Going Global: A Practical Guide to Implementing Process Improvement Across Six Continents

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Paul Morgan

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Agenda

What you will hear...

- A little about GTECH
- Our process improvement history and benefits achieved
- Gaining momentum and the inevitable resistance
- Specific techniques to:
  - Obtain sponsorship and achieve corporate alignment
  - Develop usable process documentation
  - Deal with “trouble spots” such as sizing, DAR, and quantitative analysis
  - Institutionalize the process
- Take home thoughts
GTECH is the global leader in the online lottery business and a leading provider of gaming and technology services worldwide.

- Incorporated in 1980.
- Headquartered in Rhode Island, USA.
- 5,300 employees worldwide in more than 50 countries.
- In 2006 GTECH was acquired by Lottomatica S.p.A. (Milan: LTO).
GTECH Market Focus

<table>
<thead>
<tr>
<th>Lottery</th>
<th>Gaming Solutions</th>
<th>Commercial and Government Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTECH Enterprise Series</td>
<td>SPIELLO</td>
<td>POLCARD</td>
</tr>
<tr>
<td>Europrint</td>
<td>Atronic</td>
<td>VIA</td>
</tr>
<tr>
<td>LilHCo</td>
<td>INTERLOTT</td>
<td>billbird</td>
</tr>
</tbody>
</table>

Supply end-to-end lottery technology and services. Design, assemble, install, operate, and maintain online lottery systems for governments and licensed operators worldwide.

Provide complete gaming systems technology to government-sponsored machine gaming programs as well as commercial and Native American gaming venues.

Deliver reliable, secure, and high-volume transaction processing solutions to commercial, financial, and governmental customers.
Many of the world’s lotteries have selected GTECH as their technology partner.

100+ customers in 50+ countries
- 86 Online customers
- 39 Instant Ticket Vending Machine (ITVM) customers
- 20 Video gaming jurisdictions
- Software development centers spread across six continents and seventeen time zones.
March 2000
Process improvement initiative commenced.

October 2001
CMM Level 2 – Ireland Development Center

February 2004
CMM Level 3 – Austin & Chennai Technology Centers

February 2005
CMM Level 3 – Austin, Chennai and Warsaw

December 2006
CMMI Level 4 – Software Engineering - Support

Total: 5 years and 10 months

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CMMI Benefits
‘Faster – Better – Cheaper’

- The % of defects resolved prior to customer delivery.
- A simple, although some would say crude, indicator of product quality.
- Standard deviation is an indicator of performance repeatability.

- Finding defects earlier in the development lifecycle is cheaper.
- For GTECH it is 23 times more expensive to fix defects during customer acceptance testing as opposed to the requirements phase.
- CMMI has led to a 40% reduction in rework.

Defect Removal Efficiency

The % of defects resolved prior to customer delivery.

A simple, although some would say crude, indicator of product quality.

Standard deviation is an indicator of performance repeatability.

Defect Detection Profile

Finding defects earlier in the development lifecycle is cheaper.

For GTECH it is 23 times more expensive to fix defects during customer acceptance testing as opposed to the requirements phase.

CMMI has led to a 40% reduction in rework.
CMMI Benefits
‘Faster - Better - Cheaper’

- The % of defects resolved as a function of the size of the delivery.
- A good indicator of the effectiveness of your development practices.

- Historically GTECH’s mean estimation results have been good.
- CMMI has added repeatability and predictability by reducing the range of estimates.
CMMI Benefits
‘Faster – Better – Cheaper’

- Requirement changes are driven by external customer factors.
- Historically not every requirement change was documented, which skewed our original metrics.
- CMMI validation activities have helped to reverse the negative trend.

- Establishing standards to be followed irrespective of where software development work takes place also ensures:
  - More effective resource utilization.
  - Faster project start-up and less re-training.
  - Improved teamwork and employee morale.
  - Increased customer confidence.

- Formal process definition is also recognition that software development practices are valuable business assets that must be defined, documented and secured.
Now The Bad News - Resistance To Change

Restraining forces

- Low tolerance for change
- Self interest
- Lack of understanding
- Lack of trust
- Different assessment

GTECH CMMI Strategy

Overcoming Resistance: Negotiation and Agreement
- Participation and Involvement
- Education and Communication
- Facilitation and Support
- Address Non-Compliance

Driving forces

- Corporate goals
- New management culture
- Improving customer satisfaction
- Improving productivity
- Reducing costs

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Sponsorship – Establishing a Dedicated Process Group

Technology Process Group (TPG) Steering Group

- Chief Technology Officer
  - Business Unit Head – etc.
  - Business Unit Head – Services
  - Business Unit Head – Systems Design & Implementation
  - Business Unit Head – Systems Engineering
  - Business Unit Head – Quality Engineering
  - Business Unit Head – Software Engineering

Technology Process Group (TPG)

- TPG Director
  - Organizational Process Improvement Lead
  - Organizational Training Lead
  - Organizational Standards Compliance Lead
  - Organizational Quantitative Management Lead

Regional Process Leads & Engineers

Technology Process Group
- 20 people located globally.
- >100 person years of process improvement experience.
Charter
- Deploy a ‘franchise’ model to support the consolidation of development centers.

Challenge
- Institutionalization of common processes across multiple multicultural organizations that span 17 time zones.

Opportunity
- Creation of the new Technology Centers provided the perfect catalyst for implementing change.
## Aligning with Corporate Goals - Metrics

<table>
<thead>
<tr>
<th>Business Goals</th>
<th>Process/Product Goals</th>
<th>Objectives</th>
<th>Measures</th>
<th>Metric Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Cost of Operations</td>
<td>Improve Effort Estimation Capability</td>
<td>Software project effort estimates will be accurate to within plus or minus X%</td>
<td>Effort Variance</td>
<td>Process</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Software project cost estimates will be accurate to within plus X% or minus X%</td>
<td>Cost Variance</td>
<td>Process</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>Increase Productivity</td>
<td>Software project size estimates will be tracked and monitored throughout the project lifecycle</td>
<td>Size Variance</td>
<td>Process</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Productivity rates will increase by 10% from the FY 05 baseline.</td>
<td>Productivity</td>
<td>Process</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>Reduce Rework</td>
<td>Identify and remove more than X% of the total amount of project defects before BTC/Integration Testing.</td>
<td>Defect Distribution</td>
<td>Process</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Become more effective at identifying defects during the formal inspection.</td>
<td>Inspection Effectiveness</td>
<td>Process</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gain an understanding of the amount of time expended fixing defects introduced by the project team</td>
<td>Rework</td>
<td>Process</td>
<td>Optional (To be finalised)</td>
</tr>
<tr>
<td>Increase Quality and Reliability</td>
<td>Reduce Defects Delivered to the Customer</td>
<td>Identify and correct X% of all software defects prior to customer delivery</td>
<td>Defect Removal Efficiency</td>
<td>Product</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>Reduce Project Defects</td>
<td>Reduce the overall number of defects introduced by the project team relative to product size by X% from the FY 05 baseline.</td>
<td>Defect Density</td>
<td>Product</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor and track the number of changes to the original requirements, and understand how the changes can affect the project.</td>
<td>Requirements Volatility (Total and by Phase)</td>
<td>Process</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>Ensure Process Compliance</td>
<td>All services projects will receive a process compliance score of not less than X%.</td>
<td>Process Compliance</td>
<td>Process</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>Improve Customer Satisfaction</td>
<td>Gain an understanding of the customer’s satisfaction of the software deliverable.</td>
<td>Customer Satisfaction Survey</td>
<td>Product</td>
<td>Optional</td>
</tr>
</tbody>
</table>
Aligning with Corporate Goals - Setting Targets

Metrics Definition

<table>
<thead>
<tr>
<th>Defect Removal Efficiency</th>
<th>Mandatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Measures the number of defects found after the Customer Acceptance Test (CAT) date relative to the total number of defects associated with a project.</td>
</tr>
<tr>
<td>Objective</td>
<td>Improve the quality and reliability of the software deliverable.</td>
</tr>
<tr>
<td>Target Value/Range and Goals</td>
<td>Please refer to Organizational Quantitative Management Targets.</td>
</tr>
</tbody>
</table>

Benefits:
- Indication of the quality of the software deliverable.
- Provides insight on the Quality Assurance activities of the project.

Data Items:
- Total Number of Medium and High Inspection Defects
- Total Number of Low, Medium and High Test TIRs

Data Source:
- Total Number of Medium and High Inspection Defects [processMax®]
- Total Number of Low, Medium and High Test TIRs [MUTT]

Computation:
\[
\text{DRE} = \frac{(\text{Total Number of Medium and High Inspection Defects} + \text{Total Number of Low, Medium and High Test TIRs For Entire Project}) - (\text{Total Number of Medium and High Inspection Defects} + \text{Total Number of Low, Medium and High Test TIRs For Entire Project})}{\text{Total Number of Medium and High Inspection Defects}}
\]

Collected:
Initially collected by Organizational Quantitative Measurement Analyst prior to project lessons learned meeting. Revisited and revised when facts or data changes.

Reported:

Stored:
Organizational Quantitative Management Data Repository.

Analysis Technique:
Control Chart.

Interpretation:
DRE scores should rise as quality practices improve. Additionally, a drop in the standard deviation indicates that the quality practices are becoming more consistent.

Interpretation:
Analysis will be made to identify correlations between process compliance, requirements stability, and cost variance.

Considerations:
Note: The DRE score is driven by the CAT data. The metric assumes that the required customer solution is completed and able to meet the customer requirements without fault by the CAT date established in the WBS.
Usable Processes – The Challenge

- Process models are auditor’s tools. They are not written to easily support project managers or developers in their daily activities.
Usable Processes - Solution

- Role based approach

- ‘Light’ process documentation designed for ease of use.
- Intranet based to provide corporate wide accessibility and management visibility.
- A historic ‘information’ repository to provide a knowledge base facilitating reuse of project artefacts.
<table>
<thead>
<tr>
<th>Role Steps</th>
<th>Role Responsibility</th>
<th>Role Assignment</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

**Usable Processes - Documentation**

**Step Description**

- **Step Input and Output**
- **Required Reading**
- **Required Personnel**

**Usable Processes**

- Project Software Leads - Seysha Robinson
- Conduct Project Kickoff Meeting
- Prepare Project Kickoff Meeting Agenda
- Verify and Assign Roles
- Establish Configuration Control Board
- Identify Risks
- Conduct Project Kickoff Meeting
- Plan Software Project
- Prepare to Execute the Software Development Plan
GTECH Function Points (GFP) based upon a simple Excel spreadsheet.

Approach has served us well and only now are we investigating a more sophisticated and scaleable solution.

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<table>
<thead>
<tr>
<th>Requirement number</th>
<th>Complexity Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement number 001</td>
<td>3</td>
</tr>
<tr>
<td>Requirement number 002</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 003</td>
<td>6</td>
</tr>
<tr>
<td>Requirement number 004</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 005</td>
<td>6</td>
</tr>
<tr>
<td>Requirement number 006</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 007</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 008</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 009</td>
<td>6</td>
</tr>
<tr>
<td>Requirement number 010</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 011</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 012</td>
<td>3</td>
</tr>
<tr>
<td>Requirement number 013</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 014</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 015</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 016</td>
<td>5</td>
</tr>
<tr>
<td>Requirement number 017</td>
<td>5</td>
</tr>
</tbody>
</table>

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Trouble Spots - Decision Analysis and Resolution (DAR)

**Problem Statement and Alternatives**

The customer has requested a change that will result in the project going significantly over budget.

- Incorporate the change and increase schedule budget.
- Delay the change to the final project and start earlier than planned.
- Rejected the change.

<table>
<thead>
<tr>
<th>Description</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase budget and schedule</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Delay schedule and start earlier</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Rejected change</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Weighted Criteria**

- Customer satisfaction
- Delivered quality project

**Final Selection and Comments**

Team V

- Criteria-based Evaluation
- Total Votes
- Final Choice
- Comments

All team members agreed with the criteria-based evaluation.
Is All What It Seems? Institutionalization

**Scatterplot of Requirements vs Batch Live Date**

- **Austin**
- **Chennai**
- **Warsaw**

**Scatterplot of Productivity (GFPs/100 Hrs) vs Batch Live Date**

- **Hub**
- **Austin**
- **Benelux**
- **Chennai**
- **Warsaw**

**Scatterplot of Number of Requirements vs Batch Live Date**

- **Austin**
- **Chennai**
- **Warsaw**

**Legend:**
- **Total Number of Requirements Changed, Added, Deleted**
- **Original Number of Requirements**

**Key Observations:**
- The process has become stable and capable.
- Requirements and batch live dates show a clear pattern.

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Institutionalization - Information Feedback Loops

- New version of our Standard Project Process (SPP) released in November 2004 and contained for the first time size based estimation utilities.
Take Home Thoughts

- The time to achieve a maturity level entirely depends upon the level of Senior Management commitment and sponsorship.

- Staff the Process Improvement Group with recognized leaders and discipline experts.

- Manage the initiative as the company’s highest priority project with an adequate budget, enforced accountability, and high-visibility status reporting.

- Do not adopt the maturity model as your process. Interpret it based upon the specific needs of your business.

- CMMI provides the ‘What’ but not the ‘How.’ Expect to find missing project management and technical skills within the delivery teams.

- Use the best technology available to deploy the process.
Plan ahead. Establish the foundations for future maturity levels higher than your current objective:

- Work towards establishing a defined organizational process even if your initial objective is level 2.
- Establish an organizational metrics program early with dedicated resources even if your objective is level 2 or 3. This will help build a baseline for future use and simplify the transition to level 4.

To institutionalize change, the use of effective feedback loops is essential:

- Develop models/utilities/tools for use by project personnel. These can be enhanced to support statistical analysis when moving to level 4.
- Provide training and ongoing mentoring to project personnel on how to use and analyze the data and statistical models.

Ensure accountability via standards compliance and periodic assessments (internal and external). Report the results to all and follow through with an action plan.
An Alternative Perspective….

Here is Edward Bear, coming downstairs now, bump, bump, on the back of his head behind Christopher Robin. It is, as far as he knows, the only way of coming downstairs, but sometimes he feels there really is another way, if only he could stop bumping for a moment and think of it.

A A Milne
Winnie the Pooh
Thank You

Any Questions?

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