Bucket List for Data Center’s Design

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AGENDA

• Digital Transformation in Society & Business?
• Technology is Triggering Digital Transformation (DT)
• What does Data Centre’s Designer envisioning?
• Flowchart (proposal) for DC’s designing
• Bucket list
Digital Transformation in Society & Business

- Millennials & Gen. “Z” values, immediate response
- Smartphone devices global ubiquity
- Climate change environmental awareness
- CSR responsibility awareness
- Use instead of property (automobile, house, equipment,....)
- User “experience” QUALITY immediate solutions

Among several others
Digital Transformation in Society & Business
• What does it mean for business?

ADAPT OR DIE
MAKE REAL TRANSFORMATION HAPPEN
TECHNOLOGY IS TRIGGERING DIGITAL TRANSFORMATION (DT) In Society & Business

But DT is not a –only– about Technology!
Internet of things

Vehicle, asset, person & pet monitoring & controlling
Agriculture automation
Energy consumption
Security & surveillance
Building management

Embedded Mobile
M2M & wireless sensor network
Everyday things
Smart homes & cities
Telemedicine & healthcare

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So what will happen in Data Centers in 2025+?

What must a Data Center’s Designer foresee?
What must a Data Center’s Designer forsee?

Data Center makes business’ money

DCs’ services must be aligned to organization’s business
What must a Data Center’s Designer foresee?

- Risk
- Resiliency – Availability  (uptime 8760hs per year)
- Agility – Performance  (adaptative to organization’s needs)
- Cost  (CapEx vs. OpEx)
Which are Data Center’s Designer considerations?

• Think Big
  – Best solution
  – Reevaluate technology always
  – Outsource what you can
Which are Data Center’s Designer considerations?

• Start Small
  – Opportunity cost vs. Business expansión
  – Divide spaces
  – Pay as you Grow
Which are Data Center’s Designer considerations?

• Move Fast
  – Understand your customer’s business & needs
  – Assess technology trends
  – Identify core services & gaps
  – Improve each time
Which are Data Center’s Designer considerations?

- Flexibility
- Agility
- Cost
- Scale
## Project’s Life Time Cycle

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<td>(PDC)</td>
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<td>(DB)</td>
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<td>Development Design (Construction Documents)</td>
<td>(DD)</td>
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<tr>
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<td>(DF)</td>
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### Design
1. OPRs Owner’s Project Requirements
2. BoD Bases of Design

### Basic Design Book
1. Submittals
2. Approved to purchase
3. Approved to Construct

### Construction Documents (Proyecto Ejecutivo)
1. Supervision
2. Cross-functional
3. Laser 3D docs.

### Supplier’s Information Book
1. BID development process
2. Contracts’ terms
3. Reception-test-approval

### Project’s Construction LOG
1. Pre-functional (per system)
2. Functional (full Bldg.)

### Testing, Adjusting Balancing Book
1. Pre-functional (per system)
2. Functional (full Bldg.)

### Building Operation Manual Maintenance Training (Bldg as system)

### Construction Documents Refurbish, Reconstruction

### Construction Documents Final Disposal

### Commissioning services
(Checking, Reporting) to OWNER

### Project’s Management CONSULTING services
(Planning & Programming, WBS, Control: finances, monitoring, MACs, Quality)
Flowchart for DC’s Design Stage

Common incumbents for DC’s Project
- Owner
- Project management
- Commissioning Agent
- Consultants (legal, financial,
- AHJ’s
- Designing Team (specialized designers)
- General Contractor & Subcontractors
- Manufactures & Vendors
Flowchart for DC's Design Stage
Conceptual Design Stage

1. CONCEPTUAL (Pre - DESIGN) STAGE
   - DESIGN TEAM (DT) INTEGRATION

2. PROJECT OWNER's REQUIREMENTS (OPRs), all information available revision (DT & PM & CxA)
   - Feasibility studies & initial Design planning (systems definition)

3. Owner accepts
   - DT & PM & CxA INFORMATION REVISION
   - BASES OF DESIGN development Per system

4. BoD Vs OPRs
   - DEVELOPMENT CONCEPTUAL DESIGN INFORMATION

   YES
   NO
Basic Design Stage

Design Team (DT) develops Bases of Design (BoD) Document per system

PM & Owner Check if BoD fulfillment OPRs

OPRs & BoD to update

DT states & evaluate solution alternatives per systems

DT define: Operational sequences, general specs per system in compliance with OPRs

DT set equipments, materials, tools training for each design alternative

DT set pre-functional tests and initial Check lists per alternative

DT calculate the basic cost per solution alternative

PM & CxA Check if BoD fulfill OPRs

NO GO

GO

Basic Design Document Information Update
Flowchart for DC’s Design Stage

Development Design Stage

C

Development Design Stage

DT elaborates per system: narrative, operational sequences, calculation, chart, block & single line diagrams, models (2D & 3D)

Test models (2D,3D) like CFD, confirm best solution alternative

DT set technical submittals per system to fulfill all OPRs & BoD

DT, PM & CxA identify longer delivery time (equipments/components) Per system

PM & CxA approval

YES

Bill Of Materials & equipments Update

NO

DT develops construction/installation work breakdown structure (WBS), defines schedule of activities

DT Confirms KPIs, set pre-functional and functional testing procedures & check lists

DT defines training and SLAs requirements

DT quote the integral & detailed project’s costs to get the initial budget

All digital & physical information is set in the deliverable documentation (Construction Documents)

YES

PM & CxA Approval

Development Design Information deliverable (Construction Documents) Update

NO
Flowchart for DC’s project
Procurement & Construction Stage

1. **Administative**: Contracts, performance bond, insurance, Procurement & Construction
2. **Logsitics Follow up (importation, receiving equipments, manouvers, storage,...)**
3. **Site’s Industrial Security & Safety (curse, risk analysis,...)**
4. **DC’s Construction plan & programm**
5. **Spaces, pathways Construction/ installation**
6. **Cabling & connecting Hdw Installation**
7. **Components & equipment deployment per System**
8. **Inspection Start Up Cx**
9. **Prefunctional Testing**
10. **Delivery – Reception - Acceptance (DRA)**

- **Solving Issues**
- **GO**
- **NO GO**

- **Materials & equipments Reception Storage & Administration (materials, storage, inventory, testing)**
- **Functional Testing**
- **ICT equipment deployment Building Operational Manual**
- **Delivery – Reception - Acceptance (DRA)**

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Flowchart for DC’s project
Hand over & Occupancy Stage

1. Final testing results revision by PM, CxA, DT, Contractors & Sub
2. Final Testing U/Cs as a System (Owner, PM, DT CoA, Contractor & Sub)
3. Event Log Update
4. Warranties delivery
5. PM, CxA, DT, Contractors & Sub issues solutions
6. Lessons Learned Workshop
7. ACCEPTANCE D-R-A process Final stage
8. Project Closing
General Designer’s bucket list

• OWNER’s Project Requirements
  – Business alignment (industry, market,..)
  – DC’s Type (Colo-Host-Cloud-Enterprise-Edge; public, private,..)
  – Site location (Risk Analysis -climate, natural/human risks-)
  – Legal (local/state’s Laws, Permits, national Standards)
  – Operational (3870hs?, business impact, availability) see BICSI 002
  – Day ONE (in operation)
General Designer’s bucket list

• **Risk**
  – Risk assessment
  – Business applications priority
  – Industry / business Compliance (HIPAA, SOX, PCI…)

• **Business Impact**
  – Local, Regional, National, Global

• **Availability**
  – Uptime 8760hs per year,
  – Downtime – planned / unplanned –
General Designer’s bucket list

• Designing team members
  – Experience
  – Updated knowledge
  – Credentials (RCDD, DCDC, ATD,....)

• Resiliency – Availability
  – Uptime 8760hs per year,
  – Downtime – planned / unplanned-

• Agility – Performance
General Designer’s bucket list

- Decide which Standard to follow
  + International: ISO/TS 22237 Data Centers  [https://www.iso.org/]
    ISO/IEC 11801-5 Generic cabling for customer premises — Part 5: Data centres
  + Japón: JDDC FS  [https://www.jdcc.or.jp]
  + Singapur: SS 564 Green Data Centres  [https://www.nccs.gov.sg/public-consultation/overview]
  + México: NMX - J - C - I - 489 High Performance Data Centres  [https://www.onncce.org.mx]
  + USA
    *ANSI/BICSI 002 Data Center Design and Implementation Best Practices  [https://www.bicsi.org/standards]
    *ANSI/ASHRAE Standard 90.4-2016, Energy Standard for Data Centers
    *NFPA 75 Standard for the Fire Protection of Information Technology Equipment
General Designer’s bucket list

• Decide Classification –better than Certification- programs

WARNING: “certification” could be a legal concept in different countries

+ (GLOBAL) CEEDA (Data Center Dynamics/BCS)
+ (Europe) BREEAM
+ (Australia) NABER
+ (Japan) CASBEE
+ (México) NMX (ANCE-ONNCE_NYCE)
+ (USA) ENERGY STAR Score for Data Centers
+ (USA) LEED (USGBC)
+ (USA) TIA (EPI)
+ (USA) Uptime Institute (UTI)
General Designer’s bucket list

- **Time**
  - Design Stages
    - Conceptual – Basic – Development
    - Modelling (CFD, BIM,...)
  - Construction
    - Equipment longest period delivery
    - Building facility
    - Testing (pre-functional & functional)
General Designer’s bucket list

- Designing
  - Commissioning (Cx) & Project Management
    - Collaboration & coordination
    - Conceptual – Basic – Development
    - RFI & Submittals
  - Technology
    - Revision & Evaluation
    - Calculation, Specifications
    - Choosing best solution alternatives
    - Documentation
General Designer’s bucket list

• Digital Platform
  ❖ Modelling (2D & 3D)
    • CFD, BIM
    • Conceptual – Basic – Development
    • Submittals approval
• Construction
  ❖ Meetings on site
  ❖ RFIs & Submittals (revisión & answering)
  ❖ MACs (evaluation, calculation, definitions)
  ❖ Witness Testing procedures (pre-functional & functional)
General Designer’s bucket list

• Hand Over & Occupancy Stage
  ❖ Delivery – Reception – Acceptance
    ➢ Last revisión AS BUILT documentation (as required by PM & CxA)
    ➢ Sign Acceptance document (if is included in Design’s services SOW)
GRACIAS!

QUESTIONS?