

White Paper

Managed Testing Services

Focus on your Core Competencies
by Test Outsourcing

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1. Management Summary

This whitepaper outlines the concept of Managed Testing Services (MTS), an outsourcing technique for testing related tasks across one or more projects delivering one or more applications and systems, spanning the lifecycle of software and system development and system operation.

The paper examines the idea of IT industrialisation as an underlying motivation for using MTS and shows that MTS is an important step on the road to industrialisation. It describes the different parameters to be taken into account when deciding on IT outsourcing and gives an overview of important prerequisites that have to be checked before MTS' benefits can be leveraged.

MTS are a logical consequence of IT industrialisation in a modern IT environment. MTS promise significant savings and quality improvements due to the effects of division of labour and specialisation as well as exploiting location-independent delivery of well-defined pieces of work. Nevertheless, MTS are most efficient and effective when an organisation has achieved a reasonable level of maturity and seeks a higher degree of process and organisational modularisation, standardisation, automation and focus on core business competencies. Even if these prerequisites are not met, it is still worthwhile in itself to develop an organisation towards higher maturity.

Since MTS are a specific instantiation of the outsourcing concept, the current status of this market is analysed and an outlook is given on expected future developments for MTS. Managed Testing Services will mainly be delivered by independent testing companies, blurring the differentiation between these organisations and the large full-service providers.

Based on these high expectations, this paper describes the steps to be taken in setting up and operating MTS, focusing on costs and benefits, opportunities and risks in the context of MTS. Since MTS will often apply to pre-existing testing projects, a separate section explains the necessary transition step to implementing MTS.

2. The Concept of Managed Testing Services

This section gives a short overview of the fundamental basics of Managed Testing Services (MTS). Before giving a clear definition, the evolution of IT itself over the past few decades will be explored, and it will be maintained that MTS are a manifestation of a more fundamental concept. This overall idea leads to specialisation (i.e., organisations focus on their core competences), division of labour (i.e., outsourcing in different variations) and (cross-country/cross-cultural) supply chains (global delivery).

As Smith outlined as early as 1776 in his famous “An Inquiry into the Nature and Causes of the Wealth of Nations” (1), progress and a qualitative increase in productivity in society lie in specialisation and industrialism, and are essentially represented by the concept of the division of labour. In Smith’s work, the different approaches to manufacture pins were investigated and compared, but the same principles apply to IT industry today and reflect the evolution seen over the past decades.

As the IT industry has evolved over time, fundamental changes to businesses and their supporting IT organisations have occurred. Recent years have seen the development from integrated full-service units towards specialisation of departments and companies along the various functions required to run businesses and their supporting IT. Additionally, cost efficiency considerations put higher pressure on executives who try to focus on their core competencies and hand over non-core tasks to specialised providers.

2.1. Industrialisation: The essence behind many innovations

Growing technical innovations in the IT industry increasingly affect the way in which a service or product is built, delivered, and consumed. The new way in which IT understands itself is often called Industrialisation, a process strongly related to the car industry and its history: While production-focused sectors (such as the automotive industry) already have undergone significant changes from craftsmanship into an industrialised approach, a similar transformation is just beginning in the IT industry.

There are different dimensions to be considered when looking into the details of the IT service industry. Firstly and most prominently, considerations about the vertical range of manufacturing appear and refer to the various engagement styles of liaising with businesses. The second dimension addresses the service delivery location and brings attention to the fact that in today’s IT industry various technical means of collaboration across geographical limits are ready for day-to-day use (e.g., through the use of internet technology available virtually everywhere in the developed and developing world, or delivery of the service through concepts such as ‘Cloud Computing’). Thirdly, compensation models evolve according to the maturity of the business partners to offer increased predictability of costs as well as flexibility and improved overall resource utilisation.

These three dimensions and the most important discrete values are visualised in Figure 1 below and are further refined in the following sub sections. Later on these three dimensions will be used for a localisation of Managed Testing Services.

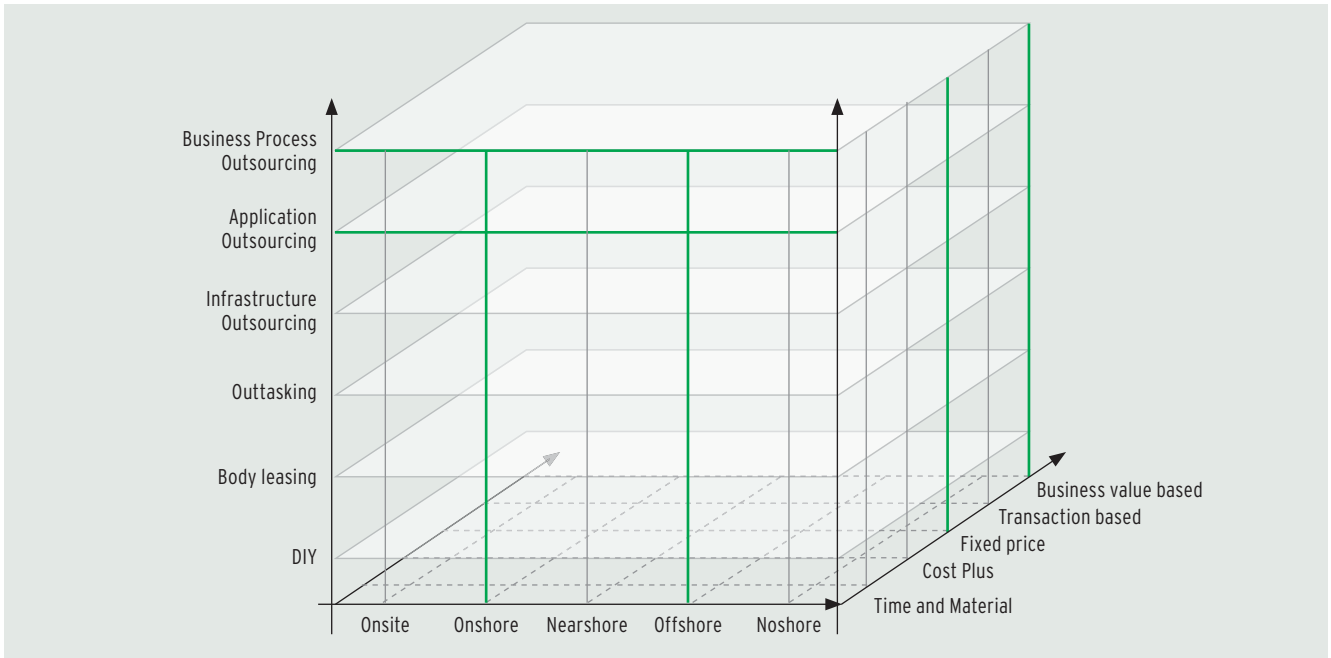


Figure 1: The IT Service Innovation Cube

2.1.1. Engagement styles and the vertical range of manufacture

Engagement styles in the IT industry vary and evolve similarly to the way in which the production industry has grown: Starting from one man shops where universal geniuses (e.g., Carl Benz, Alexander Graham Bell, Thomas Edison, and Werner von Siemens to mention a few) created numerous inventions and assembled everything in a unique style, going through a transformation into modern industrialised production schemes with a large number of third-party building parts for the overall product. For IT, this development is reflected in the following engagement styles:

- DIY (do it yourself): The style requiring the least mature organisation in terms of division of labour is simply making use of internal resources performing all the necessary activities. This way of production works even when communication is informal, and processes are non-existent or in their first stages. Effectiveness and efficiency are difficult to predict and measure and depend largely on individuals. Scalability is limited, work is done at the customer’s premises and at the customer’s risk.
- Body Leasing: To overcome limited scalability (i.e., ramping up and down resources according to the staffing profile of a project), external resources are brought into the organisation by contracting freelancers or utilising body leasing companies providing skilled and experienced individuals. On this level, the CV of a candidate is the prime decision-making instrument and predictability of the outcome is limited. Delivery risk still lies mostly with the customer.

- **Outtasking:** As soon as an organisation is mature enough to identify repetitive tasks that do not form a part of its core competencies, outtasking can be applied. Partner companies are asked to complete specific tasks autonomously on behalf of the customer, typically on site with close interaction with the customer's employees. On this level, the CVs of workers are less important than the tasks they have to complete in order to achieve the required results. Depending on the nature of the task, the delivery utilises the customer's infrastructure to a large extent. Delivery risk is shared between customer and partner company, but ultimately remains in the customer's ownership.
- **Infrastructure Outsourcing:** At a higher level of maturity, companies strive to reduce their own risk and outsource more and more complex services. Processes need to be defined and followed, interfaces between processes need to be clear and documented, and task distribution in the customer's organisation needs to be transparent. To this end, services can be identified and the customer's management can consciously decide what service is part of the core business (and therefore needs to be retained) and what services can be outsourced. The first candidates to be outsourced are infrastructure services: the application of the service itself is still retained in-house but the supporting infrastructure is provided through a third party. Typical examples are provision of desktop and server hardware, databases, web servers or file storage.
- **Application Outsourcing:** On the next level, applications used to perform the business processes are also outsourced. Typical examples are SAP hostings, Office providers (e.g., Google Docs, or Office365.com) or the famous CRM provider salesforce.com.
- **Business Process Outsourcing:** In some cases, whole business processes can be run by a partner company (e.g., HR processes can be implemented with the support of external providers and can even be operated by third parties). Typically, the interfaces between customer and provider are well defined and relatively limited. Services are delivered to the customer according to a formal contract (an SLA) with specified objectives that fall within quantified boundaries. The delivery risk (along with resource risks) lies entirely with the service provider as does the management of the necessary infrastructure. From the customer's point of view, the outsourced business service becomes a black box, i.e. he is no longer a specialist in this business field.

In the above engagement models, a shift in risk ownership occurs when IT industrialisation takes place. On the one hand, some risks with the delivery (of the service or task) are handed over to the service provider and risks concerned with the quality of service are the responsibility of the provider (who promises to manage these risks in improved ways compared to the service consumer). On the other hand, risks that arise from immaturity in organisations (primarily the consumer's organisation) and service/supplier management related risks come into play (cf. 2.3).

2.1.2. Geographical locations

With the entire globe transforming by means of internet technologies into a "global village", the delivery location of a service or a product technically becomes less and less important. However, in reality, technology consideration does not always bridge all gaps: Different types of communication, different cultures, different price levels and many more parameters still influence the selection of the geographical location utilised for a service/product delivery.

The more mature the organisation, the less dependent the operational service delivery is on location. In immature organisations, and during the setup of projects, the fewest risks occur if the delivery takes place on site. In a more stable environment, and with more experience and trust gained, it can be beneficial to relocate the service delivery to different regions. In some cases, however, technical, legal and regulatory restrictions may require the service delivery to take place in the same country or region (known as near shoring), e.g. due to sensitivity of data. If these restrictions do not apply, providers can span delivery across different time zones to exploit the different working hours, for example. In such situations it is possible to have around-the-globe development and testing with an additional increase in turnaround times.

From a very local perspective to a global perspective, the following classifications can be identified:

- On site: The service/product is delivered on the premises of the customer company, i.e. within the company buildings or directly neighbouring locations.
- Onshore: The service/product is delivered within the borders of the same country, i.e. within the same legal area. (2)
- Nearshore: The contractors providing the service/product are dispersed over different locations but still are cohesive in terms of cultural behaviour. The EU is a typical nearshore community, i.e. if a Swiss company utilised Swedish resources this would be seen as nearshore. A more quantitative definition of nearshore is given in (3): “nearshore [...] refers to outsourcing to a country or location that has a time differential of no more than three hours from the [...] main business locations”.
- Offshore: The contractors providing the service/product are in low-cost countries like India, Malaysia or China. The most obvious characteristic of those countries is a much lower salary level. At the same time, cultural differences may be significant, e.g., high staff fluctuation and incompatible working styles.
- Noshore: The location of delivery is not transparent or important to the customer. The service provider needs to ensure delivery at a certain level of quality regardless of where the staff performing the delivery are located.

In all variations of the geographical solution, customers and providers face different risks in the context of cultural and language issues. The more borders that are crossed, the higher the risk. Language still is a main source of misunderstanding if the customer’s and service provider’s first language is not the common business language (e.g., German, Chinese, English). Culture here not only refers to the culture of different nationalities but also to varying company cultures in the same national arena.

2.1.3. Compensation models

For internal resources, no sophisticated payment model is needed and the deployment of resources and assignment is more a question of enterprise resource planning. As soon as external resources are brought aboard, customers need to think about how to pay for them. The more experience exists (expected response times, quantities and qualities) for the service or product, the more likely a compensation model that is output-based can be applied. If there is only limited experience with the service or product, the compensation model will focus on structures outlining what resources are required to deliver results.

Evolving from a white box service view towards a black box service view the following stages can be identified:

- Time & Material: All hours and material utilised to deliver a service/product are accounted for. The compensation model focuses on endeavour instead of output, so even if the output is not adequate, the time & material model obliges complete payment unless negligence comes into play. The value delivered may be perceived differently by the customer and there is no way of ensuring the delivery of the results.
- Cost-Plus: This model needs a rough overview about the desired result and a cost estimation to be achieved (cf. (4)). In a best-case scenario, the created result fulfils the requirements and could be created within the estimated effort threshold. If additional effort is needed, this surplus is usually paid for if it can be justified why the originally planned effort has been exceeded.
- Fixed-Price. For more output-oriented tasks, organisations can pay for specified results of the delivery rather than for the effort of producing results (black box view). If the deliverable can be fully understood and specified a priori, customers and providers simply agree on a fixed price. Payment is due when delivered, usually supported by quality criteria to some extent.
- Transaction-based Pricing: If the parts of delivery are clear, but the quantity is a variable customers and providers can agree on transaction based (output based) pricing. Payment is closely linked to quantity delivered at specified quality and scheduled on a regular basis (e.g., monthly).
- Business-value based: On this level the customer does not pay for the direct product/service, but for the business value that can be achieved by using the product or service. A typical scenario is outsourcing the complete invoicing for a company, i.e. it does not matter which tool is used, nor how many resources are necessary etc. Instead, payment is based on a fraction of the invoicing volume.

In general, to achieve a fair price the challenges of managing the how-to of the delivery are traded in for challenges of properly specifying the quantities and qualities of the deliverables.

2.2. The Term of Managed Testing Service

Managed Testing Services are a combination of managed services and testing activities. Each is refined in terms of the innovation cube (cf. Figure 1) in the following sub-sections before a complete definition of managed testing services is given.

2.2.1. Managed Services

The term managed service refers to a business situation where a customer and a service provider interact in a particular setup. The customer may wish to make use of a service outside of his core competencies that is required to deliver an important (supporting) process for his core business processes, but does not want to manage the resources required for delivering and the risks associated with the delivery. To this end the complete service is defined and handed over to the service provider, making the service provider responsible for delivery of the respective service on time, within budget and to the expected quality.

Managed services can be pinpointed in the IT service innovation cube:

- Engagement style: Managed Services can be applied for infrastructure outsourcing (e.g. managed services for delivering databases), application outsourcing (e.g. managed services for delivering office suites) and even business process outsourcing (see managed testing services below).
- Geographical locations: There is no need for a particular geographical favourite since managed services focus on output. However, in many cases nearshore and/or offshore resources are utilised to be able to offer competitive pricing if they are not hindered by legal and regulatory constraints.
- Compensation models: With the aim of offering competitive pricing and realisation of scaling effects, and to account for investments into the setup of a managed service, the overall volume of the services purchased needs to be reasonably sized. In most cases managed services focus on repetitive tasks, suggesting a transaction-based compensation model. If there is a link between the delivered service and the business value, a business value based pricing might even be possible.

2.2.2. Testing

In the IT industry, testing refers to “the process consisting of all life cycle activities, both static and dynamic, concerned with the planning, preparation and evaluation of software products and related work products to determine whether they satisfy the specified requirements, to demonstrate that they are fit for purpose and to detect defects” (5). Typically, the input to testing is the asset under test and the corresponding specification of the asset under test. The output of testing is an analysis of deviations of the asset under test with regards to its corresponding specification. The output will be used to remove errors from the test asset and to assess the overall completion of development work. Before the go-live of systems, test results can be used to evaluate the systems’ readiness for use in productive environments and the risks associated with the go-live. Today, testing is widely recognised as a mandatory activity in the software development lifecycle and should be closely linked to enterprise risk management, since testing identifies the defects that may engender specific risks if rolled out.

Testing activities can start as early as needed in the software and systems development lifecycle and span the whole lifecycle to the deployment and maintenance phases of software and systems. Recent surveys confirm that testing activities are deemed most effective when in ownership of an organisational unit independent from the development units (6).

International standards for testing (ISTQB) including capability and qualification schemes are available. Testing is a prime candidate for service outsourcing for customers not only in order to focus on core competencies, but also to exploit the advantage of utilising independent resources. Further, many organisations are already used to collaborating with testing teams and will have identified and set up their testing capacities in a proper organisational framework. Depending on the maturity of the organisation, tests are executed independently from the development tasks and reported into different lines to ensure independence. This frequently found setup allows for integrating a specialised service provider with reasonable effort.

2.2.3. The Definition of Managed Testing Services

Following the preceding two sections, a definition for Managed Testing Services can be phrased as follows:

Managed Testing Services (MTS) are managed services used for testing related tasks across one or more projects delivering one or more applications and systems, spanning the lifecycle of software and system development and system operation. The resources for testing (staff, testing infrastructure, system under test) are managed by and in the responsibility of the service provider to support the customer’s business processes. Based on transaction or business value based prices the service provider ensures scalability of the MTS and takes care of the resource management according the utilisation scheme required to support the tasks.

Definition 1: Managed Testing Services (MTS)

Using the IT Service Innovation cube mentioned above (cf. Figure 1) Managed Testing Services can be located in it as displayed in Figure 2 below:

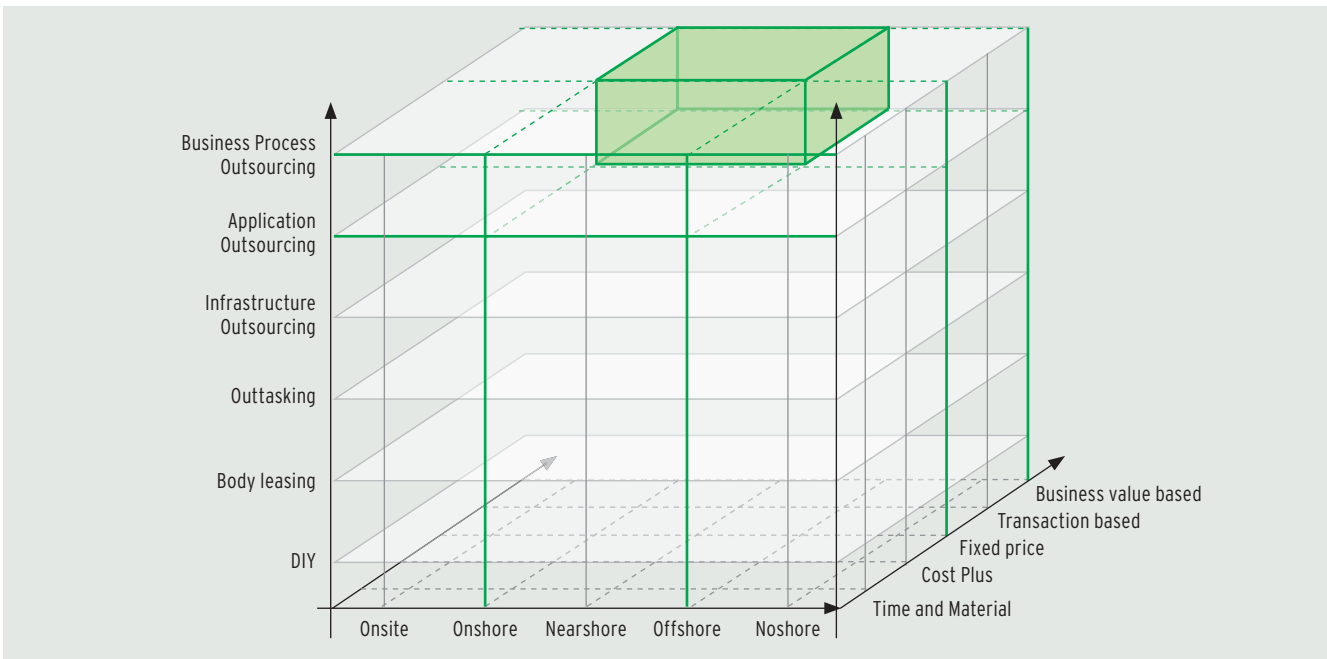


Figure 2: Managed Testing Services within IT-Innovation Cube

Managed Testing Services following this definition have the following objectives (cf. (7)):

- Complexity reduction: Since MTS involve outsourcing on a high level within the process chain, they reduce the overall process and organisation complexity on the customer's side by enabling a black box view.
- Risk reduction: MTS providers usually take over a high degree of risk to deliver MTS. These are underpinned with corresponding service level agreements (SLAs) to shift overall testing risks to the provider.
- Competitive pricing: This is typically realised by a low onshore rate and by moving the geographical focus of the service mainly to nearshore and offshore locations.
- Output or transaction based compensation model: This enables overcoming the time and material based models and shifts enterprise resource risks towards the provider. Thus, it simplifies budget planning and generates more budget flexibility.
- Leveraging scale-effects on MTS provider's side: An MTS provider is specialised in testing and processes many similar tasks around testing, enabling the set-up of a best possible fit-for-purpose infrastructure supported by the best fitting tools integrated into a smoothly integrated tool chain. These scaling effects enable rapid testing cycles (as the provider typically uses an optimised tool suite for automation) and short response times (as an MTS provider has an established and matured process landscape in place suggesting dedicated processes for incident management or reporting).
- High quality of service: For MTS providers, testing is a core competency and the provider has access to specialists, best practices, tools and infrastructures to deliver high quality services. In addition, many service providers are able to utilise the advantage of being truly independent from the development disciplines as the provider is not integrated into the customer's organisation (cf. 3.3).
- Innovation improvement: Using MTS allows customers to re-focus on their core competencies. It thereby frees up customer employees' capacities, improves motivation, and generates new potential for innovation.
- Increased range of the service oriented approach: The idea of thinking in service oriented structures and organisations is not limited to testing but can be expanded to HR, marketing, sales etc. Using MTS supports this general approach.

2.3. Prerequisites and Benefits

MTS have benefits for both service providers and customers. The benefits for service providers are transferred to the consumer, e. g., by higher cost efficiency and more competitive prices compared to time and material based projects. Even though both the monetary and non-monetary benefits are widely recognised, it must be stated that exploitation of these benefits comes with prerequisites. If these prerequisites are not met on either the customer's or the service provider's side, the risk of false promises and failure to achieve the objectives are high. However, a well-defined transition process like the one presented in Section 4 will identify those gaps as early as possible and will bridge them efficiently.

2.3.1. Prerequisites

There are three different types of prerequisites that should be fulfilled before leveraging MTS' benefits:

- Industrialised process chain: First of all, the organisation and processes on the customer side must be mature enough to support the division of labour across organisational units. This typical industrialisation stage has at least 4 prerequisites:
 1. Modularisation: The overall business process chain must be refined to a level where a detailed process landscape can be identified. This process landscape defines activities, responsibilities, dependencies and results.
 2. Standardisation: Based on the modularisation, the process landscape as well as the interfaces must utilise standards. Applying those standards guarantees a specific level of quality as well as simplifying set-up, thanks to a large amount of existing literature and knowledge.
 3. Automation: For each activity within each process step, or even for complete process steps, the possible level of automation has to be considered. There will be activities requiring a lot of manual interaction, while others might be automated completely.
 4. Focus on core competencies: On this level it can be decided if MTS are possible or not. The fundamental decision of whether it makes sense to utilise MTS can be taken if and only if management has a conscious view on what the core competencies of the business are. This decision can only be taken for identified tasks (modularisation) using standards (e.g. ISTQB) and automation to a certain degree.

The decision for or against MTS can only be made if steps 1 to 3 are successfully completed. Otherwise it is not clear: (1) what testing means, (2) how testing works, and (3) to what degree testing can be automated. It is important to point out that a company on its way to level 4 can realise significant benefits along the way by improving its industrialisation level. E.g., standardisation has values on its own long before MTS can be used at the end. And these values can be utilised even without undertaking the last step of using MTS.

- MTS Volume: For reasons of scaling effects and ramp up efforts, the degree to which MTS pay off depends on the size of the testing effort and the number of applications subject to the Managed Testing Services. Typically, the benefits of MTS are realised in three to five year engagements and are not achieved in a single project based liaison between customer and provider. Therefore, the customer should be ready to make the strategic investment with the respective senior management support. A customer should be in the position to commit to a 3 to 5 year plan (often known as 'mid-term planning') for MTS. Otherwise, the increased risks for the service provider will have to be compensated for by higher prices.
- Openness for changes: Setting up MTS in an organisation implies the shift of labour from internal (or body leasing or outtasking) to external resources that have their own responsibilities. In pure MTS, the external resources are even no longer visible for the customer's staff. To this end, for most customers changes occur that need to be managed properly, and management must be fully aware of the consequences for internal resources and address concerns proactively. Ideally, the customer will already have experience in the field of supplier management and can build upon this experience to collaborate with the service provider.

2.3.2. Benefits for customers

Key benefits for service consumers can be realised over the runtime of the MTS agreement, most prominently the cost savings resulting from transparent pricing models such as output based pricing as well as delegated procurement of test infrastructure and tooling. If set up properly, customers will see an increase in the transparency of cost with regards to their application lifecycles. Note that this does not necessarily imply lower pricing - prices are made explicit rather than hidden in various budgets. One additional benefit is provided by cost flattening: usually the ramp-up phase needs more effort than the MTS execution. However, this effort peak is not directly invoiced to the customer - who instead pays a flat fee over the whole lifecycle. This is a key enabler for management as an engineering discipline.

As MTS will be delivered by service providers having expertise in the field of quality assurance and testing, it can be assumed that service providers have highly skilled resources and modern technical environments. If MTS providers are independent from the development organisation, the best possible organisational set up for running independent tests is chosen. This has both a positive impact on the overall effectiveness of the testing and will ultimately result in a higher quality of the applications and systems to be tested (cf. 3.3).

In many cases the volume of the MTS is high enough to justify investments to leverage cross-project and system synergies in terms of test automation and systematic regression testing. Not only does this increase the effectiveness of the testing service but it also reduces response times from the testing functions to the development organisation.

If the MTS provider can make use of offshore testing in different time zones and the delivery processes are set up properly, a "follow the sun approach" of MTS delivery can be achieved, reducing the turnaround times of testing dramatically. This means that the development and testing capabilities in a project can be used in a 24 hour schedule by following the time zones. On the other hand, this approach requires mature processes and a significant amount of trust between the different parties to be successful.

From the perspective of the customer, a significant risk and management effort concerning the resources is delegated to the service providers. As service providers will have different customers with different schedules, the scalability of resources in the project lifecycle is no longer an issue for the customer and will be managed by the service provider. The customer's internal resources can be released from non-business related tasks and can focus on their business core activities. They still have to contribute and provide input, but this can happen in a more systematically structured way and will therefore result in higher quality and less effort.

2.3.3. Benefits for providers

Providing MTS to a customer has a number of advantages over time, including material benefits for service providers. Typically, MTS are aligned with an overall strategic sourcing decision of the service customer and a strategic partnership is established for delivering MTS. Strategic partnership decisions usually cover a timeline of three to five year commitments and give the service provider a security of revenue for his own planning, along with an enhanced forecast on staffing needs. The significant sizing of MTS allows for setting up core teams that facilitate internal handover in case of staff fluctuations or peak workload. The service provider has the potential to build up internal core expert teams that can become cross-pollinated from testing expertise and customer/domain expertise. At the same time, resource demands from different projects (even across different customers) can be managed on a more flexible and scalable basis.

3. Market – Current Status and Outlook

3.1. Outsourcing and Cloud Computing

Outsourcing as the overall approach behind MTS is already a well-known and established concept. However, maximum coverage has not yet been achieved in IT industry. Typical trends in outsourcing and how they have evolved over the few last years in terms of percentage of Total IT budgets are given in Figure 3 below, based on a study published by Computer Economics (8):

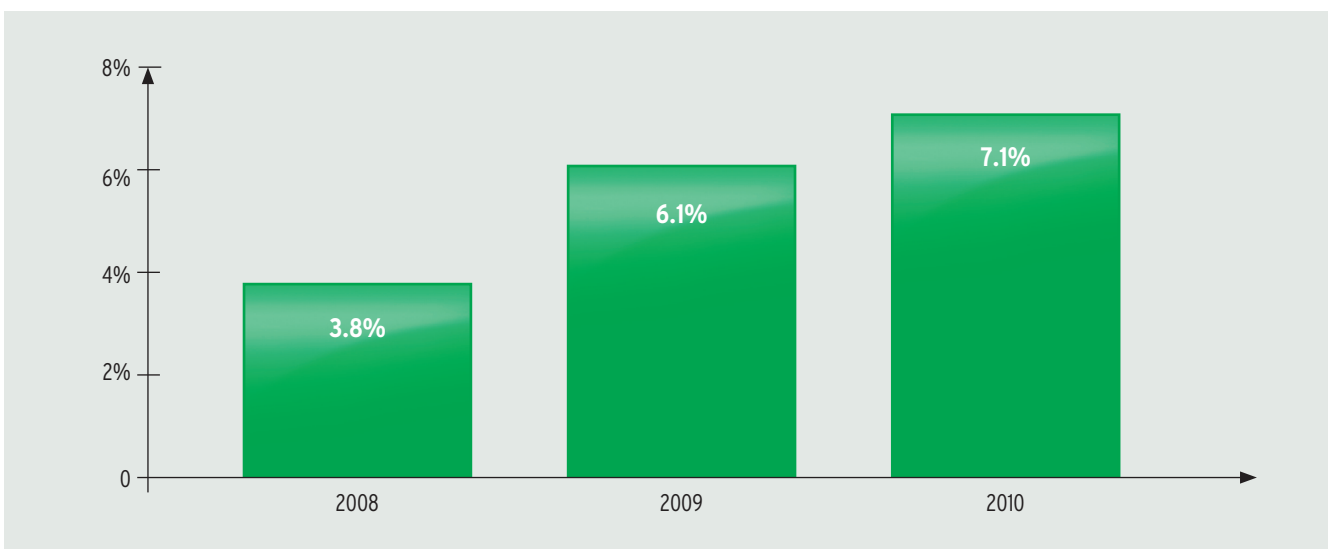


Figure 3: Outsourcing ratios in percentage of total IT-budgets over the last 3 years

These numbers significantly demonstrate the overall trend of IT industrialisation: More and more companies use third parties to deliver IT services, a trend that is set to increase in the coming years. A study by market research firm PAC expects (9) an outsourcing ratio of about 25% by 2020: This means that one out of four Euros in the IT market will be spent on outsourcing.

Today, outsourcing is strongly associated with the use of cloud services and cloud computing in general. For the following we use Gartner's definition of Cloud Computing (10):

“Public cloud computing [is a] style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service to external customers using internet technologies. **Private cloud computing** is defined as a style of computing in which scalable and elastic IT enabled capabilities are delivered as a service to internal customers using internet technologies”

Definition 2: Cloud Computing

Looking at cloud computing from an outsourcing perspective, cloud services are a particular type of outsourcing with some additional constraints. Nevertheless cloud computing's share of the outsourcing market is predicted to increase from less than 20% today to 70% in 2020 (9). A direct comparison between the MTS definition and the cloud service definition reveals a high similarity between MTS and cloud computing because MTS are also scalable and elastic, most of the MTS delivery is IT enabled and the results can be provided using internet technologies.

This similarity suggests that MTS will have a similar rate of growth and MTS can be delivered by means of cloud computing.

3.2. Testing Services

The overview given in the previous section about the general IT market can now be refined to focus on MTS. Both academic research and industry experience report a range of numbers about how much test effort is necessary and reasonable for a project. Some studies refer to 40% - 50% of the cost of software development to testing (11), others are measuring a ratio of 1:1 for developer to test effort (12). In a recent survey at the Iqnite 2011 conference, 65% of the participants reported spending between 20% to 40% of their overall project budget on quality management and testing activities (6).

However, most of the testing budget is spent on system integrators - in contrast to the best-practice approach of separating product development from system testing. In a PAC study, 78% of the overall quality assurance budget was spent on system integrators and only 22% was spent on dedicated and independent testers (13). This is expected to change significantly over the course of the next few years as today 57% of companies are still doing testing on the DIY-level and need to mature in that respect.

3.3. Full Service providers vs. Test Service Specialists

In general, Managed Testing Services can be provided by two different types of providers:

Test Service Specialists

Specialist providers typically offer services in subject matter “testing” only. They do not offer forward development (implementation services), they do not design software architectures, nor do they have any particular interest in (or derive any benefit from) any proprietary solution compromising their independent approach. The advantage of those players is that they are independent from all systems under test. According to most known testing literature, being independent is one of the most important prerequisites for efficient and effective testing. Usually, test service specialists fulfil these requirements by being an independent test organisation:

“An **independent test organization** is an organization, person, or company that tests products, materials, software, etc. according to agreed requirements. [...] They are independent because they are not affiliated with the producer nor the user of the item being tested: no commercial bias is present.”

Definition 3: Independent test organisation (taken from (14))

The key advantages of using an independent test organisation are:

- Independence: Independent people are more likely to question everything, provide an objective second opinion, identify implicit requirements and objectively report any findings. Different lines of reporting assure no interference from conflicts of interests.
- Scale effects: Because independent test organisations are usually pure-play testers, they test many different projects at the same time, allowing them to set up highly sophisticated tool chains and utilise a large number of synergies between different projects.
- Resource capabilities: The skills within a test service specialist are clearly focussed on a single topic, i.e. testing. This guarantees a high, coherent skill level for all employees simplifying resource exchange.

Full service providers

These providers usually deliver all services around IT systems, starting from collecting requirements, designing system architectures, implementing the entire system, testing the system and finally deploying the systems into productive use. Additionally, administration of the systems is part of the service portfolio. Testing services, and with it managed testing services, are a small sub-set of the overall service portfolio. In many cases, the full service providers even market their own tool platforms, complementing and mixing up the service ideas with software license vending.

The main advantages of using a full-service provider are:

- Company size: A broader portfolio of services and tools allows for a bigger market enabling a bigger company size. Typical full service providers are known globally and have a large pool of employees.
- All inclusive single sourcing: Using a full service provider simplifies the process of selecting third parties and the negotiation step: Having one contract with the full service provider enables getting everything through one contract, with one key-account person etc.
- Technical Knowledge: Introducing an independent test organisation into a new IT system costs more time and money than using one of their developers. The full service provider has deep knowledge of the technologies they develop and provide, enabling them to start working without having a clear knowledge-transfer step.

Both independent test organisations and full-service providers will try to move into managed testing services market (see Section 2.3.3). However the market will be further segmented: The more mature an organisation (e.g. in terms of industrialization) the more important attributes like provider exchangeability, dependency reduction and output-based pricing are. These considerations assume an explicit testing awareness on the customer's side. If this is provided, the application of MTS is a natural step, i.e. MTS will be successfully provided by test service specialists.

The following figure presents the overall revenue of independent test organisations in 2010.

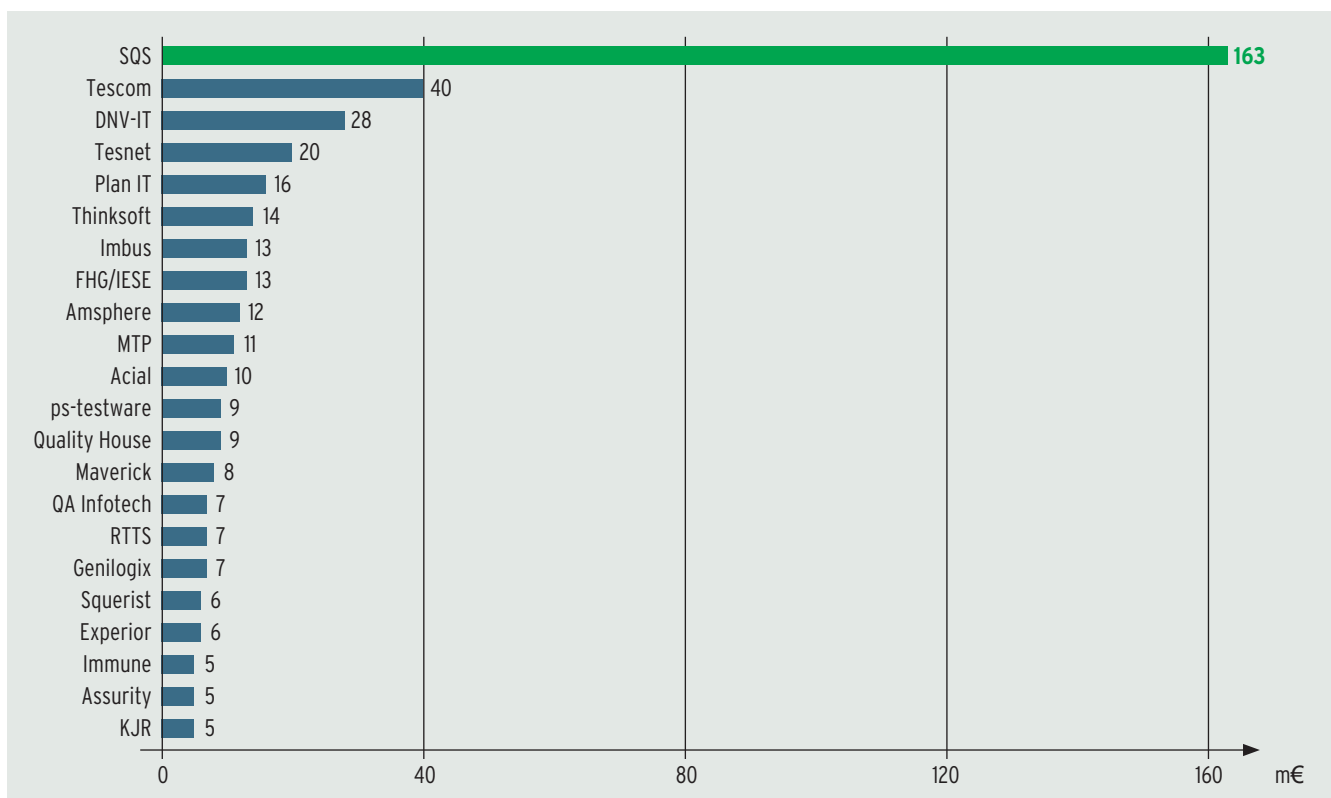


Figure 4: Revenue of independent testing companies (15)

Current conservative estimates anticipate that about 20% to 25% of all testing activities provided by test service specialists will be realised through MTS in 2015. For the listed independent test organisations, this adds up to an overall business size up of about 121 million Euro revenue for MTS (25% of the total market share as listed above).

On the other hand, full service providers usually blend testing activities and package them into an all-inclusive package. If the client lacks full awareness and clarity about testing, the testing effort and testing outputs motivating him to change the testing approach to MTS will be difficult. In other words, MTS will remain a side product for full service providers and consequently only about 5% of all testing activities provided by full-service providers will be delivered as MTS in 2015. Using the revenue list for full-service providers in (15) this adds up to an overall business size of up to 150 million Euro revenue for MTS (5% of total market size as listed in (15)).

Consequently for MTS, the independent test organisations will reach the same market share as the full service providers.

4. MTS Setup and Operation

4.1. Transition Overview

The MTS process is structured into three phases: Pre-Engagement, MTS Framework Design, and MTS Operation and is laid out in the following figure:

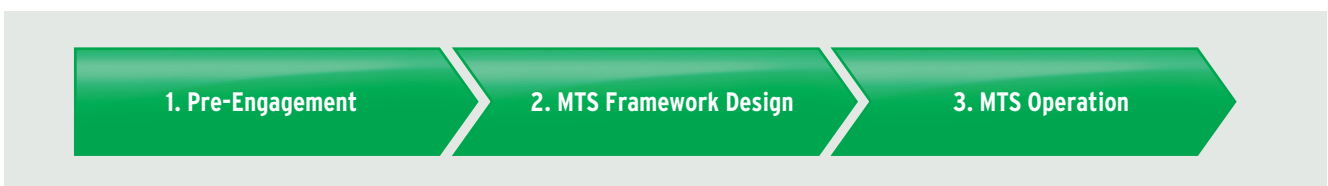


Figure 5: MTS Overview process

The Pre-Engagement step covers the strategic activities for a client that are necessary to apply MTS. The MTS Framework design step covers the tactical activities within each client's project to prepare MTS' application. The MTS operation step leverages the benefits associated with MTS. Each step is refined in the following subsections.

4.1.1. Pre-Engagement Phase

At the very beginning of the transition towards MTS, the customer needs to define and commit to the vision of industrialising their IT environment. Management needs to identify the strategic services and core competencies it wants to operate on its own behalf on one hand and the supporting non-core services to be outsourced on the other hand.

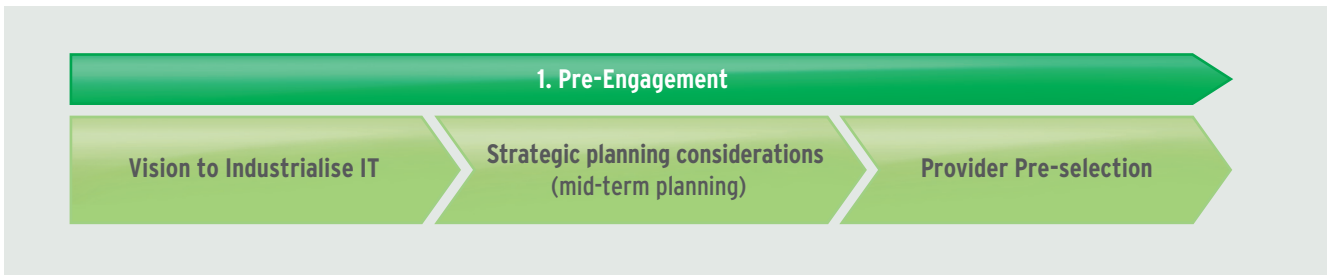


Figure 6: Pre-Engagement activities

The vision to industrialise IT and make use of service providers has to be supported by conscious planning and budgeting decisions. A successful migration into an outsourcing model demands proper preparation of the underlying business case. Before MTS can be deployed into the organisation, the strategic sourcing decision must be taken, and, at the least, mid-term planning perspectives have to account for handing over a complete process to a service provider. The strategic decision is a sine qua non because of the sizing of the engagement. Typically, using a managed service requires the investment of significant efforts into organisational maturity and the corresponding changes have to be communicated and managed properly.

The final step of the Pre-Engagement Phase is to set up the relationship to potential service providers and select the best supplier. For MTS, criteria for supplier selection start with matching the three dimensions from the IT Innovation Cube (engagement style, geographical location, and compensation model, cf. Section 2.1) to the customer's needs. Additional parameters to be considered are

- Level of testing expertise
- Independence from the development organisation
- Domain knowledge
- Size of the provider
- Commercial background
- Track record and reputation of the service provider

4.1.2. MTS Framework Design Phase

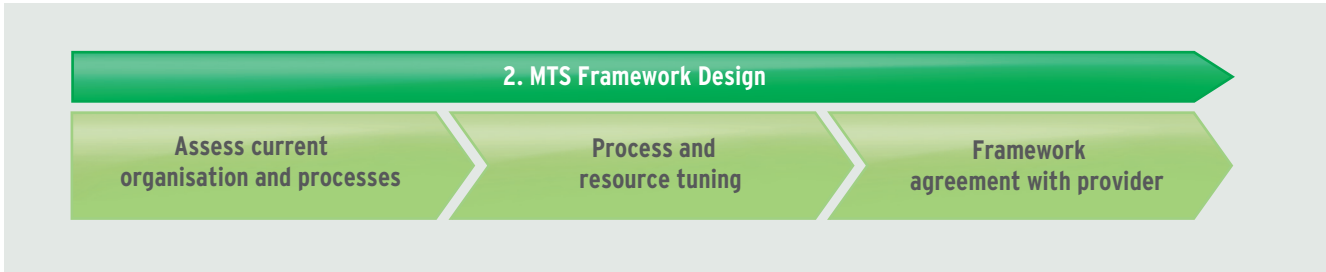


Figure 7: MTS Framework Design Activities

One of the biggest challenges involved in setting up MTS lies in the degree of IT industrialisation on the consumer's side. Clearly, without explicit organisational setup and mature processes, the realisation of benefits from division of labour and the consumption of specific processes/services from the outside are rarely possible. Therefore, the first step in bringing MTS to life is the assessment of the current customer's organisation and its processes to evaluate the fitness for purpose. The assessment typically uncovers a number of necessary improvements needed to close the gaps and to achieve the adequate level of maturity. However, these improvements do not only affect the MTS readiness but generate added value even without using MTS.

In our experience, customers aiming at the use of MTS (or other managed services) often overestimate their readiness for the consumption of services. Typical unrecognised shortcomings are

- Insufficiently structured and defined processes, tasks and supporting IT landscape and undefined or unclear ownership of the process or IT components
- Insufficient deployment of process and IT standards (e.g., a non-existent or incomplete process landscape, a high number of variations in business processes, unclear and undocumented interfaces between processes and departments)
- A high proportion of manually executed processes and technological and organisational ruptures in process chains as well as deficiencies in process interactions
- Heterogeneous views on core business competencies and unclear strategic considerations with regards to sourcing decisions

Depending on the results from the maturity assessment, different initiatives to industrialise and professionalise IT will be launched as business processes are set up, streamlined, and optimised. Preparing the organisation for MTS increases the demand for outlining the strategic vision of future IT setup and brings visibility of the corporate strategy to all employees.

Accordingly, the typical setup for IT improvement towards industrialisation consists of the steps mentioned in Section 2.3.1.:

1. Modularise the overall value chain within the organisation
2. Standardise the process landscape, the processes themselves and their interfaces
3. Automate single processes, process interactions or process chains where possible.
4. Focus on core competencies and delegate outer services to external service providers as managed service.

The benefits of preparing for MTS are tangible for customers when MTS are being used as a driver for maturing the organisation. As a side effect of the MTS Framework Design phase, customers need to re-consider internal processes and organisational set up. The maturity assessment of processes and organisation can be leveraged to foster clarity and transparency on core competencies and non-core supporting functions. It is worthwhile to mention that through the course of process improvement, the relationship with the service provider can be established and the transformation can be used to build up mutual trust.

Finally, when readiness has been accomplished, the customer has to design the framework agreements with the service provider of choice. Utilising Managed Testing Services requires methods to monitor and control service delivery. The challenges lie in a proper definition of SLAs: Due to the black box view on MTS, it should focus on the compensation model instead of focusing on internal MTS-details. A sound framework needs to be defined to link the KPIs to the compensation model and to evaluate the KPIs on a reasonable schedule. From the very beginning the definition of KPIs should take into account the evolution of service level objectives over time to establish the appropriate productivity goals. For monitoring and controlling these KPIs are utilized for an effective governance and communication structure and process to react when the control limits are reached.

4.1.3. MTS Operation Phase

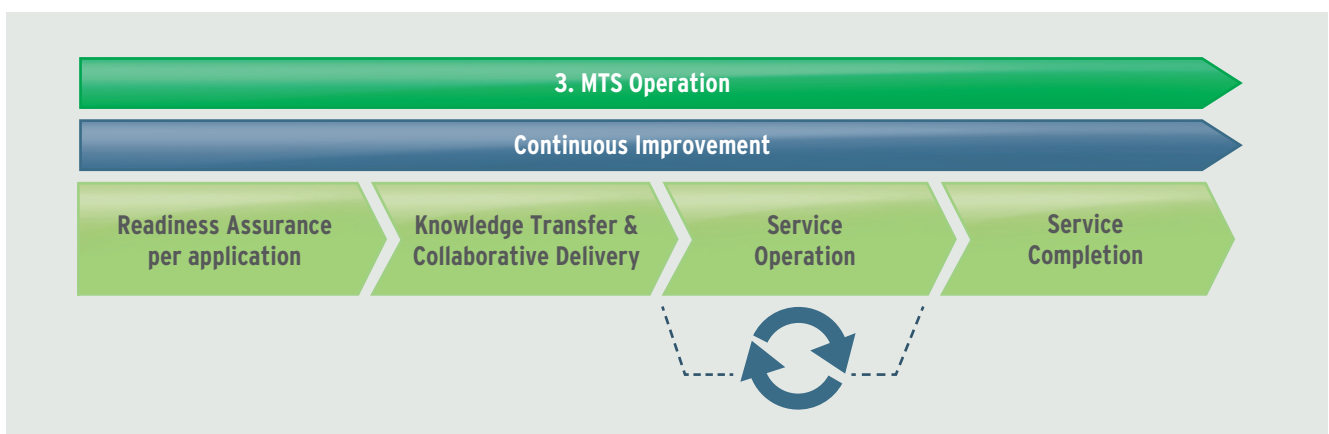


Figure 8: MTS Operation Processes

After having set up the general MTS framework for collaboration between customer and service provider, the testing activities for individual applications have to be transferred from the customer's responsibility to the aegis of the MTS provider. For green field projects, this seems a straightforward task, whereas for existing projects there is potentially more change involved. In any case, the readiness of the transfer is assured in the first step to identify potential gaps and to close the gaps accordingly. Secondly, knowledge transfer (both from the development organisation to the MTS provider or the test organisation to the MTS provider) is initiated and the first iteration of the delivery is accomplished jointly. The collaborative delivery is a one-off undertaking designed to ensure successful transfer of the testing activities to the third step called 'Service Operation' by transferring full knowledge to the MTS provider and to sort out any issues that potentially could arise during stand-alone delivery to the best possible extent.

From here on, Service Operation is executed as many times as necessary over the lifetime of an application until the lifetime of the application comes to a close and the application and the MTS for the application is decommissioned in the 'Service Completion' step. The service completion step is the opposite of the transition step: Planning for this step helps to limit dependency on a specific MTS provider: The Service Completion step takes care of providing all information (including internal details like test scripts, test data or test procedures) necessary to deliver MTS for a particular project. This allows the customer to hand over the collateral information to any other MTS provider or to insource the testing activities at a later point in time, guaranteeing a shorter introduction time.

Overarching the four previously mentioned processes is the Continuous Improvement for the MTS Service Operation phase. During Knowledge Transfer & Collaborative Delivery it helps to determine and fine tune the agreed KPIs from the framework agreements and can be used to adjust the SLAs. While Service Operation is repeatedly executed, continuous improvement makes sure the KPIs are properly monitored and adequate actions are taken for improvement and control of the delivery. The same KPIs used to report back on service performance should also be applied to manage and govern the MTS Operation phase. Since the benefits based on improvements affect both consumer and MTS provider the sharing of the benefits needs to be clearly defined in the SLA.

Out of the three MTS phases, the MTS operation phase is the phase with the longest time span and implies a shift from a project governance towards a programme governance structure. A stereotypical organisational setup is depicted in Figure 9.

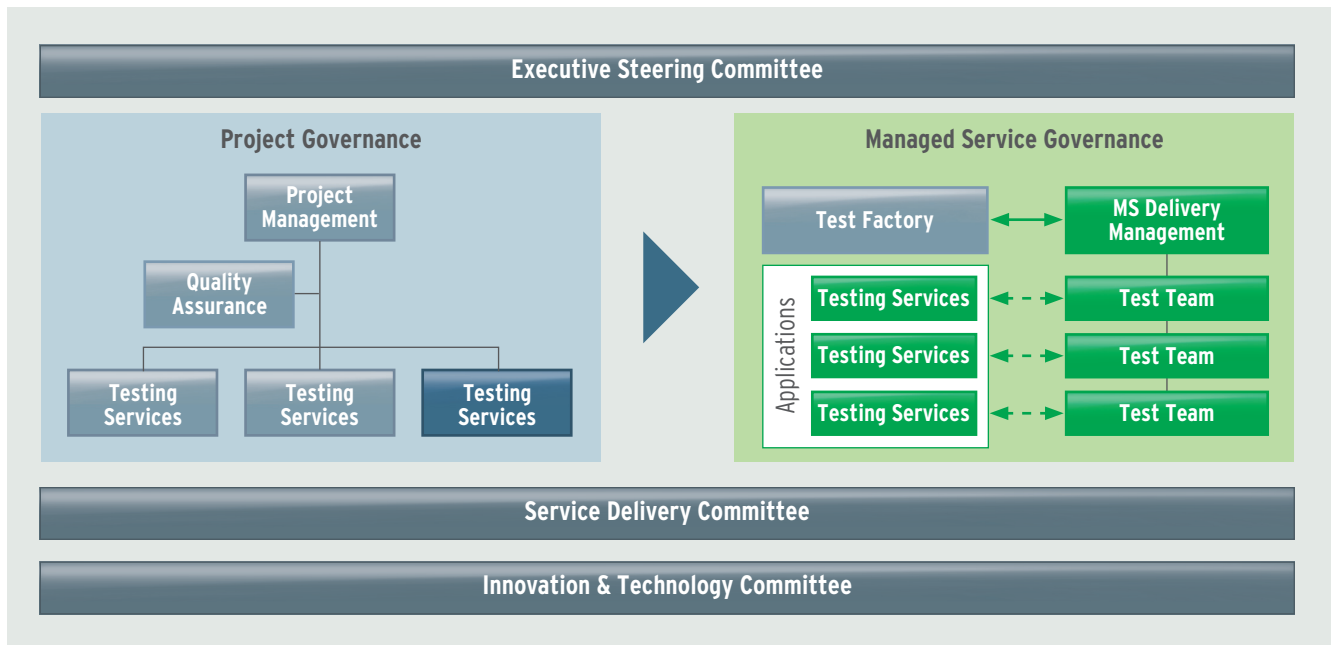


Figure 9: Governance Structures for MTS Operations Phase

The project governance lies entirely with the Project Management function (who then reports to the executive level). Project Management - supported by a Quality Assurance function - performs Testing Services as per project following the same hierarchical composition as the functional and technical subprojects. In the MTS setting, testing services are managed per application by suppliers interfacing with the respective project teams and liaising with the Quality Assurance functions. The reporting lines to executive level are no longer purely bottom-up but complement the internal reports with an independent view on projects and applications from the supplier perspective. This typically gives customer management deeper insight into the project status and increases trust in the reports.

As a general principle, the MTS Operation phase must be supported by an open dialogue between customer and service provider relating to the provision of the services throughout the term. In order to keep up with technological changes over the runtime of the overall agreement, details of the agreement may need to be amended whether as a result of market trends, new technology, evolution of new services, or otherwise, and must be kept under constant review, control and subject to a proactive search for improvements in the MTS Operation phase. To facilitate the dialogue, both partner organisations typically appoint a Relationship Manager at a senior management level to cover all matters concerning the agreements. The service provider appoints a Service Delivery Manager as the point of contact for operational matters affecting the services (e.g., adding new applications to the portfolio, customer projects ordering services, etc.).

Having defined the roles, a corresponding formal and structured channel of escalation and communication has to be set up and maintained. The proven governance structure consists of the following decision bodies in a strategic and an operational layer:

Strategic layer

- Executive Steering Committee (ESC) meetings are held quarterly (or as described in the framework agreement) as a senior management meeting to monitor overall MTS performance, to govern MTS from a long term perspective, and to resolve escalations from the operational layer.
- The Innovation and Technology Committee (ITC) meets quarterly to share latest Industry & Innovation and Technical Trends to decide on major innovation projects and jointly agree on business cases and funding if required. ITC proposes changes to the agreements of the ESC and consults the ESC in strategic decision making.

Operational layer

- The Service Delivery Committee (SDC) performs weekly reviews of current performance and progress, focusing on the domain, project and service level. It decides on priorities, resolves escalations to the best possible extent and elaborates on how to mitigate risk and issues in scope of the service's operation. Issues outside of SDC's responsibility are escalated to the ESC.
- Operational Status Meetings are scheduled weekly and are aligned with core testing processes to review progress focusing on project or application level and to decide on priorities and work on risks and issues and to seek for resolution wherever possible or to escalate to the SDC.

4.2. MTS Risk Management

As with all other business activities, there are risks associated with MTS. For risk, we use the following definition, based on the concept of uncertainty:

“**Uncertainty** is the lack of complete certainty, that is, the existence of more than one possibility. [...] **Risk** is a state of uncertainty where some of the possibilities involve a loss, catastrophe, or other undesirable outcome.”

Definition 4: Uncertainty and risk (16)

So each risk is an uncertainty but not vice versa. Uncertainties can have both positive and negative impacts, risks only have negative impacts on business. Please note that this risk understanding is more focussed than the one used in ISO 31.000 since there even positive impacts are classified as risk.

From a risk management perspective, the focus is on risks because they require mitigation actions in order to deal with negative impacts.

For a customer, MTS brings two different types of risks:

- Ineffective Testing: Testing does not work properly, i.e. the SLA's for the MTS or the strategic objectives to do MTS are not fulfilled.
- Unfulfilled Collaterals: Testing works but other collaterals are uncertain. This uncertainty can cover the economic future of the service provider or might touch the cultural acceptance of MTS within an organisation.

Both risks are refined in the following sub-sections.

4.2.1. Ineffective Testing

If testing is ineffective, the uncertainty about the system to be rolled-out increases because nobody knows about possible hidden errors in production and potential impacts. Since risks are based on uncertainties the overall risk of an IT-system increases as well. This does not necessarily imply that the system fails in production, but that it lacks the necessary transparency and reliable insights about production readiness. Therefore, ineffective MTS for a business critical application might induce additional risk.

From a MTS perspective (as described above) the following counter measures must be taken:

- Within the transition step many pre-requisites for MTS are verified. The transition step will identify most of the detailed hurdles for effective testing and eliminate the respective reasons.
- Before MTS enters the operational phase the collaborative delivery is an explicit mitigation activity to ensure that a dry-run testing can be implemented as planned.
- The MTS process incorporates the definition of an overall control framework underpinned by supporting KPIs to make the status of the testing process transparent to all stakeholders. Therefore, uncertainties about the test progress should be minimised.

4.2.2. Unfulfilled Collaterals

Outsourcing of a well-defined service might stipulate uncertainty in some collateral areas. Most of them are not solely related to MTS but to all major changes in the context of service delivery. In a study about the risks of outsourcing (not limited to MTS) a set of most common risks was identified by survey respondents (17). Most of them are valid for MTS as well:

- Pricing risks: In many cases using MTS should have positive effect on costs. However, the specific costs of MTS are not ultimately known before the first service operation step. The MTS framework provides general guidance but only the collaborative delivery will determine the final price. From a customer perspective, a mitigation action would be to select an experienced MTS provider whose first effort estimation does not need much adjustment. If there are price adjustments while the service is delivered the test completion step ensures that it is possible to change the service provider to a cheaper one.

- Planning risks: If some other constraints from MTS are not met (e.g. missed deadlines, unclear planning) this might generate additional risks as well. The MTS process guarantees to identify deviations as early as possible. In most cases, any deviations are followed by contractual penalties, which compensate for negative effects by planning risks.
- Communication risks: In general MTS needs more mature communication channels (no longer 'gossiping') when communicating from customer to testing. In addition, a more mature defect management is necessary since the organisational boundaries discourage over-the-floor communication. And last but not least, cultural and language issues are a major source of misunderstanding, in particular if cross-national and offshore locations are involved. MTS might generate risks in this field, but these can be minimised by the industrialisation steps, checked on customer's side in advance, as well as the systematic transition step.
- Dependency risks: Outsourcing is often associated with outsourcing responsibilities, i.e. testing capabilities for MTS. The less knowledge retained on the customer's side, the more he is dependent on MTS service providers. Typical examples of a high dependency are price adjustments without any reason, disburdening details of the negotiations or low quality. In all cases, MTS proposes a well-defined service completion step, ensuring that all customers can step back. Assuming well-defined entry criteria (industrialisation), the customer will have a very clear understanding about the dependency, possible impact and alternatives for delivery.

5. Conclusion

Today, testing is established as important discipline for risk management. For maximum efficiency testing activities, methods, practices, tools and skills should only be of interest for those who execute testing. From a business perspective, testing should be seen as black box that focuses the output of testing. So there is a great opportunity to outsource testing activities based on an output based pricing: Managed Testing Services.

Applying MTS is the next step of IT-industrialisation and needs both a mature process landscape on the consumer side as well as on the producer side. Even if there is no need to apply MTS as last step on the industrialisation step, the journey itself generates a great deal of additional value for improving testing efficiency and effectiveness.

The market for MTS will increase dramatically the next years. Even if both full service providers and pure testing specialists try to make business in that area, pure testing specialists will dominate the market for some time due to many advantages in their MTS delivery. Their process of establishing MTS on the customer side reflects a well-defined current-state analysis as well as a corresponding transition step for MTS-readiness. Based on a continuous improvement loop, the MTS execution itself can be managed effectively. Possible closing steps at the end could reflect the termination of an application or the demand to in-house all activities again.

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