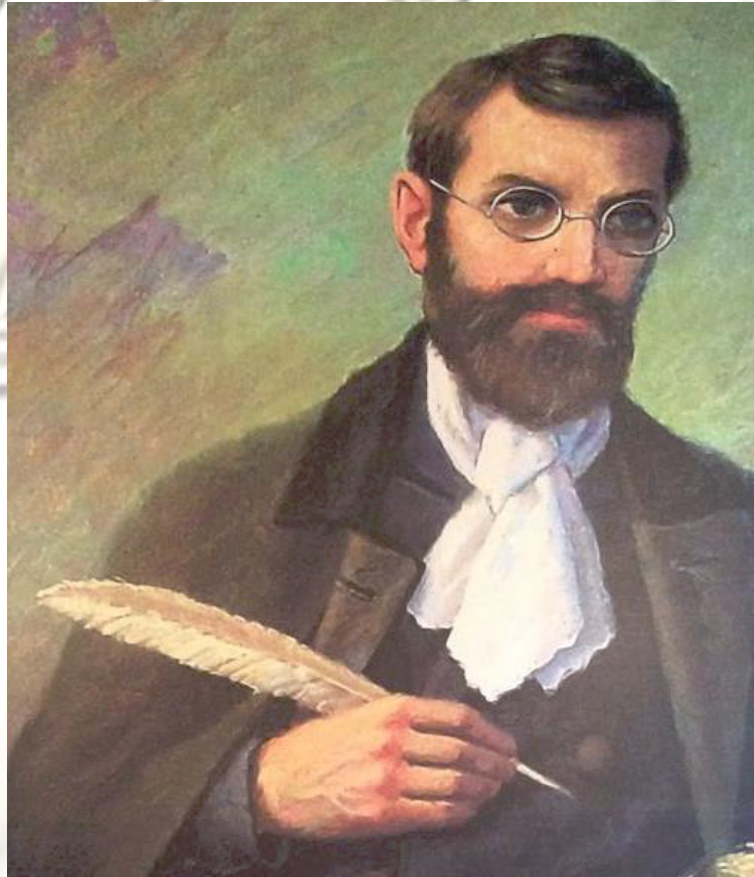
HAND

CAD

CAX

BIM

PAST :



PAPER

PEN

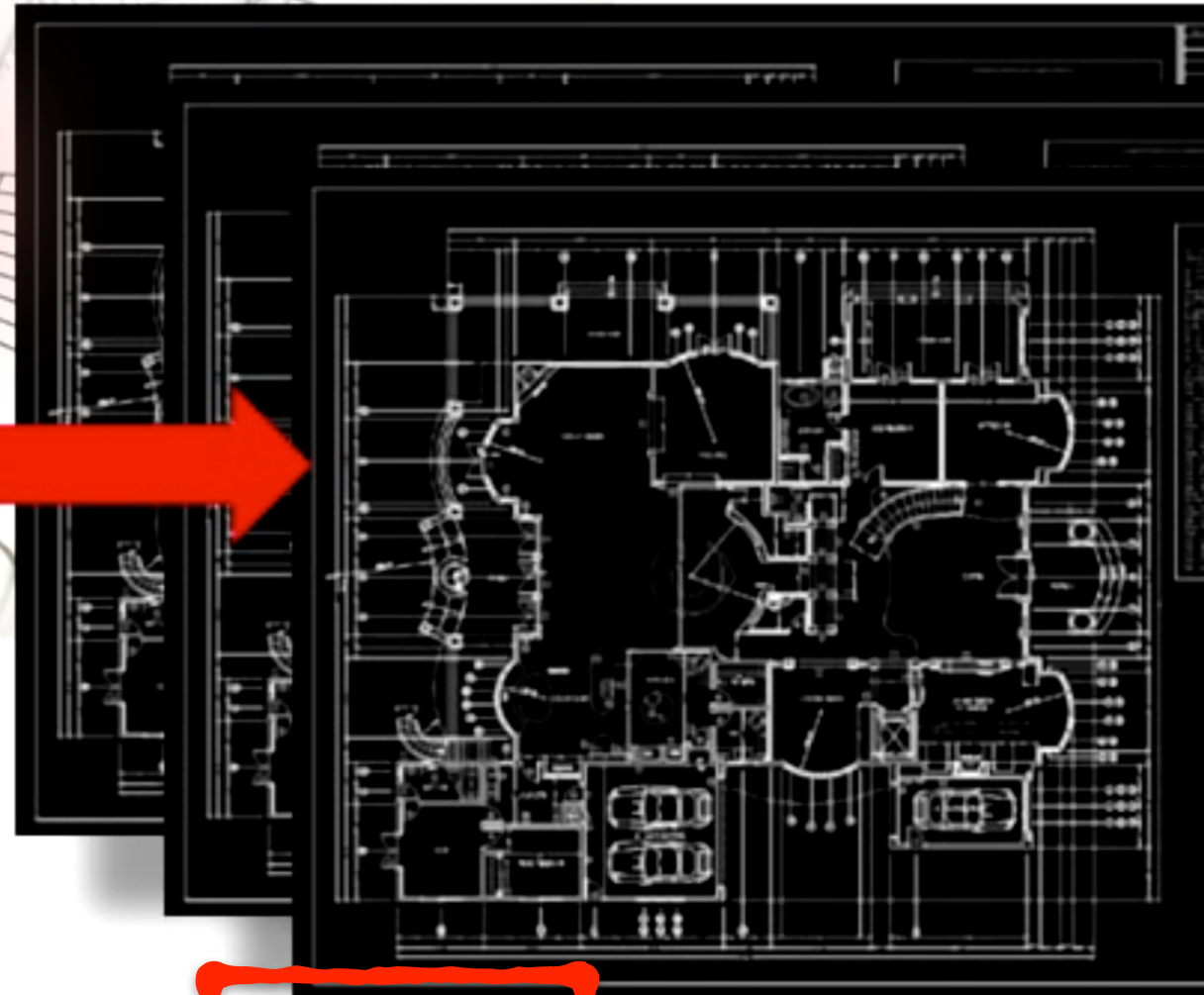
LINE

INK

REVISION

PRESENT :

1989



Paper

CAD

PAPER

PEN

LINE

PLOTTER

2D-CAD

PAPER

PRINT

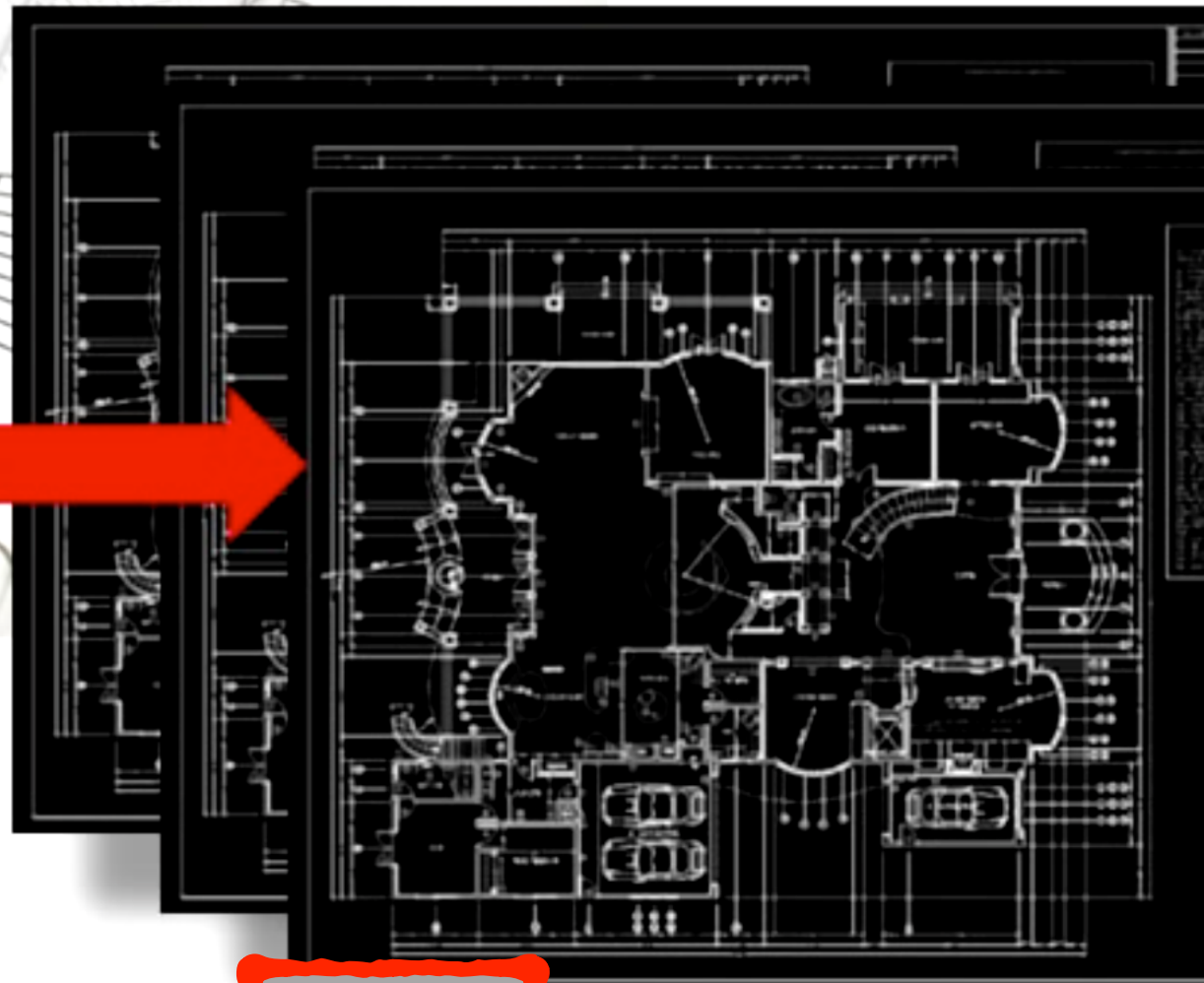
LINE

SCREEN

Robot

3dmax

Pap



CAX

PAPER

PEN

LINE

PLOTTER

2D-CAD

e-PAPER

interNET

~~LINE~~

TABLET

AutoBIM

NEXT :

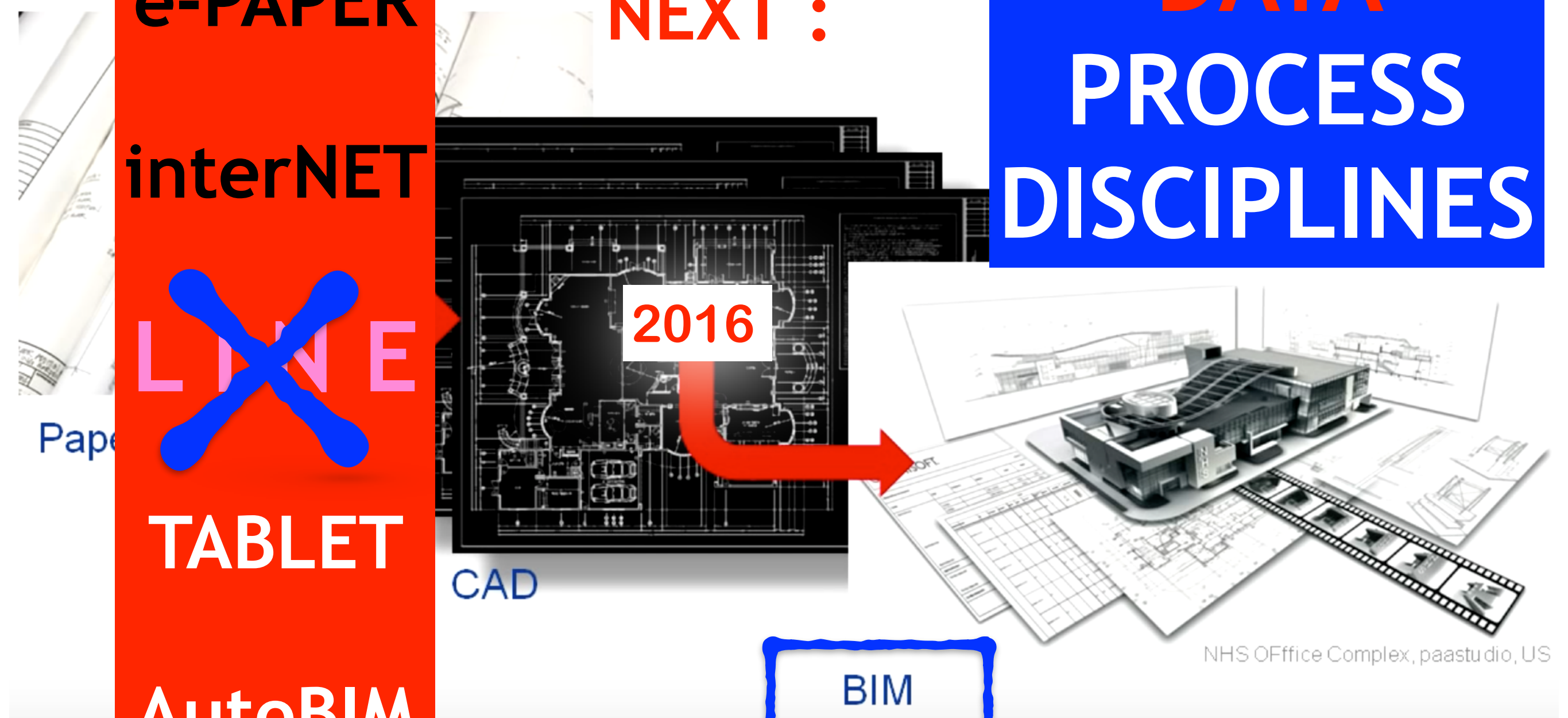
DATA
PROCESS
DISCIPLINES

2016

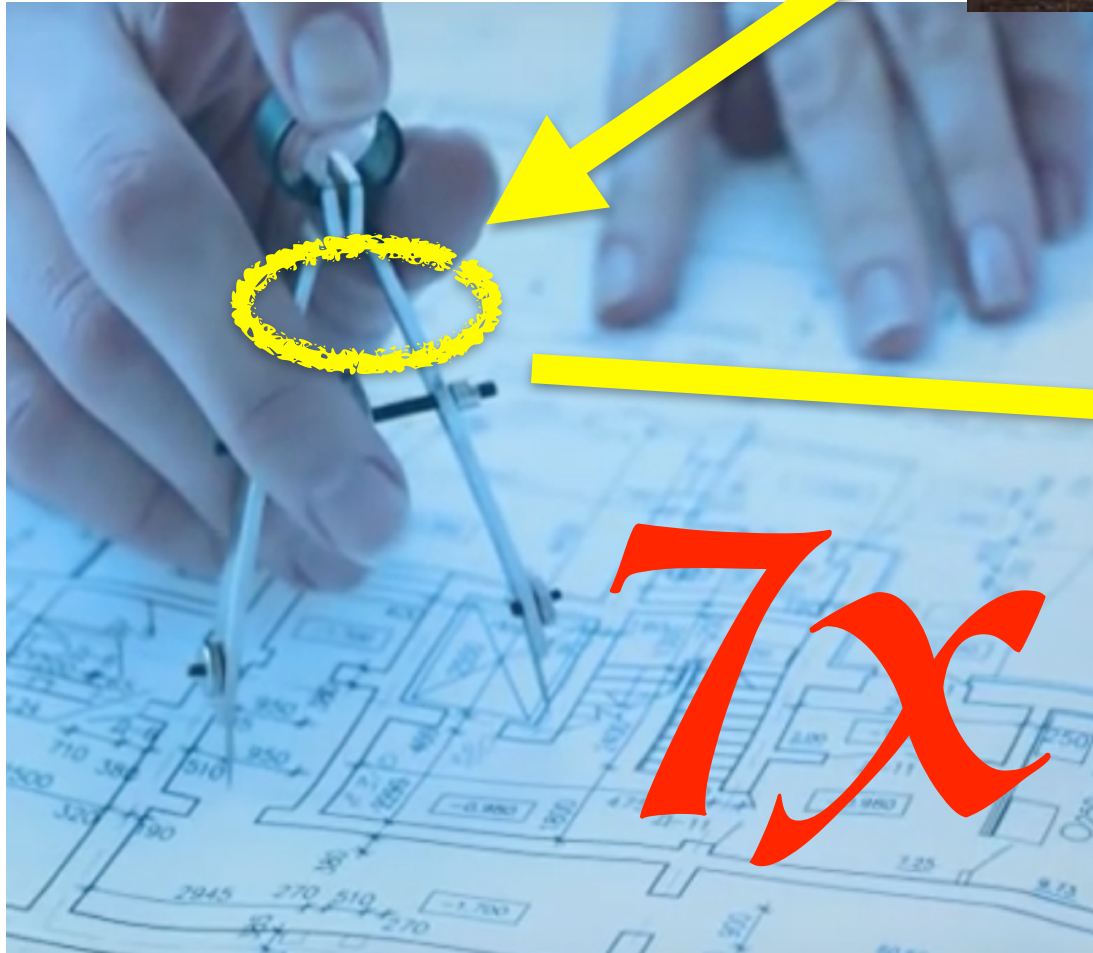
CAD

BIM

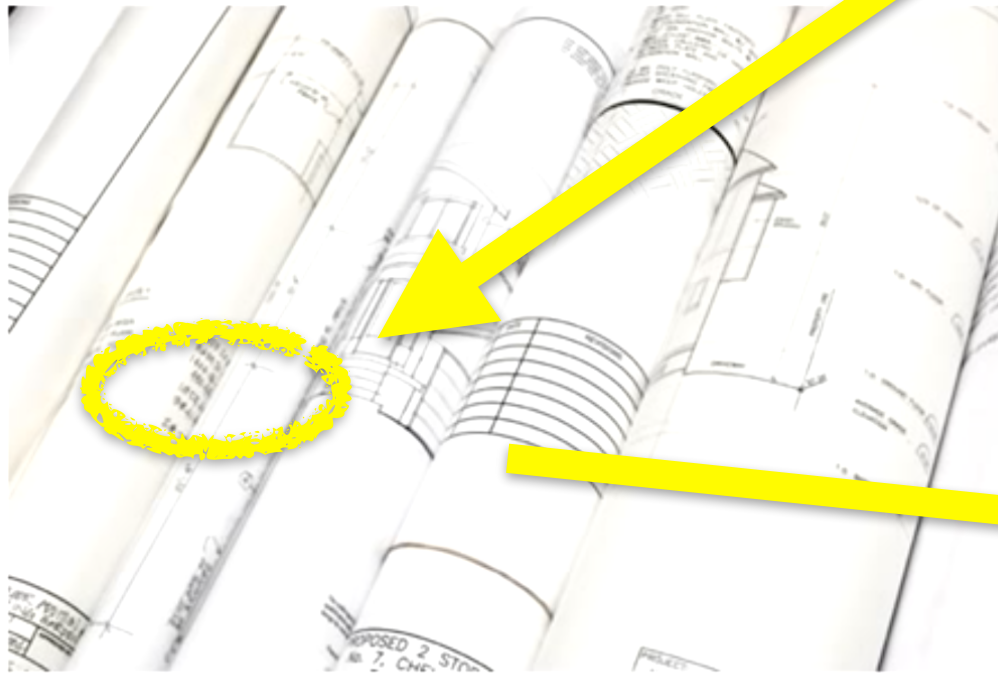
NHS OFFice Complex, paastudio, US



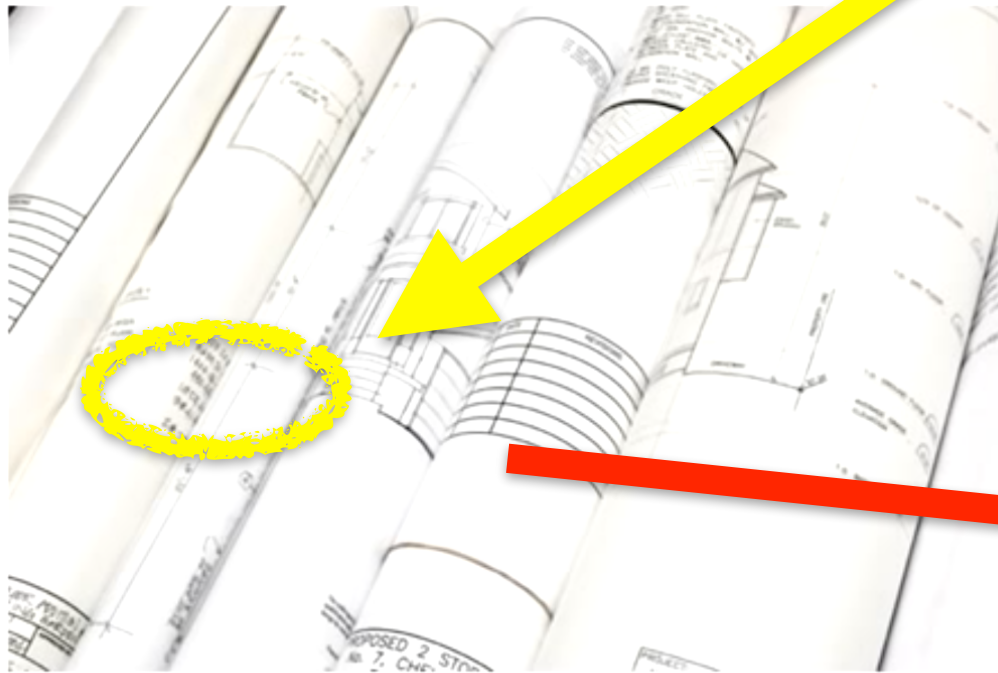
- BUILDING
- INFORMATION
- MODELing



- BUILDING
- INFORMATION
- MODELing

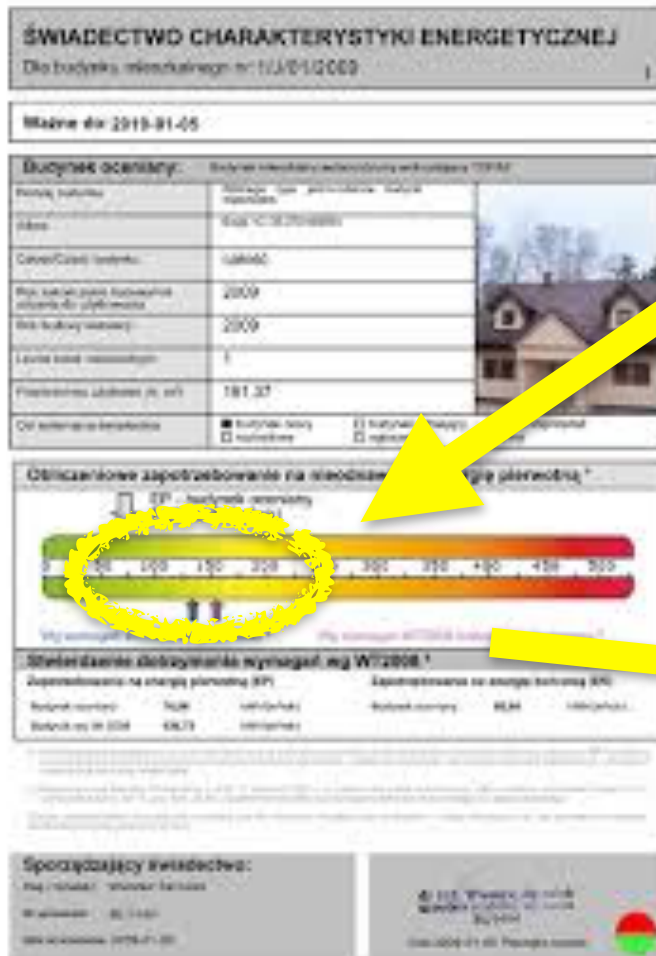


- BUILDING
- INFORMATION
- MODELing



MIND CHANGE

- BUILDING
- INFORMATION
- MODELing



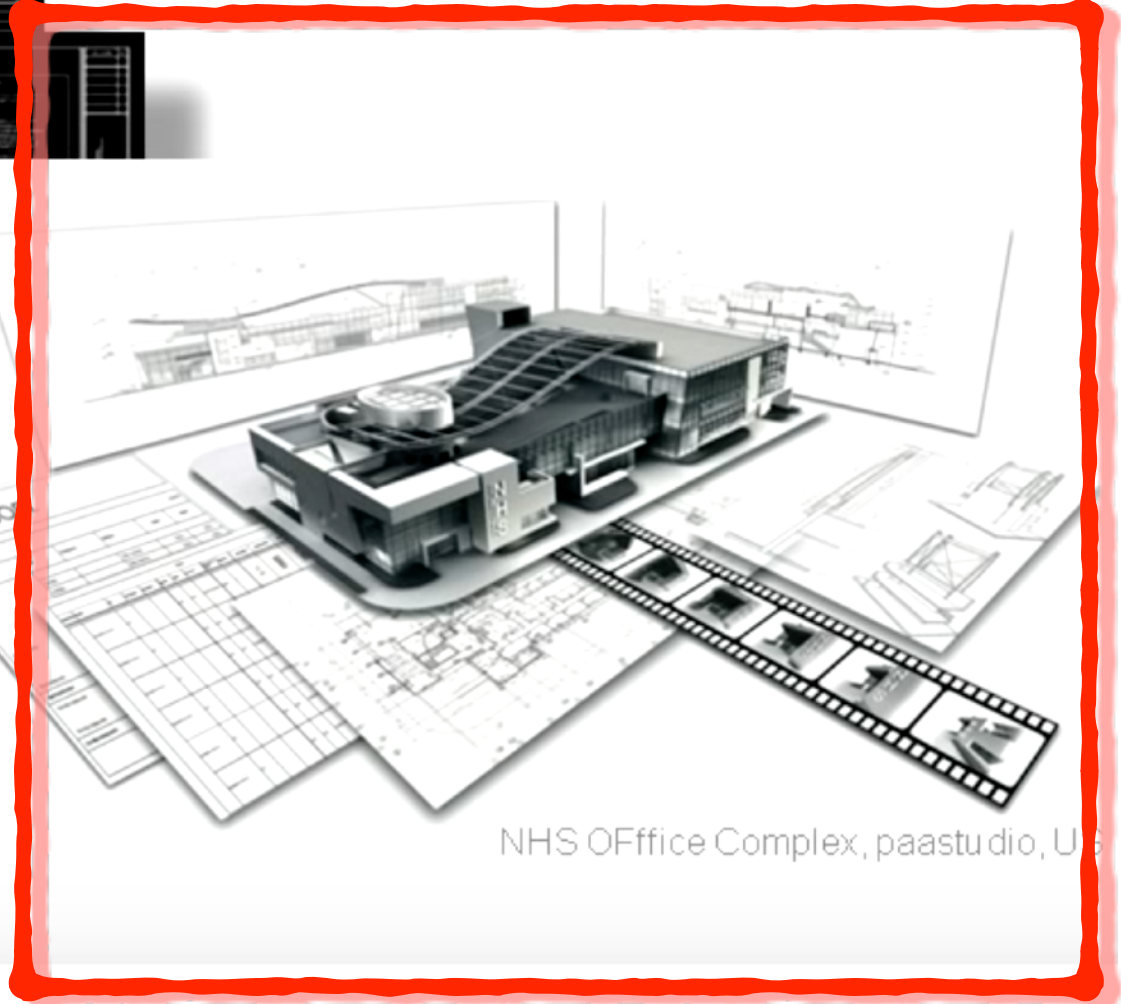
DIGITAL

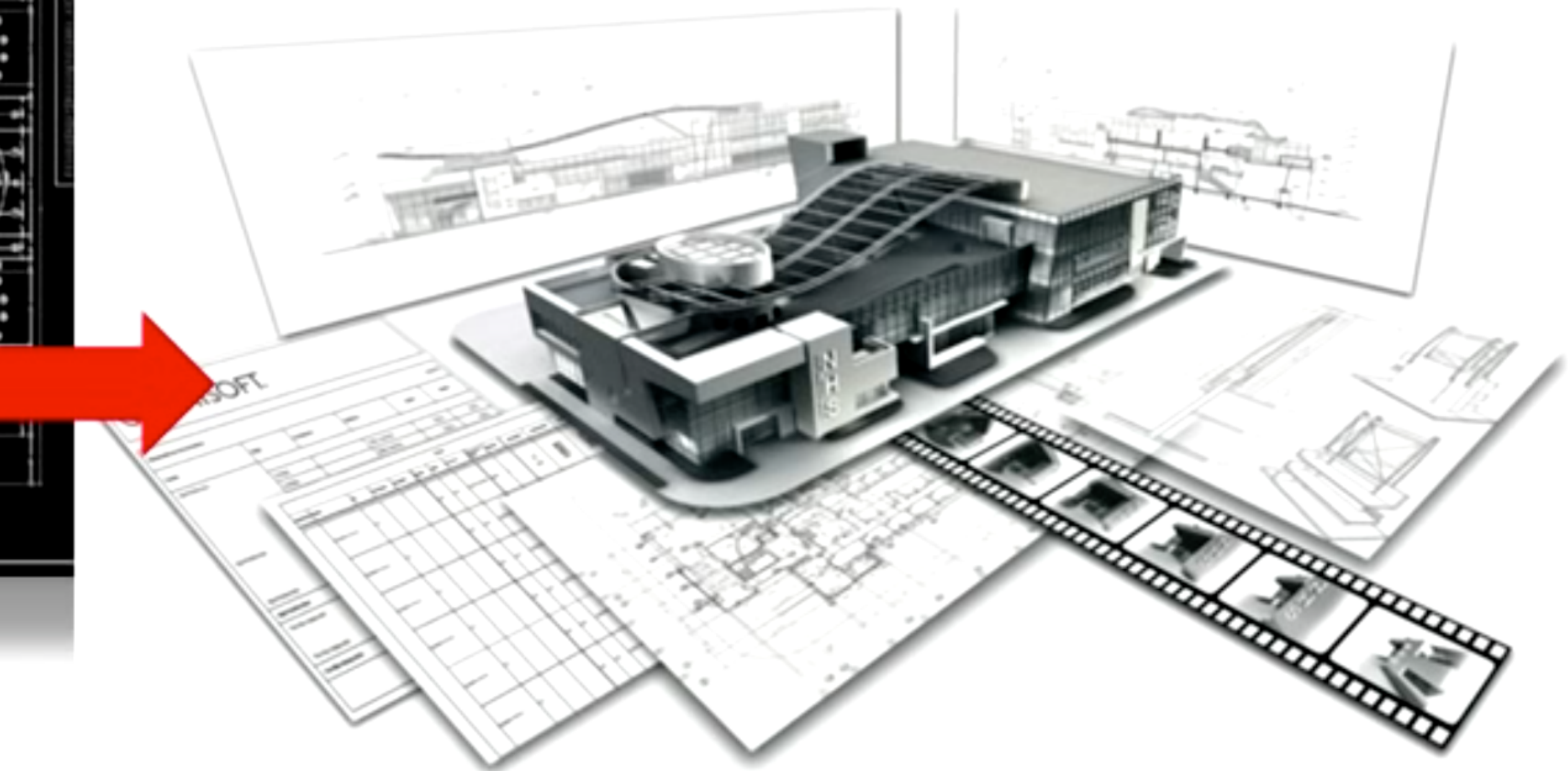
**MODEL
OBJECTS
DATA
PROCESS
DISCIPLINES**

Paper



BIM





NHS Office Complex, paastudio, US

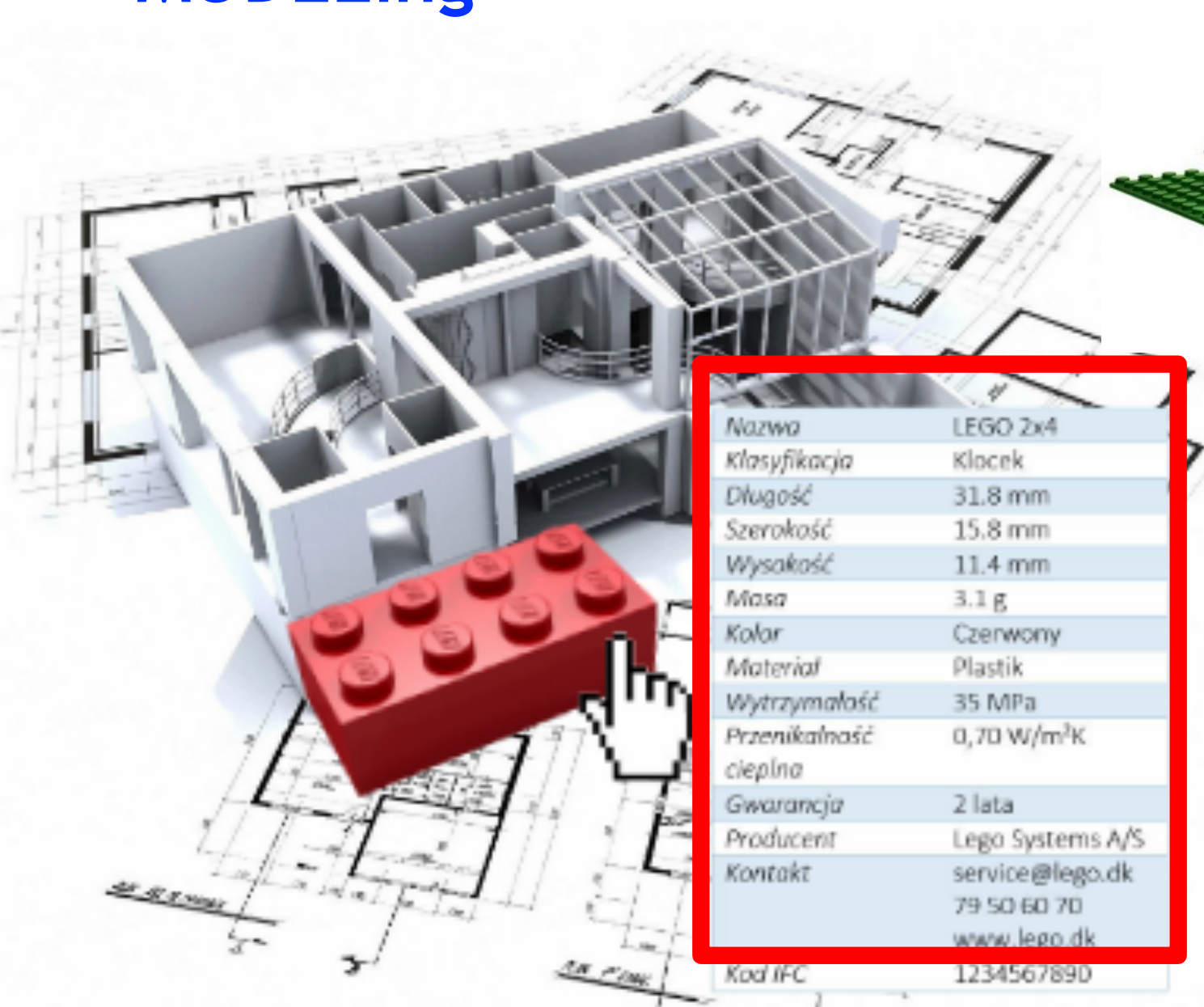
BIM

- BUILDING
- INFORMATION
- MODELing



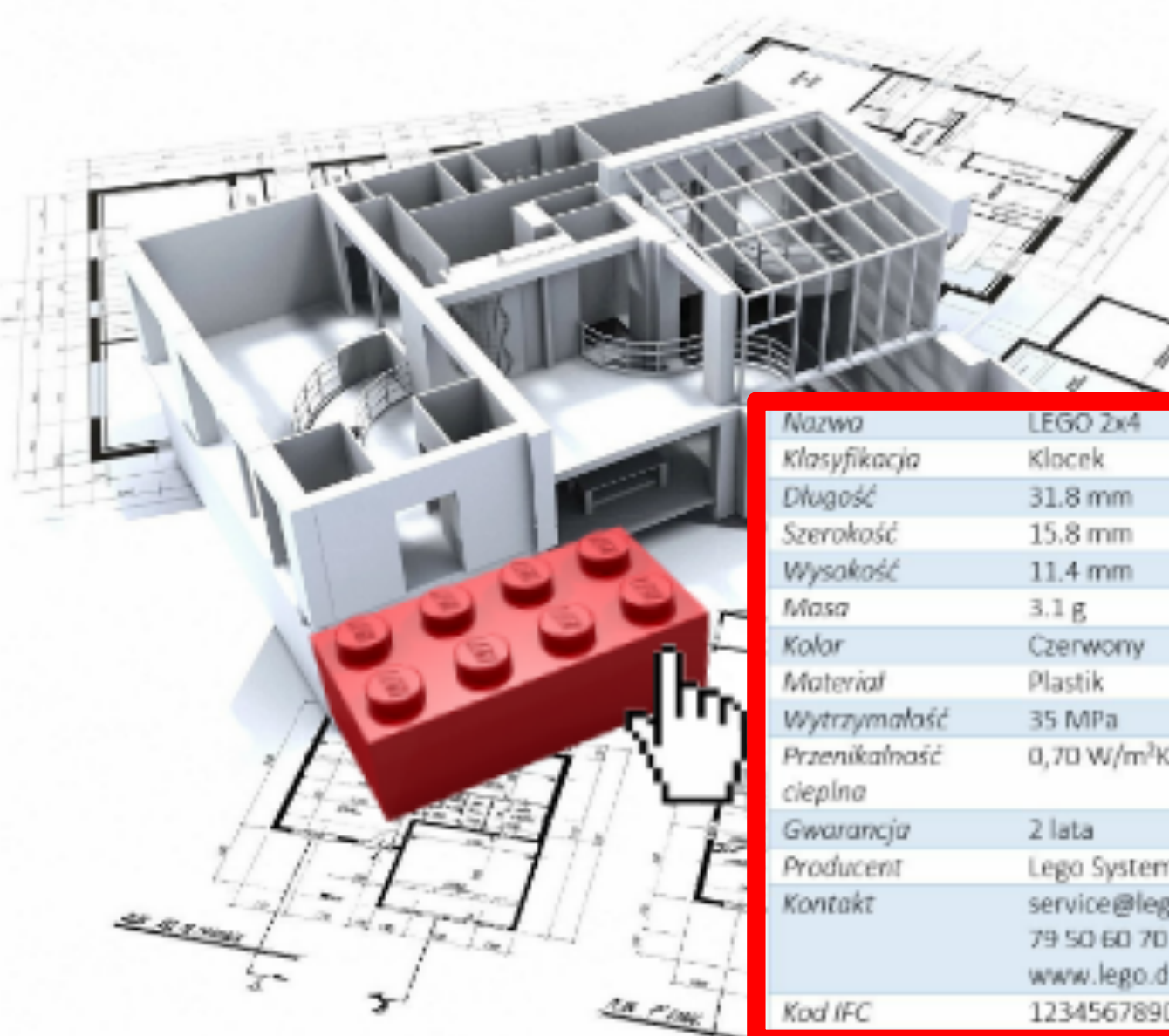
Example:

- brick
- wall
- window
- chair



Nazwa	LEGO 2x4
Klasyfikacja	Kłoczek
Długość	31.8 mm
Szerokość	15.8 mm
Wysokość	11.4 mm
Masa	3.1 g
Kolor	Czerwony
Materiał	Plastik
Wytrzymałość	35 MPa
Przenikalność cieplna	0,70 W/m ² K
Gwarancja	2 lata
Producent	Lego Systems A/S
Kontakt	service@lego.dk 79 50 60 70 www.lego.dk
Kod IFC	1234567890

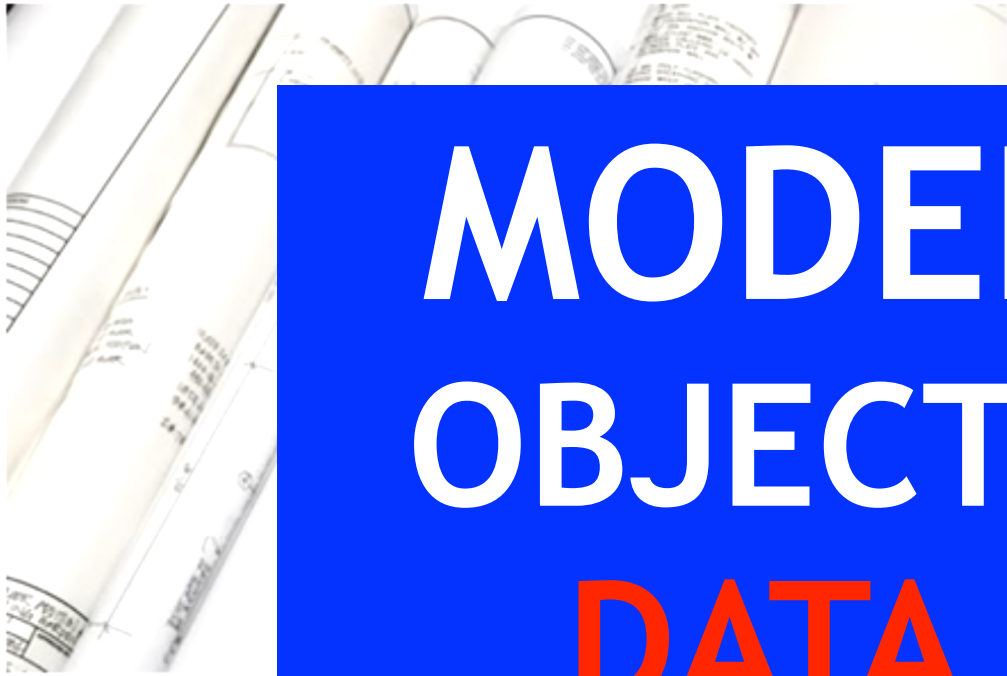
- definicja cyklu życia- należy przez to rozumieć wszelkie możliwe kolejne lub powiązane fazy istnienia przedmiotu dostawy, usługi lub roboty budowlanej, w szczególności: badanie, rozwój, projektowanie przemysłowe, testowanie, produkcję, transport, używanie, naprawę, modernizację, zmianę, utrzymanie przez okres istnienia, logistykę, szkolenie, zużycie, wyburzenie, wycofanie i usuwanie,



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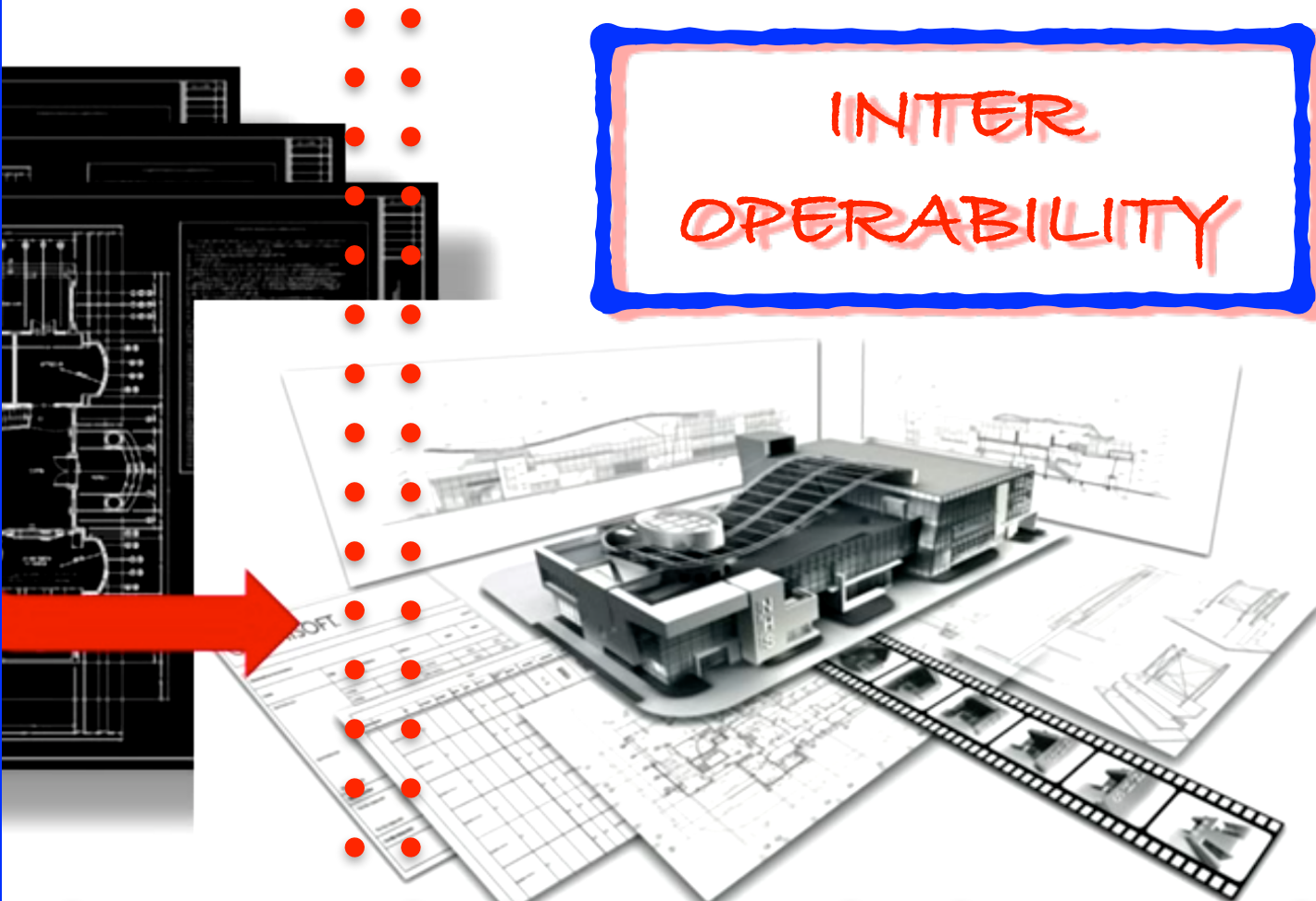
Processes:

- inception
- design
- construction
- operation
- renovation
-



Paper

**MODEL
OBJECTS
DATA
PROCESS
DISCIPLINES**



MIND CHANGE

INTER OPERABILITY

BIM

BAM

BOM

OPEN

ASSEMBLE

OPERATE

NHS Office Complex, paastudio, U.S.

B I M

acronym

**three different,
but related functions**

Official definition presented by
BuildingSMART International
raport 31-01-2012

DEFINICJE BIModel

is the DIGITAL REPRESENTATION of physical and functional characteristics of a facility.

As such it serves as a shared knowledge resource for information about a facility, forming a reliable basis for decisions during its life-cycle from inception onwards.

jest to CYFROWY OPIS fizycznych i funkcjonalnych właściwości budowli, służący jako źródło wiedzy i wszelkich danych o obiekcie, w pełni dostępny dla uczestników procesu inwestycyjnego i stanowiący niezawodną podstawę dla podejmowania decyzji w trakcie cyklu funkcjonowania, od pierwszej koncepcji do rozbiórki budynku.

DEFINICJE BIModeling

is a BUSINESS PROCESS for generating and leveraging building data to design, construct and operate the building during its lifecycle. BIM allows all stakeholders to have access to the same information at the same time through interoperability between technology platforms.

jest to PROCES TWÓRCZY generowania i wykorzystania danych o budowli, jej projektowania, budowy i eksploatacji w trakcie pełnego cyklu funkcjonowania. BIM pozwala, aby wszyscy zainteresowani uczestnicy inwestycji mieli dostęp do tych samych informacji, w tym samym czasie, przez interoperacyjność platform technologicznych.

DEFINICJE BIManagement

is the ORGANIZATION&CONTROL of the business process by utilizing the information in the digital prototype to effect the sharing of information over the entire lifecycle of an asset. The benefits include centralized and visual communication, early exploration of options, sustainability, efficient design, integration of disciplines, site control, as built documentation, etc. - effectively developing an asset lifecycle process and model from conception to final retirement.

DEFINICJE BIManagement

jest to ORGANIZACJA i KONTROLA procesów inwestycyjnych poprzez wykorzystanie parametrów cyfrowego modelu budynku dla dokonywania wymiany informacji o składnikach aktywów w całym cyklu inwestowania. Korzyści wynikają z scentralizowanej wymiany danych, wizualnej komunikacji poprzez obiekty trójwymiarowe, wczesnego rozpoznawania możliwości, zrównoważonego i efektywnego, interdyscyplinarnego i interaktywnego projektowania, kontroli w trakcie i na miejscu budowy, aktualizacji dokumentacji do stanu rzeczywistego (zmiany projektowe, podczas budowy oraz w trakcie eksploatacji), itp. efektywnie rozwijając składniki aktywów i model obiektu w cyklu inwestowania od pierwszej koncepcji do rozbiórki budynku.

