

Minitab與Quality Companion 在Six Sigma中整合之應用

By 楊婷茹 (Roxanne Yang)

公司簡介

- ▶ **Minitab® Statistical Software**於1972年開發成功
- ▶ Minitab Inc. 成立於1983年
 - 總公司位於美國賓州
 - 員工人數約200人
- ▶ **Quality Companion®**於2002年上市
- ▶ 致力於資料分析研究已有35年歷史

主要市場

- ▶ 學術教學
- ▶ 一般統計應用
- ▶ 工業統計
- ▶ 六標準差(Six Sigma)

Minitab® Statistical Software

- ▶ 全球約有4000所大專院校採用Minitab為教學軟體
- ▶ 超過300本以上的專業參考書籍
- ▶ 一般業界的使用者領域包括
 - 半導體、電子、航太、化工、醫療產品及設備、電腦工業、汽車、電信、金屬製造、造紙、控制設備、石油煉製等等…
 - 服務業

Quality Companion

- ▶ 一套能夠處理 Six Sigma 所有工具的系統
- ▶ 系統化專案準則(Roadmap)導引方式展開專案
- ▶ 集中及分享專案資料 (data sharing)
- ▶ 內建多種表單 (Forms)
- ▶ 可以客製化各種表單 (Customization)
- ▶ 腦力激盪工具 (Brainstorming)
- ▶ 與Minitab結合使用
- ▶ 內建專案呈現功能 (Presentation)

範例說明

- ▶ 您在一間網路書店工作，一直以來都有很多顧客抱怨貨品遞送太慢。經過和業務以及運輸部門討論過後，並且重新檢視現有資料，希望能運用六標準差專案將遞送時間縮短，提高客戶滿意度，以及縮短訂單完成時間。
- ▶ 整合Quality Companion和Minitab來完成此專案，縮短訂單完成時間

Quality Companion

© Untitled - Quality Companion - [Project Today]

File Edit View Tools Window Help

New (Apply a format) Go To

Project Manager

- DMAIC Project
 - Management
 - Project Today
 - Team Members
 - Tasks
 - Data Store
 - Y Metrics
 - Related Documents
 - Roadmap
 - Define 1: Define and Scope Project
 - Define 2: Define Defect
 - Define 3: Plan and Document Project
 - Measure 1: Evaluate Measurement System
 - Measure 2: Establish Baseline
 - Measure 3: Set Improvement Goals
 - Measure 4: Map Process and Identify Key Inputs
 - Analyze 1: Isolate Key Inputs
 - Analyze 2: Develop $Y = f(X)$ Function
 - Analyze 3: Determine Optimal Settings
 - Improve 1: Implement Proposed Improvements
 - Improve 2: Validate Proposed Improvements
 - Control 1: Implement Control Strategies
 - Control 2: Close Out Project

2008年12月14日 [Customize Project Today >>](#)

Welcome

- Getting Started**
 - Welcome to Quality Companion
 - The Quality Companion Environment
 - Create a Project
 - Use a Coach
- Advanced Topics**
 - Create a Form
 - Use the Data Store
 - Share Data
 - Create Templates
- Watch a Demo**
 - Introduction to Quality Companion
 - Manage a Project
 - Use Project Today

Status

Project	Planned start date	Due date	% Complete	Status	Assigned to
DMAIC Project	None	None	0	Not Started	None

No tools assigned to you - [Add a Tool](#)

Tasks >>

No tasks assigned to you - [Add a Task](#)

Variables >>

0 X variables 0 Y variables

Ballots

No ballots assigned to you - [Add a Ballot](#)

Getting Started

Recent Files

- OrderFulfillment_06.qcp
- OrderFulfillment_05.qcp
- OrderFulfillment_04.qcp
- OrderFulfillment_03.qcp
- OrderFulfillment_02.qcp
- More...

Project Templates

- New Blank Project
- New 12-Step Project
- New DMAIC Project

Samples

- Warehouse Damage.qcp
- Medical Claims Processing.qcp

Demos

- Introduction to Quality Companion
- Manage a Project
- Fill Out a Form
- Create a Process Map
- Create a Fishbone Diagram
- Help with Quality Companion

CH 善善

選擇專案種類

▶ DMAIC

The screenshot displays the Minitab Project Manager interface. The main window is titled "Project Manager" and shows a hierarchical tree structure. The "Management" folder is expanded, revealing several sub-items: "Project Today" (highlighted in blue), "Team Members", "Tasks", "Data Store", "Y Metrics", and "Related Documents". Below the "Management" folder is the "Roadmap" folder, which is also expanded to show a list of 18 project steps, each with a small icon and a description:

- Define 1: Define and Scope Project
- Define 2: Define Defect
- Define 3: Plan and Document Project
- Measure 1: Evaluate Measurement System
- Measure 2: Establish Baseline
- Measure 3: Set Improvement Goals
- Measure 4: Map Process and Identify Inputs
- Analyze 1: Isolate Key Inputs
- Analyze 2: Develop $Y = f(X)$ Function
- Analyze 3: Determine Optimal Settings
- Improve 1: Implement Proposed Improvement
- Improve 2: Validate Proposed Improvement
- Control 1: Implement Control Strategy
- Control 2: Close Out Project

加入組員

- ▶ 也可以從Outlook通訊錄或其他通訊錄類型檔案匯入組員資料

Name	E-mail	Business Phone	Role
Click here to add a team member			
 Kristina Rowlf	krowlf@buymorebooks.com		Team Member
 Li Kim	lkim@buymorebooks.com		Team Member
 Yang			Process Owner

建立基線 (Baseline)

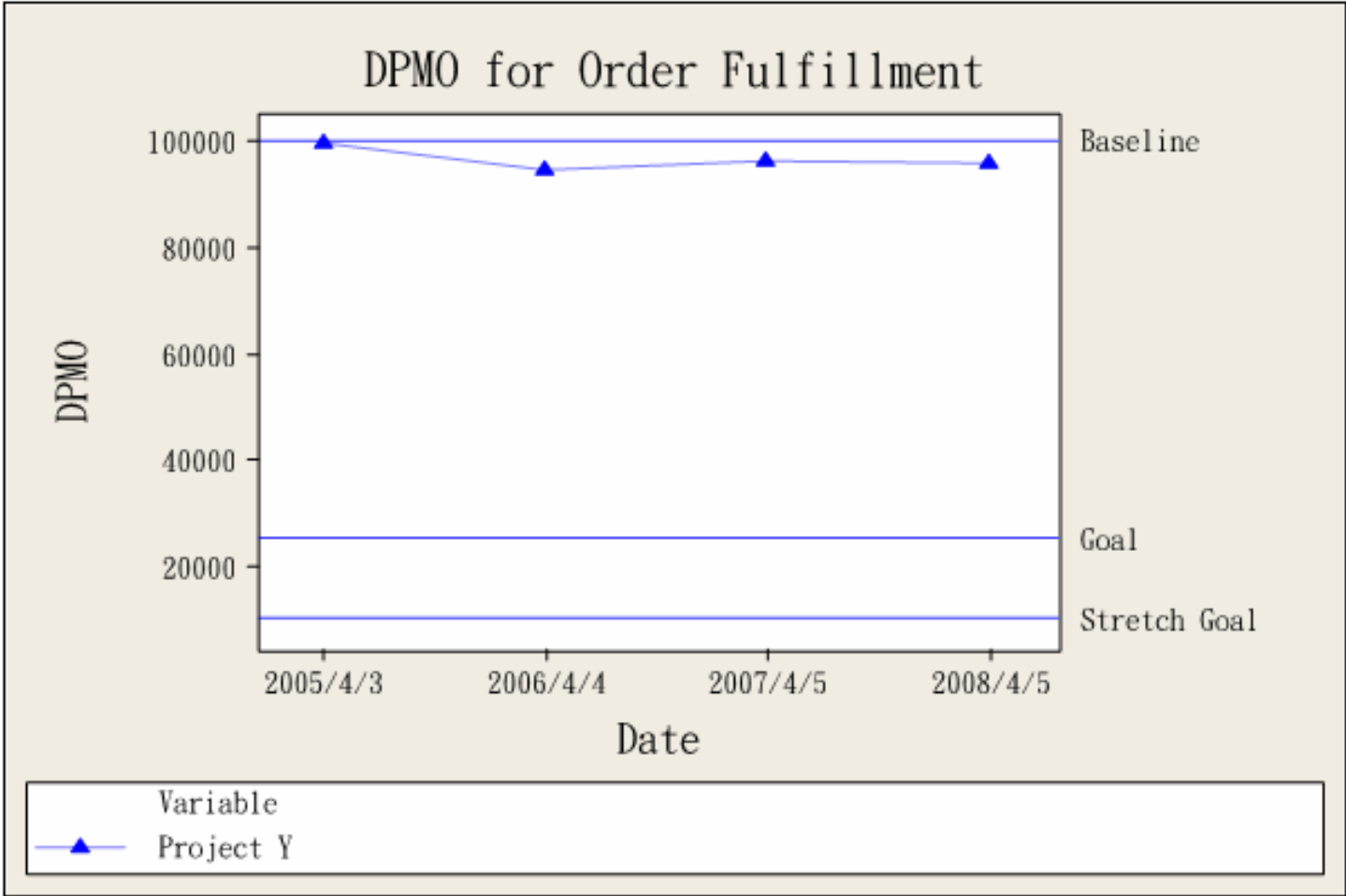
- ▶ Defect : Cycle time > 32小時
- ▶ 協助您了解您的流程在不同時間 (里程碑) 下改變的情況，並可利用基線與目標的設定來監控您的流程隨時間變化之狀況。您亦可利用此工具來定義一個未來的目標，一個您或許無法立刻達成、一個理想化的目標。

DPMO

	Date	Project Y
Baseline		100000
Goal		25000
Stretch Goal		10000
	2005/4/4	99700
	2006/4/4	94500
	2007/4/4	96300
	2008/4/4	95800

目標 →



極限目標 →



專案章程 (Project Charter)

Project Charter

Project Authorization

Organization:	Champion:	Process Owner:
<input type="text" value="buymorebooks.com"/>	<input type="text" value="Fred Mitchell"/>	<input type="text" value="Yang"/>
Project:	Project #:	
<input type="text" value="顧客沒有準時收到貨"/>	<input type="text"/>	
Problem Statement:		
<input type="text"/>		
Project Objective:		
<input type="text" value="縮短訂單完成時間(cycle time)"/>		
Estimated Defect Level:	Initial Goal:	Estimated Benefits:
<input type="text"/>	<input type="text"/>	<input type="text"/>
Approval Date:	Champion Signature:	Process Owner Signature:
<input type="text" value=""/> 	<input type="text"/>	<input type="text"/>
Estimated Completion Date:	Project Leader:	Finance Analyst:
<input type="text" value=""/> 	<input type="text"/>	<input type="text"/>

Project Team

Name	Role	Comments	Phone
Yang	Process Owner		
Kristina Rowlf	Team Member		
Li Kim	Team Member		
Fred Mitchell	Champion		

基線及目標設定&效益和成本預估

Project Definition and Scoping

Metrics (unit of measure):

訂單完成時間(小時)=收到訂單到貨品送出之時間

Critical to Satisfaction (linkage to customer):

顧客滿意度調查，確認的確有貨品延遲送達之問題

Defect Definition (include opportunity):

Cycle time的目標為24小時。超過32小時代表延遲交貨。

Goals and Benefits

Defect Levels/Goals:

	Date	DPMO(LT)	Zbench(ST)	Cpk
Baseline		100000	0.00	0.00
Goal		25000	0.00	0.00
Stretch Goal		10000	0.00	0.00

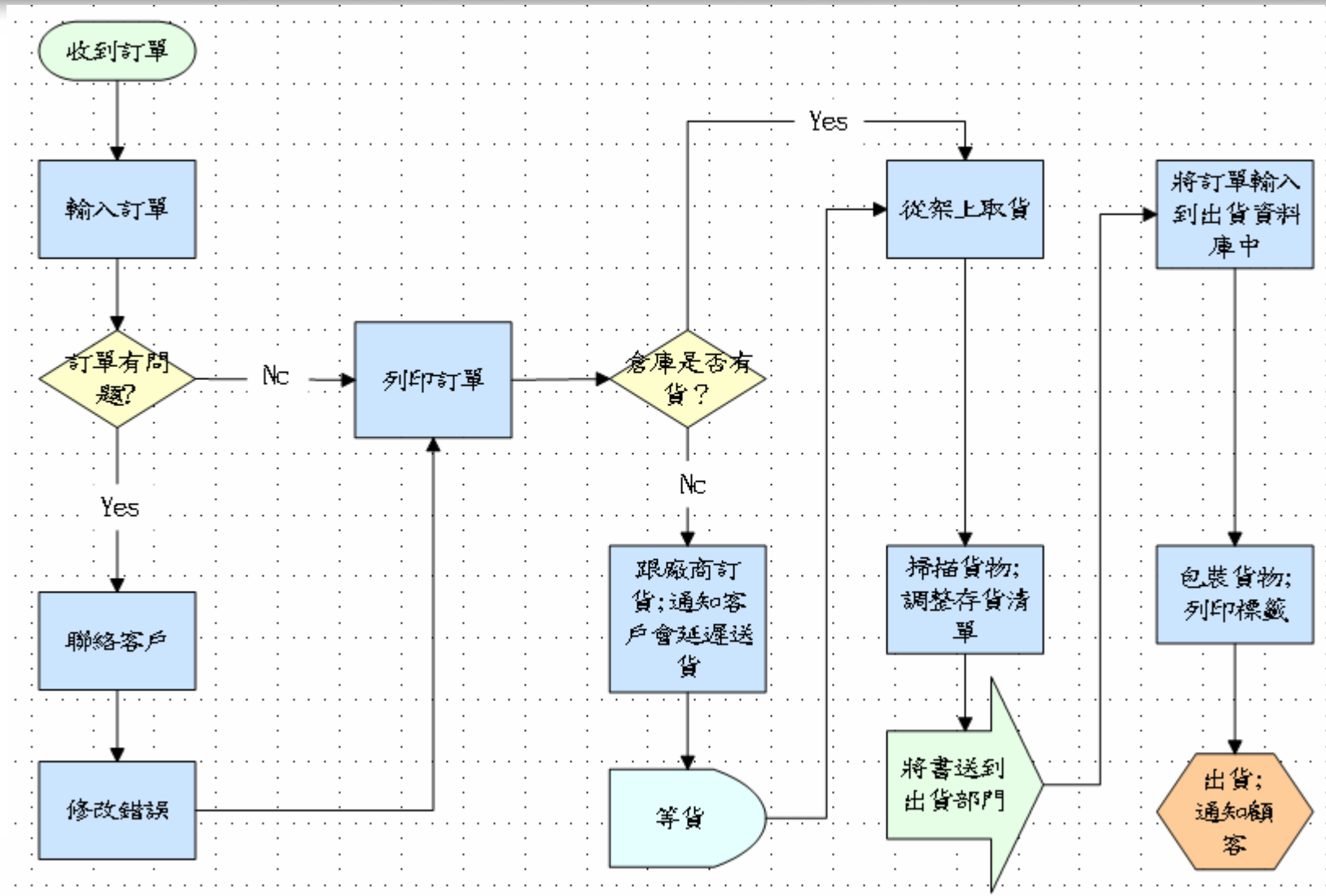
Estimated Financial Benefits:

 Important information

Hard Savings	\$150,000
Soft Savings	\$20,000
Implementation Costs	\$0

Based on how many months: 12

流程圖 (Process Map)



輸入與輸出變數

▶ X's & Y's

Variable [Close]

← → Home

X X - Input Variable

Name: * 信用卡號碼

Type: SOP [v]

Data Type: [v]

Status: **Potential**

Units: []

Optimal Setting: []

Lower Limit: []

Target: []

Upper Limit: []

Variables [Close]

← → Home

Variables Process Lean

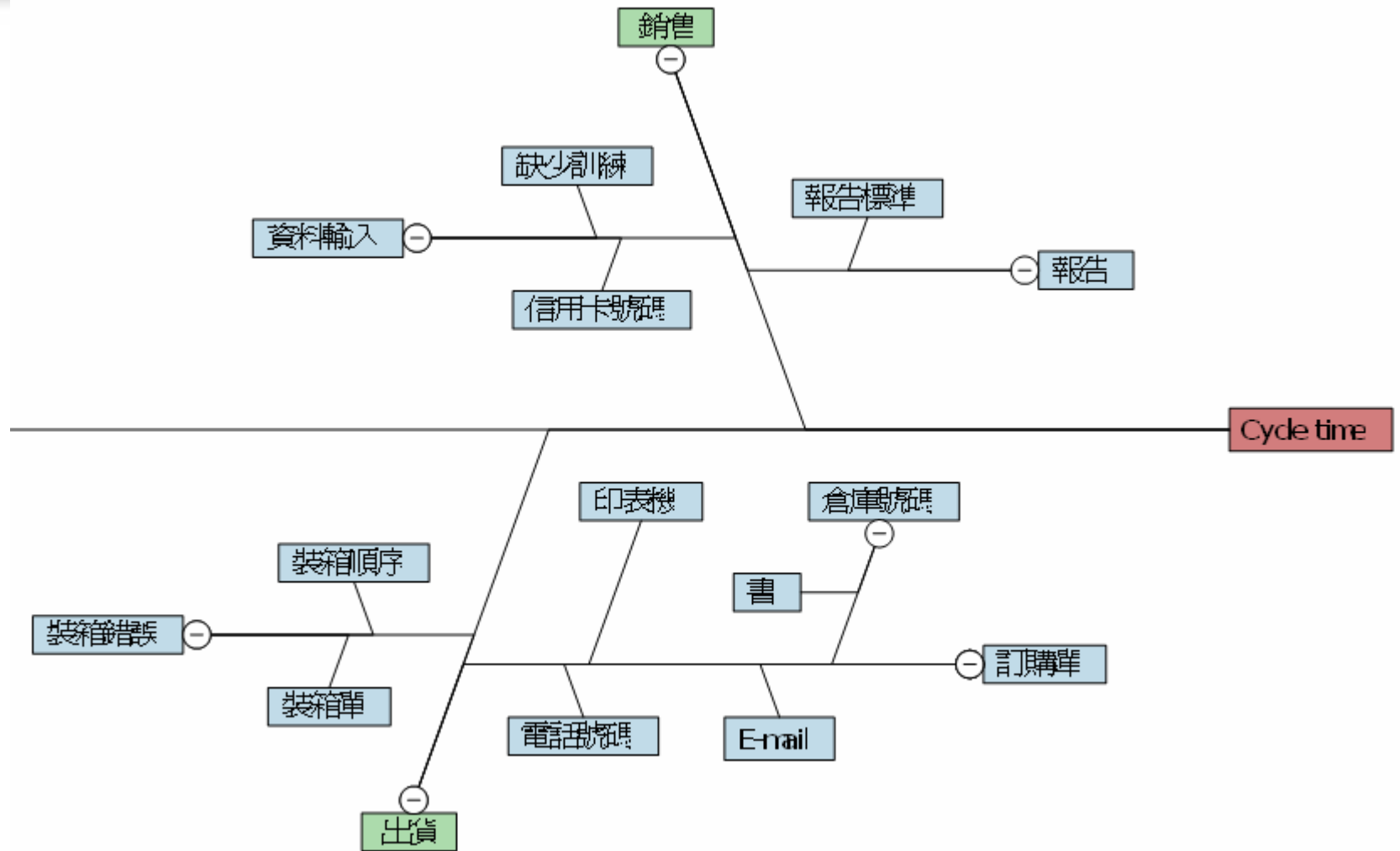
X X - Input Variables
信用卡號碼

New | Move | Copy X or Y

y Y - Output Variables
訂單確認號碼

New | Move | Copy Y or X

腦力激盪 (Brainstorming)

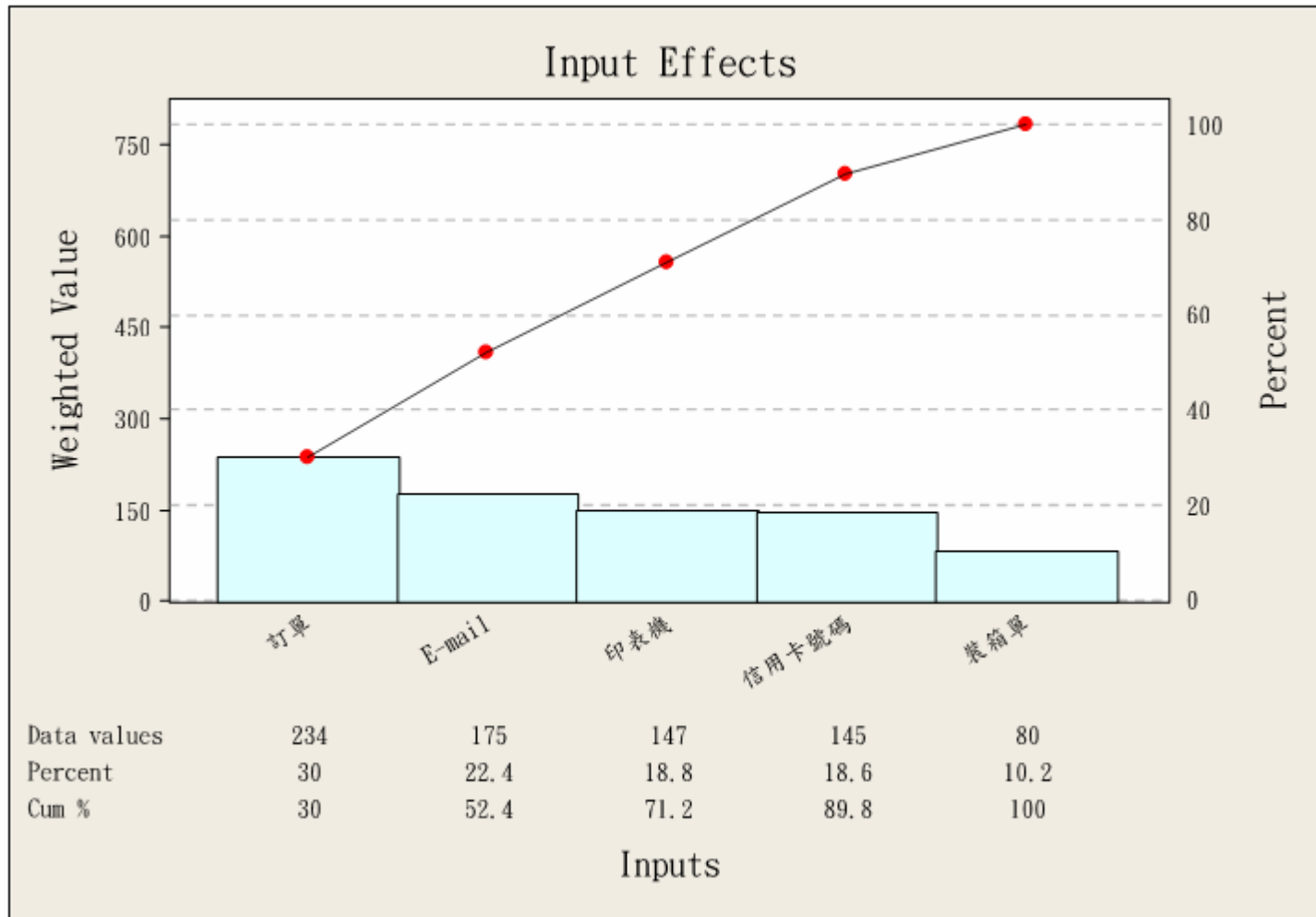


C&E Matrix

Rating Scale - Min Max

Process Map - Activity		Inputs (X Variable)	9	8	9	Weighted Value by Input	% of Net Effect by Input	Status
		Outlets	出貨資料庫記錄	銷售資料庫記錄	正確的訂單			
		Importance of each output to the customer	9	8	9			
Order Process - 輸入訂單	信用卡號碼	8	8	1	145	18.6%	Potential	
Order Process - 列印訂單	印表機	3	6	8	147	18.8%	Potential	
Order Process - 從架上取貨	訂單	9	9	9	234	30.0%	Potential	
Order Process - 將訂單輸入到出貨資料	E-mail	8	5	7	175	22.4%	Potential	
Order Process - 包裝貨物; 列印標籤	裝箱單	7	1	1	80	10.2%	Potential	
		Weighted effect on each output	315	232	234			

柏拉圖



教練功能 (Coach)

The screenshot displays the Minitab Coach interface within a window titled "Analyze 1 - Isolate Key Inputs". The interface is divided into several sections:

- Coach**: The main header area.
- Analyze 1 - Isolate Key Inputs**: The current project name.
- Summary**: A section with an "expand" button.
- Available Tools**: A section with a "collapse" button.
- Planning Tools**: A list of tools including Data Collection Planner, Gantt Chart, Task Progress Report, Tool Progress Report, Schedule Evaluation Worksheet, Meeting Minutes, Preliminary Screening of X Variables, and Evaluating X-Y Relationships (Continuous Y).
- 2-Sample t-test**: The selected tool, with tabs for Summary, How-to, and Guidelines.

The **2-Sample t-test** tool details are as follows:

Summary

Insert Tool

Summary | How-to | Guidelines

Analyzes the difference between the observed process mean at two settings of an input. To use a 2-sample t-test, you must collect a sample of data at both levels of the input variable.

Answers the questions:

- If I change an input from one level to another level, does the process mean stay the same or does it change?
- Is the process mean the same before and after a change has been made to the process?

When to Use	Purpose
Mid-project	Fixing an input at two different settings (levels) helps determine which inputs have significant influence on the mean of the output.
End of project	Verify a significant difference exists between the means of the pre-project process and the post-project improved process. Of course, this assumes that one of the goals of the project was to shift the location of the process (change the process mean).

Data

Continuous Y (output), a single X (input) at two levels

分析結果擷取功能 (Analysis Capture)

Input

Output / Y / Response:

Cycle time

Null Hypothesis (Ho):

訂單重新設計後的平均cycle time和設計前的平均cycle time一樣

Alternative Hypothesis (Ha):

訂單重新設計後的平均cycle time比設計前的平均cycle time短

Factor: 定單

Level Names: Cycle time

Unit of Measure: 小時

Sample 1 Size: 101

Alpha: 0.05

Sample 2 Size: 169

Checklist

Are the data reasonably normal? (test is very robust to non-normal data) Yes No

Has the measurement system been validated? Yes No

Note: Do not check "Assume equal variances" unless variances have been shown to be equal.

Have you determined the sample size requirements? Yes No

- What is the recommended sample size? (this should be the smaller of the two samples)

✓ Sample Size Details

Minitab Statistical Software

Minitab - Untitled

File Edit Data Calc Stat Graph Editor Tools Window Help

Define Measure Analyze Improve Control

Session

----- 12/14 21:38:55 -----
Welcome to Minitab, press F1 for help.

Worksheet 1 ***

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				

Current Worksheet: Worksheet 1

Editable



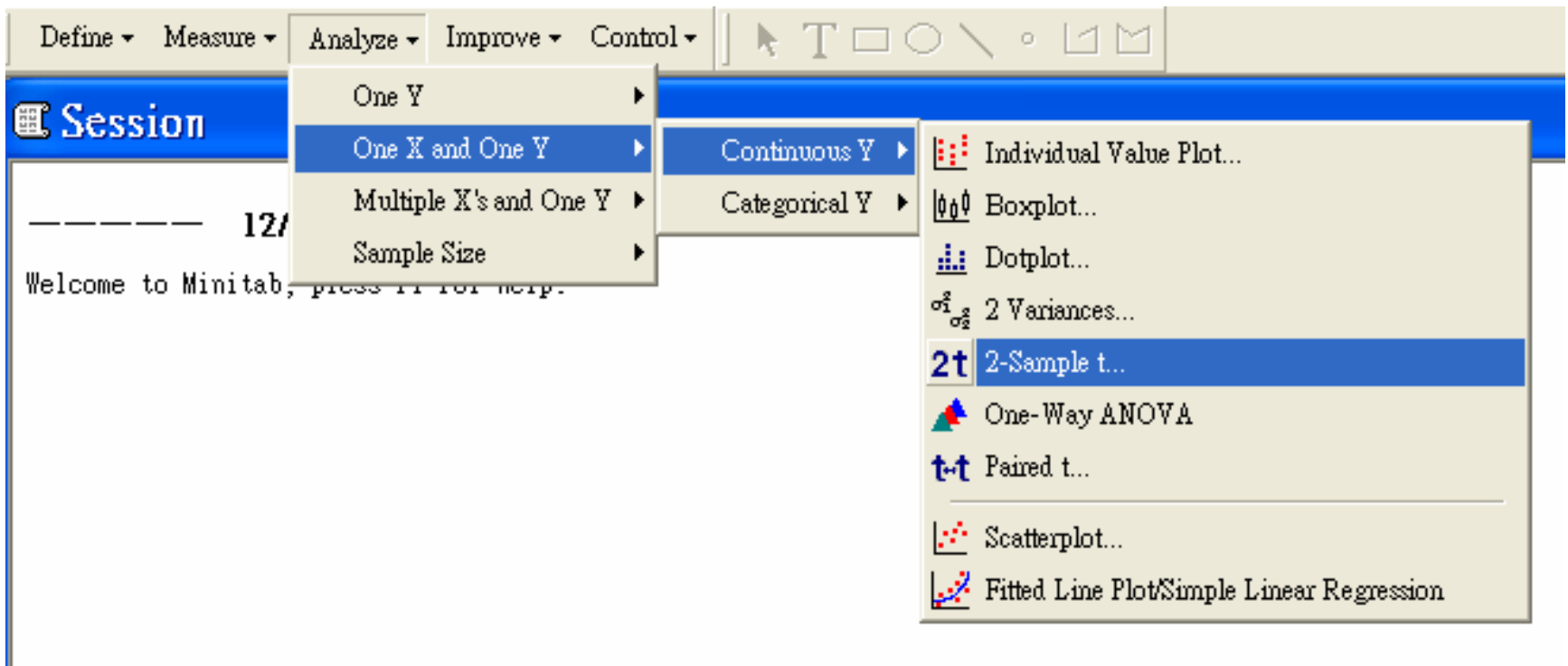
➤ 修改訂單格式

➤ 使用2-Sample t-檢定來分析修改訂單過後cycle time是否有改善

+	C1	C2
	CycleTime (hours)	CycleTime (1st improve)
1	27.8361	24.3549
2	30.9050	22.9411
3	26.5750	22.4652
4	20.0897	24.4087
5	29.7823	17.1074
6	24.5451	20.4114
7	37.5159	19.2766
8	27.7990	20.3478
9	32.3924	28.4899
10	25.1350	12.2420
11	27.6265	22.6881
12	14.2901	23.7376
13	20.6814	19.0575
14	41.8120	25.4038
15	27.1591	27.6185
16	21.3394	20.2836
17	23.4274	20.0992
18	31.0774	28.8619

DMAIC工具列

▶ Minitab 15版免費下載安裝



2-Sample t-test

Two-Sample T-Test and CI: CycleTime (hours), CycleTime (1st improve)

Two-sample T for CycleTime (hours) vs CycleTime (1st improve)

	N	Mean	StDev	SE Mean
CycleTime (hours)	101	28.62	5.77	0.57
CycleTime (1st improve)	169	22.13	4.06	0.31

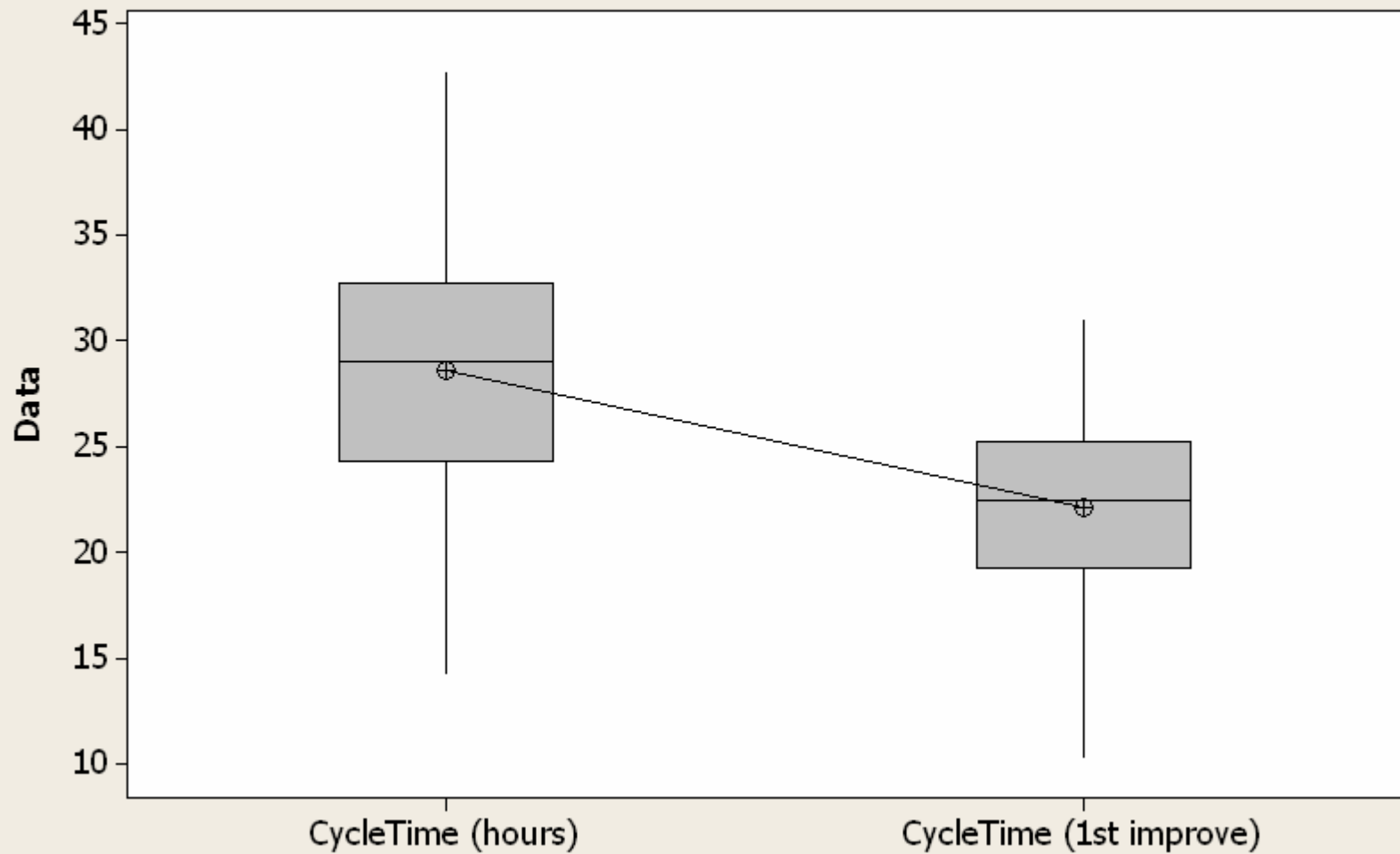
Difference = μ (CycleTime (hours)) - μ (CycleTime (1st improve))

Estimate for difference: 6.495

95% lower bound for difference: 5.413

T-Test of difference = 0 (vs >): T-Value = 9.93 P-Value = 0.000 DF = 159

Boxplot of CycleTime (hours), CycleTime (1st improve)



Output

p-value: 0.000

Session (Output from t-test, Output fr

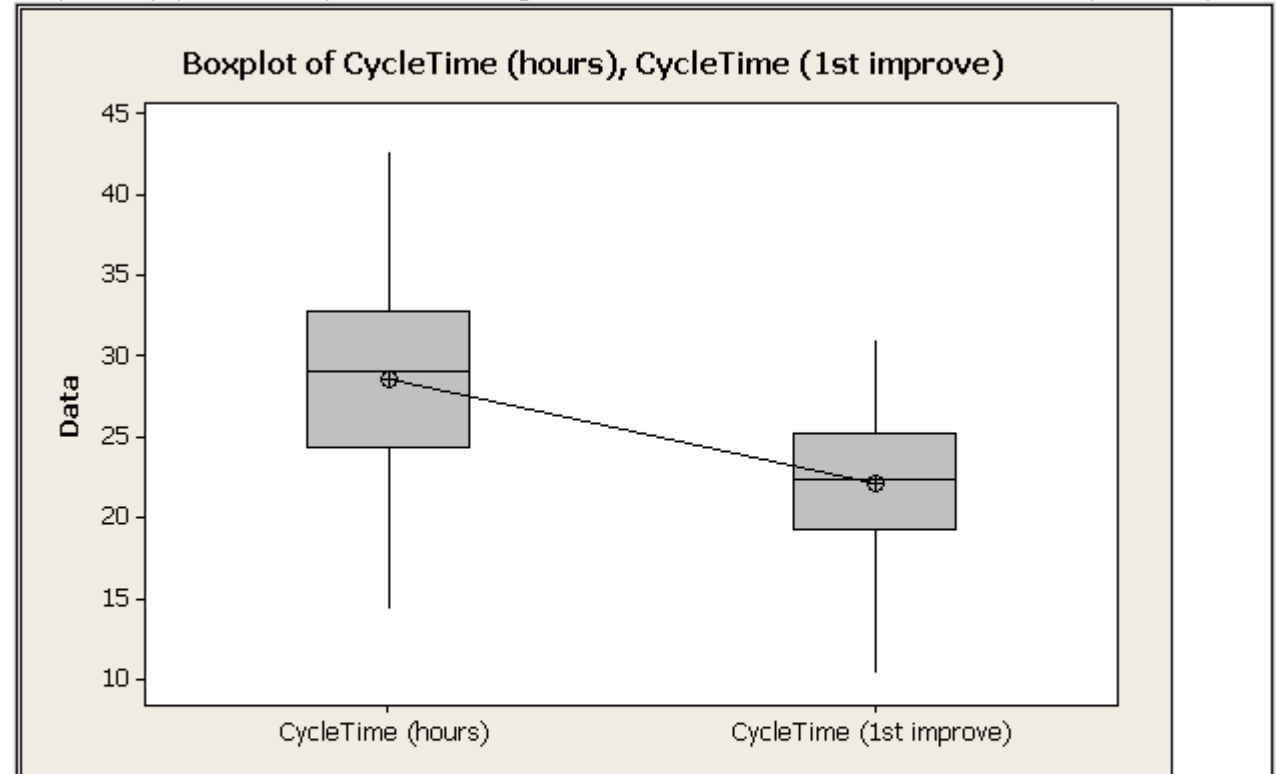
Two-Sample T-Test and CI: CycleTime

Two-sample T for CycleTime (hour

	N	I
CycleTime (hours)	101	28
CycleTime (1st improve)	169	22

Difference = mu (CycleTime (hour
Estimate for difference: 6.495
95% lower bound for difference:
T-Test of difference = 0 (vs >):

Graphical (Optional, may include Histograms or Individual Value Plots of both samples, etc):

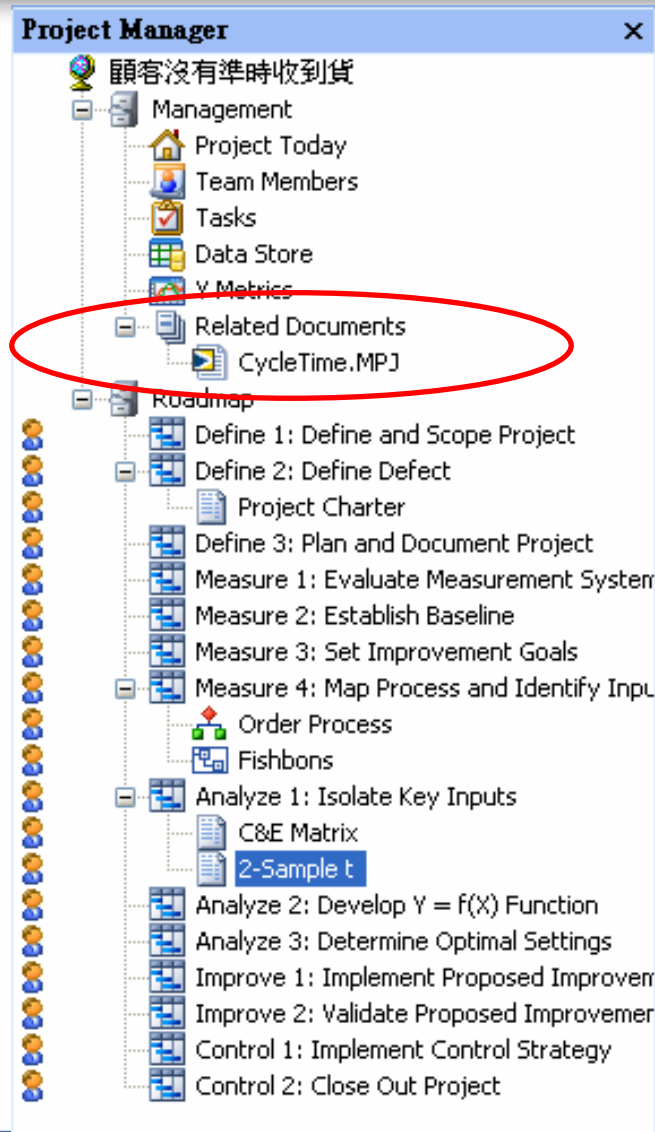


Conclusion

Observations:

P值接近0，代表重新設計的訂單有顯著的縮短cycle time

相關檔案



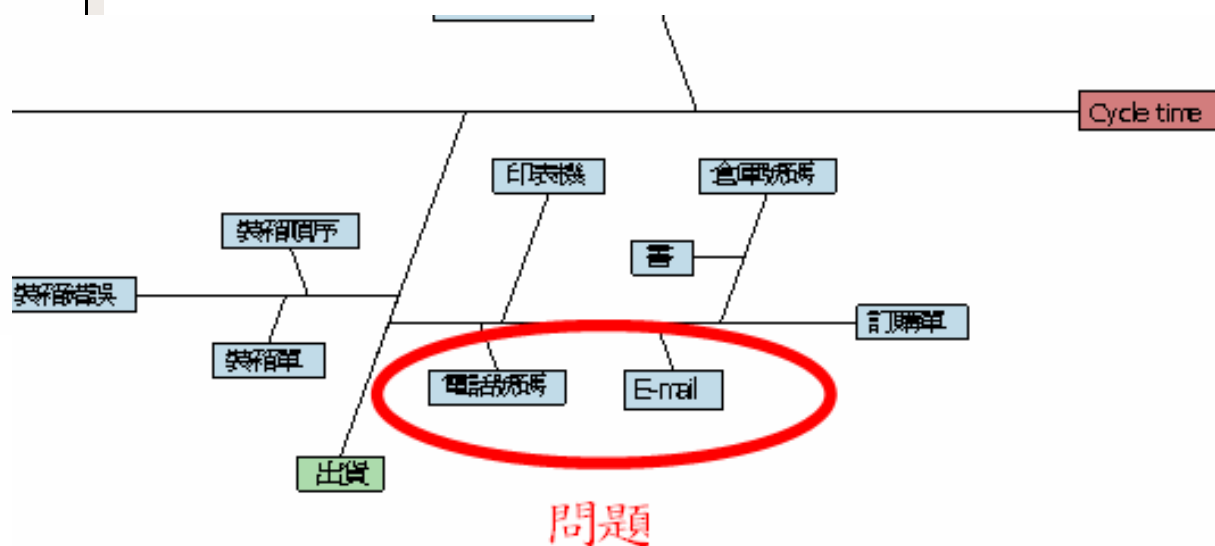
簡報管理員 (Presentation Manager)

▶ 能夠匯出至Powerpoint

Slide List

← → 🏠

- 1: 縮短訂單完成時間專案
- 2: Team Members
- 3: Fishbone
- 4: 2-Sample t




其他整合工具

- ▶ Quality Companion Viewer
 - 提供讀取QC專案的功能，但是不能修改
- ▶ Quality Companion Dashboard
 - 列出所有進行中或已完成的專案
 - 日期，財務狀況或團隊成員…過濾或列出所有相關專案
 - 提供客製化功能
- ▶ 兩種工具都是完全免費下載安裝

Dashboard

[Configure](#) | [Help](#)


Quality Companion Dashboard

Look In: My Projects [Edit](#) | [New](#)
0 projects in folder list.

Updated:
 2:28 PM on 5/28/2008







Filter: None [Edit](#) | [New](#)
0 of 0 projects match filter.

Summary

Projects	Finance (Estimate) (\$)	Finance (Final) (\$)
All Projects	In Progress: Avg over 12 mo.	Completed Projects: Avg over 12 mo.
Total: 8	Hard Savings: 1,800,000	Hard Savings: 26,270,000
Completed: 3	Soft Savings: 21,800	Soft Savings: 30,000
In Progress: 5	Implementation Costs: 122,200	Implementation Costs: 182,000
Part Done: 4	Net Savings: 1,658,600	Net Savings: 26,193,000
Average Duration(days): 75.67		Final - Estimated Net Savings: 22,626,000

Projects

[Expand All](#) | [Collapse All](#)

Project Name 		Due Date	Champion	Zbench(ST) Goal	Hard Savings (Estimate)	Hard Savings (Final)
CT Scan Throughput		1/28/2008	Leland Palmer	2.50	250,000	375,000
Customer Identity Verification		12/31/2008	Sandy Williams	2.50	750,000	0
Damaged Inventory		1/31/2008	Peter Lonergan	3.00	200,000	0
Electric Load Forecasting		1/31/2008	Sandy Williams	1.25	250,000	20,000,000
Improving Engine Disassembly		1/28/2008	Leland Palmer	2.00	3,000,000	6,000,000
Membership Renewal Rate		1/28/2008	Catherine Lenoix	1.50	12,000	0
Wave Solder Process Improvement		4/30/2009	Will Panzner	4.00	300,000	0
Website Response Time		1/28/2009	Rowland Howard	2.00	546,000	0

[Expand All](#) | [Collapse All](#)

Q & A