

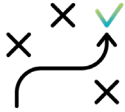
Digitizing EPC Completions and Handover Process

How-to Implementation Guide, Including Workflows, Timeline and ROI



Why Digital Completions Is Necessary

Why We Need Best Practices | Project Completions Performance Trends



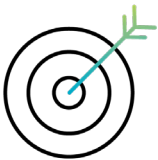
Increasing Complexity

48 megaprojects showed poor execution was responsible for cost and time overruns in 73% of cases (McKinsey).



Lack of Reliable and Validated Data

Data is validated on an average of 11 times during a project due to ongoing data integrity; this creates inefficiencies.



Opportunity During Transition

A majority of (67%) petroleum companies successfully navigated from project delivery to operating refinery with an Operational Readiness program.

Why We Need Best Practices | Digital Completions Financial Impact



Reduce Unrealized Revenue

Ready For Operations (RFO) effort can be reduced 10% to 20% with faster, smoother and more visible completions processes leading to quicker time to first production.



Less Administrative Cost

Eliminate the chance for costly human error through brute force data translation and take printer maintenance cost out of the business. 98% dossier compilation productivity.

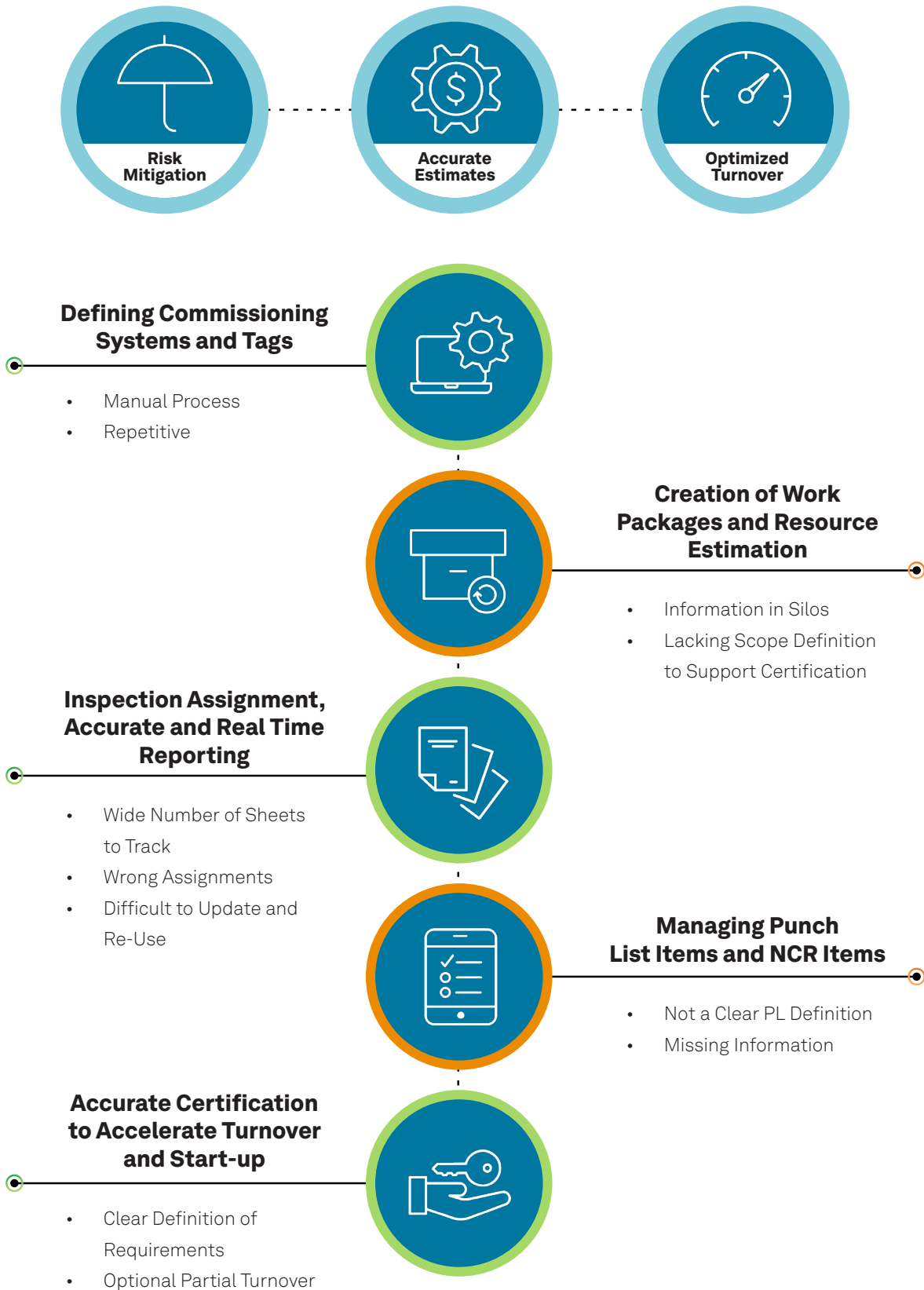


Increase Productivity

Decrease wheel spin 30% and boost time-on-tools with the right information at the right time. Create standardized, repeatable deployment processes to reduce setup costs up to 70%.

What Challenges Completions Faces

Why We Need Best Practices | Examples of Completion Challenges



How Digital Completions Works

Example of Digital At Work | Automatic Check Sheet Assignment



Mechanical (Static)

- ✓ Foundation release
- ✓ Installation check
- ✓ Equipment
- ✓ Alignment
- ✓ Grouted
- ✓ Internals complete
- ✓ Box-up / Final closure



Mechanical (Static)

- ✓ Base plate align
- ✓ Pre-align (pre-grout)
- ✓ Grouted
- ✓ Final Alignment



Electrical (Equipment)

- ✓ Equipment
- ✓ Inspection
- ✓ Installed
- ✓ Cable terminated
- ✓ Solo motor run



Electrical (Cable)

- ✓ Cable pulled
- ✓ Cable Megger tested
- ✓ Cable termination
- ✓ HV/LV cable test
- ✓ Insulation test



Instrument

- ✓ Pre-calibration
- ✓ Instrument
- ✓ Installed
- ✓ Terminated
- ✓ Pre-loop check
- ✓ Loop check



Instrument (Cable)

- ✓ Cable pulled
- ✓ Cable megger tested
- ✓ Cable termination
- ✓ Insulation test



Piping

- ✓ Pre-test line check
- ✓ Pressure test (hydro etc.)
- ✓ Flushed
- ✓ Blowing / Drying
- ✓ Reinstatement
- ✓ Chemical cleaned
- ✓ Flange torquing

Asset : 77-PI-0010
Discipline : Instrumentation
Type : Pressure Indicator (PI)
Stage : Commissioning
System : LC

Automatic assignment based on business rules

Business rules based on asset type, phase, etc.

Tasks are created automatically, and it's possible to set recurrence for preservation activities, maintenance jobs, etc.

Digitized or Paper execution

Case Study

CSG Upstream Project, Australia (Mega Project)

Project Information	Challenges
<ul style="list-style-type: none">• AUD \$25 to \$30 Billion• Developing CSG fields in Surat and Bowen Basins in Queensland• Construction of:<ul style="list-style-type: none">- 530 km Pipeline- 2 Water Treatment Facilities (WTFs)- 7 Gas Processing Facilities (GPFs) - total of 15 trains- 1100 Well Sites	<ul style="list-style-type: none">• Average of 15 employees for printing and compiling check sheets for technicians, scanning and uploading complete check sheets to database• Generally 5 hours to manually compile an average commissioning dossier (over 180 pages)

Benefits After Digitizing Completions & Commissioning

- Average savings of about 45% to 50% on resources and time
- Huge reduction in paper printing, printer ink cartridges and printer maintenance by implementing digital execution
- Reduction in human error
- Reduction in time and resources for Handover / Turnover MDR pack compilation
- Live progress updates
- Reduce re-work
- Trend analysis
- Information accessible and available anywhere



Systems Completion Maturity Matrix

Where is Your Business?

Systems Completion Maturity Matrix

SC = Systems Completion	Heroic Effort (Level 1)	Organize (Level 2)	Control (Level 3)	Optimize (Level 4)	Best Practices (Level 5)
Management Approach	Hands-off approach to what checks are used in Mechanical Completions 'The EPC knows best ...'	Project and Operational Team (O, M & R) involvement in defining check list content	3D model/Dashboard used to track status Requirement to use 4D information to optimize Completion progress	KPIs tracked to improve processes and reduce the overall schedule in a sustainable manner	Project Personnel transition into Operations for that facility Using AIM content from day one
Work Process	Little or no S.C. methodology in place Leaving it up to the EPC...	Client defines the check documentation Data/Docs reused for Commissioning	Automated creation of check documentation and work packages P6 actively used	Mobile used to optimize the overall work process	Combined Engineering and Operations content used in the decision making process
Technology	No deliverables defined, client leaves it to the EPC to provide the paper Mechanical Completions dossier	Data centric design tools used to define data and work packages in support of S.C.	3D model and P&IDs used for status visualization P6 integration to optimize sequencing	Mobile access to S.C. support information	Engineering and Operations content focused on AIM-driven S.C.s
Data and Documents	Paper deliverables (Dump truck approach/ Wall of Books) Paper Mechanical Completions dossier	Requirement to capture all S.C. documentation electronically	All information in a AIM system and available 3 months before first Mechanical completion event	Use of 'Briefcase' to package up support information All documents available via mobile	Data flows become more important than Documents
Technical Support	Little or no support team in place Everything left to EPC	Project I.M. team captures data/ content on Project to support System Completions	A Central Information Management Team manages data/ content for S.C.	KPIs actively tracked to improve processes and reduce the overall schedule	S.C. work processes embedded in the culture Can't function without it
Culture	Holding onto old work process, not taking advantage of newer technology	Embracing newer technology but still thinking in a document-centric world	Utilizing AIM data/ content for additional work process	Leveraging KPIs to improve what and when to capture AIM data/content	AIM embedded in the culture Can't function without AIM content

Data and Document Maturity Matrix

Where is Your Business?

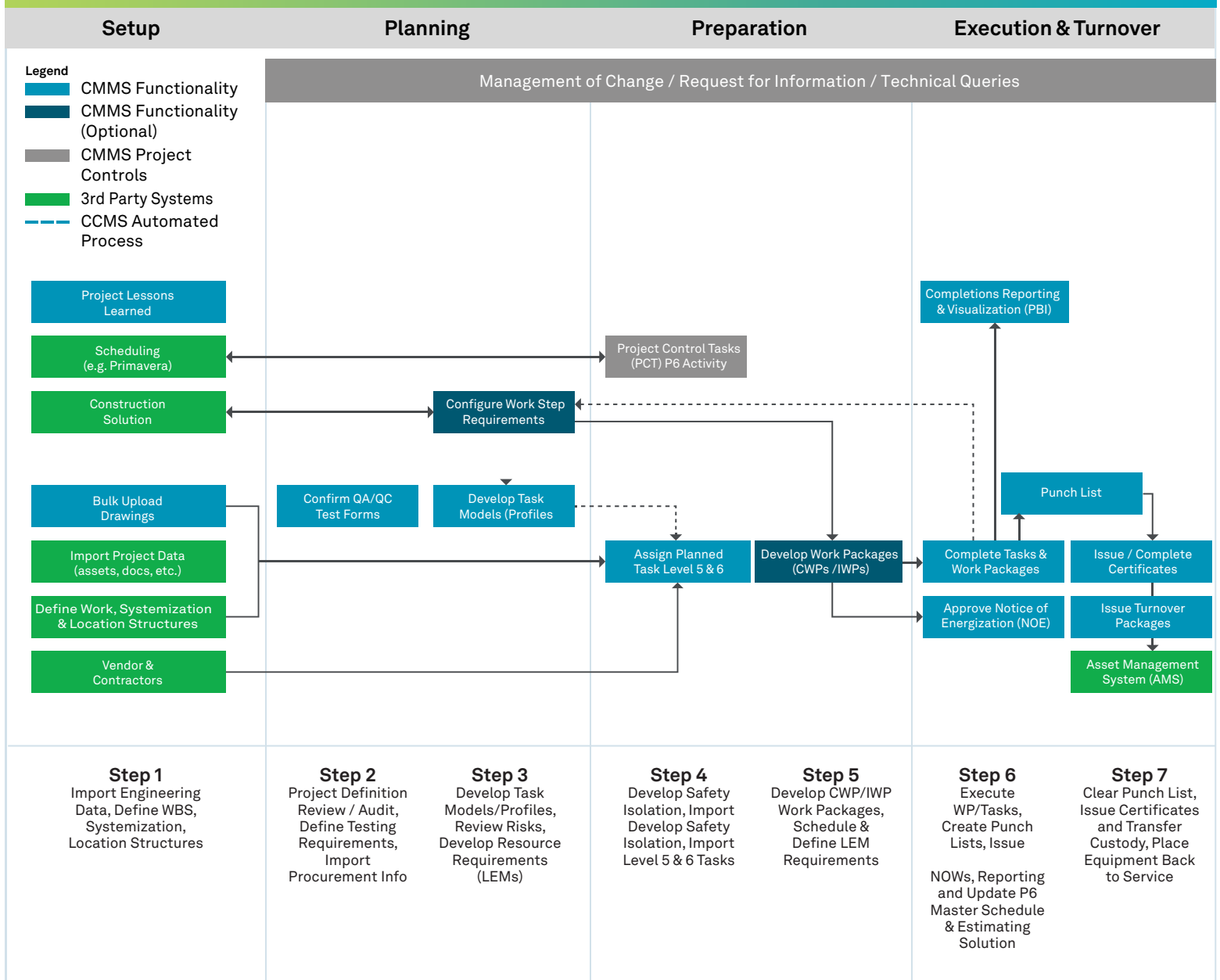
Data and Document Handover for Operational Readiness

AIM = Asset Information Management	Heroic Effort (Level 1)	Organize (Level 2)	Control (Level 3)	Optimize (Level 4)	Best Practices (Level 5)
Management Approach	Hands-off approach to what data/content is Handed Over by the EPC or Supplier	Operational Team (O, M & R) involvement in Handover requirements	Requirement to capture all AIM data/content in an organized and auditable format	KPIs tracked to improve processes and mitigate risks and exposure	Understands "Total cost of ownership" and "Cost of Un-Reliability" Design reuse a requirement
Work Process	Little or no AIM methodology in place, lack of mature work processes	Gathering and cataloging AIM Information for use by Projects & Operations	AIM Strategy in place including MoC and audit trail	Actively tracking KPIs, looking to improve processes and reduce costs	Combined Engineering and Operations content used in the decision making process
Technology	No deliverables defined, client leaves it to the EPC or Supplier provide the handover	Data/content Handover Specification defines AIM requirements	AIM and Data Centric Design Tools used to manage and maintain Content	Data reused to load Operational systems MoC keeps the Ops systems updated	Engineering and Operations content focused on AIM Operational systems up-to-date
Data and Documents	Paper/CAD deliverables (Dump truck approach/ Wall of Books)	Data-centric tools defined for project execution including form, format, etc.	AIM system in place with QA/QC, MoC, PSM with regulatory audit trail	Data/content used to enhance Engineering and Operational decision support	Data flows become more important than Documents
Technical Support	Little or no support team in place. Users survive via tribal Knowledge	I.M. team captures data/content on the Project to support the AIM Strategy	A Central Information Management Team manages data/content for AIM MoC in place	KPIs and demonstrable audit trail Support Team shares data with all Operational Systems	Center of Excellence sharing developed best practices across all Business Units
Culture	Holding onto old work process, not taking advantage of newer technology	Embracing newer technology but still thinking in a document-centric world	Utilizing AIM data/content for additional work process	Leveraging KPIs to improve what and when to capture AIM data/content	AIM embedded in the culture Can't function without AIM content

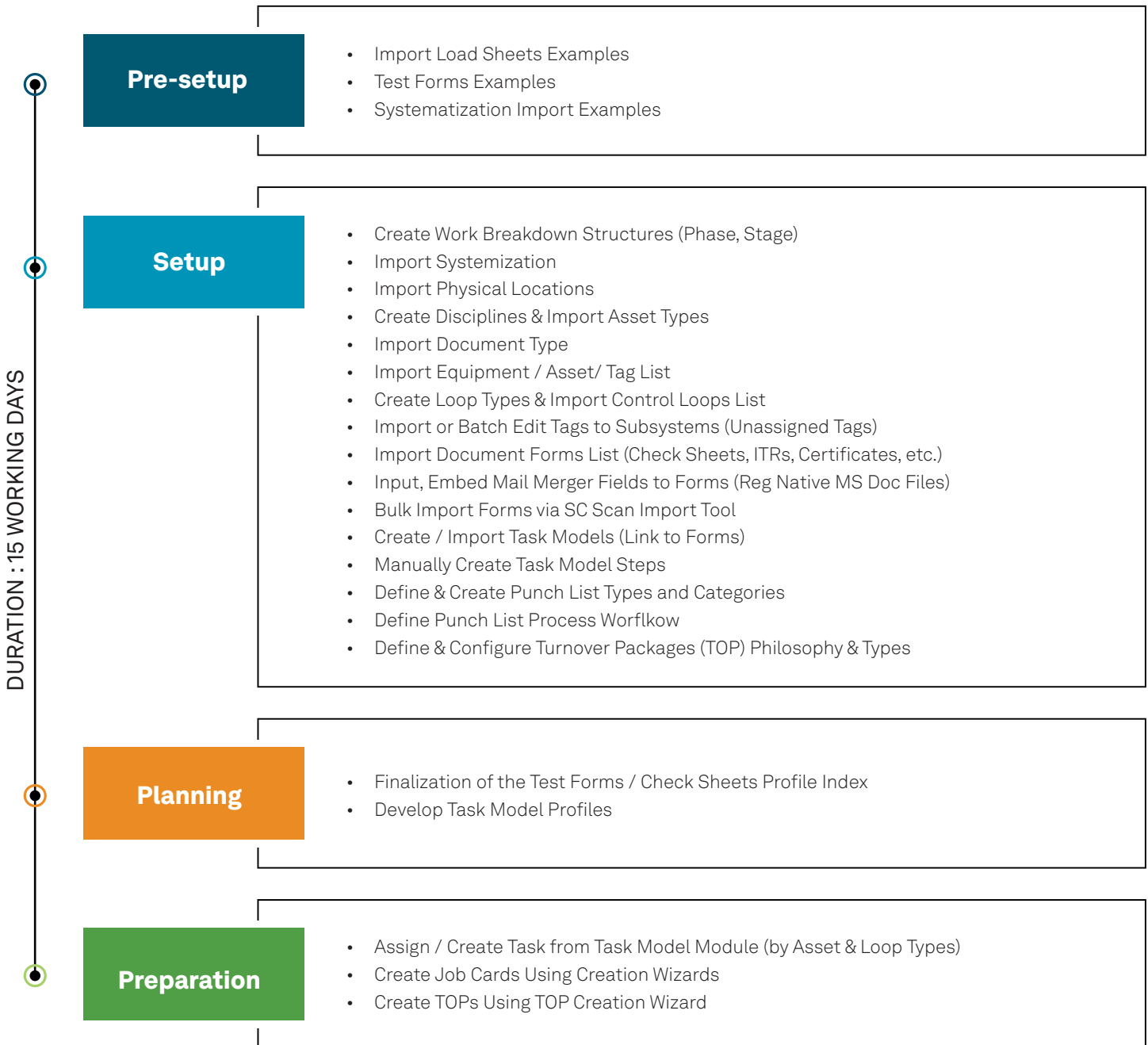
Best Practices Implementation Guide

Implementation | Best Practice Workflow

Completions & Commissioning Implementation Workflow



Best Practices Implementation Guide



Important

1. Pre-Setup can occur earlier
2. Based on 30-50 check sheets
3. Data received will not be validated
4. Setting up users, roles and profiles are not included in the 15 days period
5. Clients can provide Completions & Commissioning Execution Plan
6. This general implementation time might vary according to the specific project requirements



About Hexagon

Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications.

Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Asset Lifecycle Intelligence division helps clients design, construct, and operate more profitable, safe, and sustainable industrial facilities. We empower customers to unlock data, accelerate industrial project modernization and digital maturity, increase productivity, and move the sustainability needle.

Our technologies help produce actionable insights that enable better decision-making and intelligence across the asset lifecycle of industrial projects, leading to improvements in safety, quality, efficiency, and productivity, which contribute to Economic and Environmental Sustainability.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 22,000 employees in 50 countries and net sales of approximately 4.3bn EUR. Learn more at hexagon.com and follow us @HexagonAB.