

GD&T Implementation

Case Study

- An Example of How It Shouldn't Go

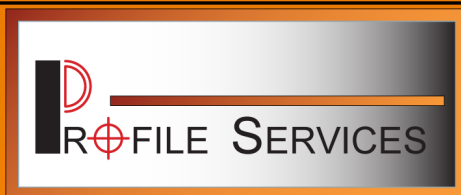
Company **BIG H**

Approximately timeframe **2002-2003**

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The Starters

Who?

What?

When?

Where?

Why?

How?

Why implement GD&T?

1. **Because a VP read a magazine article about it**
2. To impress industry and intimidate competitors
3. Unify engineering
4. Prepare for Lean
5. To reduce Field Issues



What did we expect to achieve?

Original Scope

- A divisional undertaking
- One person responsible (**suicide mission**)
- Implementation in **design group of one business unit only**
- **Implement for new product lines only**
- Education and application capabilities for all production and product development designers
- **No involvement of manufacturing, purchasing, quality**

Revised Scope (1)

- **Four** business units on 3 global campuses*
- Include redesigns, cost reductions, design standardizations, service resolutions*
- Design automation application (support of parallel project) *
- New product developments & 8 current product lines *
- Geometric control applications only (no TSU)
- No involvement of manufacturing, purchasing, quality
- Four nominal group leaders, with **one assigned overall responsibility** for the project *

What did we expect to achieve?

Revised Scope (2)

- **Two business units on 3 global campuses***
- Include redesigns, cost reductions, design standardizations, service resolutions
- Design automation application (support of parallel project)
- New product developments & 8 current product lines
- Geometric control applications only (no TSU)
- **Include manufacturing, purchasing, quality, suppliers ***
- **Troika of 3 nominal group leaders, with one assigned overall responsibility for the project ***

Final Scope (3)

- **Two** business units on 3 global campuses
- **Include redesigns, cost reductions, design standardizations, limited service resolutions ***
- Design automation application (support of parallel project)
- **8** current product lines, **0 new product developments ***
- **TSU for specific service resolutions ***
- Include manufacturing, purchasing, quality, suppliers
- Troika of 3 nominal group leaders, with one assigned overall responsibility for the project


Who was to be involved?

How deeply ingrained did we want GD&T to be?

- Design, development, detailing – ***In Depth***
- Process planners – ***Enhanced***
- Manufacturing personnel – ***Basic***
- Quality personnel
 - inspectors, CMM operators, analysts – ***In Depth***
- Project managers / customer liaison – ***Cursory***
- Sales team – ***None***
- Management team
 - Sales, purchasing, engineering, manufacturing – ***Cursory***
- Suppliers
 - Design, manufacturing, quality – ***In Depth***

Fourth ... “When?”

Initially, timing was not important; there was no deadline. 

During first year, we worked on team development, learning GD&T and other aspects including cost reduction, inclusion of service resolutions, etc. 

Within a year, a deadline was imposed ... 4 more months **or else.** 



*Note: Most implementations take 3-5 years for a company of this size.
We had about 16 months.*

Fifth ... “How?”

How would we achieve the implementation goal?

Full engagement of all parties. ❌

Management must **endorse**, **support**, **champion** and **enable** the project.

- Management Endorsed the project because they were directed to. There was an expectation that the technology would be abandoned by executive management, and therefore was of no value. 
- Management generally Supported the effort ... they said the right things and mostly fulfilled commitments. 
- Management did **NOT** Champion the project. The Implementation Team was largely left to fight their own battles without specific authority to make any changes. ❌

Implementation Plan Components

1. Project Management

1. Management Capability Requirements

2. Governance Independence and Accountability

1. Independence
2. Roles and Responsibilities

3. Planning

1. Establish Goal
2. Benefits
3. Deliverables
4. Scheduling

4. Resource Management

1. Required Expertise
2. Business Case
3. Resource Types

5. Risk Management

1. Considerations
2. Identification
3. Mitigation

6. Stakeholder Engagement

1. Identification
2. Engagement and Communication Plan

7. Review, Monitoring and Evaluation

1. Context
2. Considerations
3. Control Variables

Implementation Plan Components

1. Management Control and Project Management

1. Management Capability Requirements

- Project management 
- Personnel leadership 
- Resource planning 
- Design experience 
- Manufacturing knowledge 
- Metrology and gauging knowledge 
- Risk management knowledge 
- GD&T expertise (GDTP-S) 

Implementation Plan Components

2. Governance Independence and Accountability

1. Independence






- Implementation responsibilities were added on top of regular duties for the Implementation Team leadership.
- New responsibilities were regularly added to Implementation Team leadership.
- Fire-Fighting was a way of life, within and external to the implementation.

Implementation Plan Components

2. Governance Independence and Accountability

2. Accountability, Roles and Responsibilities

- Project leadership was accountable to everyone within the team, and on the entire corporate engineering and manufacturing management structure.

- Nominal Project Champion had no experience in GD&T, nor new technology implementations, but did have direct communication channel to the VP who originated the project.

- Team management structure was largely undefined with pseudo-equality within the troika for the planning and implementation. One leader was held accountable above all others.


Implementation Plan Components

3. Planning

1. Establish Goal(s)



Clearly defined the desired future state, including expected changes for each stakeholder group (positive and negative aspects)..



We anticipated resistance and addressed it beforehand whenever possible, and directly as it was encountered otherwise.



One of the greatest tools for converting resistance to active participation is by making those resisting to be partially responsible for the outcomes.

Implementation Plan Components

3. Planning



Quantitative

- 15% average cost reduction

2. Benefits



Qualitative

- Improved skillsets and morale in manufacturing
- Reduced Engineering Support calls
- Customer perception of quality



- Benefits were :
 - Specific and stated
 - Measurable
 - Achievable
 - Relevant



- Few performance measures were included, and none were integrated into quality management processes

Implementation Plan Components

3. Planning

3. Deliverables



- Drawing packages defined for 8 production molds and EOATs, including service issues to be resolved, design unifications, cost reductions, etc.



- No set / documented milestones



- Explained activities to be undertaken to deliver the project



- Explained what activities would NOT be undertaken as part of the project (***eventually this became critical***)

Implementation Plan Components

3. Planning

4. Scheduling

-  A general mapping of the project allowed us to anticipate bottle-necks and do rudimentary resource planning.

Implementation Plan Components

4. Resource Management



1. Required Expertise



2. Business Case

3. Resource Types

- **Human resources**



- Leadership
- Representatives from invested groups
- Subject Matter Experts (SMEs)
- Support teams

- **Office space and equipment**



- **Technology access**



- Manufacturing
- Quality / metrology
- suppliers

- **Funding**



- Salaries & Consultants
- Travel
- Resource materials
- Training

Implementation Plan Components

5. Risk Management

1. Considerations and

2. Identification



We anticipated a number of risks (+ve & -ve), and planned for these as best we could.

- Risks anticipated from:
 - Project evolution
 - Scope creep
- Identified risks thru:
 - Stakeholder input
 - Consultation with SMEs for GD&T Implementations



3. Mitigation

We were largely successful in mitigating risks thru anticipation and open dialogue.

Implementation Plan Components

6. Stakeholder Engagement

1. Identification



Determined specific group representatives

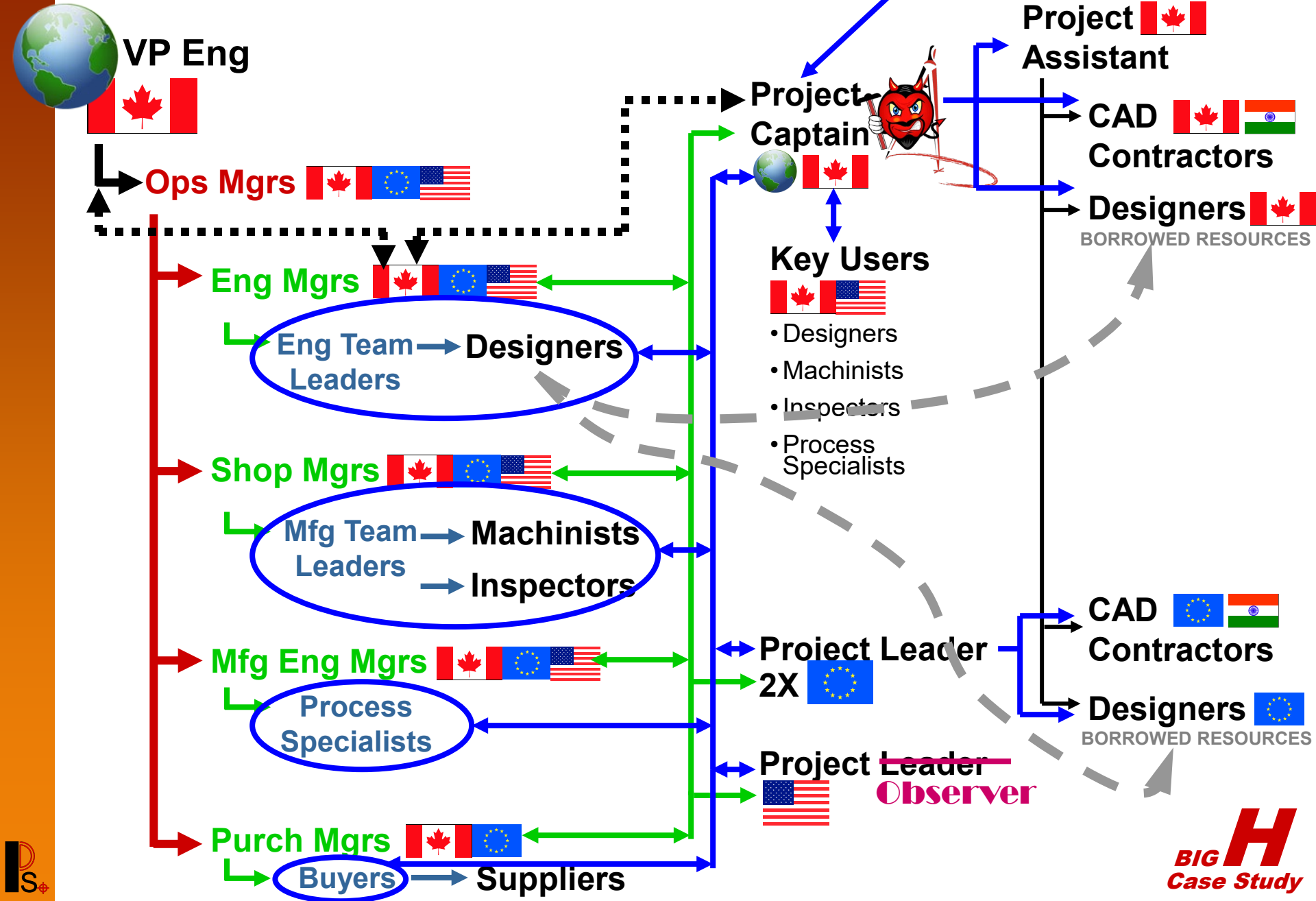
2. Engagement and Communication Plan

We consciously focused on the *purpose* of each communication:



- *Relationship* building with internal and external resources
- *Goal* dissemination and updates to stakeholders
- *Soliciting* feedback and input
- *Forwarding* information
- *Establishing* a paper trail ... *just in case*
- *Reflecting* positions or perspectives from feedback
- *Building* consensus among stakeholders

Corporate and GD&T Implementation Team Communication Structure



Implementation Plan Components

7. Review, Monitoring and Evaluation

1. Context, 2. Consideration

- Stakeholder Evaluations*** We focused on extended participation, not on post-game analysis.
- Because stakeholders were involved heavily throughout the process, they understood the evolving scope and impact on them.
 - No quantified evaluations other than the quantity of drawings completed.

3. Control Variables

Control and monitoring of variables included:

- Time – Once final deadline set, ***zero tolerance allowed.***
- Cost – No declared budget, No budget constraints
- Quality – Initial drawing release was a preliminary application of GD&T, with refinements to follow
- Scope – Changed, but eventually solidified
- Risk –resources were single greatest issue

Implementation - Final Results **BIG H**

Quantitative

- 8 Mold Configurations converted to GD&T
- Design standardization on same 8 molds
- Automation templates converted to GD&T
- Approximately 350-450 drawings completed with GD&T
- ~20-25% net cost savings available from design changes
- Significant number of field issue resolutions incorporated
- Corporate design standards templated with GD&T
- Up to 45 designers working on implementation simultaneously

- Drawing Packages released and delivered with
1/2 hour to spare

Implementation - Final Results

Quantitative

GD&T Training Completed					
	Fundamentals	Applications	TSUs	Inspection	Custom
Prod. Engrs	200+	100+	10+		
Dev. Engrs	60+	60+	20+		
Process Spec.	60+			10+	
Machinists	700+			10+	
Inspectors	15+			15+	
Assemblers	50+				
Buyers	30+				
Suppliers	10+			5+	20+
Management					25+
Proj. Engrs					20+

Implementation - **Final Results**

Qualitative

- Acceptance and adoption of GD&T within business units
- Unification of GD&T within corporate umbrella
- Single source GD&T training supplier
- Evolved understanding of actual mechanical functionality of system contrasted with tribal knowledge
- Supplier base semi-prepared for GD&T
- Improved communications between business units, and between functional groups within and between business units
- Anticipation of SPC capabilities

Post - Implementation

Value Realized and Recognized

- Technology selections based on GD&T needs
- Significant contributions to cost reduction efforts in mfg
- Value perceived on shop floor
- Field Issue investigations using GD&T found sources of extensive service costs, leading to reconciliation and cost recoveries
- Suppliers able to quote on higher value-added contracts based on GD&T training
- Preparation for SPC data collection to provide process capabilities and tolerance analysis data to development team

Post - Implementation

Backslide: 3-10 years later

- GD&T applications have not improved nor been corrected
- Despite high turnover rates, training only provided for individuals by special request
- No further commitment by management to improve long term quality and efficiencies
- Despite change in supplier base, training not required of suppliers
- Expansion to new facilities in China without GD&T design or manufacturing training
- No progress on SPC data collection

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