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Using Lessons Learned to Challenge ERP Projects

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Paul Gerrard

Paul is the founder and Principal of Gerrard Consulting, a services company focused on increasing the success rate of IT-based projects for clients. He has conducted assignments in all aspects of Software Testing and Quality Assurance. Previously, he has worked as a developer, designer, project manager and consultant for small and large developments using all major technologies and is the webmaster of gerrardconsulting.com and several other websites.

Paul has degrees from the Universities of Oxford and London, is Web Secretary for the BCS SIG in Software Testing (SIGIST), Founding Chair of the ISEB Tester Qualification Board and the host/organiser of the UK Test Management Forum conferences. He is a regular speaker at seminars and conferences in the UK, continental Europe and the USA and was recently awarded the "Best Presentation of the Year" prize by the BCS SIGIST.

Paul has written many papers and articles, most of which are on the Evolutif website. With Neil Thompson, Paul wrote "Risk-Based E-Business Testing" – the standard text for risk-based testing.

In his spare time, Paul is a coach for Maidenhead Rowing club.

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Agenda

- Why Lessons Learned?
- Introduction to ERP (brief)
- ERP Testing (very brief)
- Some Lessons Learned
- Conclusion

- NB this is a work in progress...
- PowerPoint slide pack can be found on the GC website.

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Why "Lessons Learned"?

- *"Those that do not learn the lessons of history, are doomed to make the same mistakes"*
- "You only learn from making mistakes"
- Better still – learn from the mistakes of others

- The aim of this talk is to introduce "lessons learned" and illustrate how these could help you as a tester, and your projects in general.

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Why lessons learned?

- I'm researching patterns of failure in (typically) large scale, long-term projects
- Sources included integration companies, project manager staff and user management
- Eighty-four actual project failure modes and risk mitigation actions experienced by interviewees were identified
- The purpose of this work was to provide a coherent set of 'challenges' to projects
- Why?

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It started with a client (of course)

- Large multinational has implemented SAP in UK, most European countries, USA and around the world 59 times (yes... 59)
- Most implementations had problems – some minor, some major
- Client culture is risk-averse, high integrity, mature, humane, reasonable, rational (unusual?)
- Wanted to check 'all the bases are covered'
- Wanted me to 'challenge' the project.

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Simple Methodology

- Interviewed project management, integrators, users and senior business management
- User, supplier, project manager, tester viewpoints gathered
- I provided hints to risk areas, but the interviewees brainstormed their lessons
- Not focused on testing, but, as we'll see later most have a testing component.

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What was I asking for?

- Modes of failure in production that
  - "Were anticipated – we addressed it and here's how"
  - "Materialised – we should have addressed earlier – here's how"
- Each lesson represents a potential or actual mode of failure, so is a potential risk of concern to future projects
- Once you have the risks and mitigations, the question for each in your project is:
  - Is this risk relevant, significant to our project?
  - Has this risk been addressed?
  - How is it being addressed?
  - Is it still a concern?

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Lesson = Risk + Response(s)

Risks

Potential Responses

- Do nothing!
- Pre-emptive risk reduction measures
  - information buying
  - process model
  - risk influencing
  - contractual transfer
- Reactive risk reduction measures
  - contingency plans
  - insurance

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Using the Lessons Learned

- A jump start to risk management
- Easier than starting with a blank sheet of paper
- Credibility – these are real failures that could happen to your implementation
- If you research recent failures that are known to your management – you will be listened to
  - They cannot ignore failures in their own company (or industry)
  - They must never repeat the failures of their predecessors (or their own mistakes).

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Introduction to ERP
(Enterprise Resource Planning Systems)

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Overview

- Enterprise Resource Planning (ERP) systems represent a huge market in the commercial arena
- SAP, Oracle and more recently, Microsoft, dominate the market
- Testing is a significant effort but hardly supported by non-proprietary methods and tools
- Experience shows that testing in these projects is critical, but often neglected
- A Benefits-Driven, Risk and Coverage-based test approach could significantly reduce the risk of failures (well, this is my proposal).

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An Introduction to ERP

- Enterprise Resource Planning systems (ERPs) aim to integrate all data and processes of an organization into a unified system
- Typical ERP system will use multiple components of computer software and hardware to achieve the integration
- Key ingredient of most ERP systems is the use of a unified database to store data for the various system modules.

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Scope of ERP

- ERP has expanded dramatically in scope (including):
  - Manufacturing
  - Supply Chain Management
  - Financials
  - Projects
  - Human Resources
  - Customer Relationship Management
  - Data Warehouse
- Large organisations want to implement standard processes and systems across divisions and subsidiaries
- ERP offers attractive, integrated solutions
- The market for these solutions is huge.

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The ERP Market

- ERP market dominated by SAP, Oracle, Microsoft worth EUR 40 billion
- SAP is the biggest and most popular
  - Founded in 1972 by five ex-IBM employees, by 2005, there were 100,600 installations worldwide, with over 25 industry-specific modules in the SAP portfolio. SAP is the world's third-largest independent software vendor
- Founded in 1977, Oracle were first to market a reliable relational database
  - The second largest software company after Microsoft
  - Since the 1990s, they have marketed Financial, HR and other solutions and through a series of acquisitions, including PeopleSoft and Siebel is now the second largest ERP vendor after SAP. [3]
- Microsoft, also started in 1977
  - dominate the proprietary software market on the desktop and small to medium servers.
  - Microsoft were a big Siebel software user but since Oracle acquired Siebel, they have worked hard to build an ERP product suite of their own and are now probably in third place in ERP.

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ERP Services Market

- ERP services market possibly worth more than EUR 100 billion
- Accenture, IBM, CapGemini, LogicaCMG, CSC, HP and others have substantial ERP practices
- ERP services include
  - Consultancy
  - Configuration
  - Application hosting
  - Integration
  - Implementation and deployment
  - Training
  - Full-process outsourcing
- Projects tend to be large, long term, business critical and big-budget. EUR 200m implementation projects are not unusual.

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The (Near) Future of ERP

- If the big three get their way, the integration of desktop (Windows), ERP and associated applications builders are poised to transform the use of IT in business
- SAP and Microsoft Duet project integrates SAP back office data with the ubiquitous Office suite from Microsoft
- Currently, these applications are small in number, but full integration of desktop office products and ERP systems appear to be the next phase of development in the market.

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The Nature of ERP Implementation Projects

- ERP implementation projects typically have a mix of the following disciplines:
  - Package configuration and/or parameterisation
  - Package customisation (including programming)
  - Infrastructure development/upgrading
  - Integration with legacy systems
  - Data migration
  - Business change (process design and training)
  - Testing (typically unit, sub-system integration, system-system integration, acceptance)
- Most projects are large scale and business critical, the testing budget is substantial – perhaps 50%.

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ERP Testing

ERP Testing 1

- Remarkably, very little research into the testing of packaged ERP suites
- Few books on the subject; those that do exist focus on bundled tools
- Very poorly supported
- The software vendors have their own methodologies for testing, but these focus on process flows through configured components
- In effect, such tests prove the software 'does what it does'
- The behaviour of ERP suites are typically controlled by configuration parameters and do not involve 'software' maintenance at all.

ERP Testing 2

- However, there are specific areas of software change and risk
  - Where where the ERP system must trigger an interface and import from or export to legacy systems
  - 'user-exits', custom procedures, interface programs
  - Amendments to the legacy systems themselves are required.
- Much of the testing has to focus on
  - The behaviour of the system as experienced by its users
  - The outputs generated
  - Integration with legacy systems
- Data migration is a challenging area of ERP projects
  - A lot of the functionality in integrated systems is master-data driven
  - Data migration efforts need evaluation, reconciliation, and testing using the integrated applications.

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SAP testing (as an example)

- Many SAP customers continue to experience rough implementations taking months or sometimes years to resolve post go-live
- SAP testing mostly done by integrators
  - Integrators are SAP specialists, not testers so their test methods are basic
  - Test teams often functional analysts with a few contractors
  - Integrators are marking their own homework so independent assurance may be required
- SAP implementations require many test environments
  - 9 SAP environments is not unusual:
    - ➤ development, integration, E2E, UAT, UAT Support, Tech Test, OAT, Training and Production
  - PLUS interfacing system dev/test environments too.

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The ERP Testing 'Problem'

- 'How to approach testing of ERP systems to demonstrate its behaviour, to meet the needs of its users and address the risks of failure?'
- An integrated set of test methods and tools is required:
  - Results-based management (aka Benefits Realisation), modelling of results-chains to provide input to a benefits-based test approach
  - Experience-based risk assessments that can provide input to a risk-based test approach.
  - Modelling of integrated user, automated and manual processes and interactions in a format useful to testers.
- Derivation of objective, measurable and manageable test objectives from these three models.
- To integrate these three test objectives into a non-proprietary life-cycle test methodology that can be managed systematically.
- Some foundation/visionary work has already been performed by the author, but the approach needs more research, rigor and proving in a commercial environment.

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Some Lessons Learned

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84 SAP Project 'Lessons Learned'

- 68 lessons relate to:
  - Project Organisation and Management (9)
  - Poor Preparation for Deployment (14)
  - User Discipline Issues (7)
  - Process Management, User Engagement (5)
  - Lack of SAP Understanding (5)
  - Change Management (4)
  - Incomplete or Inaccurate Data Migration (5)
  - Poor Testing Practices (13)
  - Lack of Realism in Testing (3)
  - Legacy System Issues (3)
- 16 lessons relate to detailed SAP-Specific functional anomalies (but there could be hundreds across all SAP modules)

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Lessons that are testing and environment related marked ****

- 68 lessons relate to:
  - Project Organisation and Management (9) ***
  - Poor Preparation for Deployment (14) *****
  - User Discipline Issues (7) *******
  - Process Management, User Engagement (5) **
  - Lack of SAP Understanding (5) *****
  - Change Management (4) **
  - Incomplete or Inaccurate Data Migration (5) *****
  - Poor Testing Practices (13) *************
  - Lack of Realism in Testing (3) ***
  - Legacy System Issues (3) ***
- 16 lessons relate to detailed SAP-Specific functional anomalies (but there could be hundreds across all SAP modules)
  - Many of these issues require realistic trial, demonstration and investigation (i.e. testing and demonstration) prior to go-live.

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"Poor Preparation for Deployment"

- Lack of preparation for the 'worst case scenario'
  - Preparing for 'worst case scenarios' and be better positioned to cope with problems in production, regardless of how severe the production problems are
  - Operational risk analysis to ensure all the worst cases have been considered and if your exposure is significant, prepare a resolution or fallback position
- Assuming you can rollback after 4-5 days – you are probably wrong
  - Problems in the first few days after go-live are inevitable
  - Lots of data issues, user misunderstandings and mistakes
  - If these issues are unacceptable, it is possible to roll back to the old legacy system?

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User Discipline Issues

- **Different user groups use the system differently**
  - Dispersed user groups who have used different systems in the past, might use ERP in different ways, when it should be consistent across all regions
  - Might be due to a cultural difference, or they use different interfacing systems or have different national accounting practices
  - Incorporate them in your analysis, custom configuration, training and testing.
- **Multicultural problems with common templates**
  - Common solutions or templates may not work with different cultures
  - "France are militant; Spain don't like what the French did; the Germans won't play ball at all".
  - Cultural differences are often subtle and overlooked.
  - Where problems occur in an implementation, subsequent projects may use these problems as an excuse not to go live themselves. E.g. "Fix the problems in xxx before we implement here".

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Process Management, User Engagement

- Mismatches between the system and processes discovered late
  - Ensure the processes are defined and agreed early, and used to drive the business process-oriented testing in end-to-end and UAT
- Process controls fail because of lack of process ownership
  - If processes are not owned, they may not be monitored and control may be lost
  - "Lack of clear process ownership with responsibilities identified to monitor and chase process controls has lead to deterioration of purchase to pay and petty cash business processes. The system processes are perceived as not working."
- Problems in production because business change not appreciated
  - Lack of appreciation of the need to adopt new or changed processes, roles and responsibilities
  - Lack of commitment to testing these new processes, roles and responsibilities ahead of time increases the chance of problems in production.

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Lack of Product Understanding

- Reconciliations may fail because ERP system does things differently
  - Some reconciliation activities derive a figure may be different from the way that ERP system does it
  - Understand where these anomalies occur so you don't get caught out by reconciliation errors
- Some ERP accounting practices have unexpected side-effects
  - Some configuration settings of ERP used to implement specific accounting practices may not behave the way you expect
  - "The use of standard prices versus average prices: stock movements and reversals may leave stock locations with zero stock but negative stock values – perhaps a nonsensical situation, but one that is a consequence of using that feature. Before implementation, the consequences of these configuration settings may not be understood so they must be tested and not assumed to behave as you expect."

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Change Issues

- Change from too many sources can't be managed
    - Implementation involves data migration, configuration and implementation
    - Large complex projects might have multiple sources of change that are linked, and cause knock-on effects
    - Need to deal with data migration issues, legacy system changes, integration challenges, infrastructure changes etc.
    - Change difficult to manage because every change affects multiple parties
    - Changes may also conflict
    - Understanding the impact of such changes and managing the communications between teams is critical
- Global templates can change and cause disruption
    - Common templates are often used to implement SAP in a consistent way
    - Every implementation generates requests for change that have to be rolled out at some point to all regions
    - The central team might request you regression test and implement an amended template - a distraction just when you don't need one.

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Incomplete or Inaccurate Data Migration Issues

- **Issues due to poor quality data**
    - 70% of anomalies in production are related to data issues. ERP is usually master-data driven – if the master data is wrong, the transactions just won't work
    - Data problems found in production may not always be serious and reflect data quality issues in the existing systems. Repeated data loads and testing using migrated data can help to reduce the problems after go-live.
- **Incomplete data migration causes ERP transactions to fail**
    - The proportion of transactions that get through ERP always lags behind the percentage of data successfully migrated. Experience: "Only 25% of deals might get through even though 65% of data has been migrated. To achieve 90% of deals, one must have nearly perfect data. Achieving 90% of data migration does not imply the job is 90% done."
- **Poor legacy data only identified when output to customers**
    - Customer information held in legacy databases may be held in free format, unvalidated fields. Historically, this data may be for internal use. But where that data is subsequently used in ERP it might appear on sales orders or invoices – and be unacceptable.

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Poor Testing Practices

- **Confidence in development testing was unfounded**
  - Every phase of testing has it's own distinct set of objectives
  - Testing is done by 3rd parties or outsourced companies may not have been done and done thoroughly
  - Monitor developer testing closely
  - Beyond that, as ERP is a package, common misconception that thorough testing not required
  - Many examples where testing performed by development teams may not have been done properly
- **External interfaces not properly tested**
  - If you have interfaces to external organisations check the test files you send to them and receive from them are properly tested.
  - Experience: "A number of test files were sent to the bank and were signed off. It later transpired however that the bank only 'eyeballed' the files and when the first live file was processed by the bank, it failed due to a single unrecognized record type."

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Lack of Realism in Testing

- **Reports tested with perfect data might not be working**
  - Testing on reports done with designed, perfect data won't spot anomalies (which might be the reason the report exists in the first place)
- **"Integrated" testing on perfect data won't expose problems**
  - Testing on designed data is fine for proving ERP transaction configuration, but inadequate for testing end-to-end functionality across legacy systems and ERP
  - Assuming that ERP itself is relatively defect free and that if all interfaces between ERP and legacy systems are reliable, testing with 'perfect data' is unlikely to detect problems
- **Lack of testing on migrated data means cutover is not fully tested**
  - Data migration and system cutover dry runs are critical. Only then will you know how close or how far away you are from completion.

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Legacy System Issues

- **Problems in existing systems cause reconciliation problems**
  - Common scenario when diagnosing problems between ERP and legacy systems is that the legacy systems may be the source of error
  - ERP Package is likely to be reliable
  - When a reconciliation fails, the source of the error is most likely to be in legacy systems or data migration
- **When systems don't reconcile - your existing systems might be at fault**
  - When in production, and control or reconciliation reports show discrepancies between existing systems and ERP, check that the data in the existing system is correct as well as looking for faults in ERP or interfaces and so on
  - Experience: "There have been examples of pricing, and payroll calculations for companies having been wrong 'for years'. Because of the attention being paid to reconciliations and the safe assumption that ERP will report correctly, your ERP implementation may expose embarrassing legacy system problems. Be ready to accept this might be the case."

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ERP Specific Problems

- **E.g. SAP reversal processes do not behave as users expect**
  - Transaction reversals are complicated and difficult to understand
  - May be more than one apparent way of achieving the reversal, but each may have different side effects
  - Reversal process may be prone to anomalies where certain accounting practices are used
  - Experience: "Example is standard price versus moving average price. This adversely affects the behaviour and stock value in certain situations. Check that selected accounting practices behave as anticipated in test. Also try the reversal process to see the outcome is acceptable."
- **Users make Invalid compromises in the processing flow of transactions**
  - Some processes may have more than one sequence of transactions to achieve and objective
  - Experience: "For example a reversal may require several transactions to be backed out to reinstate a correct balance. But it may be possible to take a short cut to achieve what is believed to be the same end. Do the business understand the consequences of using these short cuts? Are they deprecated; do the users understand they should not use them?"

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Conclusion

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What conclusions can we draw from the lessons?

- Stakeholders need
  - To be fully engaged throughout the project
  - Demonstrations of how business benefits will be achieved
  - To see the risks that threaten these benefits addressed
  - Sufficient evidence to make the go-live decision with confidence
- The test, review and other information gathering strategy must
  - Be collaborative with stakeholders, users, integration partners
  - Focus on business benefits, risk and governance
  - Specify environmental requirements at an early stage
  - Deliver evidence through a phased process to support decision making
- Environment support must
  - Provide platforms for development, integration, functional and non-functional testing, data migration, training, cutover trials and production
  - Meet platform requirements accurately, reliably, consistently, timely

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Project Intelligence™

- PI is the information and knowledge collected in reviews, product demonstrations, functional and non-functional testing and training
- A PI strategy extends beyond testing but uses traditional test disciplines to drive the information gathering process
- PI strategy is driven by four needs:
  - *Benefits Realisation* – to demonstrate system behaviour and people, process and system working to achieve business results
  - *Product risk* – to detect faults and demonstrate stability, performance, reliability etc. and reduce the probability of failure
  - *Coverage* – to ensure sufficient intelligence is gathered to give confidence in stakeholder decision making
  - *Knowledge transfer* – the need to understand the system, new and changed processes and the impact on users in the business.

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Project Intelligence™ Strategy
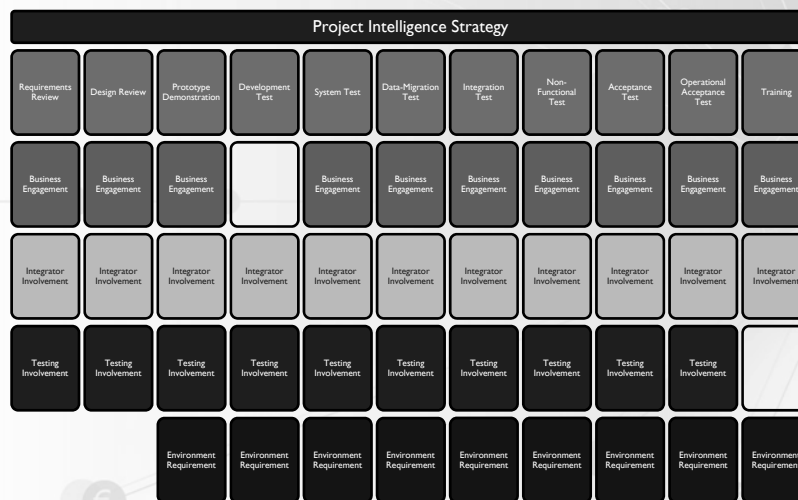
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Next Steps

- Looking for ERP user organisations to share their experiences
- Looking to partner with academic institutions
  - One software engineering school (interested in modelling and test management tools)
  - One business school (interested in benefits realisation, change and risk management)
- The plan is to research and develop methods and tools to support better ERP testing.

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Thank-You

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