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Mobile Testing Nirvana

TESTING STRATEGIES AND IMPACT ON THE BOTTOM-LINE

INDEX

INTRODUCTION

The software world is today driven by speed and accuracy. Developers and Testers do not have the luxury of time, to ensure that all is well with their apps. There's a tearing hurry to get the app and its updates to the market, but accuracy cannot be compromised, because any bugs in the app can be very costly in terms of time, money, loss of face, loss of customers etc. To cope with the demands of the modern app world, automation is undoubtedly the answer.

While automated testing brings immense benefits, it comes with its fair share of costs too. Any business always seeks to see the cost-benefit trade-off and how it affects the bottom-line. This is more so in the case of Testing Software, which can be as high as 40% for some development projects! But then, automated testing is a necessity today, and hence it is important to convince the sanctioning authorities in concrete ways, that automated testing, though mandatory, is actually an investment and not a dead cost. Here's where Cost-Benefit Analysis of Automated Testing gains great relevance. There are three Automated Testing Strategies and each of them will leave their own mark on the company's budgets and profits. Hence, a serious cost-benefit analysis must precede the management's decision on the choice of Automated Testing Strategy.

Cost-Benefit Analysis must go beyond the obvious costs and look into opportunity costs, hidden costs, and unforeseen costs too, in order to present a holistic proposal. An incomplete analysis may look good on paper at the start, but will have long term repercussions and heart burn if the bottom-line does not turn out to be as rosy as the initial proposal.

This Whitepaper will therefore dwell on the different Automated Testing Strategies and throw light on how the Cost-Benefit trade off of each strategy impacts the company's bottom-line.

ABSTRACT

The software world is driven by tight budgets and tight schedules and the 'Go-to-market' race is extremely important for the mobile app world, necessitating testing to be automated. Given the constrained budgets, every additional cost comes under scrutiny, because it eats into the company's budgets and impacts the bottom-line. Considering that there are various automated testing strategies, it is important for the company to choose the one that best suits its current and future plans.

This Whitepaper will therefore systematically unfold all that is relevant to making the apt choice. It will be presented in two parts:

Automated Testing Strategies

This section will explore the various Automated Testing Strategies and will present a comprehensive view of the available choices which are as follows:

- **In-house Automated Testing**
- **Partial Outsourcing of Automated Testing**
- **Total Outsourcing of Automated Testing**

Cost- Benefit Analysis of Automated Testing Strategies

This section will dwell on the various aspects of **Costs related to Automated Testing**, and also touch on the **Benefits of Automated Testing.** For a proper analysis, it is important to estimate all the possible costs and see how these can be minimized, while simultaneously retaining costs that add value to the project. It will therefore review the **Direct, Indirect, and Opportunity costs, paying particular attention to the substantial Hidden Costs.** The various costs will be reviewed vis-à-vis the three available automated testing strategies.

Read on to explore how the various Automated Testing Strategies affect the company's bottom-line, as this will in turn form the basis for the right choice.

AUTOMATED TESTING STRATEGIES

Broadly speaking there are two types of software testing i.e. Manual Testing and Automated Testing. In today's software world driven by immense speed, the scope of manual testing has tremendously narrowed down, with it being used for limited areas that require human intuition, eye for detail, exploratory tests, and testing of UI features. The reasons are obvious – Manual testing is subject to human fatigue, boredom etc. which can compromise testing accuracy. Even if manual testing is accurately done, it will take exponentially more time than automated testing. With the fast pace at which the IT world changes, by the time manual testing is completed there will be other innovations that could make the app or parts of it redundant.

In today's fast paced software world, automated testing is mandatory for almost all testing needs, if the app has to thrive or even survive. Costs of automated testing will vary with the strategy adopted, but there is no denying that the benefits of test automation definitely outweigh the costs, for the right choice.

This section will therefore expound on the various Automated Testing Strategies as mentioned below, and broadly touch on the costs involved.

- **In-house Automated Testing**
- **Partial Outsourcing of Automated Testing**
- **Total Outsourcing of Automated Testing**

01 In-house Automated Testing

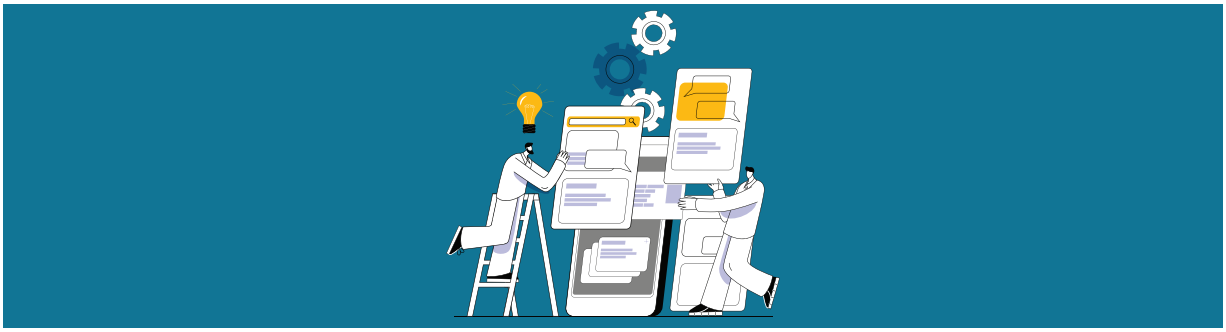
As the name suggests, under this strategy, automated testing is done entirely within the company using in-house infrastructure – by purchasing the relevant testing software, equipment and tools, with testing performed by an in-house testing team. These costs are easy to estimate. However, there are less apparent costs which tend to be overlooked and if these are not considered, it can result in erroneous cost-benefit analysis, which can be damaging in the long term. These hidden costs will be covered in the Cost-Benefit Analysis as detailed in the next section.

02 Partial Outsourcing of Automated Testing

The next automated testing strategy is a hybrid one, where the organization maintains an in-house management and testing team as well as testing infrastructure – at essential levels; and outsources the more complex testing and larger projects to a local service provider. This helps the organization take up larger projects, without blocking capital in capacities that subsequently lie idle for long stretches of time. It also ensures that the organization's resources are not strained in the case of surge testing. Thus the fixed testing infrastructure is operated at more or less 100% capacity; and the cost of test outsourcing becomes a variable cost which is offset by the additional incomes that come from larger or complex projects. However, under this strategy too, there could be unaccounted expenses that can result in budgetary overruns. These will be covered in detail in the Cost-Benefit Analysis presented in the next section.

03 Total Outsourcing of Automated Development and Testing

In this third strategy almost the entire software activity is outsourced to a reputed global IT service organization like Accenture, IBM, Infosys, Wipro, TCS, etc. which means that development and testing are outsourced and teams are often remotely located in offshore locations. This strategy could be a professional choice for large, complex projects which smaller firms may not have the bandwidth to execute. However, here too there are expenses that may not be obvious and yet must be considered. These are explained in the next section on Cost-Benefit Analysis.



Testing Strategies and Cost Concerns

Every company is ultimately interested in a good bottom-line, so care should be taken to ensure this while planning test automation. Testing strategies directly influence cost compilation and therefore warrant a deeper understanding for cost estimation. The choice of the automated testing strategy must be a well-informed one based on a proper cost-benefit analysis where all costs are considered. We must dig deeper than the obvious costs and consider the hidden and difficult to foresee costs too, in order to present a true and fair picture for decision making. Such an analysis will provide for better preparation, planning and risk mitigation. After all, being fore-warned is being forearmed!

The next section will cover in detail, the costs that one must watch out for under each automated testing strategy.

COST-BENEFIT ANALYSIS OF AUTOMATED TESTING STRATEGIES

Test Automation, as seen earlier, is undoubtedly a necessity for the software world today. As seen, there are different automated testing strategies and it is important to choose the one that most suits the organisation. The management will need to be presented with a proper analysis, in order to enable an informed decision and give its financial nod. Costs that justify their share in the limited budget pie are more likely to be sanctioned. Costs that bring more than proportionate positive returns will be viewed as investments, and get red carpet treatment. Costs that put a strain on the budget, without returns may be shown the door.

A well-researched, meticulous Cost-Benefit Analysis goes a long way in helping the Management make the right allocation from its constrained budgets. Hence this section will focus on various aspects that help present a true and correct picture of the costs of automated testing, and will touch upon the benefits too.

COSTS

Starting with costs, these must be estimated from an educated standpoint, as costs are subject to various complexities and also vary according to the test automation approach adopted. Higher the costs – lower the ROI and operational performance. For a proper cost-benefit analysis, all costs i.e. direct costs, indirect costs and opportunity costs must be considered for each automated testing strategy and these must include hidden costs too.

Direct Costs are easier to calculate as they comprise of cost of Testing Software, Testing Tools and Equipment, QA Professionals, Outsourced Contracts, and such other directly relatable costs. These are heavily dependent on the testing strategy adopted.

Indirect Costs include costs of admin and other overheads like recruitment, training, repairs and maintenance, advertisements, travel, communication, energy bills, housekeeping and the like.

Opportunity Costs which relate to change in the company's bottom-line due to forgoing one or more activities, in order to allocate funds for automated testing. Remember, the budget is limited! Hence for automated testing to have a share in the budget pie, one or more other activities will have to forgo their place in the pie, which means their contribution (if any) to the company's profits will also be lost in the process.

HIDDEN DIRECT AND INDIRECT COSTS

Costing must also consider the cost escalation that comes with industry hazards like high manpower turnover, which in turn hikes up cost of recruitment and allied admin costs. There are also unpredictable increases in project costs due to currency fluctuations in case of off-shore outsourcing of test automation; hidden costs like low productivity which delays the project and adds up costs; and wasted costs arising out of underutilization of resources.

With this broad categorisation of costs, this section will move on to explore how costs vary with the automated testing strategy. Direct cost and cost of overheads are relatively easy to estimate, and hence these will be touched upon without going into detailed explanation. However, there are costs that are not so apparent and yet account for a substantial percentage of project costs. This treatise will therefore weave in the various cost nuances for each of the automated testing strategies i.e. In-house Automated Testing, Partial Outsourcing of Automated Testing, and Total Outsourcing of Automated Testing.

IN-HOUSE AUTOMATED TESTING

In this automated testing strategy, since everything is done by the company itself, the costs are relatively easier to compute. There are clearly defined costs like the cost of testing software, equipment and tools; and manpower costs that are easy to calculate with the software testing team being part of the payroll. The allocation for infrastructure costs and overheads like repairs and maintenance, power bills, admin costs etc. can also be reasonably well estimated. However, there is a tendency to ignore the less apparent costs and hence these have been expounded below:

HIDDEN MANPOWER-RELATED COSTS

- **Cost of high manpower turnover:** It is known that software firms experience a very high manpower turnover rate which could be as high as half the team churning over a year. This translates into additional costs of recruitment, induction, training, and other manpower administrative costs which can account for 20% of the project's manpower costs.
- **Cost of experience and knowledge lost:** With high turnover in the testing team, knowledge and experience gained on the project, exits the organization. This is bound to dent the progress of testing, as it will take new testers time to understand the testing intricacies of the project, thus causing delays. While every effort should be made to retain experienced staff, it is also necessary to provide for delays and costs that come with lost knowledge.
- **Costs related to lack of relevant skill sets:** Software testing is a very volatile field with rapid changes and innovations. However, when in-house teams are not self-motivated, the company losses out on the increased productivity that innovations offer. When a company adopts new technologies, if the existing testing team is not familiar with it, there will be additional costs of training. Besides, there will be delays due to the learning curve. Furthermore, if after training, the testing team productivity is low, it will slow down the testing process and may require additional hands to complete the job in the limited time available. All this will drive up costs.

- **Costs arising from underutilization of manpower:** An in-house testing team is a fixed cost that occurs irrespective of whether there are projects or not. If the development and testing process is not properly planned, there could be idle time when testers wait for new codes to be generated. In such cases, the testing team will be underutilized and will be a drain on the limited time and financial resources available. This is yet another hidden cost that needs to be considered when deciding whether to have a full-fledged in-house team. The volatile nature of business needs, also adds to the woes of resource planning.

- **Costs related to poor control systems:** Lack of good control and monitoring systems can drive up costs if testers are intentionally or unintentionally slack in their performance, thus delaying the project. Poor co-ordination within the organisation can also result in unnecessary recruitment to meet deadlines, while testers in other project teams may be underutilized. It is vital for organisations to have good controls and co-ordinations to avoid these unwarranted costs.

HIDDEN INFRASTRUCTURE COSTS

- **Costs arising from underutilization of infrastructure:** In-house testing infrastructure is also a fixed cost that exists irrespective of whether there are projects or not. If the development and testing process is not properly planned it can result in underutilization of testing infrastructure, which will be a drain on time and monetary budgets. Resource planning is therefore necessary to prevent these avoidable costs.

- **Costs related to poor control systems:** If as mentioned earlier, testers intentionally or unintentionally delay projects, it is bound to result in underutilization of testing infrastructure too. As in the case of manpower, poor co-ordination within the organisation can also result in delays with projects queuing up for the same testing infrastructure, while other testing infrastructure lies idle. It is true that having multiple projects simultaneously running can add to planning complexities, but good controls and co-ordination systems in the organisation can avoid the cost overruns caused by unchecked slackness and/or unproductive surge testing.

HIDDEN OPPORTUNITY COSTS

Investing in a testing team and testing infrastructure means forgoing investing the limited financial resource in some other productive activity. Hence if in-house testing infrastructure and manpower are largely underutilized, or if the costs of manpower up-skilling are high, it may be prudent to outsource the testing activity to industry experts, and use those resources on core competencies that may be more productive and financially lucrative for the organisation. Hence costs of opportunities forgone to accommodate in-house testing, is an important consideration for cost-benefit analysis.

PARTIAL OUTSOURCING OF AUTOMATED TESTING

This being a hybrid automated testing strategy, there are all the costs of in-house testing, albeit on a lower scale i.e. cost of testing software, equipment and tools; payroll of software testing team; allocation for infrastructure costs and overheads, etc. as explained earlier. However, there are additional costs of the outsourced service provider and these will be largely defined by the contract value as well as terms and conditions. Since the directly identifiable costs can be easily defined they don't need explanation, and hence the spotlight will be put on the unforeseen and hidden costs of this strategy as detailed below:

UNFORESEEN/HIDDEN MANPOWER-RELATED COSTS

- **Cost of high manpower turnover:** Since there is a basic testing team in place, the problems associated with high turnover persist under this strategy, albeit to a different degree. Additional costs of recruitment, induction, training, and other manpower administrative costs can account for 20 to 25% of the project's manpower costs; with testers' turnover being as high as 40 to 50% annually. There are also delays caused by high turnover in the service provider's staff over which the organization has no control.
- **Cost of experience and knowledge lost:** This cost gets more pronounced under the hybrid testing strategy, because apart from knowledge lost from internal staff turnover, there is substantial knowledge lost as the whole outsourced team moves away once the project is done, taking with them valuable knowledge and experience gained on complex projects. If reliable internal team members diligently work closely with the local service provider's team, then knowledge loss can be minimized, but then this will duplicate resources to some extent.
- **Higher hourly rates for outsourcing:** Service providers will charge a premium on their manpower and testing infrastructure as they need to make their profits. This leads to higher costs than the in-house testing option.

COST OF LOST PRODUCTIVITY ARISING FROM OUTSOURCING

Valuable time which is in short supply has to be spent in shortlisting service providers who can deliver at the time of surge testing, or when large or complex projects are to be outsourced. This time consuming activity reduces time available for directly productive testing activities. Besides, there could be a break in testing during the shortlisting phase, which delays the project and leads to loss in productivity. These are subtle, yet fairly substantial costs that should not be ignored. There is also loss of productivity that comes from adjustments required between internal and external teams due to difference in work cultures and methodologies.

TOTAL OUTSOURCING OF AUTOMATED DEVELOPMENT AND TESTING

In this third strategy with development and testing being outsourced to one or more global organizations, the in-house costs are restricted only to the co-ordinating and monitoring team and perhaps a bare minimum testing infrastructure. However the contract costs of the global organisation to which the project is outsourced can be substantially high with their possibly state-of-the-art infrastructure, which will of course be charged at a premium. Besides the overhead of these global giants are also very high. However, these costs can easily be calculated as per the contract value, terms and conditions, and hence we will once again concentrate on the unforeseen and hidden costs.

UNFORESEEN/HIDDEN MANPOWER-RELATED COSTS

- **Cost of low productivity and high manpower turnover:** The global IT firms which undertake these projects execute them in emerging economies where manpower costs are relatively lower. However, this may often compromise on productivity. Furthermore, the fact remains that turnover of IT staff is high in these countries, with some estimates placing the turnover at 80% for such offshore projects. This creates question marks regarding the quality of output when the change of hands is so high for the project.
- **Cost of experience and knowledge lost:** This cost is very pronounced under the total outsourcing strategy, especially since development and testing are both outsourced and executed at remote locations. There is a wealth of functional and product knowledge that unfolds with these large and complex projects, which can be greatly beneficial to the original company who will own the software in due course. However, if monitoring systems are not strong enough, this plethora of important insights generated in the execution of the project may fail to make its way to the organisation's knowledge bank.
- **Cost of geographical, language, and cultural differences:** These differences can be a hurdle in the smooth flow of the project. At times, the outsourcer, developers, and testers may all be in different time zones. Furthermore, there may be communication gaps because of language differences. There may also be gaps in expectations because of differing work cultures. All this could dent productivity and cause undue delays in the project.
- **Possible lack of checks and balances in project execution:** When development and testing are outsourced to the same company there are possibilities of compromises in case of time or cost overruns. To make up for lost time or mounting costs, testing best practices may be bypassed. This may also result from overconfidence in the development process. To bring in better checks and balances, it is therefore advisable to outsource the development and testing functions to two different IT firms, if this strategy is adopted.

COSTS OF ADMIN AND CO-ORDINATION BETWEEN REMOTELY LOCATED TEAMS

Development and testing teams are often located in countries that have different time zones, language barriers etc. Co-ordination between the various teams can become inconvenient and time consuming. There are also costs of communication, travel, admin etc. that need to be considered. Extra manpower may be needed for country specific statutory compliances and also for smooth co-ordination and follow-up of the project. All these are costs that must be considered, especially since estimates place them at 20% of project cost. There is also the possibility of costly rework that could arise in case of communication gaps and poor co-ordination.

COSTS RELATED TO EXTERNAL FACTORS

When the client and teams are located in different countries, depending on the currency in which the contract has been finalized, there could be a hike in project costs due to fluctuations in volatile currencies. One way to minimize this effect is through currency hedging. There may also be further costs of licencing and other regulatory fees for different countries that add to project costs. All these need to be carefully considered in order to get a true picture of the cost of the project.

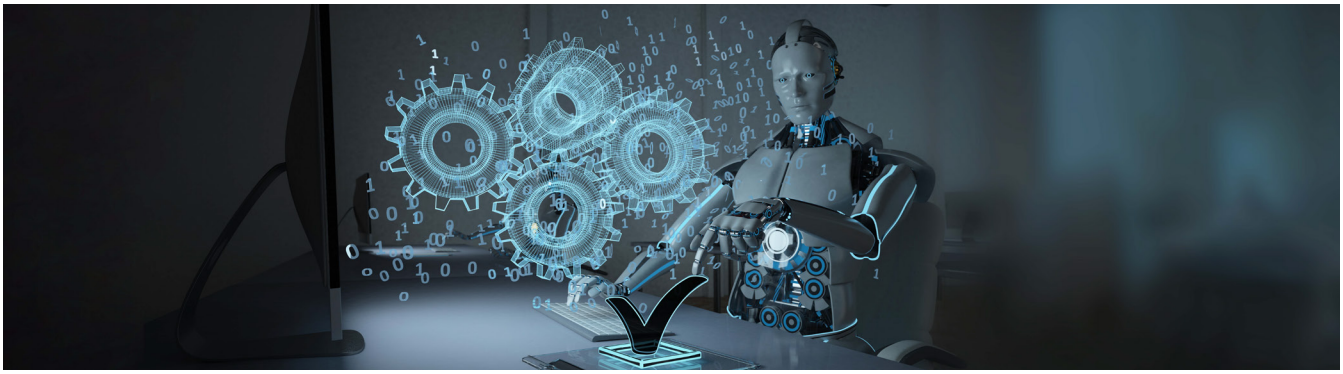
BENEFITS OF TEST AUTOMATION

Benefits of well implemented Test Automation are many. The most important among them are faster go-to-market time, better accuracy, app security, and higher confidence in the software. The first mover reaps maximum benefits before others enter to grab market share. Therefore test automation has the potential to bring monetary benefits for the organization. There are other consequential benefits that accrue in terms of avoidance of undue project delays and costly rework that could result from manual testing; prevention of downtime caused by escaped bugs and glitches, which if unchecked, can dents the company's reputation and could result in loss of customers.

To calculate benefits of Test Automation in more concrete terms, the pre and post Automated Testing results need to be compared for the following criteria:

- **Increase in Testing Speed:** Estimate how much the testing time is reduced after test automation has been adopted.
- **Accuracy and Security:** Check on improvement in the software quality after test automation as compared to the manual testing phase. This would include app performance, bugs detected, compatibility issues, app safety and security, etc.
- **Cost Savings:** Costs that have been reduced after test automation. While costs of equipment and tools will increase in test automation, manpower costs will reduce substantially. There will also be cost savings that come from a much faster project completion.

Companies must weigh the pros and cons of each of the automated testing strategies and see what best suits their goals and agenda. It is hoped that this detailed Cost-Benefit Analysis will help make the choice of automated testing strategy more informed, and also be beneficial to the long term interests of the company.



CONCLUSION

There is no doubt that Automated Testing is a must, given the speed and accuracy mandated by the competitive, innovative software world. Test Automation drives up initial costs, but benefits accrue far into the future. Costs depend on the strategy adopted, which could be In-house Automated Testing, Partial Outsourcing, or Total Outsourcing of Automated Testing. The strategy decision depends on the size of the company, the available infrastructure, the size of its projects, its long-term goals, other such considerations; and of course the impact on the bottom-line.

Each strategy has its advantages and disadvantages; its costs and its benefits; and its own ROI. The final choice must be prudently based on a detailed and conscientious cost-benefit analysis which considers not just the obvious costs, but also the hidden costs that account for a substantial percentage of project costs. Once the choice is finalized and budgets sanctioned, companies must consistently and consciously take steps to minimize unnecessary and wasteful costs, and simultaneously retain the value adding costs, so as to positively impact the company's bottom-line.

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