Evolutionary Development Methods (Evo)

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Agenda

• **Part One - EVO Basics (40 min)**
  - Evo principles
  - Evo compared to XP
  - Evo and CMM(I)

• **Part Two - Managing Projects with EVO (40 min)**
  - Task & Delivery Cycles
  - How to turn a project into an Evo Project
  - Results
Simon Porro

- Software Development, project Leader, Group Leader, Quality Consultant
- Since 1995 SPI Consultant, CMM, CMMI, ISO 9000-3, EFQM, PQA, BEST
- Current activities: training & coaching
  - Evolutionary Project organisation (Evo)
  - Requirements & Strategic Objectives Specification
  - Project Rescue
  - Reviews and Inspections
  - CMM, CMMI Training, Assessments & Consulting
Development Goals

- The right product
- The right quality
- Within the time and budget agreed
- Pleasant for everyone involved

Quality On Time
The Requirements Paradox

- Requirements must be stable
- Requirements always change

Use a process that can cope with the requirements paradox

You cannot foresee every change, but you can foresee change itself
Waterfall Development Life-Cycle Model

- Requirements analysis
- Architectural design
- Detailed design design
- Implementation & unit testing
- Integration & Test
- System Test
- Delivery, Operational acceptance & usage

Waterfall has a 30-years track record of being unsuited for dealing with unstable requirements!
The 2\textsuperscript{nd} Requirements Paradox

• We don’t want requirements to change
• Because requirements change is a \textit{known risk}: We must \textit{provoke} requirements change as early as possible
Evo is many waterfalls/V-models

cycle 1 2 3 4 5 ------- n-1 n

- prepare
- waterfall
- waterfall
- waterfall
- waterfall
- waterfall
- waterfall
- waterfall
- finalise
- finalise
### Waterfall development model (Big Bang delivery)

<table>
<thead>
<tr>
<th>Complete Detailed Frozen</th>
<th>Complete Detailed Frozen</th>
<th>Build/test</th>
<th>Build/test</th>
<th>Build/test</th>
<th>Build/test</th>
<th>Build/test</th>
<th>Deliver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements Analysis &amp; specification</td>
<td>Design Specification</td>
<td>Step 1</td>
<td>Step 2</td>
<td>Step 3</td>
<td>Step 4</td>
<td>Step n</td>
<td>Contract Acceptance Test</td>
</tr>
</tbody>
</table>

### Incremental development model (technical selection of increments)

<table>
<thead>
<tr>
<th>Best guess Updated stepwise</th>
<th>Best Guess Updated stepwise</th>
<th>Reqs</th>
<th>Feedback/Reqs</th>
<th>Feedback/Reqs</th>
<th>Feedback/Reqs</th>
<th>Feedback/Reqs</th>
<th>Feedback/Reqs</th>
<th>Deliver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements Analysis &amp; specification</td>
<td>Design specs</td>
<td>Step 1</td>
<td>Step 2</td>
<td>Step 3</td>
<td>Step 4</td>
<td>Step ‘50’</td>
<td>Contract Acceptance Test</td>
<td></td>
</tr>
</tbody>
</table>

### Evolutionary development model (stakeholder value selection of iterations)

Ref. Tom Gilb: Evo
EVO Principles

1. Very frequent, early value delivery to stakeholders
   • weekly cycles, 2% of project budget

2. Rapid feedback from stakeholders on delivered values

3. Most juicy/risky/critical stakeholder values are delivered first

4. Multi-disciplinary development teams

5. Quantification of all critical stakeholder values using Planguage:
   • Requirements defined on a Scale of Measure
   • Target stakeholder value levels: Must, Plan, Wish

6. Dynamic Prioritization
   The exact content of next week’s EVO delivery cycle is based on:
   • The current planning
   • This week’s cycle results
   • Changed requirements and priorities
   • Feedback from stakeholders

*In chess, your next move is based on the board situation and your opponent’s last move*
**Evo ‘Learning’ through Feedback**

- **System Requirements**
- **System Design**

**Feedback & Learn**

**Evo Step 1**

**Evo Step i**

**Evo Step n**

**Evo Step**
1. Requirements
2. Design
3. Construct
4. Deliver to stakeholder
5. Study results

1. Plan
   - What do we want to know or to do
2. Do
   - Carry out plan
3. Check
   - Analyse the effects
4. Act
   - What can we learn

**N R Malotaux Consultancy**

Evo Tutorial - Philips, June 12, 2002
Large System Development using EVO
Cusomano & Selby: Microsoft Secrets, McGraw Hill 1995

Internet Explorer

Shippable Quality level

6 Monthly milestones

Vital 3rd

6 - 10 Weeks

Vital 3rd

Daily builds
### EVO Management:
**Which roles are involved in the EVO Team?**

<table>
<thead>
<tr>
<th>One EVO Delivery Cycle includes:</th>
<th>PL</th>
<th>RE/Arch</th>
<th>Dev Team</th>
<th>Lib</th>
<th>Test Eng.</th>
<th>CS Eng.</th>
<th>Stakeh.</th>
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<tr>
<td>- Weekly Evaluation</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>- Requirements</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td>- Design</td>
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<tr>
<td>- Test Design</td>
<td></td>
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<tr>
<td>- Check-out</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>- Coding</td>
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<td>X</td>
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<tr>
<td>- Unit-test</td>
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<tr>
<td>- Check-in</td>
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<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Integration with existing system</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>X</td>
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<td>- Integration &amp; regression test (MS-7)</td>
<td>X</td>
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<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>- Possibly:</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- System Test (MS-8)</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- (Restr.) Delivery to Stakeholder</td>
<td>X</td>
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<td>X</td>
<td>X</td>
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<td>X</td>
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</table>

*PM, Beta Site*
# Cycle-types in Evo

<table>
<thead>
<tr>
<th>Cycle Type</th>
<th>Frequency</th>
<th>Horizon</th>
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<tbody>
<tr>
<td>Roadmapping Cycle</td>
<td>3 - 6 mo</td>
<td>6 mo - 2 yrs</td>
</tr>
<tr>
<td>Strategic Objectives Cycle</td>
<td>1 mo</td>
<td>3 - 6 mo</td>
</tr>
<tr>
<td>Value Delivery Cycle</td>
<td>1 - 2 wks</td>
<td>1 - 8 wks</td>
</tr>
<tr>
<td>Task Cycle</td>
<td>$\leq 1$ wk</td>
<td></td>
</tr>
</tbody>
</table>
Functional and Quality Requirements

- 90% of all requirements are functional requirements (features)
- Most functional requirements are really designs
- Most functional requirements have undocumented underlying requirements. Just ask: “why do you want this feature?”
- The underlying requirements (strategic objectives) are often qualitative by nature
- All Qualitative Requirements can always be specified on a Scale of Measure
- Quantifying the Strategic Objectives of a project brings very strong focus on results
Example: Strategic Objectives.OSW.[Product]

- **Synchronization** (of [XXX] Software with Assembleon products)
- **Machine-Line Utilization Effectiveness** (% maximum)
- **Functional Accuracy**
- **Performance** (execution speed)
- **Usability**
  - **Learnability**
- **Serviceability** (how fast we can ‘service’)
- **Availability** (uptime / failure rate)
  - **Reliability**
  - **Maintainability** (how fast we ‘repair’ faults)
- **Security**
- **Quality of Product Information** (to Stakeholders)
- **Accessibility**
- **Adaptability**
Planguage Example: Quantifying Goals: Product Synchronization

- **Ambition:** [Product] is never late for delivering needed and promised software to support Assembleon products releases
- **Stakeholder:** {Assembleon Sales, Assembleon CEO, other Product Teams, Customers, Prospects}
- **Scale:** Days Late compared to published or agreed delivery date
  - Days Late: Defined As: Calendar Days between agreed/promised delivery dates and the first whole day when Correctly Installed and Really Available for Customer Use, including all Necessary training, support and documentation

====Benchmarks ============= the Past
- **Past** [Emerald FNC, 2000, Optimiser] 5 months late ← FvL

====== Targets ============== the Future
- **Must** [GEM, During 2001] 1 month late ← Product Manager
- **Plan** [All Products, 2001] 15 days
- **Wish** [All OSW Products, Q4 2001] 0 days or better ← ALL OF US
## Example: Quantified Priority Setting

### ‘Impact Estimation’

<table>
<thead>
<tr>
<th>Selection Values (below)</th>
<th>Alternatives</th>
<th>Strategy 1 / Design 1</th>
<th>Strategy 2 / Design 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synchro-nization</td>
<td>3</td>
<td>9</td>
<td>0 = no value</td>
</tr>
<tr>
<td>Reliability</td>
<td>8</td>
<td>2</td>
<td>9 = top value</td>
</tr>
<tr>
<td>Machine Utilization</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Timing Accuracy</td>
<td>9</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Usability</td>
<td>2</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>------- COSTS</strong></td>
<td><strong>-------</strong></td>
<td><strong>-------</strong></td>
<td></td>
</tr>
<tr>
<td>Engineer Hours</td>
<td>300</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Value/Cost ratio</td>
<td>.10</td>
<td>.50</td>
<td></td>
</tr>
</tbody>
</table>
## Impact Table for Cycle Planning & Evaluation

<table>
<thead>
<tr>
<th>Step #1 Plan A:</th>
<th>Step #1 Actual</th>
<th>Differe-nce.</th>
<th>Total Step 1</th>
<th>Step #2 Plan B:</th>
<th>Step #2 Actual</th>
<th>Step #2 Difference</th>
<th>Total Step 1+2</th>
<th>Step #3 Next step plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design-X, Function-Y</td>
<td>50% ±50%</td>
<td>40%</td>
<td>-10%</td>
<td>40%</td>
<td>30% ±20%</td>
<td>20%</td>
<td>-10%</td>
<td>60%</td>
</tr>
<tr>
<td>Reliability 99%-99.9%</td>
<td>80% ±40%</td>
<td>40%</td>
<td>-40</td>
<td>40</td>
<td>30% ±50%</td>
<td>30%</td>
<td>0</td>
<td>70%</td>
</tr>
<tr>
<td>Performance 11sec.-1sec.</td>
<td>10% ±20%</td>
<td>12%</td>
<td>+2%</td>
<td>12%</td>
<td>20% ±15%</td>
<td>5%</td>
<td>-15%</td>
<td>17%</td>
</tr>
<tr>
<td>Usability 30 min. -30 sec.</td>
<td>20% ±1%</td>
<td>10%</td>
<td>+10%</td>
<td>10%</td>
<td>5% ±2%</td>
<td>10%</td>
<td>-5%</td>
<td>20%</td>
</tr>
<tr>
<td>Capital Cost 1 mill.</td>
<td>2% ±1%</td>
<td>4%</td>
<td>-2%</td>
<td>4%</td>
<td>10% ±2.5%</td>
<td>3%</td>
<td>+7%</td>
<td>7%</td>
</tr>
<tr>
<td>Engineering Hours 10,000</td>
<td>1 week</td>
<td>2 weeks</td>
<td>-1 week</td>
<td>2 weeks</td>
<td>1 week</td>
<td>0.5 weeks</td>
<td>+0.5 wk</td>
<td>2.5 weeks</td>
</tr>
<tr>
<td>Calendar Time</td>
<td>1 week</td>
<td>2 weeks</td>
<td>-1 week</td>
<td>2 weeks</td>
<td>1 week</td>
<td>0.5 weeks</td>
<td>+0.5 wk</td>
<td>2.5 weeks</td>
</tr>
</tbody>
</table>
Managerial Consequences of EVO Implementation

- More frequent communication with the stakeholders
- More integration effort (more CM)
- Project needs Requirements Engineer & Architect during the entire project
- More intensive priority setting and scheduling for the project leader (which he should have done in the first place)

EVO can very well be combined with existing PCP processes.

Don’t use EVO as excuse for abandoning other useful project management and PCP practices!
How does EVO affect CMM(I) compliance? → Level 2

- **RM**: EVO strongly supports RM.
- **PP**: Keep existing overall estimating techniques for size, complexity, effort and CCR. Schedule according to dynamic EVO priorities.
- **PTO**: EVO = continuous tracking & correction of plans. Do not abandon existing management reporting procedures.
- **SM**: Applying EVO-principles to the subcontractor reduces risk.
- **SQA**: Very frequent review & testing (QC), Independent QA must be covered separately.
- **SCM**: Just apply all existing CM procedures (more integration cycles).
- **M&A**: Well implemented EVO provides weekly product completion & quality measures. Process Performance Measurement must be added.
How does EVO affect CMM(I) compliance?

→ Levels 3, 4

• **IC:** EVO provides active synchronisation with other groups and disciplines: some support for IC.

• **SQM:** Quality attributes are numerically specified. Their scales of measure form a good entry for applying statistical process control.
### Overlaps between Evo and XP (BLUE)

#### Planning
- User stories are written
- Release planning creates the schedule
- Make frequent small releases
- The Project Velocity is measured
- The project is divided into iterations
- Iteration planning starts each iteration
- Move people around
- A stand-up meeting starts each day
- Fix XP when it breaks

#### Designing
- Simplicity
- Choose a system metaphor
- Use CRC cards for design sessions
- Create spike solutions to reduce risk
- No functionality is added early
- Refactor whenever and wherever possible

#### Coding
- The customer is always available.
- Code must be written to agreed standards.
- Code the unit test first.
- All production code is pair programmed.
- Only one pair integrates code at a time.
- Integrate often.
- Use collective code ownership.
- Leave optimization till last.
- No overtime.

#### Testing
- All code must have unit tests.
- All code must pass all unit tests before it can be released.
- When a bug is found tests are created.
- Acceptance tests are run often and the score is published.
Differences between Evo and XP

**EVO**
- Suited for large & small Systems & Software Development
- Results Centric
- Stakeholder focus
- Works with anybody
- Numeric
  - specification of (strategic) objectives
  - prioritization (impact tables)
  - progress tracking

**XP**
- Suited for small Software Development only
- Code Centric
- Developers focus above Process focus
- Need seasoned programmers
- NO numeric specification of objectives, prioritization nor tracking
Niels Malotaux

- Electronics 1974
- Development of computers, embedded systems and software
- Since 1998 “Quality On Time” consultant
  - Optimising outsourcing
  - Optimising way of working R&D organisation
  - Optimising way of working software organisation
- Current activities: training & coaching
  - Evolutionary Project organisation (Evo)
  - Requirements engineering
  - Reviews and Inspections
  - Project Rescue
Development cycles

1. Start
2. Plan
3. Do
4. Act

Plan
What do we want to know or to do

Do
Carry out plan

Act
What can we learn

Check
Analyse the effects

Start

Smart planning

Planning

Start

Planning
Discipline

- Control of wrong inclinations
- Discipline is very difficult
- We must help each other

Romans 7:19
Cycles in Evo

- **Weekly Task Cycle**
  - Are we *doing* the *right things*, in the *right order*, to the *right level of detail*
  - Optimising estimation, planning and tracking abilities to better predict the future
  - Select highest priority tasks, never do any lower priority tasks, never do undefined tasks
  - There are only about 26 real effort hours in a week
  - In the remaining time: do whatever else you have to do
  - Tasks are always done, 100% done
Cycles in Evo

- **Weekly Task Cycle**
- **Value Delivery Cycle**
  - Are we *delivering* the *right things*, in the *right order*, to the *right level of detail*
  - Optimising requirements and checking assumptions
  - Delivering the juiciest, most important stakeholder values that can be made in the least time
  - 1 to 2 weekly cycles
Tasks feed deliveries
Task Cycle - Delivery Cycle

Doing
the right things, in the right order to the right level of detail

Delivering

Optimising
Estimation, planning, tracking
Requirements, assumptions

Selecting
Highest priority tasks
Juiciest, most important values

≤ 1 week
1 to 2 task cycles

Always done, 100% done
How to start with tasks

• Take the requirements, architecture and design
• Make a list of things to do
• Split in tasks of 26 hours max (use effort estimation)
• Put on List of Candidate tasks
• Prioritise the tasks on the Candidate List
• Select ~26 hrs of tasks from top of the list
• Agree and commit to work packages (100% done!!!)
• Use TaskSheets to avoid extra work (what, how, how check, how done)
• Do the work
• Learn
Parkinson's Law

"Work expands to fill the time available"

- **Standard Management**
  - Do 6 days in 5 days!
  - Never succeed
  - Frustration
  - Demotivation
  - Stress
  - Higher productivity??

- **Evo**
  - Do 3 days in 5 days!
  - Success
  - Unstress
  - Energy
  - Motivation = Motor of productivity
  - Higher productivity!!
Evo Day: Goal

Turning a project into an Evo project

At the end of the day:
  • Everyone knows what to do and why in the next cycle
  • 100% commitment given
  • We know that we are going to work on highest priority issues
Evo Day: Morning

• Presentation of Evo Methods
  • Like this story

• Presentation of product
  • How well do we know the goals of the project?
Evo Day: Afternoon

- Decomposing work into subtasks (of max 26 hours effort)
  - Estimate effort in hours
  - Estimate priority
  - Who could best do this
- Listing tasks in order of priority
  - How to define priority order
- Top of the list (highest priority issues):
  - Estimate is not yet done
  - Who should do what
  - Take your tasks from the list for coming cycle (week)
  - Commit to finish these tasks completely
Task selection criteria

- Most important requirements first
- Highest risks first
- Most educational or useful for development first
- Synchronise with other developments (e.g. hardware)
- Every cycle delivers a useful, completed, working result
Delivery selection criteria

Juiciest, most important stakeholder values that can be made in the least time

- Every delivery must have symmetrical stakeholder values (features, qualities), otherwise the stakeholders get stuck
  - Delete ↔ Add
  - Copy ↔ Paste
- Every new delivery must have clear extras, otherwise the stakeholders won’t keep producing feedback
- Every delivery delivers smallest clear increment, to get the most rapid and most frequent feedback
- If a delivery takes more than two weeks, it can usually be shortened: try harder
Dependencies

resources

time

features
Priorities

Better 80% 100% done, than 100% 80% done

Let it be the most important 80%
Structure of a weekly task cycle
Past Tasks
John
This week
John
Still to do
John
Past Tasks
Bill
This week
Bill
Still to do
Bill
Past Tasks
Sue
This week
Sue
Still to do
Sue
Task 1
Task 2
Task 3
Task n
Task n+1
Task n+2
Task m
Task m+1
Task m+2
Value 1
Value 2
Value 3
Value n
Value n+1
Value n+2
Value m
Value m+1
Value m+2
Delivery 1
Delivery 2
Delivery 3
Delivery n
Delivery n+1
Delivery n+2
requirements
prioritized
prioritized
prioritized
prioritized
<table>
<thead>
<tr>
<th>ID</th>
<th>Task</th>
<th>Dur</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>3</td>
<td>task 1</td>
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<td>20 h</td>
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<td>2</td>
<td>John 126</td>
<td>26 h</td>
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Anything that must be done goes through the Candidate Task mechanism.
Testing in Evo

- Final validation shouldn’t find any problems
- Earlier verifications mirror quality level to developers: how far from goal and what to learn

Evolutionary development

Delivery
Measure quality
Delivery
Measure quality
Delivery
Measure quality
Delivery
Measure quality
Final validation

how far are we from the goal of "zero defect delivery"?
Magic words

- Focus
- Priority
- Synchronise
- Why
- Dates are sacred
- Done
- Bug, debug
- Discipline
Links

• www.gilb.com
  Evo guru

• www.spipartners.nl
  Simon’s website - Gilb’s courses in Holland

• www.malotaux.nl/nrm
  Niels’ website

• www.malotaux.nl/nrm/Evo
  Evo pages

• www.malotaux.nl/nrm/pdf/MxEvo.pdf
  Evo booklet
Can you afford **not** to use Evo?

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