

www.hcltech.com

**HCL**

# Verification and validation

Digital and print technology



#DoMoreWithHCL

#GoDigitalWithHCL

# Offerings management - Verification and Validation engineering services

## Testing as a Service

### Consulting Services

- Testing Strategy
- Industry KPI benchmarking
- As-is/To-be Road mapping
- Testing tool assessment & selection
- DevOps Environment maturity evaluation
- Certification services



### Transformation Services

- Test Automation
- AI/ML Bug Triaging
- Live Site Testing
- Data Collections, Integration & Transformation
- AI/ML Regression Optimization
- Shift-Left Testing
- CI/CD Pipeline Automation
- DevOps Design
- Testing COE



### Operation Services

- Functional Testing
- Security Testing
- Device & HW Testing
- Performance Testing
- Integration Testing
- Usability Testing
- Customization & Deployment services
- Monitoring DevOps Pipeline

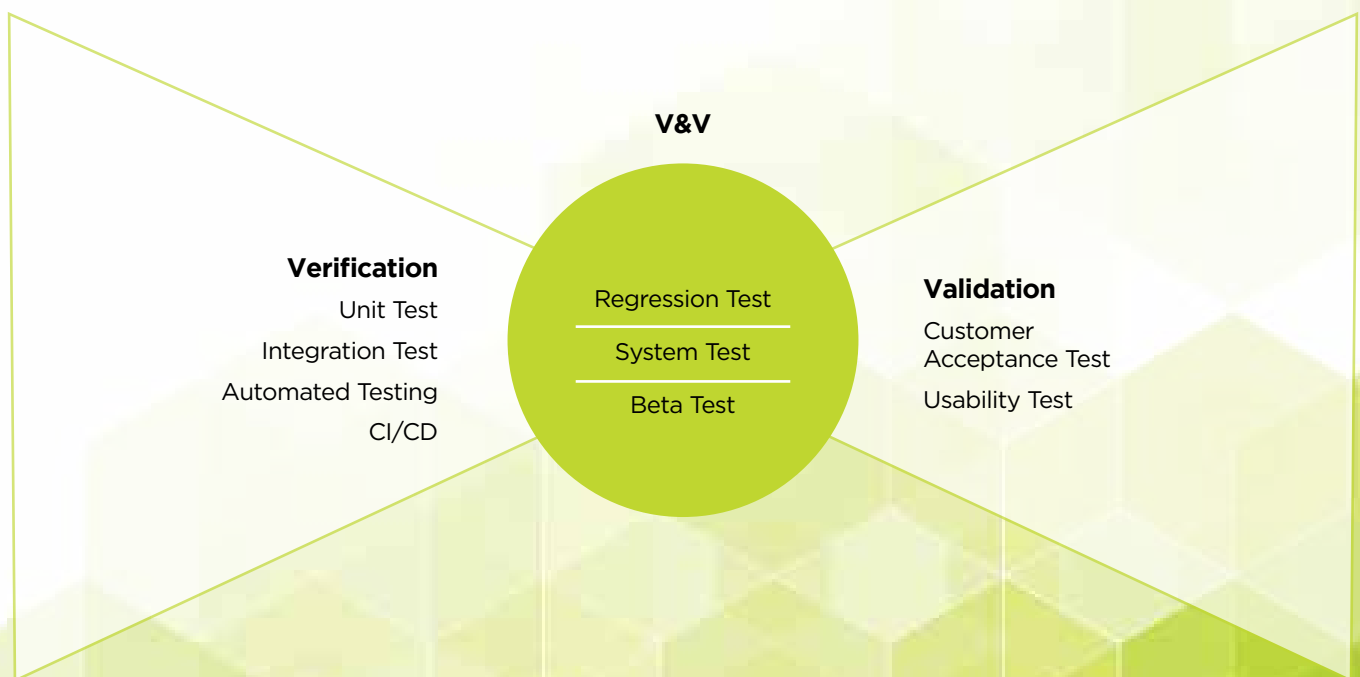
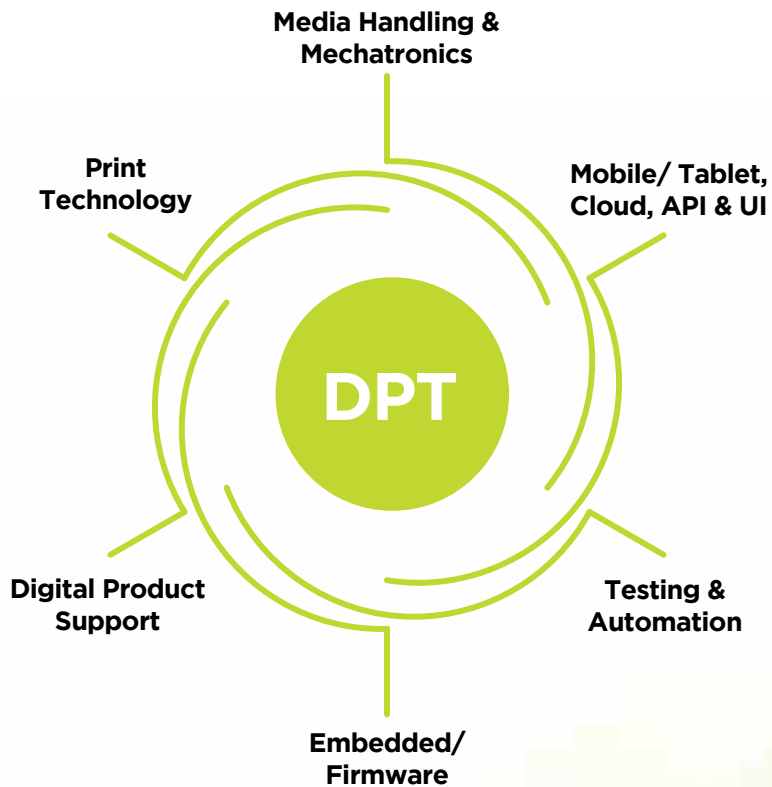


### Specialized Services

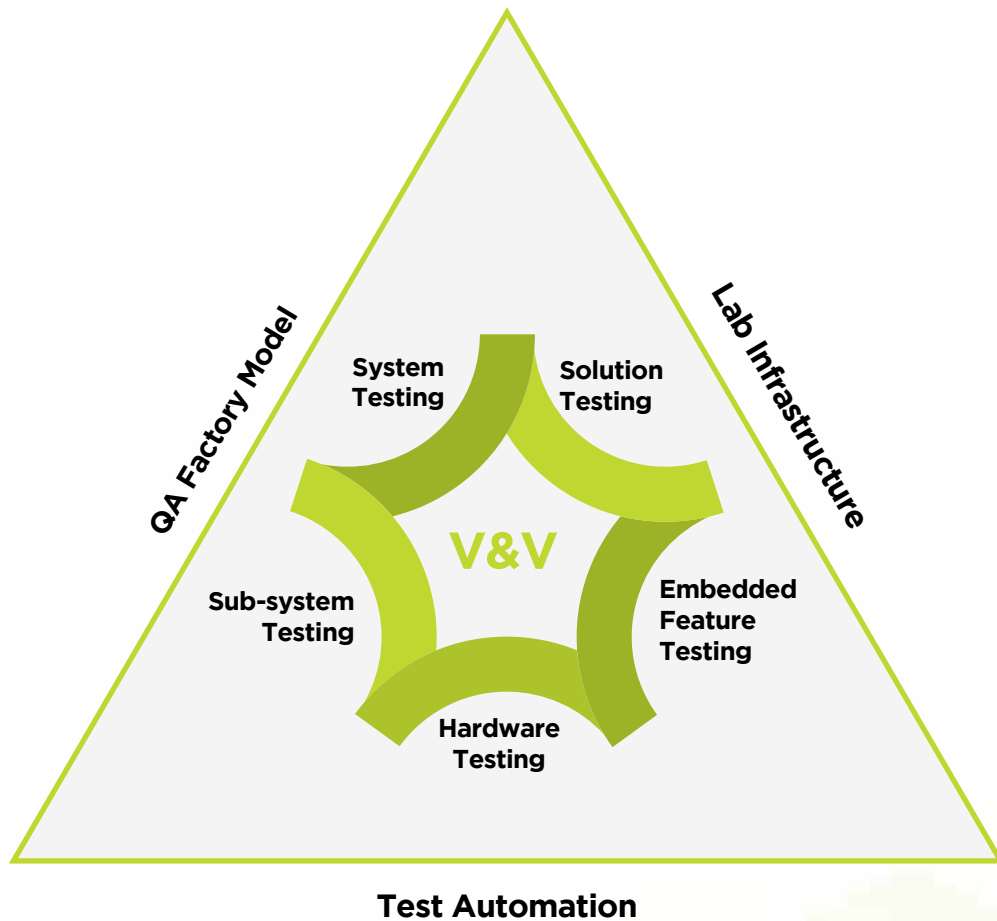
- Combability Testing
- Service Virtualization
- Accessibility Testing
- Localization Testing
- Crowdsourcing
- Gaming Testing - Console & Online
- Lab as a Service



# Digital and Print Technology (DPT) in Verification and Validation (V&V)



# Print technology domain competencies in V&V



**5000+** Person  
Years of Test  
Experience



**75+**  
Products in  
the Field



**13**  
Patents



**118** Printer  
Service Tips



Over **\$5M** Value  
Creation to the  
customer

# Test Automation



## Framework

- Data-driven
- Keyword-driven
- Hybrid



## Tools

- Test Complete
- Test Execute
- C# .NET
- Appium



## Competencies

- System Testing
- Feature Testing
- Driver Testing



## Supported App. Types

- Web apps
- Desktop apps
- Network agents in Embedded Machine
- Mobile



Expertise in developing plugin libraries that increase the scope of automation in embedded devices

Framework capable of supporting multiple 3rd Party applications

Layered approach in all frameworks to decrease significant time to port and total change of module to be tested

Local user Interface automation using image repository

Mobile automation with latest Oreo version. Support for automation of 3rd party app and plugins

# Lab operations & management capability



## Scale and Complexity

- \$100 M investments in labs across US, UK, China, Europe & India
- We manage more than 125K sq m of labs
- 100+ customer specific labs & 30+ HCL owned labs
- We operate our own labs as well as at customer premises. We also set up & operate labs for customers within HCL premises
- First-of-its-kind EMI/ EMC lab by a private company in India
- Clean rooms for high sensitivity instruments in Semiconductor & Medical Devices
- First privately owned Compliance Testing Lab in India
- Mechanical Engineering, Hardware Engineering and Networking verification labs for OEMs and Service Providers
- IoT & AI Labs across US & India



## Tools & Frameworks

SMART' Lab Framework  
Integrated Lab Management Solution (iLMS)



## Quality & Compliance

Industrial Manufacturing  
ISO/TS 16949 | IEC 61508

Telecom  
TL 9000

Software  
ISO/IEC 27001:2005

Medical Devices  
ISO13485:2003

Automotive  
ISO16949 | SPICE

Avionics  
AS 9100 | DO 178



## Multi-domain - HCL labs

Compliance Lab

Antenna & RF Lab

Emulation Lab

High Speed (100G Lab)

Wireless Systems Lab

Design Assurance Lab

10 m EMI/EMC Chamber

Implanter Lab

# Lab infrastructure for DPT clients



## Testing Labs : 90,000 sq.ft space

- Housing over 300 different printer models
- Power: 110 V/ 220 V & 16 Amps / 64 Amps
- IPV 4, IPV 6, Wireless
- MPLS connectivity to customer site



## Environmental Testing chambers

- Temp: 10 - 38 Deg C
- Relative Humidity: 5% - 90%



## Image Quality Lab



## Media Storage

- 350+ Unique media of different sizes and specification

# V&V factory model



## Matrixed Org

- Structured for scale
- Program team focus
- Plan and interface competency team focus
- Test execution, staffing, deskill team and implement automation test effectiveness & optimization



## Consolidated Infrastructure

- Unified V&V labs
- Standardized tools across test functions
- Optimized equipment deployment across teams
- Centralized inventory and automated tracking of devices, management of media, consumables & equipment



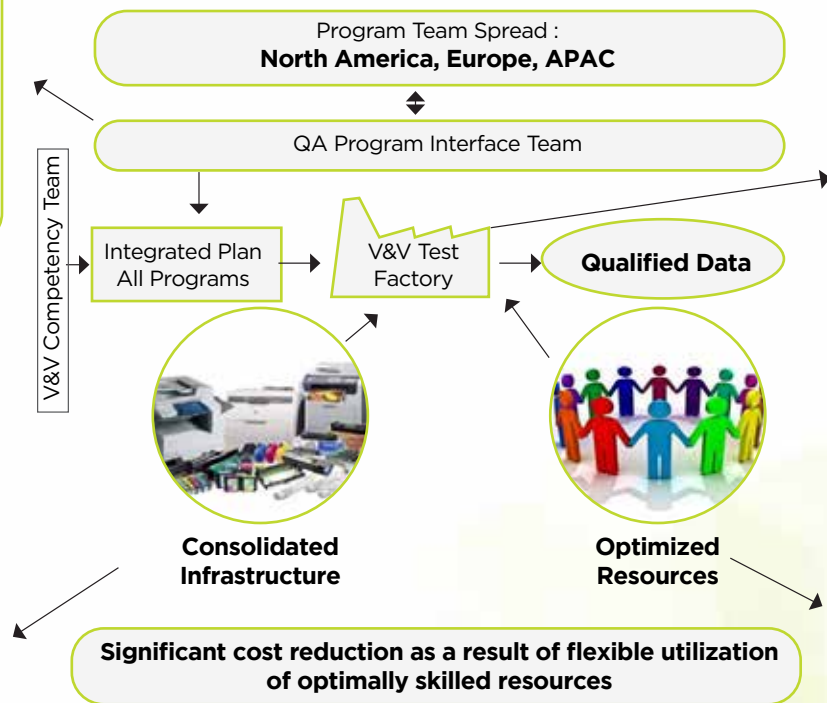
## Test Factory

- Process Driven, documented in QA Handbook
- Metrics-driven Delivery
- Automation led execution
- Execution Progress Tracked through Daily Sunrise Calls & Electronic Display



## Optimized Resources

- Standardized Test Processes & Updated Test Scenarios
- Robust Training and KM
- Team Structure
- Core: High Skill Activities
- Non-Core: (Flex team from Contractors) Test Execution





# V&V: Success stories

1

**Automation:** 50+ months of effort saved/year with script-less test automation framework; Eliminated manual error-prone black-box testing process. Automated job configuration, submission, queuing, internationalization testing, and all UI interactions for web and Local UI

---

2

**Operation Optimization:** Over \$2M RDE and \$400K+ in non-labor savings. Consolidate testing location and unified processes across products. Certified technicians in India. Optimized required media/consumables and inventory

---

3

**Quality and Productivity Metrics:** V&V effectiveness metrics and targets rolled out across products improved field quality levels. Measured quantitative and qualitative V&V effectiveness

---

4

**Tools and Process Optimization:** Standardized tools and processes across product lines. Resolved lack of uniformity across geographies and products. Standardized test methods, WOW, traced tests & improved coverage

---

5

**Resource and Knowledge Management:** Enabled ramp up/down to/from 440/208 without losing key talent minimizing cost to customer. Induction time for Test Engr 4-6 weeks and tester 4 weeks

---

6

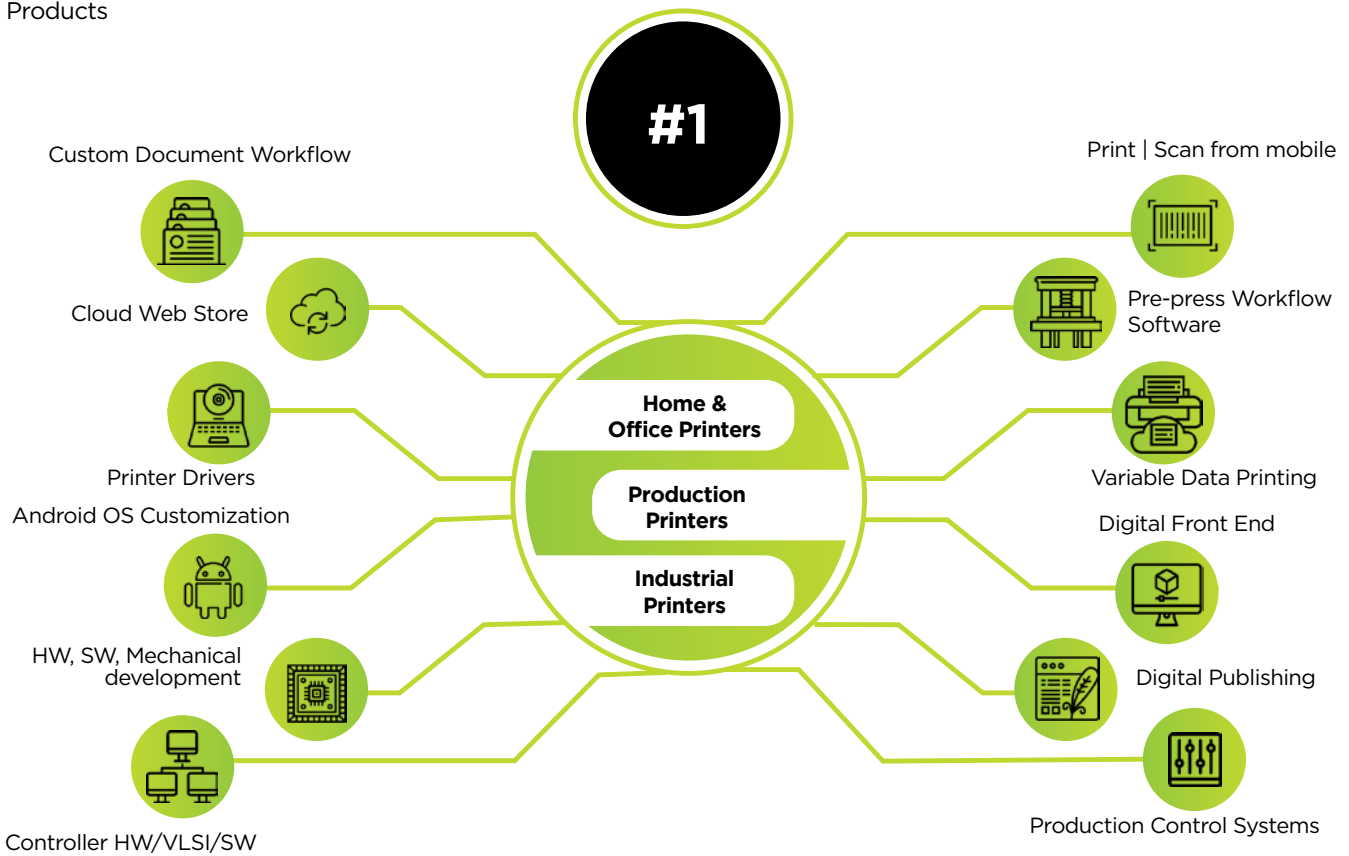
**Security Test Automation:** Reduced effort 60% and TTM 38%. Automated monthly security update testing across 5 baselines and 30+ products

---

7

**CI/CD Automation:** Enabled more than 70% cover of Integration testing for Digital Front End. Continuous builds every 15 minutes, Smoke, Nightly, and Long Lived tests pushed to 15+ hardware configurations and multiple baselines

# Largest R&D service provider across the globe in Digital and Print Technology



www.hcltech.com

**Hello there! I am an Ideapreneur.** I believe that sustainable business outcomes are driven by relationships nurtured through values like trust, transparency and flexibility. I respect the contract, but believe in going beyond through collaboration, applied innovation and new generation partnership models that put your interest above everything else. Right now 153,000+ Ideapreneurs are in a Relationship Beyond the Contract™ with 500 customers in 50 countries. **How can I help you?**

