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The IBM Technical Summit

開發者大會

搶上市，更要顧品質！測試中心如何保「質」大解密

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資訊系統規劃顧問

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IBM GTS testing service is a world-class, high-quality, low-cost, and fast-deployment testing solution leveraging a Global Delivery team that can provide test consultancy, integrated test service, and managed test service

GTS Skill & Competency

Involved in multiple Industries
- HR
- Cloud Compute
- Banking
- F&A
- Healthcare
- Retail
- Telecom

Rich experience in test management
- Process optimization
- Process customization
- Test assess & planning
- Test execution and automation
- Defect analysis
- Measurement & Analysis
- Test reporting

Follow mature test Process/ Framework
- CMMi/TMMi
- IRUP
- Agile
- IPD

Use multiple Industry and test tools
- Performance
- Monitor & Tuning
- Data management
- Automation
- Data analysis
- Configuration management
- Test assets management
- Reporting

Cover multiple technical areas
- Cloud testing
- Data Center Migration
- Infrastructure Test
- Performance Engineering
- BI Testing
- IT Capacity Planning

2 Certified CSQA by QAI 5 Certified CSTE by QAI
11 Certified PMP by PMI 1 Certified PMA by IBM
1 Certified ITS by IBM
Plus 47+ IBM and other industry products certifications in Y2011, i.e. Cloud, DB2, Cognos, Lombardi, Rational, Tivoli, WebSphere, OpenSpan, SAP, XML and etc.

調查發現在整個測試生命週期中，缺陷發現的越早，將花費越少的代價來修復缺陷

缺陷修復的階段	預期分配的有效和無效的缺陷(理想預期)*	成本倍數($120)
需求評審	4%	1
概要設計評審	7%	4
詳細需求評審	9%	2*
詳細設計評審	6%	7*
單元測試	12%	10
系統測試	49%	16 (!)
用戶接受測試	10%	70 (!!)
產品	3%	140 (!!!!)

實例:在單元測試結束之前，每發現１ % 缺陷，並且不將發現的缺陷帶入產品中，那麼將節省14倍的成本。

註釋:
(!) – 昂貴的開銷
(!!) – 非常昂貴的開銷
(!!!!) – 可怕的開銷 Expensive

Source: The High Level requirements and design figures are from Boehm and Capers-Jones
** Detailed Requirements Review and Detailed Design Review multipliers are from IBM Research and were developed subsequent to when the earlier models were published.*

面對業務需求頻頻變更，技術更迭日新月異， IT架構愈加複雜，開發週期不斷壓縮，品質風險不斷攀升—測試挑戰重重

10個客戶常見的問題....

1	沒有規範的測試流程和質量控管手段，缺乏成熟的測試方法論的指導，項目交付質量不穩定
2	很多缺陷在較晚階段才被發現，甚至在應用上線後還問題頻出，缺陷修復的成本較高
3	沒有專職的測試人員，測試由業務人員擔責，測試覆蓋率難以保證
4	測試集中在功能方面，安全，性能，穩定性等非功能性測試非常薄弱或欠缺
5	測試效率不高，測試自動化以及工具利用率較低
6	難以應對層出不窮的需求和設計變更，以及敏捷的開發模式，缺乏靈活度
7	缺乏量化的質量目標，也缺乏對全開發週期的衡量，難以把握項目的健康狀況和問題所在
8	測試環境準備人力多，成本高。測試環境與生產環境的拓撲差異大。各個項目之間的環境重用率低
9	測試專員分散在不同的項目，缺乏跨項目的交流。測試實踐經驗和工具資產等很難傳承和共用。測試人員缺乏本職專業的認同感，流動率高
10	不能客觀評估當前的測試成熟度，也同樣缺乏對業界最佳實踐的瞭解，困擾於如何改進當下的問題


解決問題的答案需要平衡成本，質量，效率三大因素
成本
如何使測試上的投資收益最大化？
如何通過加大在測試上的投資提升質量？
如何維持一個靈活的測試人員資源池？
如何縮短測試週期？
質量
如何確保穩定的高質量的項目交付？
如何確認測試充分,應用可以上線？
如何預防和減少缺陷？
如何度量測試的服務水準？
效率
如何優化流程，靈活適應變化？
如何提升測試效率,降低手工參與？
如何用最少的時間覆蓋較大的範圍？
如何管理所有測試項目？
革新的測試方法，
技術以及管理方法
與運作方式

什麼是卓越品質管制中心（Test Centre of Excellence, TCoE）？

“卓越品質管制中心遵循集中式的測試組織管理模式。它把分散在不同部門，不同項目的與測試相關的人員，環境，工具，資產等匯總在一起集中管理。通過對流程方法的規範化，人員資源的合理配置，工具的統一定制，測試過程的審計與度量，測試經驗與資產的積累與共用，對業務或開發部門提供更優質量，低成本，高效率的的測試服務”

TCoE的 框架組成

卓越質量管制中心戰略目標

- 客戶滿意度
- 投資回報
- 人才梯隊
- 服務水準

戰略驅動

- IT與業務發展
- IP保戶與領導
- 投資

標準的流程與規範

- 測試流程規範化與改進
- 測試各子流程規範化與改進
- 測試准入准出標準
- 度量體係與基準
- 測試策略與管理規範
- 質量計劃與管理策略
- 測試範本

合理配置的人員與靈活的組織

- 核心團隊與機動團隊的混合組織模式
- 人員需求計劃
- 角色和職責定義
- 組織架構定義與優化
- 測試人員成長路線定優
- 知識管理與經驗分享

創新的技術與統一的平臺

- 測試用例設計方法
- 缺陷分析方法與技術
- 自動化測試方法與技術
- 基於風險測試方法
- 創新技術調研與實踐
- 測試管理工具
- 自動化測試工具
- 測試資產發布共用平臺

共用的環境與基礎架構

- 基礎架構的集中化管理
- 基礎架構的虛擬化與雲服務
- 環境的劃分
- 使用計費
- 環境維護與監控

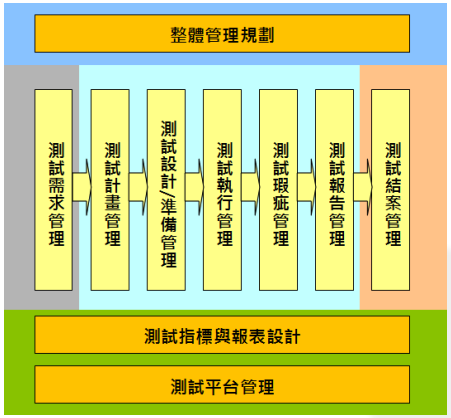
統一的管控

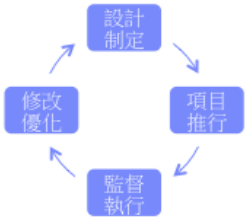
- 項目管理
- 報表與儀表盤
- 控管工作量

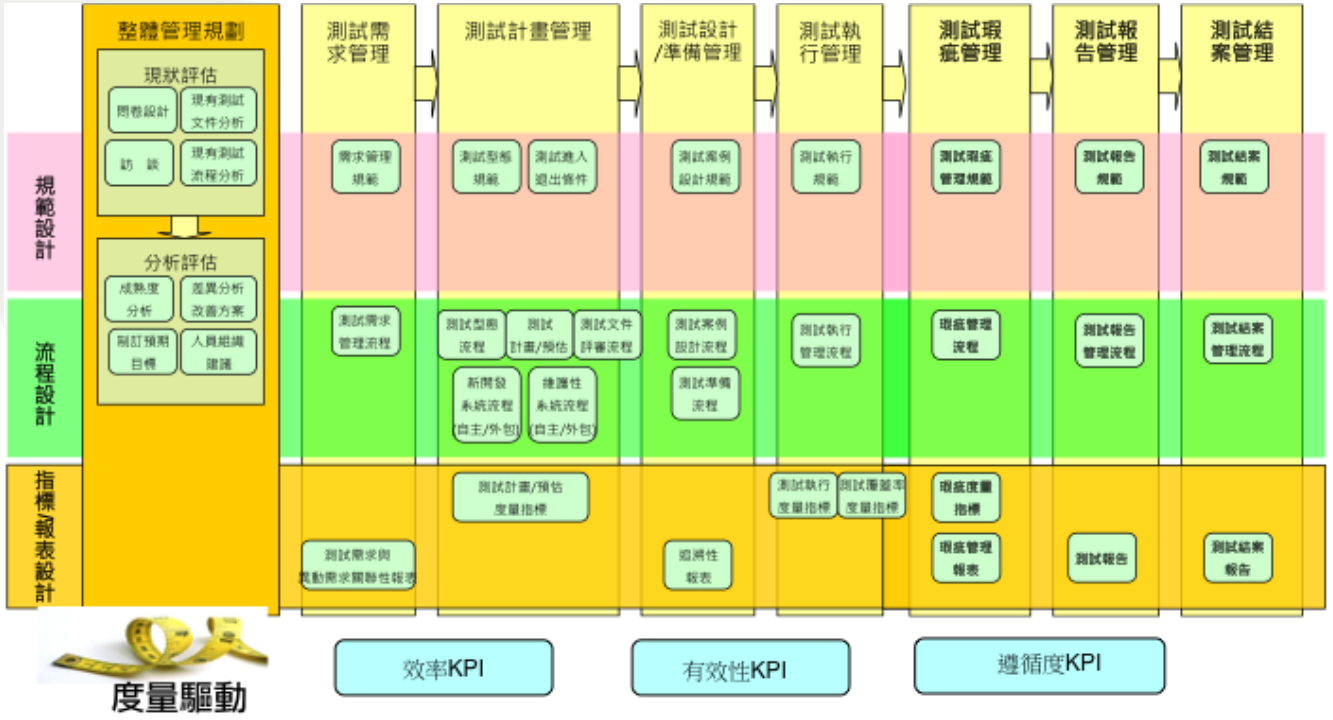
特色的TCOE

- 功能TCoE
- 性能TCoE
- 安全TCoE
- 基礎架構TCoE

TCoE的組成：建立測試流程規範，改進現有測試流程







TCoE的組成：測試中心關鍵指標(KPI)設計

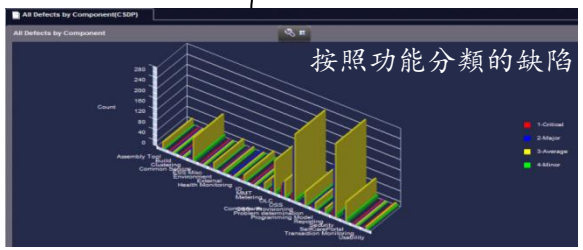
衡量項目質量，考核團隊績效，透視問題所在，預測趨勢發展，提供改進建議

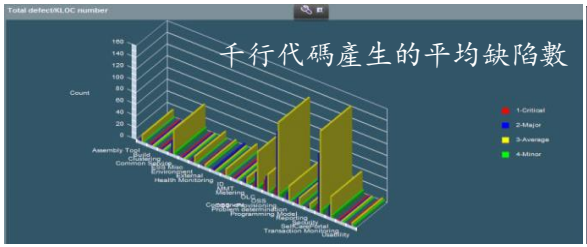
質量 KPI
千行代碼平均缺陷數
測試覆蓋率
成功通過率
不同嚴重級別缺陷數量的分佈
……

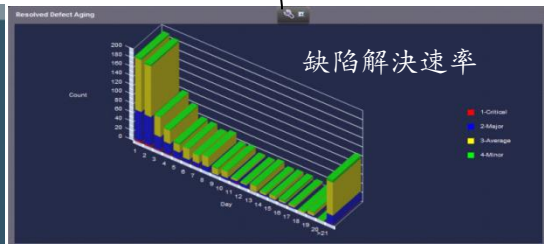
成本 KPI
成本績效指數(CPI)
計劃工作的成本預算
已完成工作的實際成本
完成工作所需成本估算
開發千行代碼的平均成本
解決缺陷所需平均成本
……

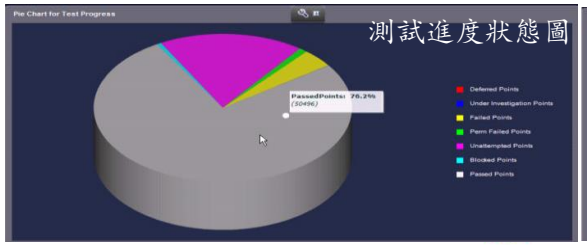
效率 KPI
進度績效指數(SPI)
測試腳本開發速率
測試執行速率
缺陷發現速率
腳本缺陷解決速率
……

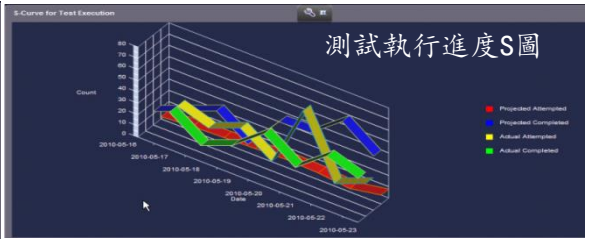
度量指標+度量基準+度量方法+度量報表+責任人 = 度量體系

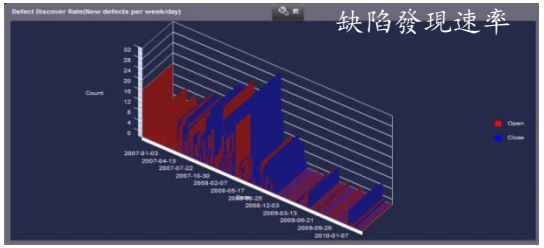






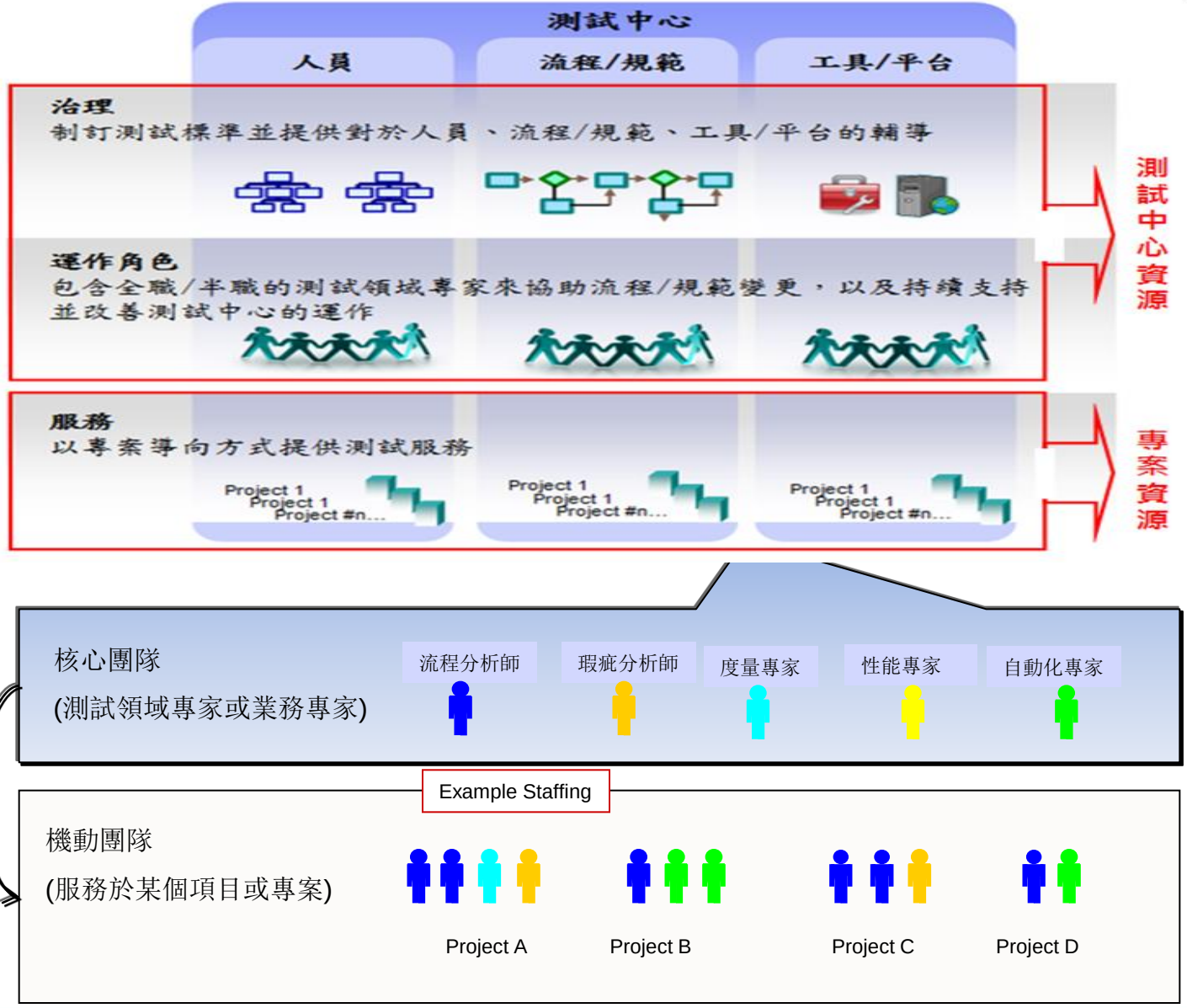




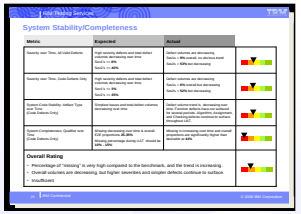


TCoE的組成：組建靈活的測試混編團隊，建立適合企業發展的組織結構

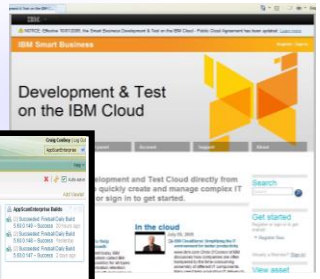
- 定義清晰的角色職責和組織架構
- 組建由核心人員和機動人員混編的可伸縮的資源池
- BA –SA-QA模型 BA攜助QA，解釋需求評審用例，評估缺陷等
- 制定測試人員職業發展路線規劃圖
- 發展虛擬社區，論壇增強人員之間的交流
- 根據業務發展預測預估對測試人員的需求



TCoE的組成：集合成開發、測試工具與環境

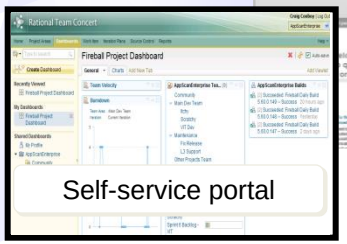


Defect Analysis indentifies areas for more robust testing to improve quality



* Defects can be loaded into Rational Quality Manager and accessed throughout the application life cycle

* Application Virtualization enables complex testing early in the life cycle by removing constraints

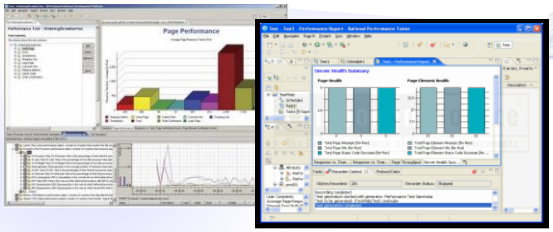


Requirements

Rational Software Delivery Services

Project Initiation | Requirements Analysis | Design | **Development** | **Test** | Deployment | Production

Unit | Integration | System | System Integration | User Acceptance | **Operability**



Maintain

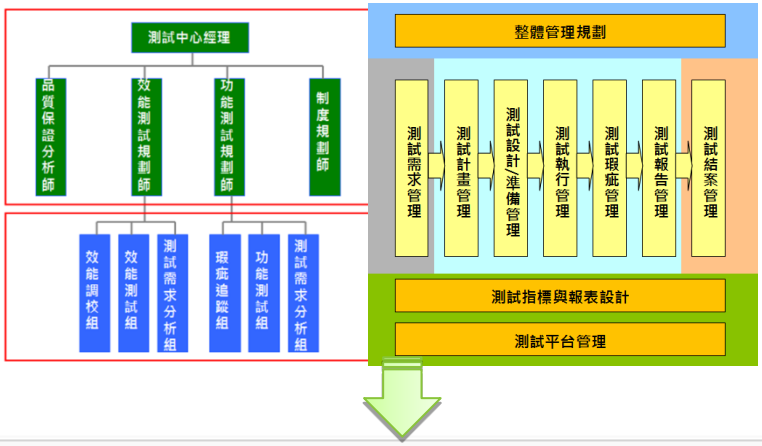
Code Analysis and Reporting before and after Unit test reduces testing time and project costs.

* Performance Testing Services identifies end to end performance issues, including Production Scale web and mobile performance testing

Mobile Device Testing for mobile applications on demand

= in the IBM Cloud

TCoE的組成：藉由系統化的工具累積企業資產



測試策略
測試計畫

產出

測試案例大綱
測試案例
測試案例/需求對照表
測試資料
測試環境/工具
測試執行計畫

產出

風險評分表(選項)
測試結果
問題/瑕疵日誌
測試報告
測試開始/結束公告

產出

經驗學習
總結報告
KPI指標報告

產出

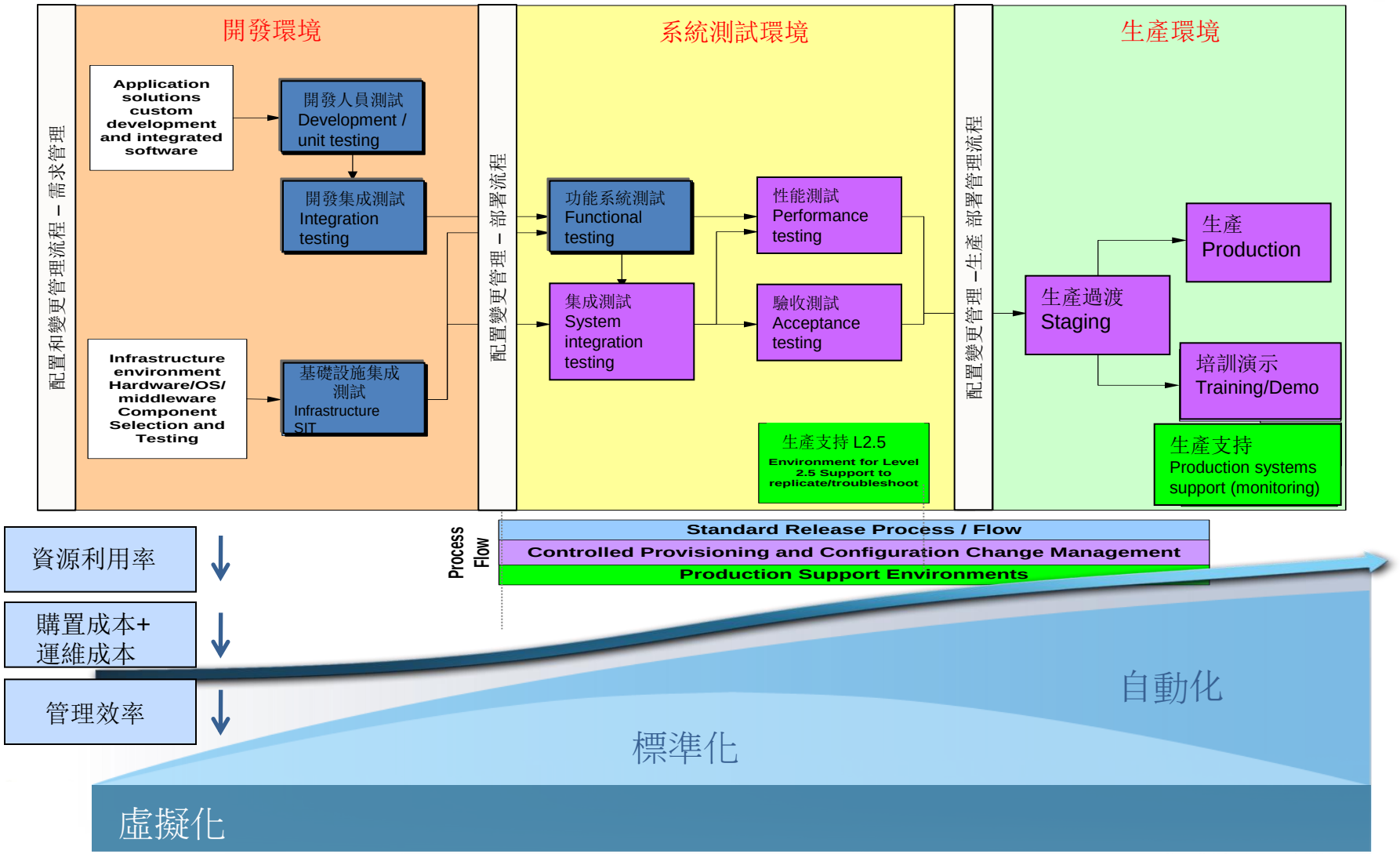
工具制訂

品質管制工具 RQM, RFT, RPT

企業品質資產

範本 | 專案歷史資料 | 檔案庫 | 專案經驗教訓 | 業界最佳實踐 | 知識庫

TCoE的組成：
基於虛擬化和雲計算技術對測試環境進行統一管理



卓越品質管制中心的特徵與價值

標準化，統一化，集中化，以及持續優化

節約成本和投入：

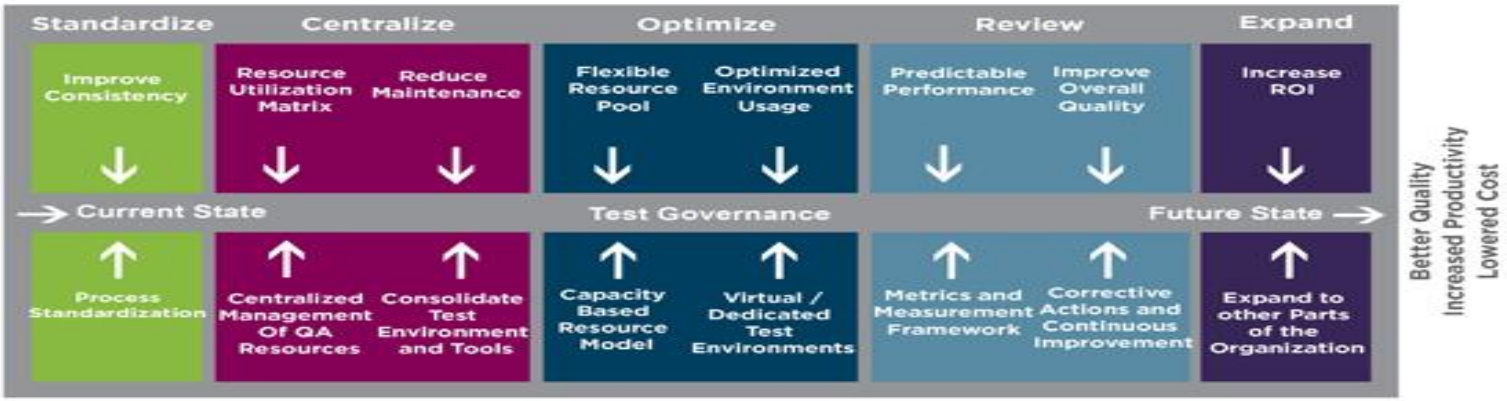
•可重用的測試流程,共用的測試基礎架構，統一的監管機制，可伸縮的團隊管理
•可以為企業減少約 15%-35%的成本和開銷，並保投入和產出比的不斷提高
• 靈活的人員組織架構和優化的人員配置，可以應對不同規模和類型的測試專案

不斷提高的交付品質

•低產品缺陷率。 約97%的系統缺陷在交付前被發現和修正，不斷提高用戶滿意度。
•更全面的質量控制能力, 可以有效的對應用的功能以及基礎架構,性能等各方進行質量管控
•通過創新的缺陷分析，幫助缺陷預防或缺陷的早期發現和修復

•不斷提高的生產效率：

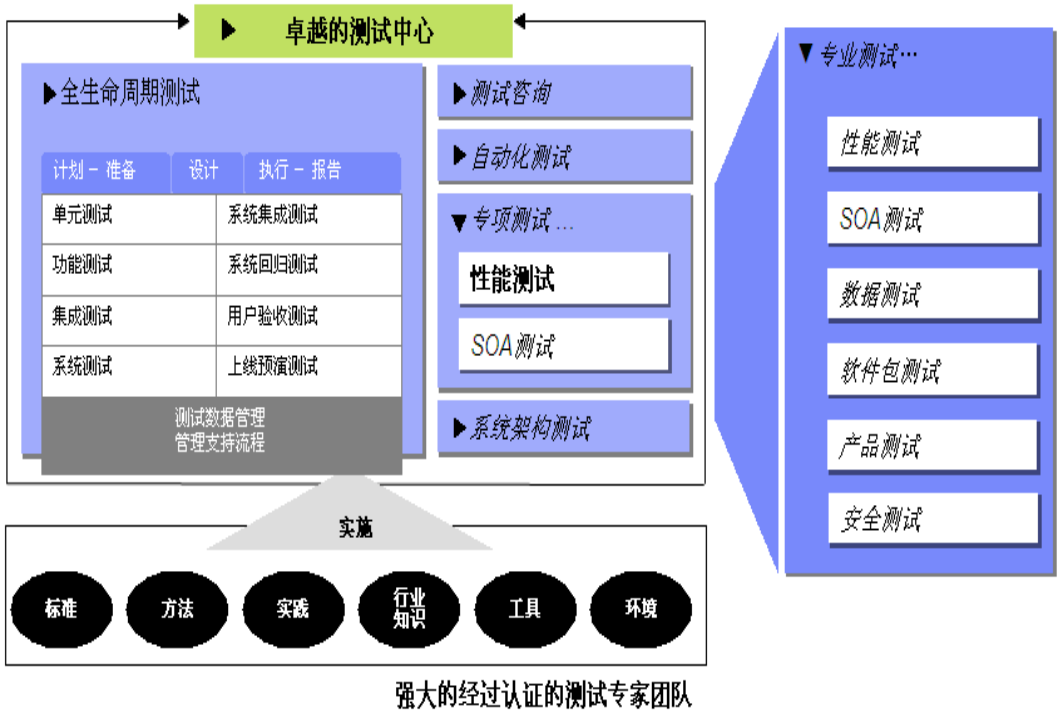
•有效使用自動化測試工具，幫助減少70%左右的回歸測試時間
•可重用的企業資產，知識庫以及跨項目的經驗交流幫助測試團隊改善工作效率 （人均>5%的年效率提高）
•從成本，效率，品質等方面對端到端的測試進行全程度量，有助於持續改善測試流程，提升效率
•關注重要功能和高風險的測試，靈活應對項目變更，縮短了產品的交付和上線時間：

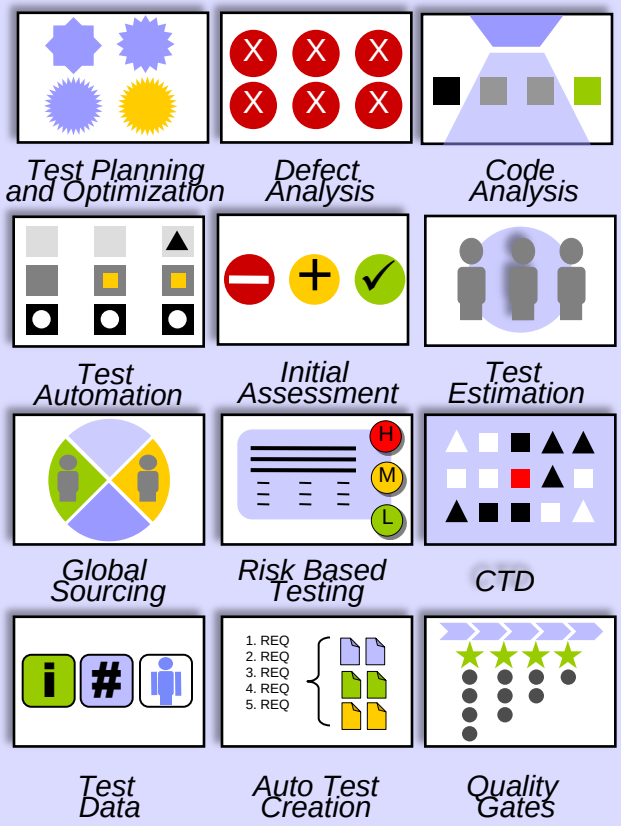


為實現TCoE，IBM 推出了全新的測試理念和工具TTQ

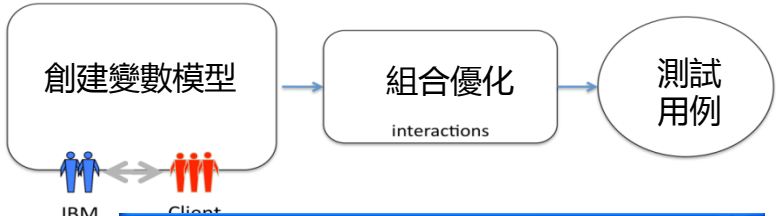
IBM Total Test Quality™ (TTQ)　　*TTQ是一個革新的理念

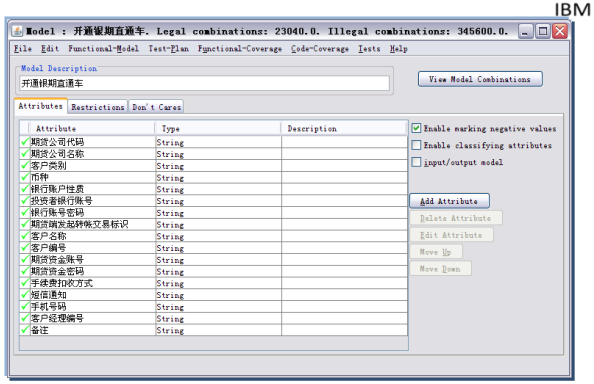
- 結合了IBM全球測試服務的豐富測試業務能力和經驗資料累積
- IBM研究院的卓越創新能力以及IBM軟體的全面自動化功能
- 借助Test Planning and Optimization Workbench™ (TPOW)的協助, 透過量化以及平衡**成本**、**時程**及**品質**給客戶帶來豐富而獨特的價值。

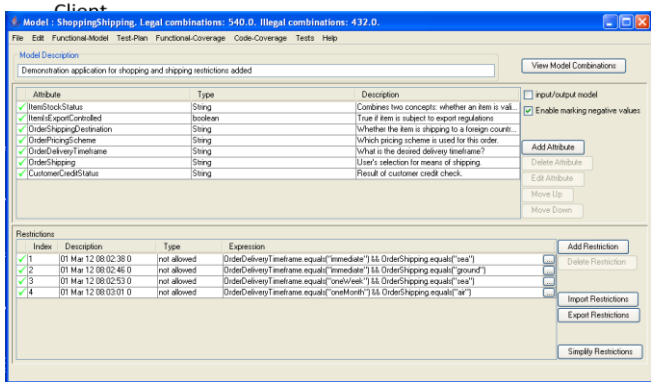


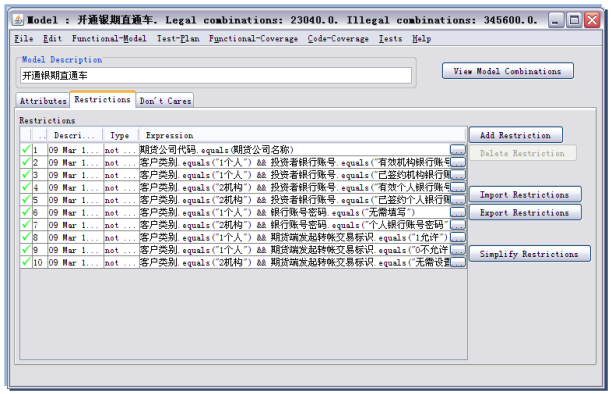


由IBM研究院研發出來的、具有專利技術的測試用例設計解決方案能夠說明客戶解決品質與成本的問題，並獲得切實的收益









減少測試漏洞

獲得覆蓋每個變數和變數間組合的測試需求

識別出已有測試用例集的漏洞

提高測試效率

有效減少冗餘的測試用例

一旦需求變更後通過調整模型快速回應

把控測試風險

組合測試模型具有較強可讀性，有助於清晰瞭解被測內容

基於風險選擇變數組合級別，獲得理想的品質目標

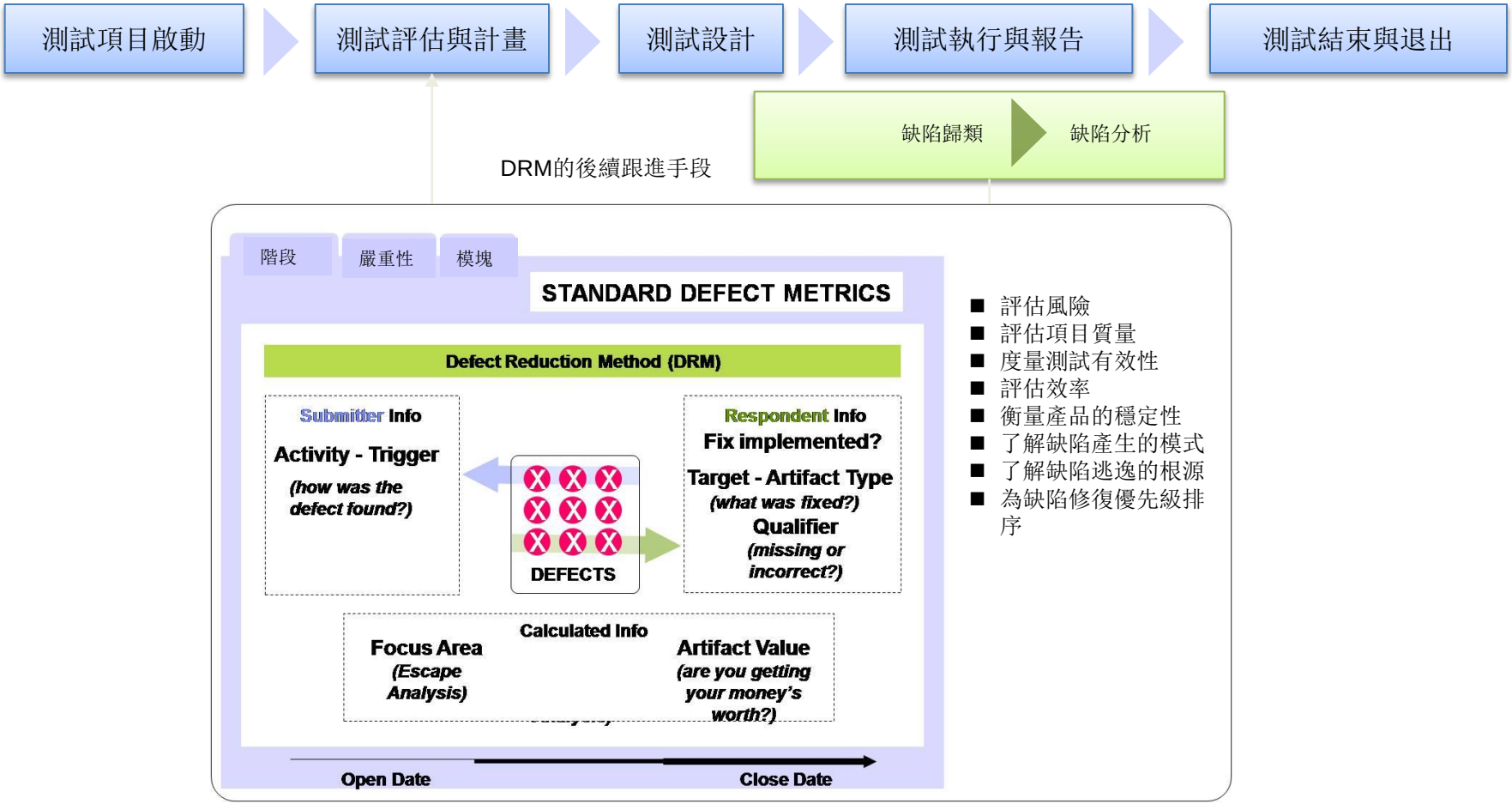
加快測試進度

減少測試用例設計階段

通過精簡的用例減少測試執行時間

IBM DRM方法—透過缺陷深入洞察軟體發展測試過程

IBM® Defect Reduction Method™ 是具有專利保護的缺陷統計，分類，分析方法。該方法能幫助深層分析缺陷的根源，從而今早地發現缺陷或者盡可能避免缺陷的注入。



IBM DRM幫助評估現在，並為未來提供改進建議

風險，品質評估

Executive summary analysis

RISK	
General Test Effectiveness	
Test Design Effectiveness	
System Stability/Completeness	

QUALITY	
Quality Benchmarks	
Focus Area Assessment	

Executive summary conclusions

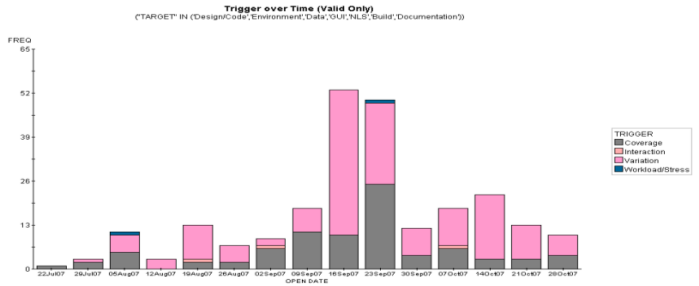
- ***Test Effectiveness is significantly adversely impacted*** due to the high % of Invalids.
- ***The system is not as stable as it should be for UAT***, especially with respect to basic and relatively simple testing, with very little evidence of more complex testing.
- The most significant defect prevention opportunity in the system code of future releases can be achieved by ***increasing focus on DETAILED DESIGN processes and activities*** *and* ***CODING.***

測試有效性評估

Test Design Effectiveness: Trigger over Time (Valid Defects):

When looking at ALL Valid defects logged, we see the dominance of two triggers throughout the UAT phase: Coverage (the testing of the most basic functionality) and Variation (testing of single functions, but with a variety of parameters and conditions. The fact that we see very little indication that more complex testing was performed is a concern in terms of the comprehensiveness of the effort. However, It is a positive indicator that considerable effort was invested in exercising variations, however there is a caveat: the variation tested were very narrow, with only the geographic location changing in most cases.

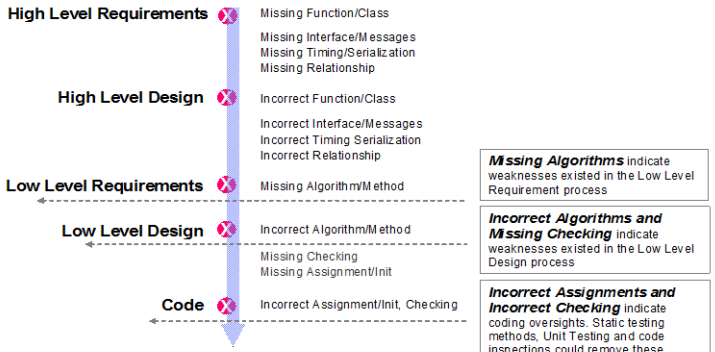
It is also a concern that Coverage is present to this extent, given that this is UAT, and we would hope that the majority of the "basic" faults would have already been detected and removed.



缺陷預防建議

Defect Prevention Opportunity

ODC defect types mapped to generic activity injecting defects



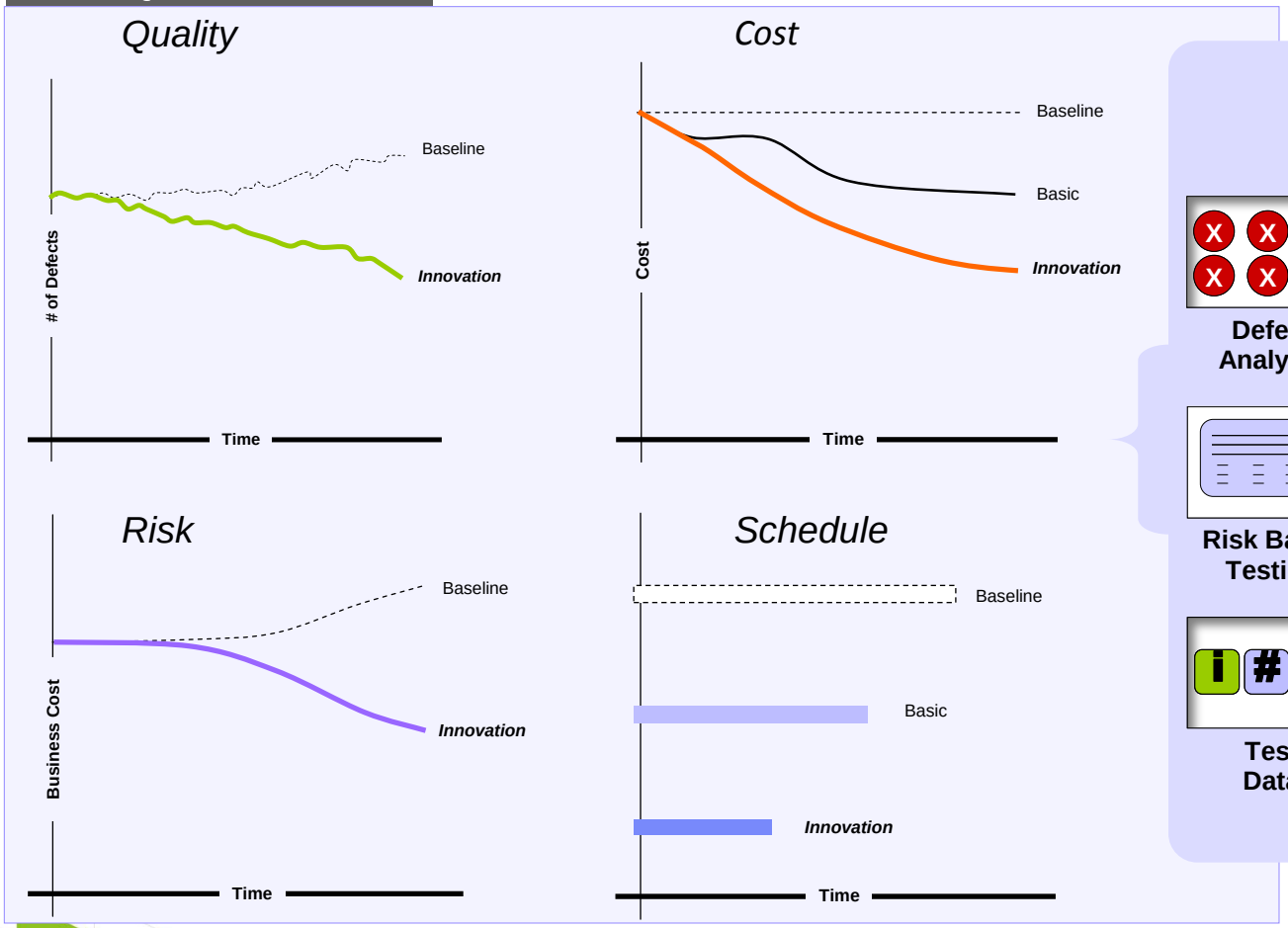
流程改進建議

Highest Priority Areas Needing Improvement:

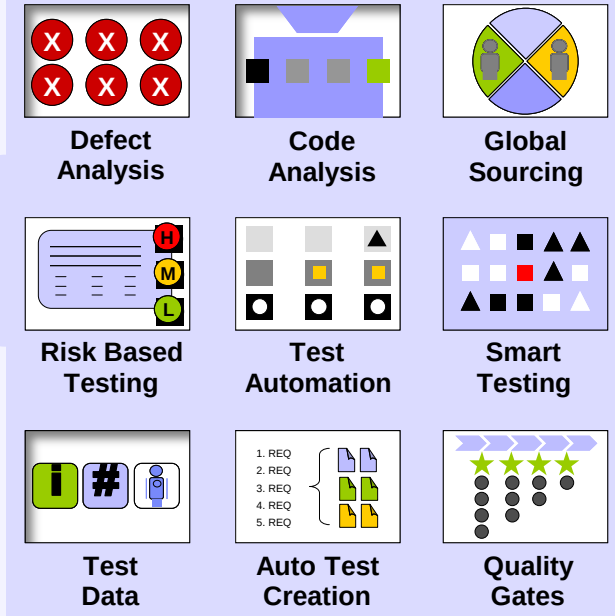
Defect Pattern:	What does it mean?	Do we need to address this?
Although overall volumes are down, more than half of the defects uncovered in recent periods were invalid	Test Effectiveness is significantly adversely impacted	**Yes.** Substantial time & project resources that should be used productively and thoroughly exercising the system code are essentially wasted when the proportion of invalid defects is so high
Defects are dominated by relatively simple triggers (Coverage and Variation). There is almost no evidence of more complex testing.	Testing is not as comprehensive as it ought to be	**Yes.** While a system of this type does not require an enormous investment in complex testing, there ought to be more than we see. Reviewing the test plan against the results ought to reveal specific exposures.
Disproportionately high # of Algorithm/Method defects uncovered, in almost equal proportions of missing and incorrect.	Significant opportunity for preventing defect injection exists	**Yes.** There are weaknesses in Detailed Requirements process and in Detailed Design process. Additional analysis of the defect records will aid in isolating explicit focus areas, and lead to process improvements in those two activities.

IBM創新測試理念與技術能讓測試活動持續優化

TTQ 儀錶盤

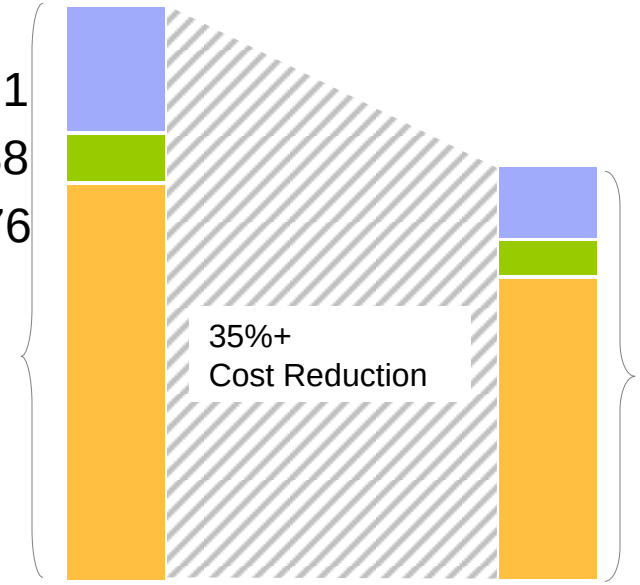


領先的測試技術



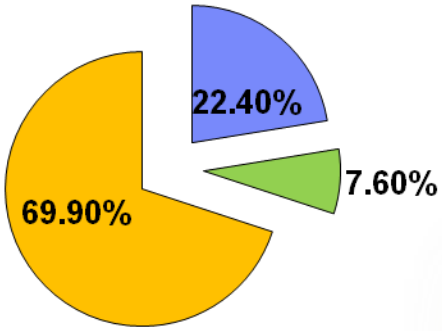
IBM TCoE 推動提升品質，節省成本，縮短週期，最終支持業務發展並降低風險

業務成本	$4,634,271
測試成本	$1,579,838
缺陷修復成本	$14,439,176



業務成本	$2,125,812
測試成本	$911,260
缺陷修復成本	$10,240,335

Cost Overview
(Total: $20,653,285)



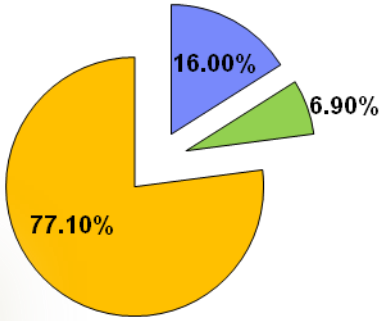
Schedule: 89 days

Environment: 14 days

客戶收益

- 成本降低 25 – 60%
- 週期加速了20 – 50%
- 品質提高了30 – 70%

Cost Overview
(Total: $13,277,407)

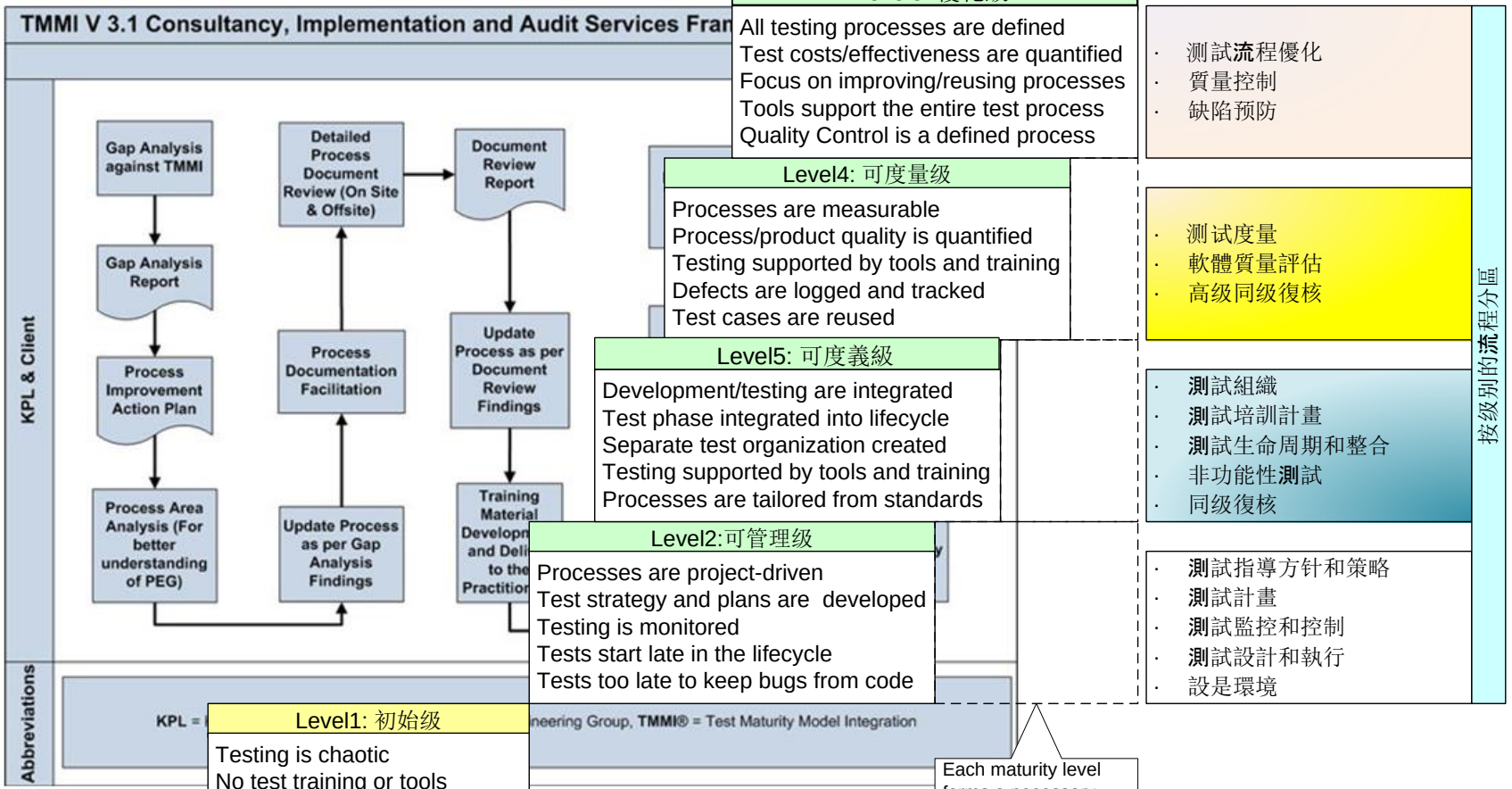


Schedule: 37 days

Environment: 5 hrs

Source: IBMTest Planning and Optimization Workbench example

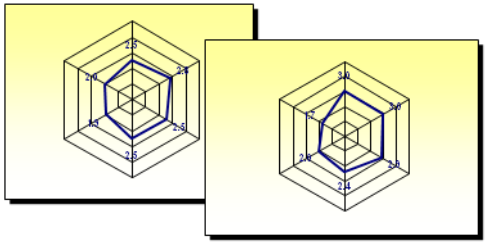
測試中心建設參考模型-軟體測試成熟度TMMi

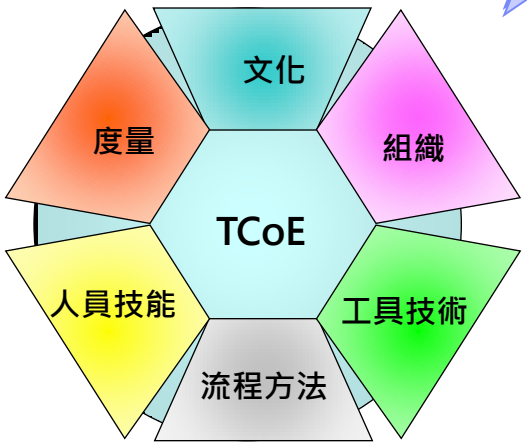


IBM基於TMMi幫助客戶測試中心提高成熟度的方法–六維評估和改進法

訪談
- 測試經理
- 專案管理人員
- 測試人員
- 品質管制人員
- IT支持人員

文件
- 測試流程；
- 測試策略和報告
- 測試交付物（計畫，用例，缺陷分析等）
- 測試度量指標





		Niveau 1	Niveau 2	Niveau 3	Niveau 4	Niveau 5
Méthodes & Outils	5.1 Méthodologie et Outils	Processus de test réalisé sans méthodologie prédéfinie	Utilisation d'une méthodologie de base et de quelques outils automatisés	Méthodologie complète, mais pas toujours suivie. Des outils disponibles mais pas complètement utilisés	Méthodologie rigoureuse, utilisée et automatisée par l'intégration d'outils	Méthodologie définie et évolutive. De nouveaux outils évalués et intégrés quand nécessaire
	5.2 Facilité d'utilisation	Outils et méthodes jugés comme inutilisables ou trop compliquées	Outils utilisés que par les experts, car considérés comme complexes	Fonctions de base faciles d'usage, fonctions avancées limitées aux experts	Majorité des outils et méthodes utilisés efficacement par tous.	Tous les outils et méthodes utilisés efficacement par tous, même sans connaissance métier
	5.3 Périmètre de l'automatisation	Pas d'automatisation	Automatisation du suivi des défauts	Automatisation du suivi des défauts et de la gestion du catalogue des scénarios de tests	Automatisation du suivi des défauts, de la gestion des scénarios de tests et de leur exécution	Automatisation du suivi des défauts, de la gestion des scénarios de tests, de leur exécution et de l'analyse des résultats
	5.4 Degré d'intégration	Pas d'intégration au niveau des outils (disparité)	Intégration des outils limitée à une interface utilisateur commune	Intégration de quelques outils clé de management	Intégration efficace et complète par un nombre réduit d'outils et de méthodes	Intégration d'outils permettant l'analyse préventive et d'éviter les défauts

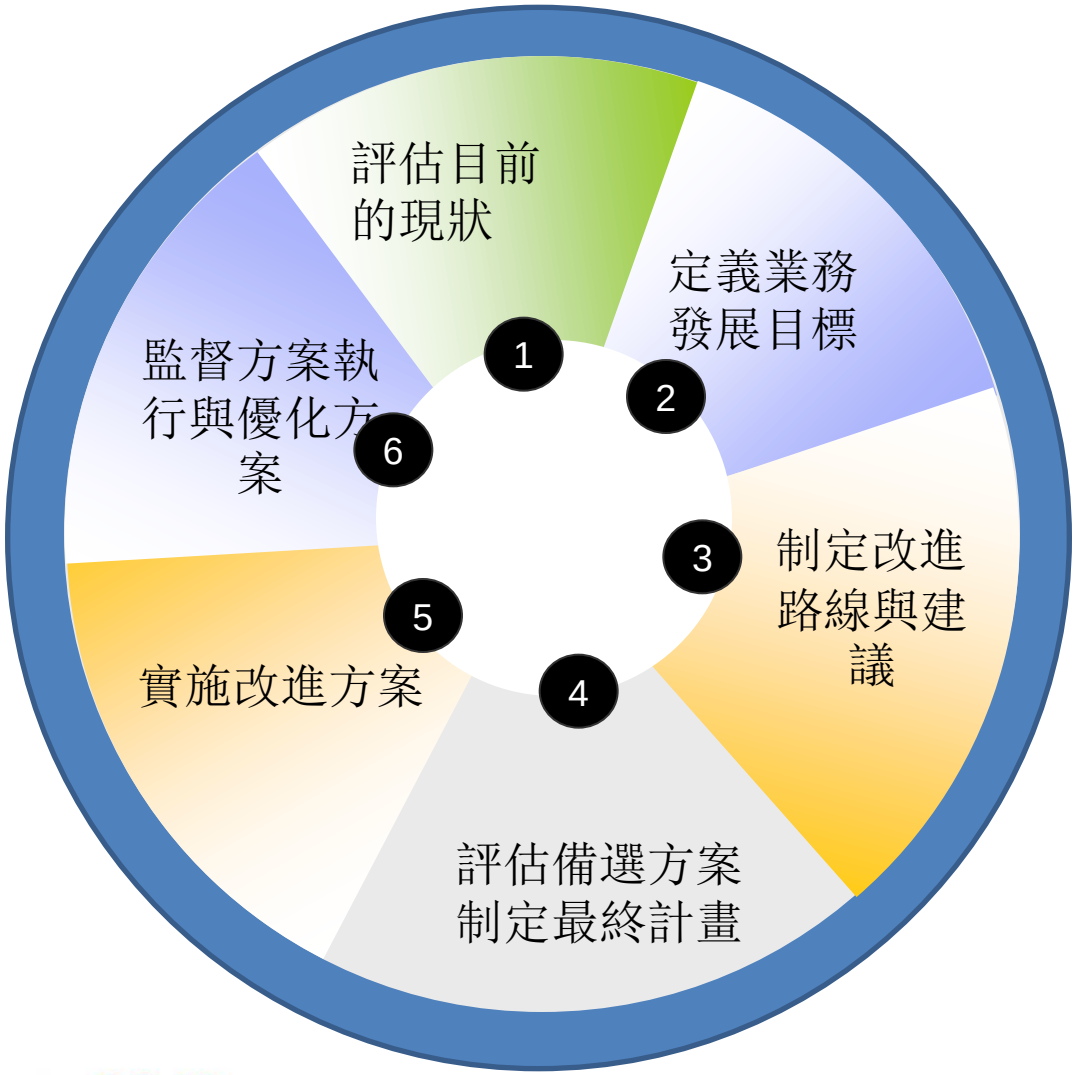
		Niveau 1	Niveau 2	Niveau 3	Niveau 4	Niveau 5
Execution des tests	2.1 Stratégie et procédures de tests	Pas de stratégie globale de test. Pas de plans de test documentés	Pas de stratégie globale de test, mais importance des tests reconnues	Stratégie globale de test existante mais pas toujours appliquée	Stratégie globale de test existante et appliquée par tous	Stratégie globale de test existante, appliquée par tous et optimisée de manière régulière
	2.2 Environnements de tests dédiés et représentatifs	Pas d'environnements de tests dédiés	Environnements de tests dédiés pour l'intégration uniquement	Environnements de tests dédiés pour chaque phase de tests, mais maintenus ponctuellement	Environnements de tests dédiés à chaque phase de tests et maintenus par une équipe spécialisée	Environnements de tests dédiés à chaque phase de tests et reflets de la production
	2.3 Scénarios de tests et données associées	Pas de réutilisation des scénarios de tests	Gestion manuelle et réutilisation partielle des scénarios de tests	Gestion des scénarios de tests par un outil	Gestion des spécifications et de leur lien avec les scénarios de test	Gestion des spécifications,des scénarios de test et des données pour optimiser la couverture des tests et la réutilisation
	2.4 Exécution et analyse des résultats Critères de début et cloture de tests	Exécution manuelle des scénarios de tests	Exécution automatique des scénarios batch mais analyse manuelle	Exécution automatique des scénarios batch et temps réel mais analyse manuelle. Critères de début/fin de tests définis, parfois non-utilisés	Outil d'analyse automatisé pour presque l'ensemble des résultats. Critères de début/fin de tests utilisés, parfois non-respectés	Outil d'analyse automatisé pour l'ensemble des résultats. Critères de début/fin de tests utilisés et respectés. Amélioration constante des critères
	2.5 Gestion des défauts	Défauts corrigés au fur et à mesure de leur détection	Défauts corrigés et suivis manuellement	Défauts enregistrés, priorisés et suivis dans un outil. Pas d'analyse des causes	Suivi automatisé des défauts et analyse des causes majeurs de défaut	Analyse systématique des causes d'erreurs pour utilisation ultérieure en développement et en production

		Niveau 1	Niveau 2	Niveau 3	Niveau 4	Niveau 5
Organisation	4.1 Propriétaire du processus de tests	Aucun responsable (propriétaire) du processus de tests	Responsabilité du processus éclatée entre plusieurs interlocuteurs d'entités différentes	Responsabilité du processus éclatée sur plusieurs interlocuteurs de l'entité IT. Pas ou peu d'améliorations du processus prévues	Responsable unique du processus de test. Certaines améliorations du processus réalisés, d'autres prévues	Responsable unique du processus de test et son améliorations permanente. Point de contact pour tout problème et focus Métier
	4.2 Rôles & Responsabilités dans le processus de test	Pas de rôles & responsabilités définis	Rôles & responsabilités en cours de discussion	Rôles attribués et documentés	Rôles acceptés et documentés. Mise en place d'un rôle de leader pour contrôler le processus	Rôles acceptés, documentés et en évolution constante. Adéquation entre spécifications et tests faite par le leader du processus
	4.3 Gestion des compétences	Peu de compétences en tests dans l'organisation	De bonnes compétences en tests mais ne couvrant pas l'ensemble du périmètre de la solution	De très bonnes compétences en tests, couvrant l'ensemble du périmètre de la solution	Compétences fortes et variées en tests. Planification de la formations en fonction des besoins en tests	Analyse régulière des compétences techniques, métier et processus et de leur adéquation avec les besoins en tests

IBM Know-How
Organization
Roles&Responsabilities
Tools
Documents

5	World Class (Continuous Improvement)
4	Mature (Measured and controlled practices)
3	Capable (Documented & Integrated Practices)
2	Aware (Unformalized practices)
1	Unfocused

依據TMMi框架，逐步地提升TCoE的成熟度



依據TMMi標準，IBM訂制卓越品質管制中心各領域關注重點，以及個等級實施的具體目標要求（現況和未來）

關注區域	不關注（1）	開始瞭解（2）	可控可量化（3）	成熟（4）	世界級（5）
文化	沒有明確的管理目標	瞭解管理目標，但存在分歧，沒有達成共識	多數人理解現有的管理目標和價值定位，團隊有制度化合作	組織內所有人員對管理和品質目標達成一致	在組織層面對管理目標和價值定位進行宣傳和推廣，所有人向一個方向努力
組織	沒有具體的管理崗位	崗位說明沒有文檔化，存在多頭管理，崗位邊界不清	有文檔化的崗位和工作範圍，職責和能力要求的描述，但沒有完全涵蓋管理內容	單一負責人，有文檔化的崗位說明，覆蓋所有的管理內容，崗位授權明晰	單一負責人，崗位說明根據工作特點，並具有追蹤與及時修正能力
人員技能	技能不能滿足共組要求	技能勉強滿足當前工作需要，沒有相應的提升培訓計畫	根據崗位說明制度基本培訓計畫，但缺少對業界新技術和成熟管理方法的培訓	關注員工的個人發展計畫，提供新技術和管理方法的培訓	關注員工的發展情況，及時調整員工的發展方向和崗位安排。員工技能持續提升
流程方法	沒有制度，工作按約定俗成的方式盡心	部分專案有管理制度，各個專案的管理方式沒有統一標準	在組織層面上制定了管理制度和流程，但覆蓋面不完整，實際執行缺少監督	有全面的管理制度和流程，有專人對制度和流程的執行進行檢查和監督	有專門的制定，監控和優化部門。測試流程通過度量指標分析持續優化
工具技術	沒有管理工具	部分關鍵管理環節引入了管理工具，但沒有推廣使用	關鍵環節的管理工具進行了培訓和推廣，並根據回饋意見制定改進措施	所有關鍵環節都有配套的管理工具支撐	有專門的部門根據工具使用情況進行工具選型，培訓和推廣，生產效率不斷提高
度量	無	度量指標只是關注數量，沒有深入分析	引入了品質方面的度量指標	引入端到端的度量方法和指標	從業務目標分解度量品質，度量資料用於組織能力的持續改善

測試中心品質保證及控管體系設計

	do the right thing	do the thing right
	品質保證 (Quality Assurance)	品質控管 (Quality Control)
強調重點	流程 主動 行政管理功能 預防瑕疵	產品 被動 生產管理功能 發現瑕疵
採用方法	品質稽核 定義流程 工具選擇 品質培訓	演練 測試 覆核 檢查點審查

測試中心品質保證及控管體系設計

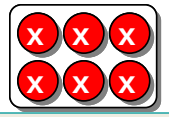
IBM Rational 軟體品質管理解決方案

Thank you

IBM will Leverage its Unique Innovations

Next Generation Testing

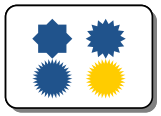
Predictive Analytics



Defect Analysis Starter (DAS)

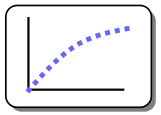
- Statistical, objective defect classification and analysis process
- Find and fix defects as early as possible and prevent future defects from being injected

Advanced Planning



Test Planning and Optimization Workbench (TPOW)

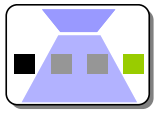
- Advanced, empirical risk-based planning tool
- Delivers an optimized test strategy, supporting master test plan & ongoing project planning
- Provides risk-based information that gives you insights about your application projects



Top GUN Lean

- Synchronizing the dev/build/test processes to deliver maximum test throughput
- Drives completion of new features development, defect closure, test case completion

Intelligent Defect Capture



Code Analysis and Reporting

- Combine static and dynamic code analyses
- Identifies errors, vulnerabilities and compliance issues prior to system wide integration testing

CAST — Achieve Insight. Deliver Excellence.

Rational. software

Test Coverage and Effectiveness

SQALE /CTD

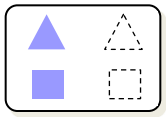
- Establish model of requirements, automate traceability
- Define reduced test case scenarios based upon combinatorial analysis

Optimized Execution

Application Virtualization

- Virtual interface definition to alleviate infrastructure constraints
- Determines schedule acceleration opportunities

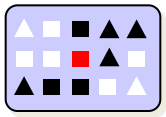
ITKO-Lisa Virtualize



Worksoft - Certify

- Automated business process testing for package & custom application development
- Fully automated E2E functional verification without coding and scripting
- Creation of re-usable assets

WORKSOFT.



Testing Services for Cloud

- Cloud-based Web application testing
- Production Scale web and mobile performance testing

CloudTest by SOASTA

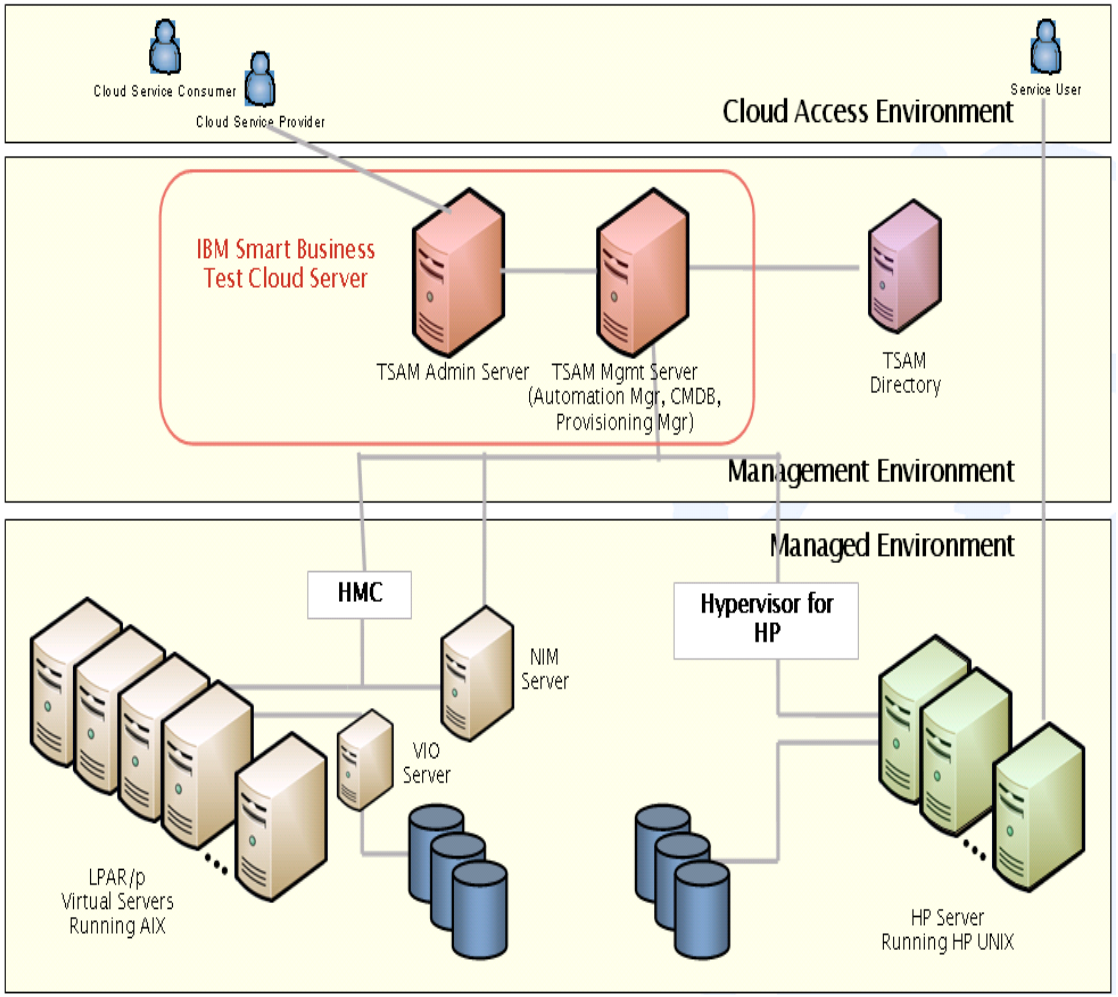
實例：中國某銀行上海資料中心通過開發測試雲節約70%的人工工作量

客戶痛點：

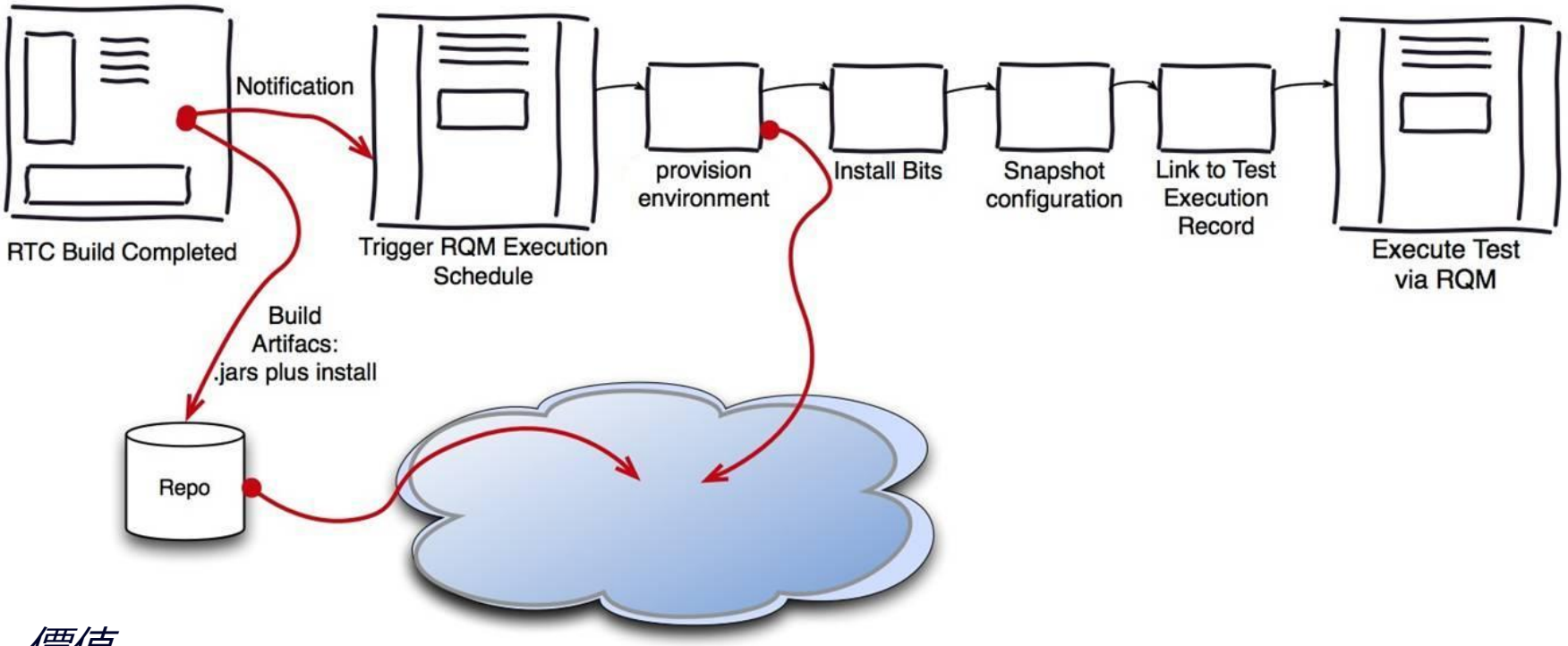
- ✓ 多樣性 - 複雜的伺服器，存儲，作業系統，中介軟體和網路環境
- ✓ 工作量 - 200 + LPAR的劃分需要 在3個月內完成部署
- ✓ 工作量 - 只有1-2周的測試環境部署 時間
- ✓ 錯誤率 - 手動配置和部署測試的高錯誤率
- ✓ 成本 - 50%的運維費用用於測試

客戶好處：

- ✓ 工作量減少：從手動到全自動的自助服務供應大幅降低IT的配置、操作的勞動力成本
- ✓ 從1-2周2-3小時：允許快速，成本有效地設置環境測試
- ✓ 標准化：標準服務目錄，簡化管理降低風險並提高品質
- ✓ 彈性擴展與先進的虛擬化，從而保證資金運用的效率
- ✓ 統一性：所有的測試資源集中到一個平臺管理
- ✓ 可追蹤：資源使用情況可監測，並具備可追溯性



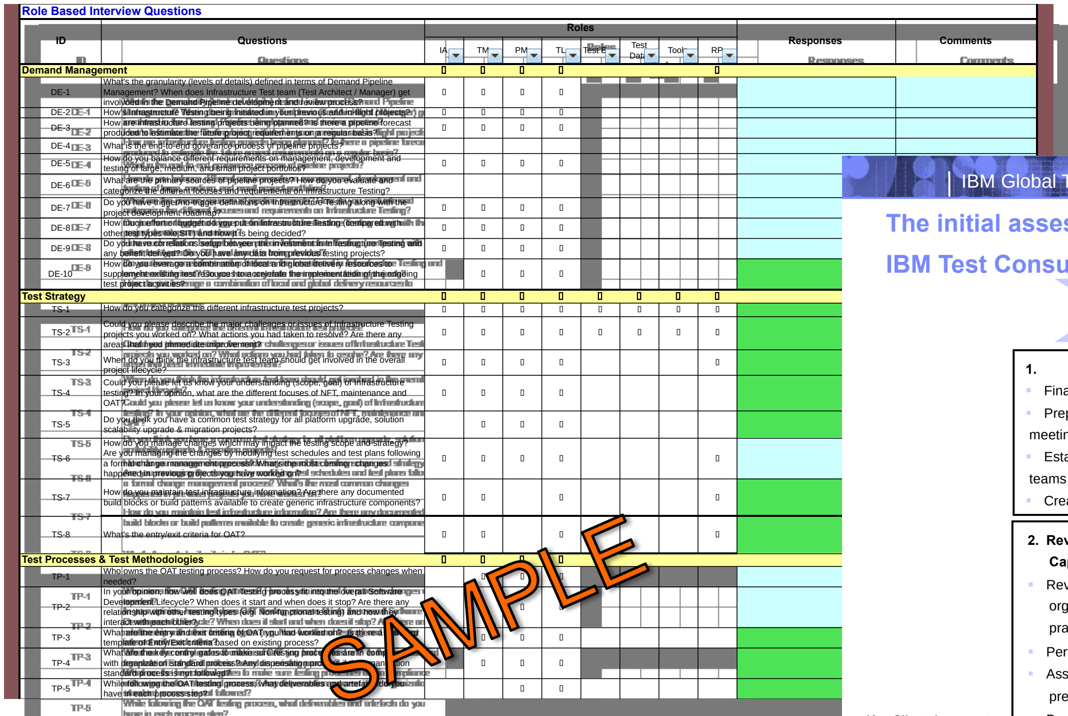
基於IBM工具框架實現端到端的無人值守的自動化測試



價值

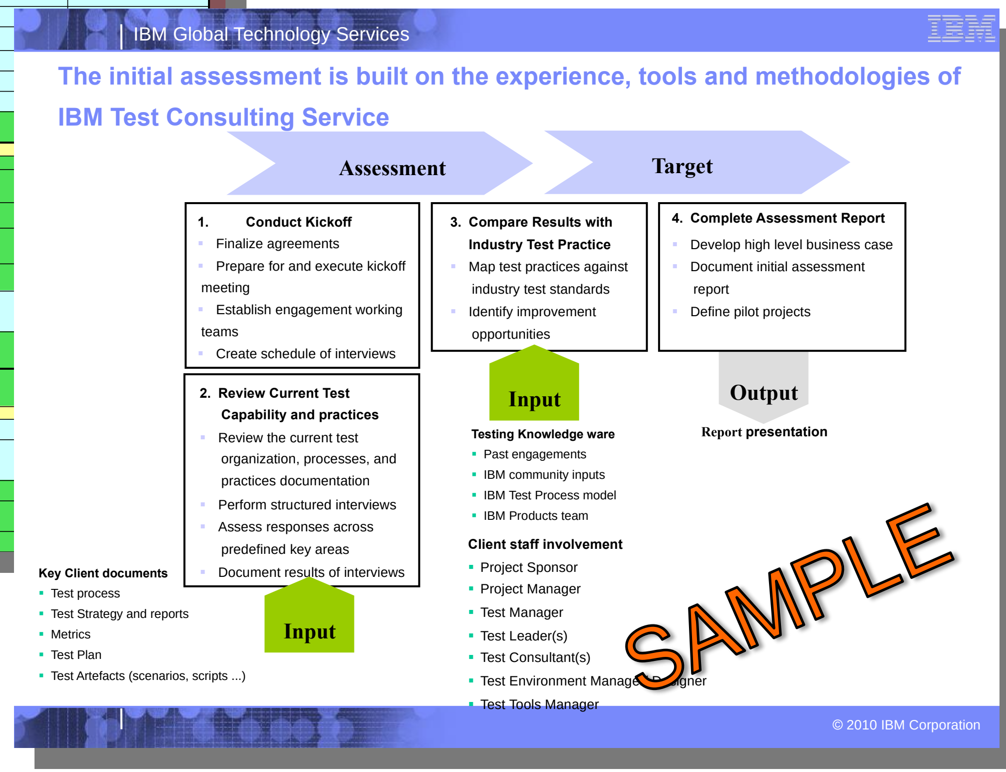
- 把開發和測試自動地串在一起
- 提高效率，杜絕人為錯誤配置等
- “測試人員在司機座位Tester is in the Driver ‘s seat” – 所有交互完全通過RQM統一控制台通過測試執行記錄立即部署完全一致的測試環

測試管理現況分析



調查問卷

Initial Finding



測試管理關鍵要素分析

關鍵性薄弱環節分析

10	Installation & Configuration Verification	Ensures the installation and configuration procedures document properly and accurately the steps required for building the system. Personnel without much know-how on the system should be able to use the procedures to build the system. No assumption on system configuration or parameter will be made during the test. System software (such as operation system) installation verification is not necessary, but any pre-requisites or parameters on system software should be documented in installation procedure and be verified during this test. It may also verify the de-installation of application, the automatic configuration of parameters to the default values, and the application interfaces with the dependent components and applications after installation.	1. Application Monitoring recommended to confirm the configuration changes [IBM] 2. If configuration issues identified, the next step of profiling of the application architecture can be recommended [IBM] 3. Support from Configuration Manager anticipated [IBM] 4. Support from Technical Architect anticipated [IBM]
9	Network Capacity & Latency	Verifies the network performance against the network requirement based on the traffic estimated. Verifies the system and application speed across WAN links. Network capacity will be identified and recommendation will be provided when appropriate.	1. WAN emulator, IP spoofing could be engaged as part of PT [IBM] 2. Support from Network Engineer anticipated [IBM] 3. Network Throttling, Network utilization reports (e.g. Wireshark) [IBM]
12	Online Stress	Stresses the system in order to find the performance threshold, ensure performance criteria stipulated in service level agreement are attainable and explore any production impact under stressed condition. The types of data load and user load should be mixed in a practical way.	1. Performance Test team will be engaged to validate online stress testing [PERF] 2. Test Strategy, Approach, Plan, Reports can be referred [PERF]
13	Performance Benchmark	Benchmarks the performance of the system (excluding areas involve internet access) and that acts as a baseline of the overall performance. Critical application functions should be identified together with Business User and BOI IT for the benchmarking.	1. Performance Test team will be engaged to validate this testing type [PERF] 2. Test Strategy, Approach, Plan, Reports can be referred [PERF]
16	Security Acceptance	Verifies the system security setup, application vulnerability, interface security and security key generation based on policies. It is executed after the operating systems tightening and application installation. It should explicitly cover security test on the in-scope infrastructure (hardware, network, packaged software).	1. All relevant Rules created for Firewall ports will be disabled after completion of Load/Performance Testing engagement [IBM]
14	System Monitoring	Tests the monitoring work in system level (e.g., CPU Utilization, free disk space, memory paging, memory availability, system response, operating system & database performance, network I/O, exceptions & failures) to ensure the monitoring job is working and the threshold is defined appropriately. Alert on critical event will be tested.	1. Performance Test team will be engaged to Monitor, Analyse and Report Systems Monitoring, specific to identifying the performance issues [PERF]
15	Application Monitoring	Tests the application monitoring jobs with failure scenarios simulated to ensure the monitoring facilities are working properly. Alert on critical event will be tested.	1. Performance Test team will be engaged to Monitor, Analyse and Report Systems Monitoring, specific to identifying the performance issues [IBM] 2. If application performance issues identified, the next step of profiling of the application architecture can be recommended. Need help from IBM in profiling exercise [IBM] 3. Access to view monitoring console (e.g. Tivoli, Openview, Sitescope) to setup alerts, failure points.
	Network Monitoring	Tests the monitoring work on network components with failure scenario simulated. Alert on critical event will be tested.	Covered in item 9

elements of OAT

測試管理指導網要

ID	Prio rity	Pinpoints	Observations from Test Practice Review	Recommendation and Action Plan
M1	H	Test cases are **NOT** formally documented. It's hard to trace the test coverage and repeat the testing t different testers.	• In most cases, test cases are **NOT** formally documented.	• Create test cases against the CR spec and also design docs and maintain them in the test management tool, like RQM
M2	H	The test coverage **Insufficient.** Some variation cases are NOT covered. And team face the challenge to decide which data sets fro the huge number o possible combinati should be covered testing		

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IBM的風險評估方法涵蓋了業務應用非功能性需求的各個方面，有針對性地制定測試策略

Area of Risk	Description
Internal Interfaces	The new location of the application platform and associated IP address range change will need to be tested within the context of existing internal system interfaces i.e. Database and application Server
External Interfaces	The new location of the application platform and associated IP address range change will need to be tested within the context of existing External system interfaces i.e. Other applications, DMZ, 3rd party support, printers, storage
Data Integrity	Failures in processing, storing or retrieving data, data validity baseline vs. target, error logs, chksum, data within batch jobs
Performance	This attribute may be affected by the migration due to increased latency or a change in the host platform or disk subsystem performance. May include; Load, Stress and Volume testing
Batch Jobs	Timings, accuracy, content, data usage within further applications (End to End)
User Access	The method used by the business user to access to the application may change i.e. Citrix (thin-client), location of login script or .exe file etc. need to check, remote access, negative testing, firewalls
User Roles	Each level of access, access rights and privileges, negative testing
Monitoring and Alerting	Checking IT processes and procedures executed i.e. HP Openview script validation, server outages, memory utilisation
Failover	Checking IT processes and procedures executed i.e. Failover within a cluster, server to server failover
Security	IBM ISEC standards met, SOX, regulatory standards
Load Balancing	Balanced load, server down-rerouting requests, sticky sessions
Backup/Restore	Network backup operational, local archive, backup and restore facilities operational i.e. Local and/or Remote backups processes tested
Change/upgrade In Platform or Database	W2K to Win 2008, HP server to IBM server
Disaster Recovery	The disaster recovery solution implemented post-migration may change and it is vital to make sure that the agreed RTO and RPO are met.
Resilience	The level of resilience may change and/or the solution implemented to provide resilience may change i.e. transition from physical to virtual
Operations, Maintenance and Stability	Failures that endanger continuing operation, including, patches and upgrades. Failures that take down the system too frequently enough or keep it down too long
Compatibility	Failures with certain supported browsers, networks, operating systems and other environmental elements/components
Documentation	Failures in installation and operating instructions for users or system administrators

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IBM非功能性風險評估標準: 風險的可能性 (Likelihood)

Likelihood						
Area	Description	5	4	3	2	1
Complexity	How complex is the design and development of this function?	Exceptionally difficult with significant issues to resolve	Quite difficult with a number of issues to resolve	Some complex parts to solution - but quite manageable	Fairly routine - with only small amounts of complexity	Very simple system - no real complexity
Technology	How mature, proven and well know is the Technology platform?	Brand new technology and never been undertaken before	Technology has been used before but few times and support may be limited	Technology has been used before but there are occasions when we may find problems	Relatively safe technology, very few times issues are hit	Very simple technology - full support - very unlikely to ever hit complications
Experience	How experienced are the developers with this technology and type of customisation?	Never touched this type of approach before	Some of team are completely new to this, but there is some experience	All team have some experience of this although there are possible pitfalls in the technology	Even though it is fairly straight forward and there is a lot of experience, there is still a slight risk in development	This is very straight forward build, little to no customisation and no risk
Integration	What is the level of cross component / system integration required for this function?	Very large complex amount of integration required	Quite significant integration, or common code used	A reasonable amount of integration and common code used	Small amount of integration only for this	Zero integration - completely standalone development
Regression	What is the level of risk to existing components from this development	Major risk to existing code or rest of development. Other areas of build may have large impact on this	Quite significant risk to existing code or remainder of development	A reasonable risk to existing code - but only average	There is overlap between code etc. - but it is very simple and low risk and easy to identify	There is no overlap with other areas and this is completely stand alone and no risk
Nature of Change	How big is the code associated with this requirement?	New	Change - Major	Change - Minor	Change - Cosmetic	No Change - Core or Existing Functionality

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IBM非功能性風險評估標準: 風險的影響力 (Impact)

Impact						
Area	Description	5	4	3	2	1
Financial	What would be the financial impact of this function failing (1 day outage)?	Major financial impact on area - may even affect share price	Would have significant impact on profitability of the application	There is quite likely to be a financial loss as a result of a day's outage	There would possibly be a financial loss as a result of a day's outage	There would be no loss and quite possibly a short term work around could be found
User	How many Operational Users would be adversely impacted by this failure of this function?	very large amount of users affected - may make the press	large amount of users (internal or external) could be affected with no real work around	some users (internal or external) will be affected	a small number of end users may be affected and any workaround (if possible) would not be perfect	there would be no users affected - or only internal users whereby a workaround could easily be found
Customer	What would be the impact on the customer	Customer likely to go elsewhere and no easy way of assisting them, or very negative feedback	Customer quite likely to go elsewhere/give up or at a minimum would be very unhappy	Some customers would be affected and we would not be making the customer journey very easy	Unlikely - but still possible that customers could be affected, either directly or indirectly	Virtually impossible that the customer would ever be aware and it would no affect their experience
Security	Could the failure of this function breach any security requirements?	very good chance of affecting security and may cause considerable bank embarrassment (financial/press etc)	good chance that Security could be breached either directly or indirectly	security may be breached as a result of failure	unlikely to have security breached as a result of this (and possible workaround) but could not be certain	no chance of any security being breached and zero risk
Frequency of Use	How many times is this function used in a working day?	used very significantly - almost every transaction goes through this	a large number of times (proportionate to overall use)	used quite a few times	used infrequently - with possible workaround would hardly be noticed	unlikely to get used - or can be rerun 'tomorrow' or later with no impact (e.g. low importance MI reports etc)

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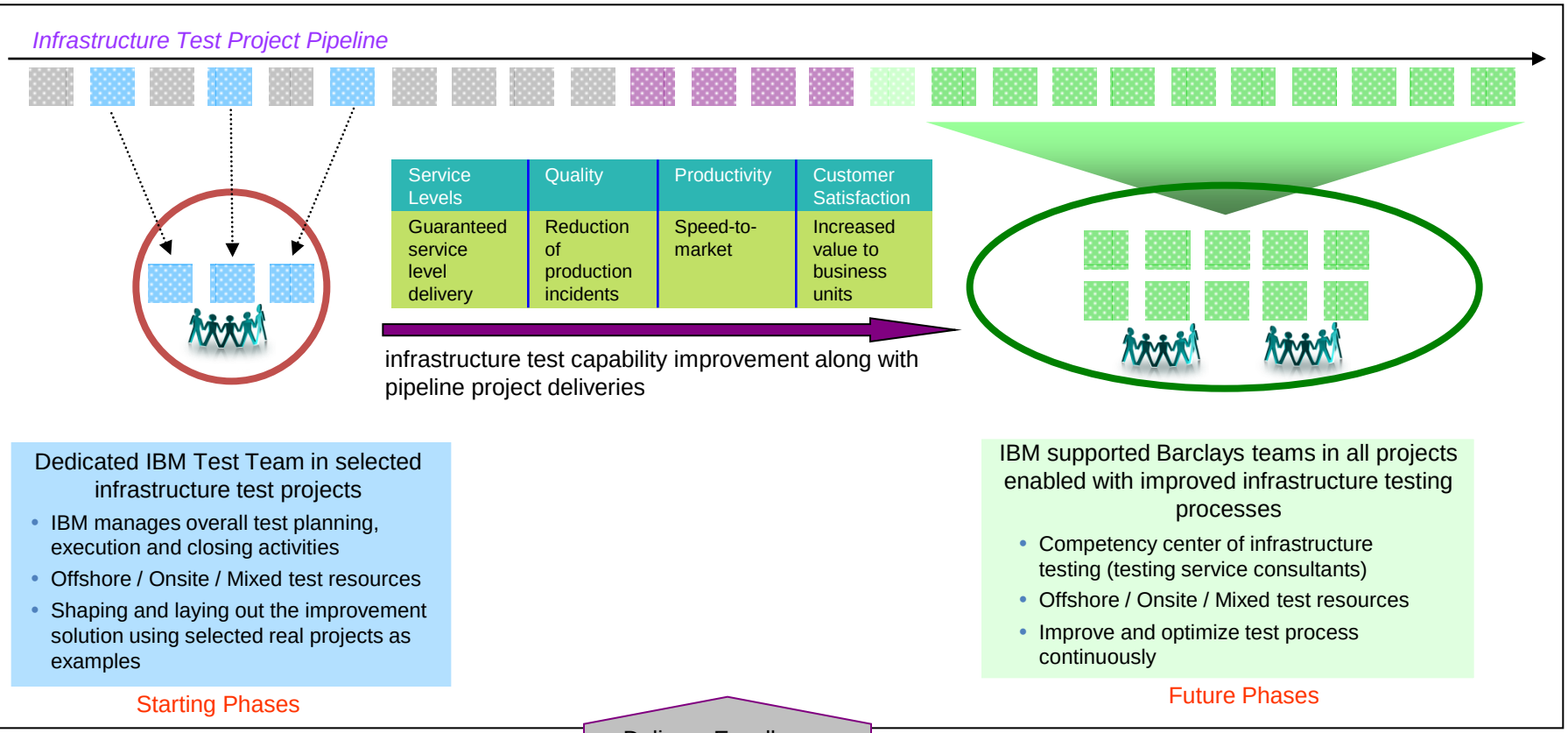
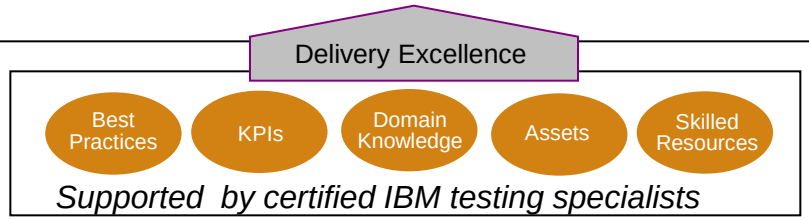
實施改進方案

- 先導專案實驗
- 服務合作模式轉變





制定改進路線

IBM建議國內某大型測試中心發展路線圖

遠景目標
- 建立符合TMMI等級5成熟度的測試中心
- 建構可持續發展的測試中心組織架構，根據組織需求制訂員工的職業生涯發展規劃
- 建構測試相關技術的社團和興趣小組，並在整個中心內外推廣測試技術和實踐
- 通過不斷改進測試流程和產品交付質量提升影響力。並建立支持企業長期戰略目標的專業化測試組織以及團隊。

卓越: 符合TMMI等級4的測試中心
- 進一步強化同級評審的流程並利用評審的結果改進現有流程
- 建立測試質量評估策略，流程及評估標準
- 建立完整的測試度量指標 (KPI)
- 部署和實施測試質量評估管理體系
- 建立自動化的測試雲環境

創新:建立完全符合TMMI等級3的測試中心
- 建立完備的同級評審的流程並涵蓋到測試流程的各個環節
- 結合業務需要和定崗情況組織和提供相對應的培訓
- 改進和優化現有流程逐漸涵蓋部分非功能性測試
- 初步建立測試的關鍵度量指標
- 建立創新型測試資產產出激勵機制

成長: 建立完全符合TMMI 2和部分符合TMMI3的測試中心
- 發展測試中心核心任務與專業能力
- 建立測試中心的核心團隊，初步建立測試人員的技術路線圖並建立相對應培訓計畫
- 建立清晰的管理測試流程並針對UAT進行裁減設計和定制
- 初步建立同級復查的流程和機制
- 實施流程，在測試中利用最佳實踐進行針對不同測試環境的配置和管理流程