Using Risk Analysis to Prioritise Your Testing

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P r e s e n t a t i o n

F9

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Survival of the Riskiest

A Pragmatic approach to Risk Based Test Planning

By
Jennifer Smith-Brock

What is Risk Based Test Planning?

- How many use risk based testing?
- What types?

Risk Based Test Planning

- IS:
  - Tool to help make better management decisions
  - Negotiation tool for test scope and strategy

Risk Based Test Planning

- IS NOT:
  - The test effort itself
  - Going to save a doomed project
  - Going to save the planet

Why am I here?

- Share experiences
- Share what works for me
- And what hasn't worked so well

Test

Assessment, Measurement, evaluation, review

Webster's New World Dictionary

Risk

- Danger, hazard, menace, threat, jeopardy

Examples

- OOPS! United Airlines inadvertently has given some of its customers bargain-basement fares……again!

- State liquor stores have been inadvertently double-charging some people who use credit cards to buy alcohol, a glitch that is apparently unusual in the retail industry

More Examples

- State workers in Missouri continued replenishing depleted food stamp accounts Friday for possibly hundreds of people snared by a computer glitch that blocked them from buying food last weekend

- Due to a computer glitch in the order processing system LAPD officers had to buy their own supplies (pens,pencils etc)
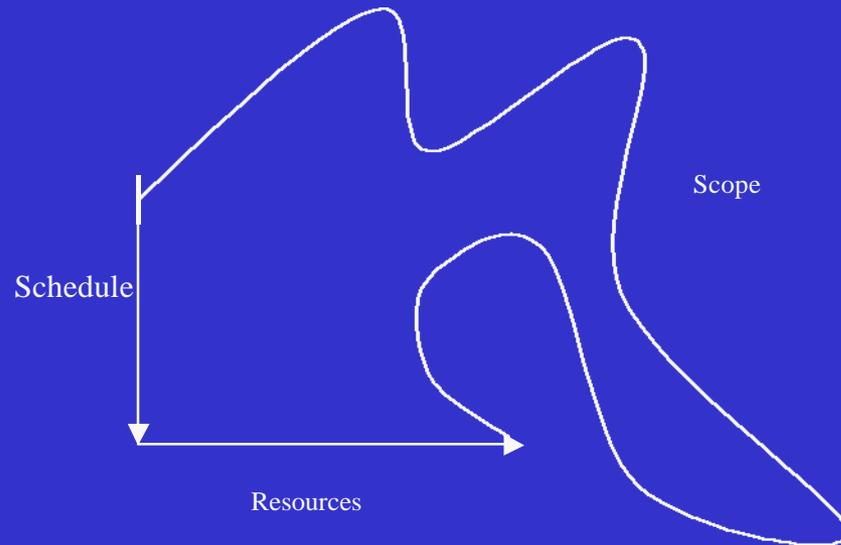
Risk Based Test Planning

Assess, measure, evaluate and review
to minimize danger, hazards, threats
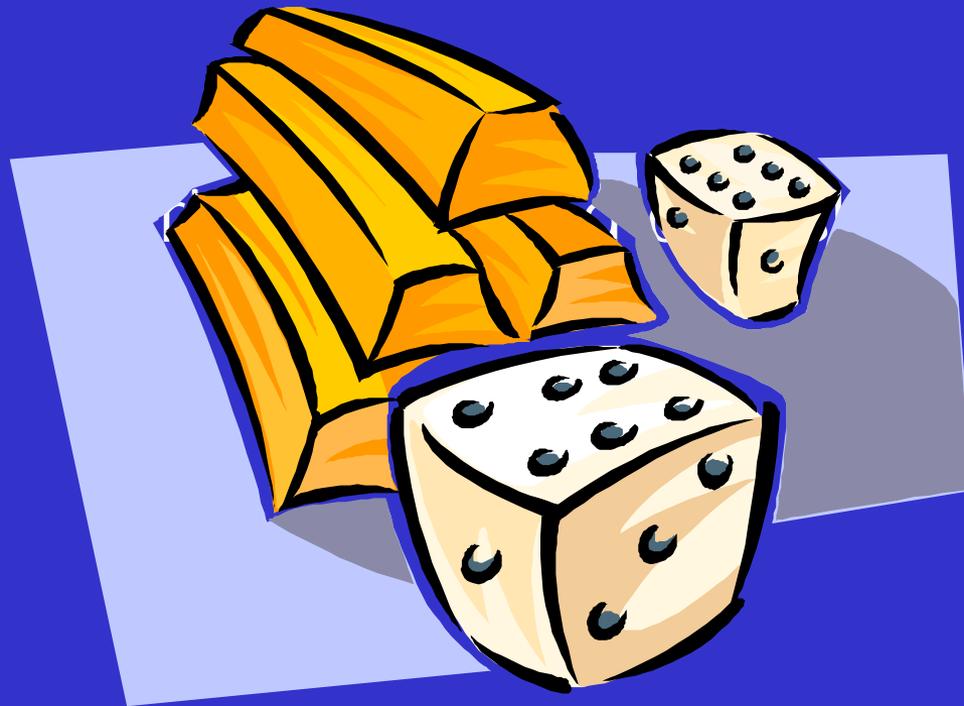menaces and jeopardy by identification
and communication

Assumptions

- Schedule Finite

- Scope infinite

- Resources finite

Scope

Schedule

Resources

What to do?

Acknowledgements

- Ingrid Ottevanger "Risk Based Testing"
- James Bach "James Bach on Risk Based Testing"
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- Hans Buwalda for input and coming up with the title

Prioritize

Can't test everything, the test effort must be prioritized, so we use risk to help us out

How?

- Identify Quality Characteristics

- Identify Risk Factors

- Identify the Impact(s)

Who?

- Project Team
  - Stakeholders
  - Sponsors
  - Developers
  - Project Managers
  - Testers
  - Trainers

Quality Characteristics	Risk Factors							Impact Factors					Total Risk & Impact
	Security	High Usage	Complexity	Development Volatility	Defect History	Cascading Failure	Total Risk Factors	Monetary Ramifications	Negative Publicity/Credibility	Other Internal systems impacted	Missed Market Opportunity (Deadlines)	Total Impact	
Usability		3	2	1	2		8	2			2	4	12
Functionality	1	3	3	3	3	1	14	2	2		2	6	20
Performance	2	3	2				7		3			3	10
Efficiency		2	2				4			2		2	6
User Friendliness			1	1	2		4					0	4
Reliability	1	3	3				7	2	3		3	8	15
Installibility	1						1	2	2			4	5
Compatibility	1		2	2			5			3		3	8
Supportability			3				3					0	3
Testability	1	3	3	3	3	3	16					0	16
Maintainability	2		2				4		2			2	6
Portability	1						1					0	1
Localizibility	1						1					0	1
Credibility	1		2				3	2	3		2	7	10
Accuracy			2				2						
Data Integrity			3	3	3	3	12	3	3	3		9	21
Total	12	17	30	13	13	7	92	13	18	8	9	48	140

What Now?

- Use the information derived from the analysis to assist in the test planning:

    - Assign staff appropriately
    - Influence code delivery schedule
    - Reduce test effort in low risk areas
    - Report progress based on risk
    - Assign risk to test cases, scripts

Conclusions

- Have witnessed improved communication amongst project team
- Learned previous test effort was not proportionate to the risk once reviewed
- Needs to be evaluated and reviewed throughout the project
- Best to start early

Survival of the Riskiest

A pragmatic approach to managing a test effort

By Jennifer Smith-Brock
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August 16, 2001

Abstract

This paper outlines an approach to help test managers and test team leads prioritize and communicate strategy and status for the test effort in a pragmatic and useful manner. It also provides insight into approaches for utilizing resources efficiently and effectively. This risk-based approach compliments and encourages teamwork across functional boundaries. It provides insight into how test managers and test leads can communicate effectively the status of the test effort as it relates to risk, therefore provides much needed information as to business risks discovered or possible business risks not yet uncovered. Several papers are published on risk based testing, such James Bach's Heuristic Risk Based testing, and Ingrid Ottevanger's Risk Based Testing. This paper attempts ways to use the information once collected. The content of this paper is from practical experience utilizing parts of the above-mentioned papers to develop this unique approach.

Biographical information

Jennifer Smith-Brock has over 17 years experience in Test management and software testing. She was instrumental in implementing Test Process Improvements in a large development organization. One of the test process improvements she has focused on over her career is Risk Based testing. She has tried many approaches and has found some work better than others. She has also led the Test effort of several high risk, high profile projects to a successful conclusion, exceeding quality expectations and adhering to established schedules. Jennifer was the program chair for Star West 99, Star East 00 and Star West 00. Currently she is consulting in a large development organization implementing new test methodologies, and again is focusing on Risk Based Testing.

RISK:

The possibility of loss or harm; danger

TEST:

A set of questions, problems or tasks used to measure

Introduction

What do you do when you are given a project to manage the testing and you don't have enough resources and time to conduct all the testing you would like to do? Many times we feel compelled to test it all anyway, because we think this is what is expected of us. Now think about what it would be like if you said "I don't have enough time and resources to test everything the way I would like, so let's look at it carefully and collaborate as to the smartest approach".

The message you are sending is multifold, you are sending the message there is more than you can comfortably handle, that you want to work as a team to decide the best approach, and that maybe the way you've always done it may not work.

This can provide many opportunities to improve both the quality and focus of the testing and the perception and relationships of the test organization.

There are many ways to start this process. The one that works for you may not work for others or another organization but there are some items you should address early (very early).

The quality characteristics that are critical to this project or organization are crucial to identify early on.

The project breakdown is also crucial to identify early on, you may choose to break it down by component or by deliverable. The right answer depends on what is right in your organization and for your project.

Once these two elements are identified you are almost ready to start conducting some test risk analysis. By almost, the remaining important task is to learn as much as much as

you can, within the time frame allotted, about the project or program before starting into the risk analysis portion.

Prior to going into the actual analysis, it is important to understand the elements that will be considered.

Quality Characteristics

Quality characteristics are the attributes you and your project team identify as being critical to the success of the project they will differ from project to project but shouldn't differ within a given project. They need to be defined upfront for the entire project so when you are conducting your comparative analysis of the risk you are on an equal playing field. Many of the quality characteristics will apply to most if not all projects such as functionality and testability, there are several that may or may not apply such as localizability and portability. Up until recently most of us have focused our test efforts on functionality, but are now expanding the focus to include additional attributes of a product. The Risk Factors are the aspects that effect the risk for a given quality characteristic. Rather than providing definitions of each one of the elements, considerations are provided which give you a framework to think about.
List of Quality Characteristics and considerations follows:

Figure 1

Quality Characteristic	Consideration
Usability	What is the effectiveness, efficiency and overall satisfaction for the users to achieve their goals?
Functionality	Can it perform the required function? Is it doing what it was designed to do?
Performance	How responsive is the application or system? Are there any bottlenecks with the application or system, which could cause it to slow down or be inefficient?
User Friendliness	How easy or difficult is it to learn to use the application or system?
Reliability	What is the mean time to failure? What is the rate of occurrence of failure?
Installibility	How easy can it be installed and uninstalled?
Compatibility	How well will it work with external components and configurations?
Testability	How much effort will it take to economically and effectively test the application or system?
Maintainability	How economical will it be to build, fix or enhance the system or application? How economical will it be to provide support?
Portability	How economical will it be to port the technology?
Localizability	How economical would it be to release the product in another language or culture?
Credibility	Will the customer have confidence to make decisions based on the system or application results?
Data Integrity	How reliable must the data be in order to be successful?

Risk Factors

These are the facets that introduce risk to a project, release or business process. When the risk factors are inherent in a release or application it is probable the risk will increase accordingly. A highly complex module is more likely to introduce risk to a deliverable than a simple module. List of Risk factors and considerations follow:

Figure 2

Risk Factors	Considerations
Security	Does security introduce risk to the application or system?
New Technology	Are any technologies being introduced to the project team that is new to them?
High Usage	Would high usage from users or high volumes of data introduce risk to the system or application?
Complexity	Does the complexity (I/O, interfaces, calculations, data base updates etc) introduce additional risk to the application or system?
Development Volatility	Is the application or system volatile? In other words are there rapid and unexpected changes occurring in the code or requirements?
Defect History	Historically has there been a high amount of defects in the application or system and what has been the fix rate if there has been a high number?
Cascading Impacts	Is there a possibility of a chain reaction impact with the application or system?

Now, think of a project you are familiar with. Keeping in mind this project do a mental risk analysis using defect history as the risk factor and functionality as the quality characteristic.

What is the probability of defect history introducing risk to the functionality of this project or program?

One answer may be very likely there is always a high amount of defects in the code affecting the functionality and it takes the programmers forever to fix the defects.

Or it could be very unlikely because historically the code has been clean and what few problems there have been have been corrected quickly and with few errors. Each of the risk factors should be assessed against the quality characteristics in this manner.

Figure 3

	Security	New Technology	High Usage	Complexity	Development Volatility	Defect History	Cascading Impacts	*Total Risk Factors*
Functionality	3	2	3	3	3	3	3	20
Usability	NA	2	2	2	1	2	1	10
Performance	1	1	3	3	3	2	3	16
Installibility	NA	1	NA	2	2	1	2	8
Compatibility	NA	1	NA	2	2	1	1	7
Testability	1	1	2	3	3	3	2	15
Total	5	8	10	15	14	12	12	76

Risk Impacts

Risk Impacts represent the ramifications if there is a failure. By addressing the factors introducing risk to a project we are only looking at the problem in partiality since there could be a difference in the impact of the risk.

 For example the likelihood of introducing risk to the functionality is low, but if it just happened to fail what would be the impact? It could be either higher or lower depending on the situation.

There are cases where there are many factors introducing risk to an application and historically many test resources are assigned and tied up for long periods of time, when in actuality a failure isn't catastrophic at all.
The risk analysis provides information that can assist the test manager or test team lead in making difficult decisions such as to the assignments of the testers based on skill level, risk and quality goals. Risk Impacts along with their considerations listed below:

Figure 4

Impact Factors	Considerations
Monetary Ramifications	What would the monetary impact be to either your business or your customer(s) if there were a failure for the system or application?
Regulatory/compliance/negative publicity	What would be the cost to the business in a) loss of existing business b) loss of potential business c) liability?
Other Internal systems impact	What would be the economical impact of this type of failure?
Missed Market opportunity	What would be the ramifications if you missed the market by either delivering late or missing the market needs?

Here is a sample of the Impact factors assessed against the Quality Characteristics:

Quality Characteristics	Security	New Technology	High Usage	Complexity	Development Volatility	Defect History	Cascading Impacts	Total Risk Factors	Monetary Ramifications	Compliance/Negative Publicity	Other Internal systems impacted	Missed Market Opportunity (Deadlines)	Total Impact	Total Risk & Impact
Functionality	3	2	3	3	3	3	3	20	3	3	3	3	12	32
Usability	NA	2	2	2	1	2	1	10	1	1	NA	NA	2	12
Performance	1	1	3	3	3	2	3	16	2	3	2	3	10	26
Installibility	NA	1	NA	2	2	1	2	8	2	2	2	2	8	16
Compatibility	NA	1	NA	2	2	1	1	7	1	2	2	1	6	13
Testability	1	1	2	3	3	3	2	15	2	2	3	1	8	23
Total	2	6	7	12	11	9	9	56	8	10	9	7	34	90

Methods of documenting the assessed value

There are several methods of documenting and communicating the analysis. This approach doesn't prescribe any particular method. It depends on the situation and

culture. One technique is the use of numeric data. Numeric data can mislead people to think it is scientific when in fact it is relative and no more scientific than stating the risk as high medium or low. With all that said the starting place can be normal risk and the risk is either higher or lower. This is the method James Bach uses in his heuristic risk based testing. There are many very good reasons for using this approach. Another approach is to assign numeric values such as 1, 2, 3 or 0.

- 0 meaning it is not applicable, there is no possibility at all the risk factor will introduce risk to a quality characteristic.
- A value of 1 may indicate there is a possibility of risk being introduced but is unlikely.
- A value of 2 may mean there is a possibility of introducing risk and it is likely to occur.
- A value of 3 could mean the likelihood is very high and probably will happen.

This is the scheme I have used on projects. You may notice both schemes are simple. Whatever scheme you prefer, remember that simplicity is critical to the practical use of the analysis. The analysis is a tool to assist with the planning and managing of the test effort and shouldn't consume the project.

The Analysis

The quality characteristics are determined for the project, and the project has been broken down into a logical structure for the team, the testers have learned as much as they can about the project prior to this assessment. You are now ready to assess the risk. This is a significant step and it is essential to have all the stakeholders involved in this aspect. Developers, Users and Testers are key participants and there are often several others who are key to participate in these sessions.

It is crucial for everyone involved to understand why you are doing this and how the results will help you. It is better this is explained up front otherwise some may not focus during the session, because they are so busy trying to figure out why and how this will be used later.

Review the project scope with the group prior to assessing the risk; some interesting information can be derived from this part of the session. Then begin going through each characteristic and ranking the risk factors and impact factors for each one. This exercise can be surprising especially when the developers are ranking items much higher than you would. Be open and ask lots of questions as to why someone ranks it differently than you would, a lot can be learned from this. It is valuable to reiterate how this information will be used upon conclusion of the session as well and ask if participant's want follow up information.

Using the information

The sessions are complete and you have a worksheet completed as a result of the discussion with the key players for the project. It is time to put this information to use, please note that many times the sessions themselves have proven to have incredible value for the team in its entirety. Most test managers assign resources, manage the focus of the test effort and schedule the test effort, and report status, just to name a few responsibilities.

As a result of the assessment a deliverable might have high risk factors and high impact; this information may influence a decision to assign experienced tester(s) to this area. The scheduling may be adjusted to provide additional time for this deliverable, this can be done in a couple of ways:

1) Influence the developers to develop in this area earlier and therefore turn it over sooner
2) Reduce the effort of another deliverable with considerable less risk.
3) Provide testing support to unit test.

On the contrary a deliverable that has low risk factors and low impacts, inspections may cover all the testing necessary for this particular deliverable. These types of deliverables can also provide an opportunity to get a new tester, or less experienced tester started with minimal risk to the project.

It gets trickier with the mixed bag so to speak, high in risk factors but low in impacts. This type probably requires more effort than an inspection, but less vigorous an effort than the high risk factors and high-risk impacts. You may want to assign some experienced testers, especially to the high impact deliverables, but may want to mix the expertise in order to gain some additional strength for future projects. Below is a sample of a chart used in communicating out the strategy the test organization took on a release assessed using this approach.

Figure 5

Release/Component	Skill Set	Effort	Unit test	Early delivery
Sample A	Expert	Moderate	Yes	Attempt
Sample B	Newbie	Low	No	No
Sample C	Moderate	High	Yes	Yes

It is recommended to report status based on risk rather than number of tests executed passed etc. By reporting on the number of passes and fails provides limited information at best and can be very misleading. When the status reporting is based on the risk analysis it provides a much clearer picture of the true status. For example 60 tests have been executed out of 100 possible, of those 60 40 passed and 20 failed. At first glance

this tells us 20% failed, 40% passed and we are 60% complete. From this information are you comfortable making a decision whether to ship tomorrow?

Now lets take the same 100 tests and break them down by risk. Of the 100 tests 40 cover the high-risk areas, 40 cover the moderate risk and 20 cover the low risk. The 40 tests that have passed are the tests that cover the high risk areas, so in effect you have tested 100% of the high risk tests, the 20 that failed are in the moderate risk area and the 40 that haven't been executed yet are the remaining 20 moderate and the 20 low. Now ask yourself am I more comfortable making a ship/don't ship decision. The tool is available to look further and decipher what types of problems you may encounter if shipped without further testing; this provides information valuable when making these types of decisions.

Another approach is to conduct a comparative analysis from deliverable to deliverable. This would entail holding two up and asking the team which is riskier? From what perspective are they riskier than the other? This is a valuable tool to use when up against a situation where your demand for expertise in one area is higher than your supply (or testers). This has happened to me, how about you?

As with most good things there are some unexpected benefits as well:

- Don't be surprised if the project is reevaluated if there are several areas with high risk and high impacts.

- It can be a tool for communicating with the project team. Only with this approach they are providing input and helping you with your planning, this fosters teamwork.

- Provides a clear, focused approach to the test effort and the assignments.

- The framework can be used as a mental checklist when in a position to make a "hasty" decision.

- Provides a tool for negotiating time, resources and functionality on a project or deliverable. It is easier to communicate the importance of the test effort in particular areas.

- Supports an iterative approach and should be revisited often to understand where the risks have changed and shifted.

Summary

This approach can be an effective tool for planning and reporting status for the test effort. Even though the advantages are far greater when used through out the development cycle

there are definite advantages to begin using it later as well. It can be used as a tool to help prioritize and influence the effort. It can also help identify areas that should have more test focus than others, or on the other hand sometimes you might find an area that doesn't require as much focus since the risk impacts are minimal. It provides information that managers can use to utilize their resources wisely such as minimizing risk by assigning testers with higher expertise on higher risk assignments and assigning newbies (newcomers to the field) to the low risk areas. This also helps the team morale, since the experienced testers are recognized for their expertise and the newbies aren't assigned to difficult if not impossible tasks.

The next time you are asked to manage a test effort that you don't have enough time and resources to test as you would like, try this approach. Collaborate with your peers and determine which components or releases or projects are the riskiest and let them rise to the top of the priorities, thus, the Survival of the Riskiest.

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Jennifer Smith-Brock

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