



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

(Apply a format) Go To Y Variables

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
 - Measure 2: Establish Baseline
 - Measure 3: Set Improvement Goals
 - Measure 4: Map Process and Identify
 - Analyze 1: Isolate Key Inputs
 - Analyze 2: Develop $Y = f(X)$ Function
 - Analyze 3: Determine Optimal Setting
 - Improve 1: Implement Proposed Imp
 - Improve 2: Validate Proposed Improv
 - Control 1: Implement Control Strat
 - 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
- Fill Out a Form
- Create a Process Map
- Create a Fishbone Diagram

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

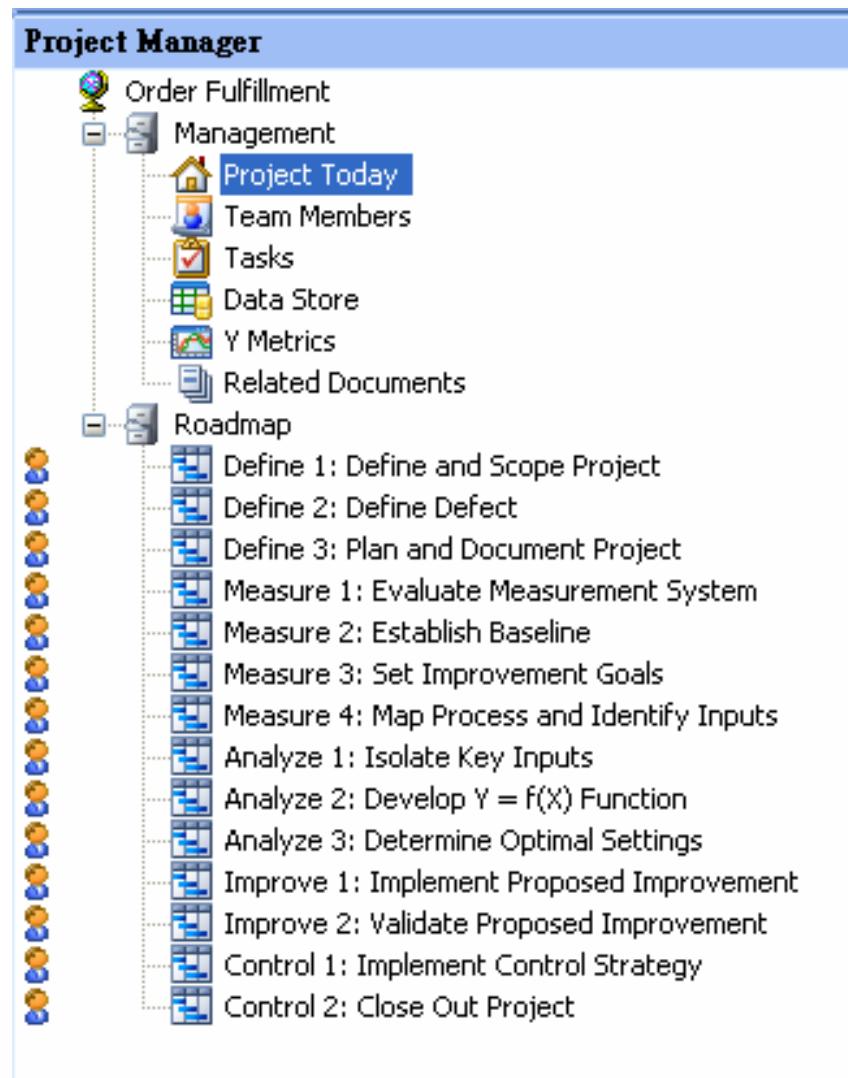
[Help with Quality Companion](#)

CH 計 算 單 入

Minitab

選擇專案種類

DMAIC



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

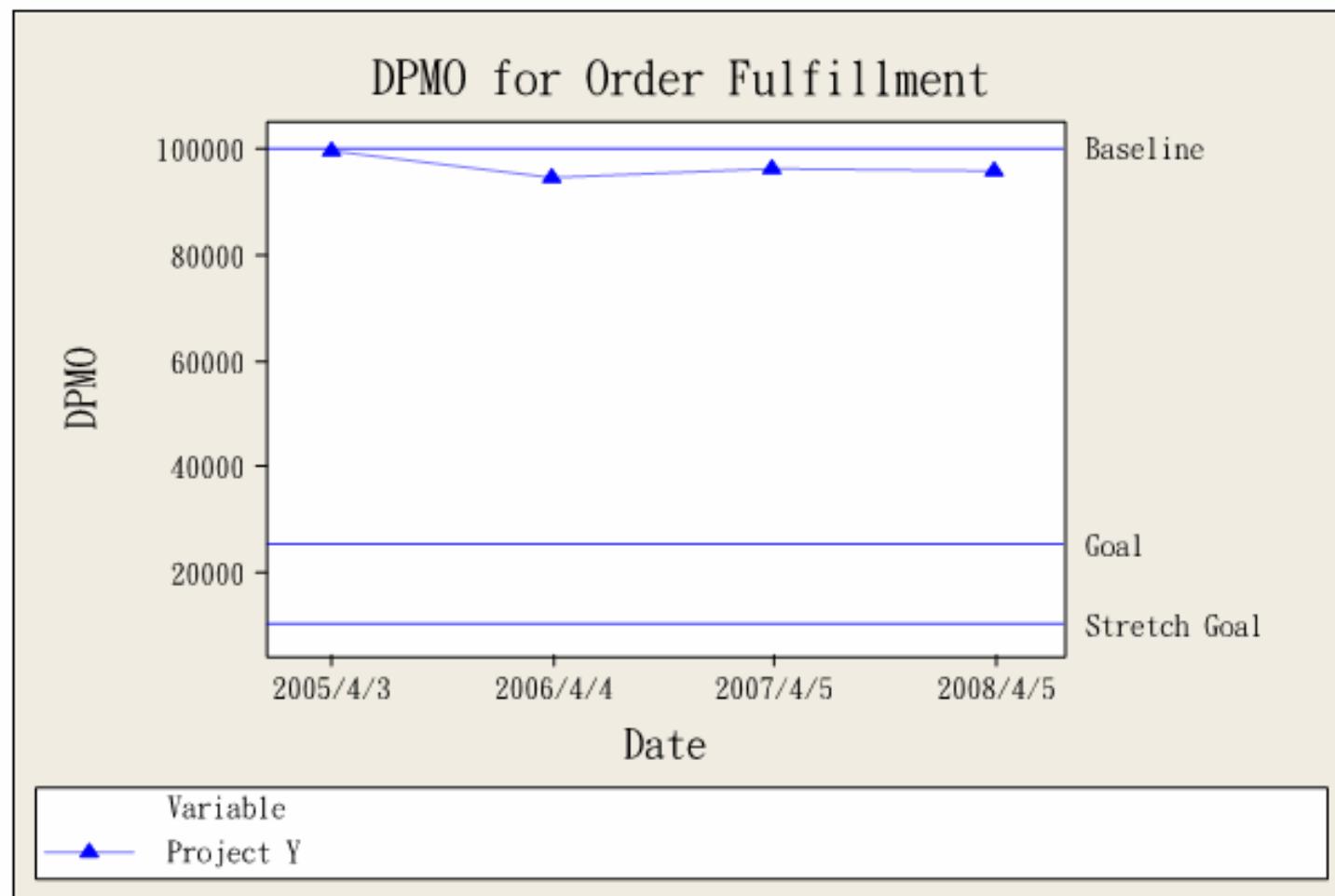
建立基線 (Baseline)

- ▶ 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:

buymorebooks.com

Champion:

Fred Mitchell

Process Owner:

Yang

Project:

顧客沒有準時收到貨

Project #:

Problem Statement:

Project Objective:

縮短訂單完成時間(cycle time)

Estimated Defect Level:

Initial Goal:

Estimated Benefits:

Approval Date:

Champion Signature:

Process Owner Signature:

Estimated Completion Date:

Project Leader:

Finance Analyst:

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

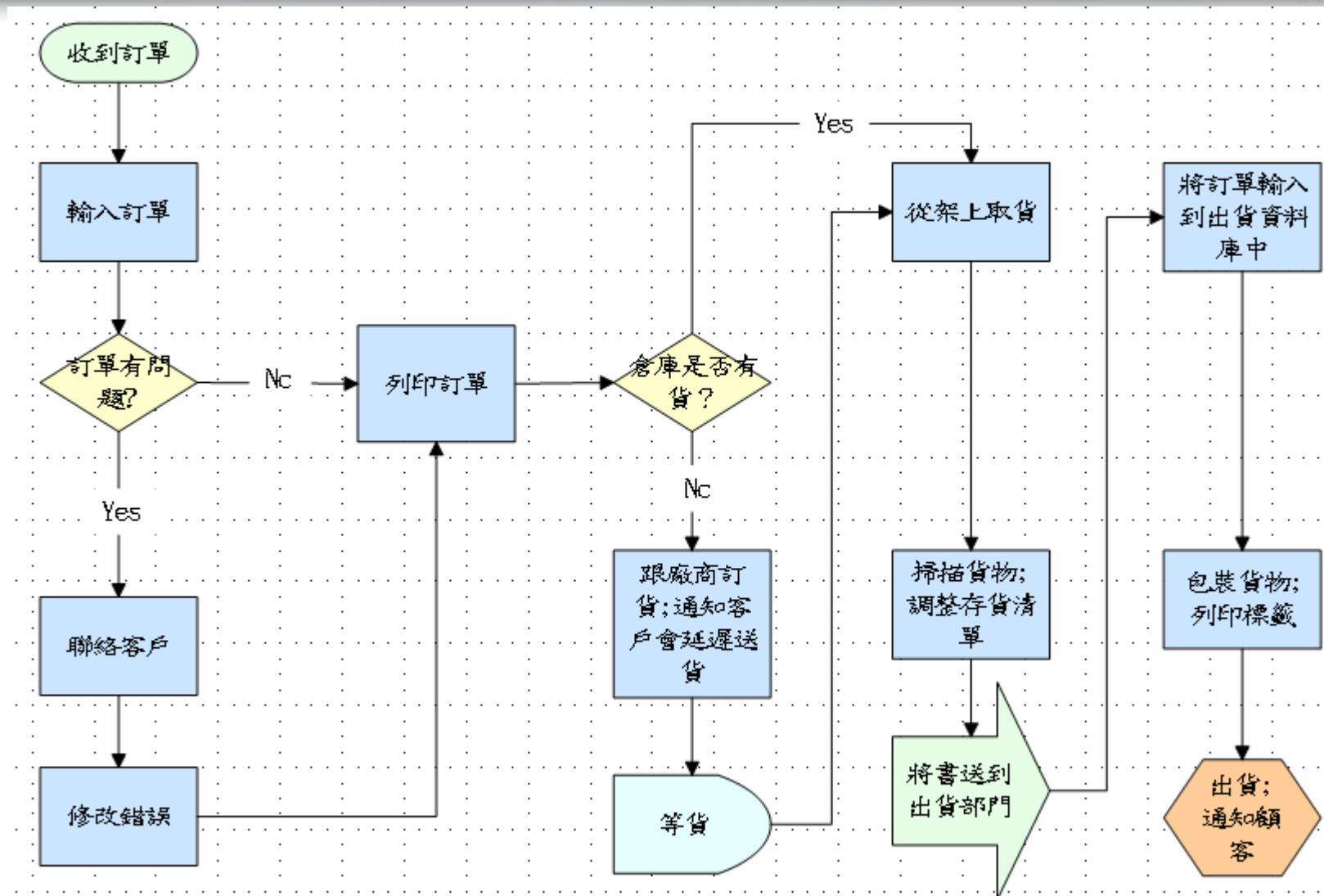
Estimated Financial Benefits:

 Important information

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

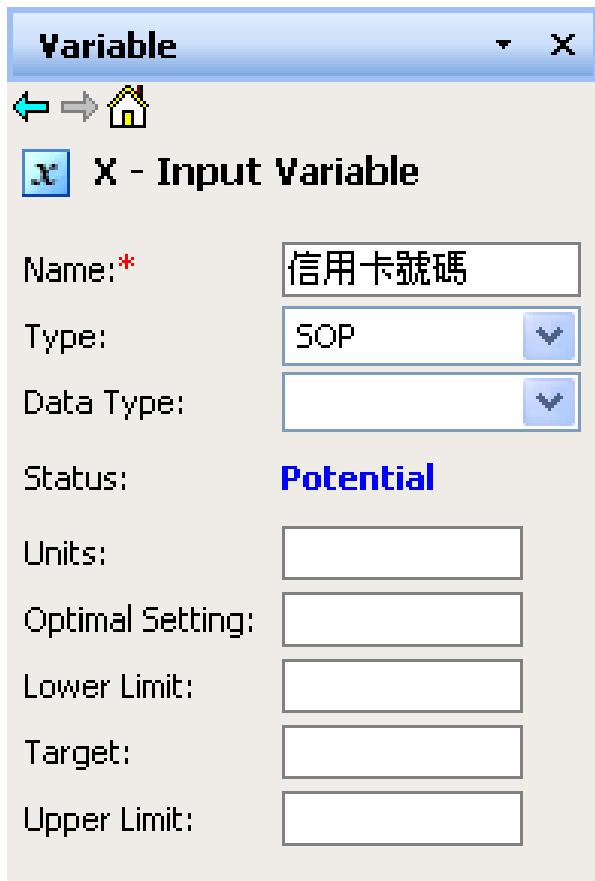
Based on how many months:

流程圖 (Process Map)

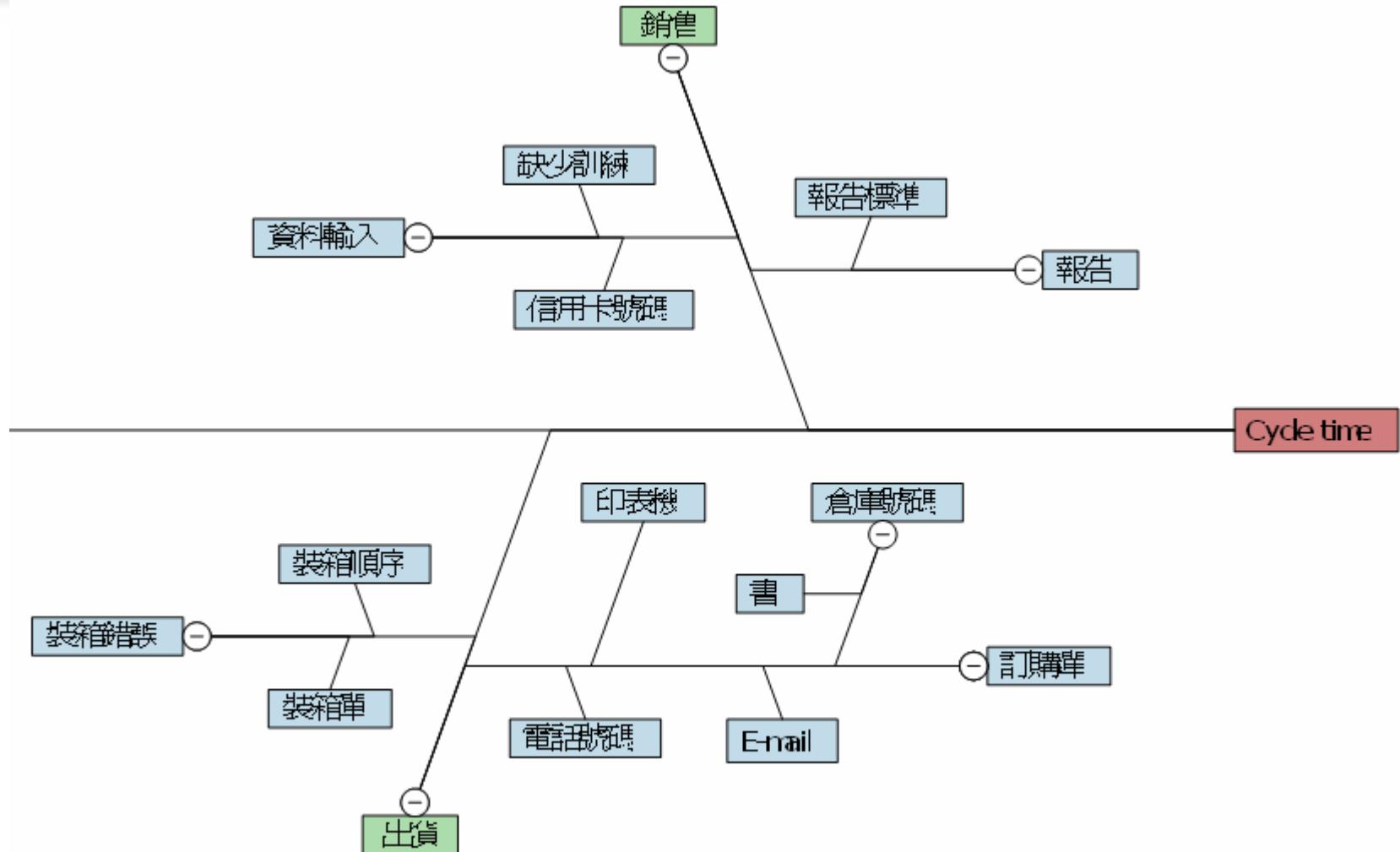


輸入與輸出變數

► X's & Y's



腦力激盪 (Brainstorming)

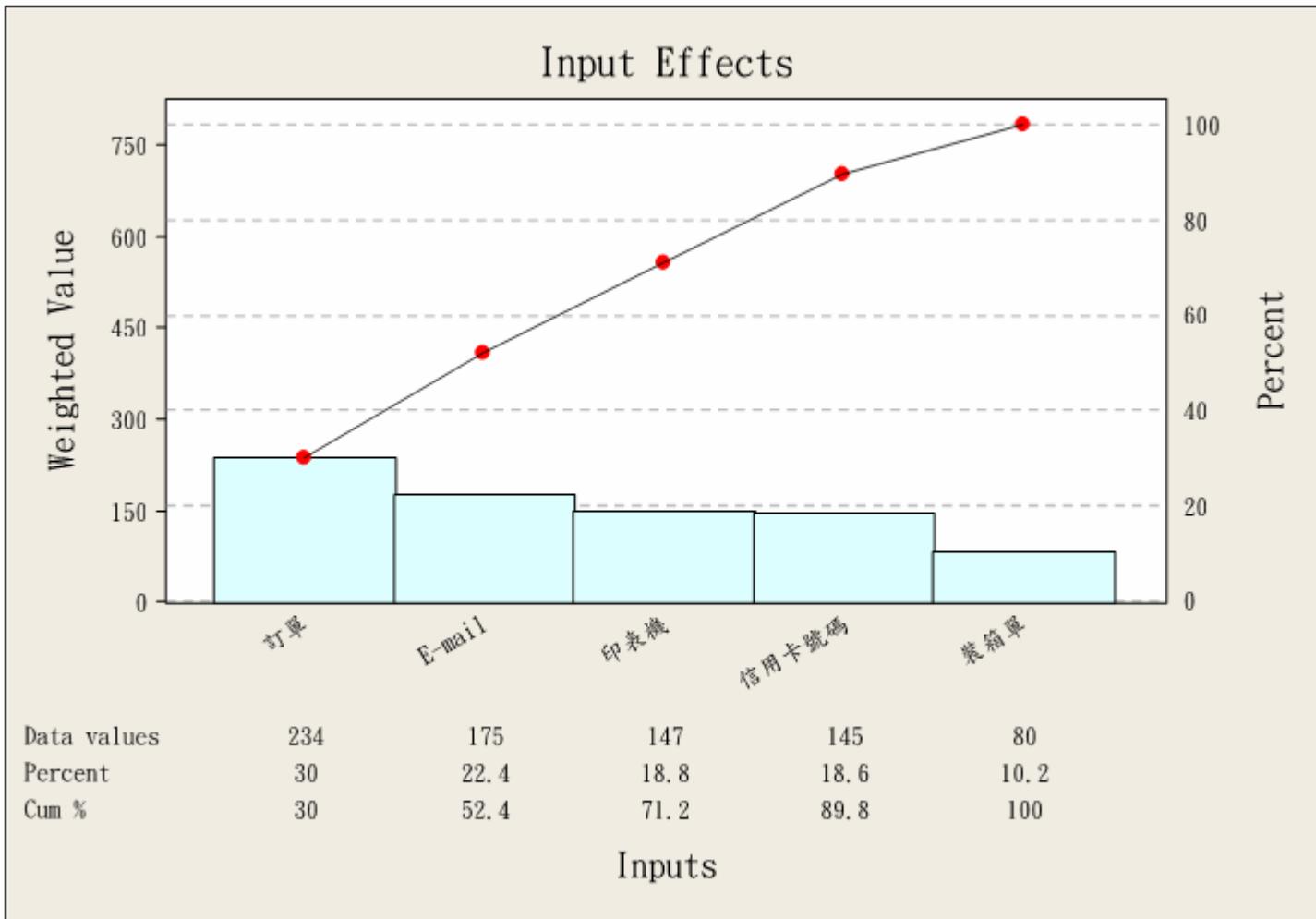


C&E Matrix

Rating Scale - Min Max

Importance of each output to the customer			9	8	9			
			Outputs	出貨資料庫記錄	銷售資料庫記錄	正確的訂單		
Process Map - Activity		Inputs (X Variable)				Weighted Value by Input	% of Net Effect by Input	Status
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)

Analyze 1 - Isolate Key Inputs

Coach

Analyze 1 - Isolate Key Inputs

Summary

Available Tools

Planning Tools

- Data Collection Planner
- Gantt Chart
- Task Progress Report
- Tool Progress Report
- Schedule Evaluation Worksheet
- Meeting Minutes

Preliminary Screening of X Variables

- Process Map
- Cross Functional Process Map
- VSM (Value Stream Map)
- Fishbone (C&E Diagram)
- Man Machines Materials
- C&E Matrix or X-Y Matrix
- FMEA
- Pareto Chart
- Pareto Chart Worksheet - Raw Data
- Pareto Chart Worksheet - Summary Data
- Bar Chart Worksheet
- Idea Map
- Ballot

Evaluating X-Y Relationships (Continuous Y)

- Scatterplot
- Scatterplot Worksheet

Insert Tool 2-Sample t-test

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 (H₀):

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 (H_a):

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.

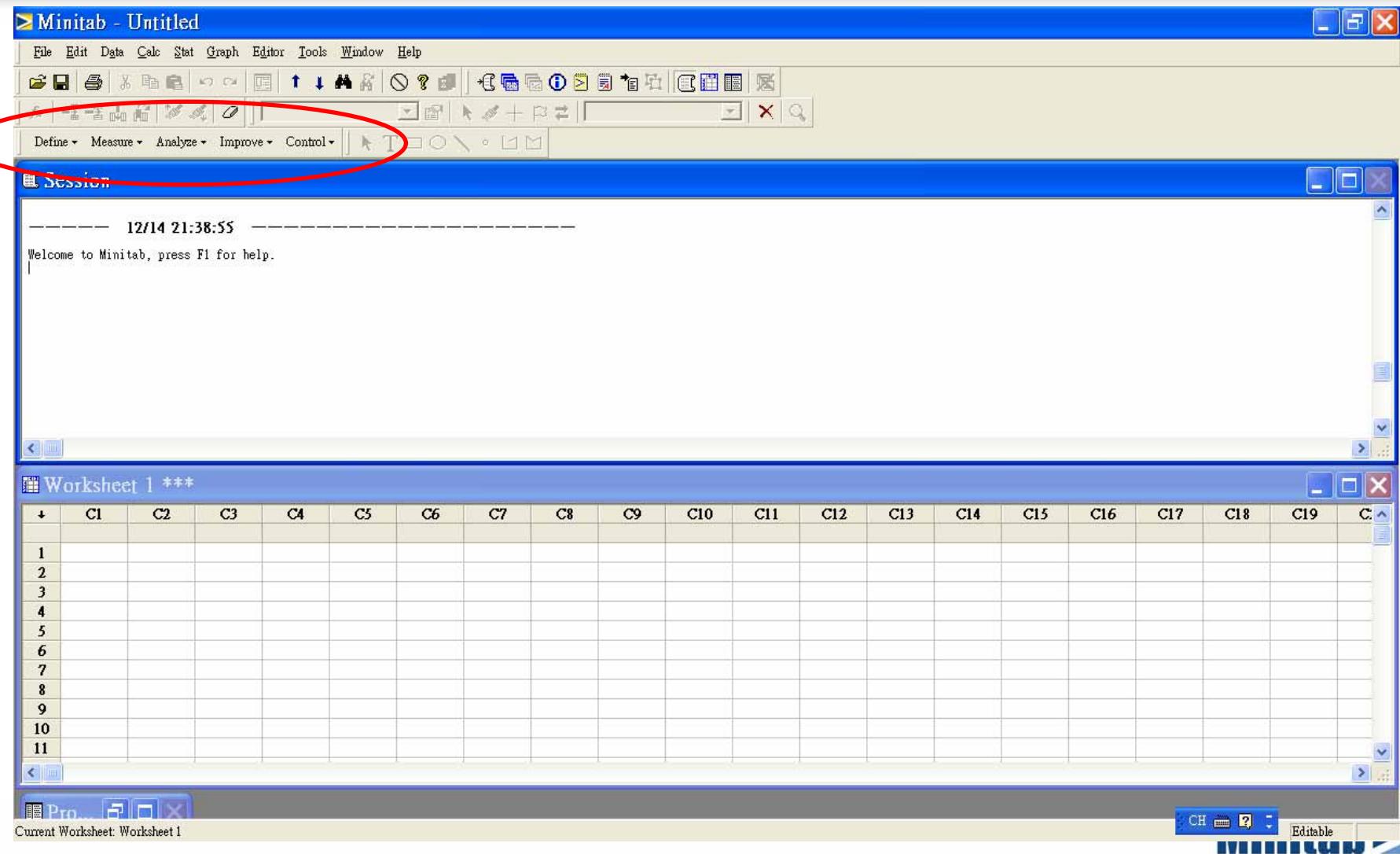
Have you determined the sample size requirements? Yes No

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

✓ Sample Size Details

Minitab 

Minitab Statistical Software

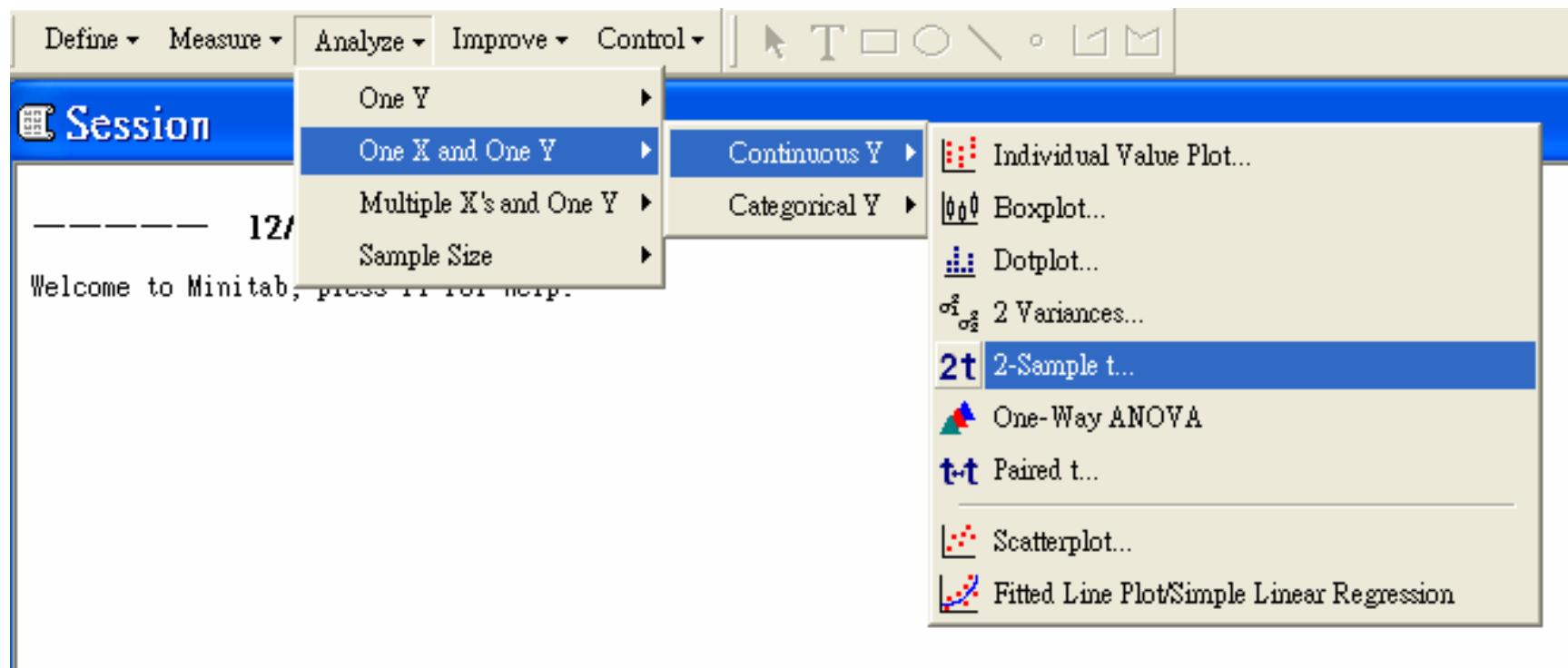


- 修改訂單格式
- 使用2-Sample t-檢定來分析修改訂單過後cycle time是否有改善

	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



Minitab

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

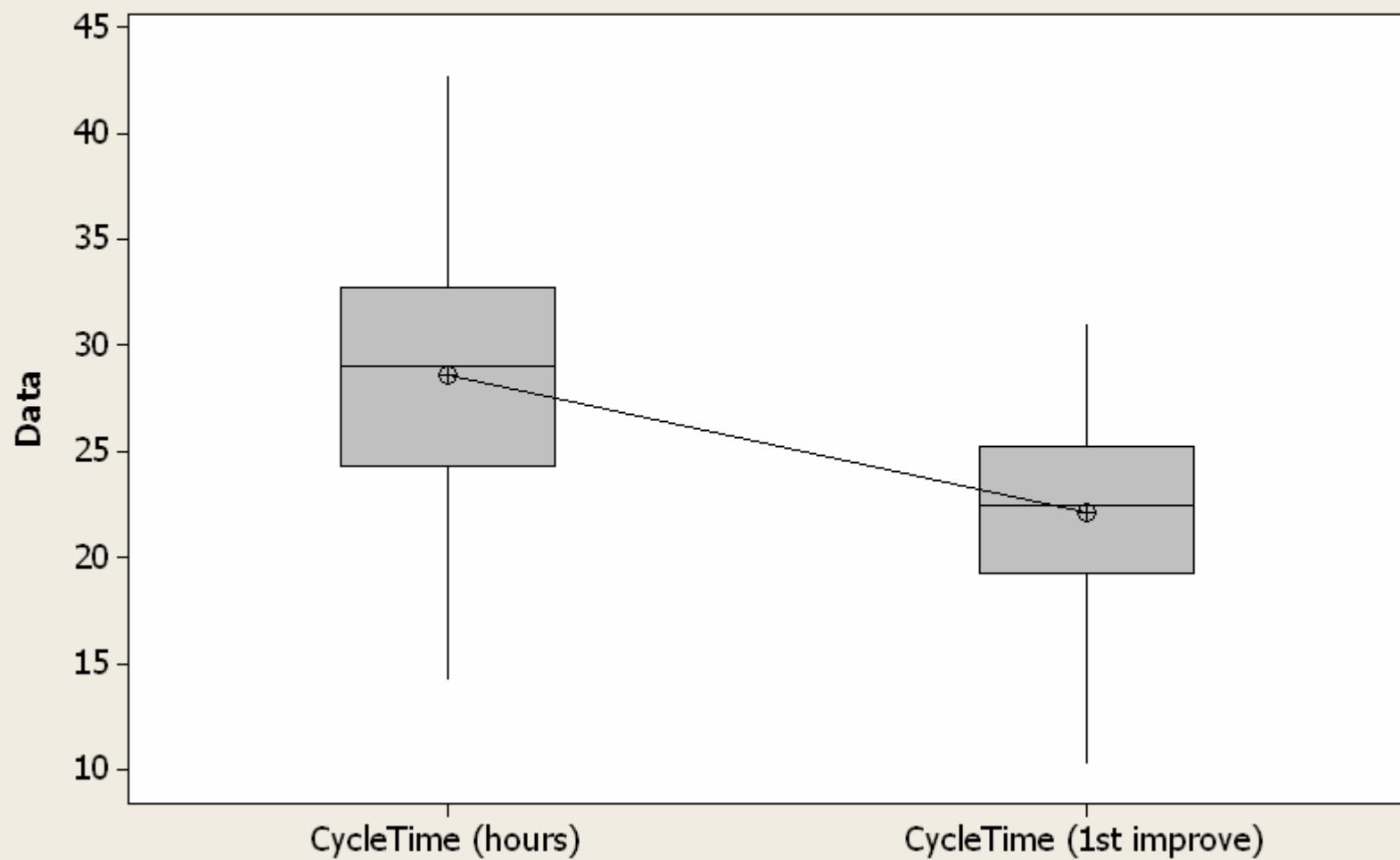
Difference = mu (CycleTime (hours)) - mu (CycleTime (1st improve))

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

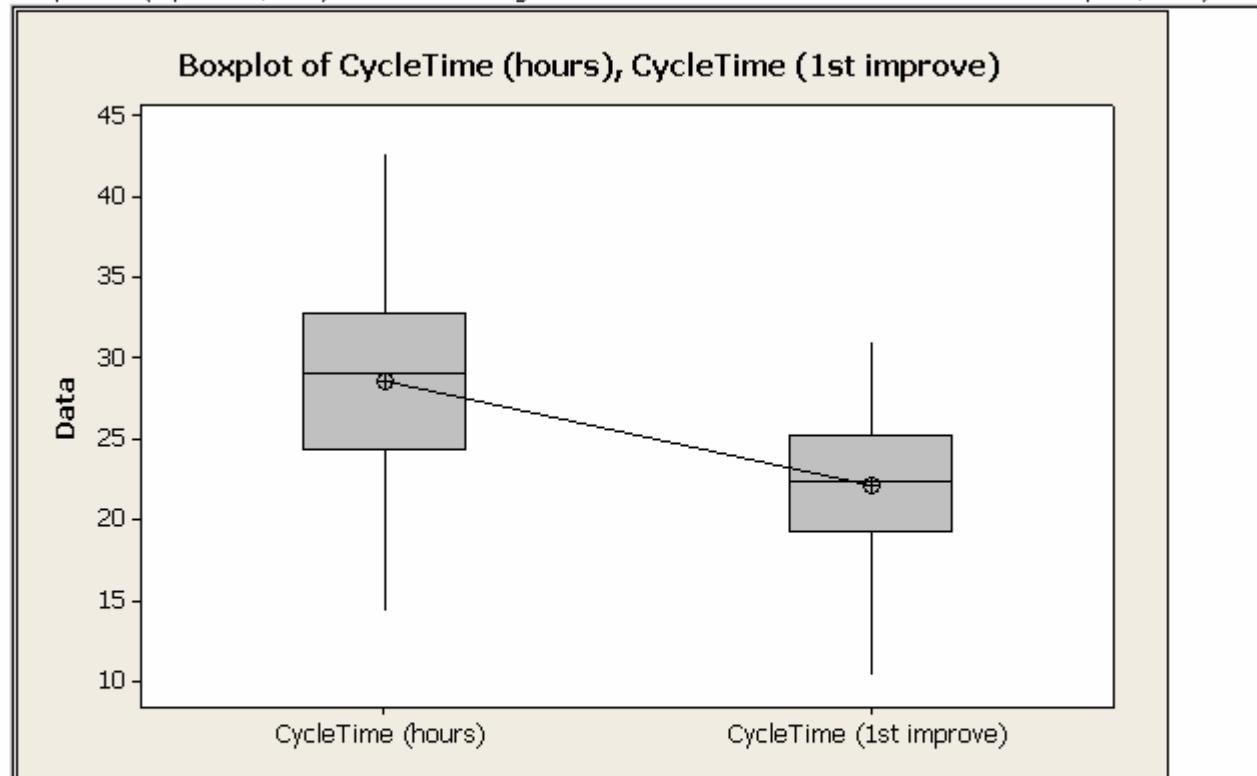
Two-Sample T-Test and CI: CycleT

Two-sample T for CycleTime (hour

	N	1
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):

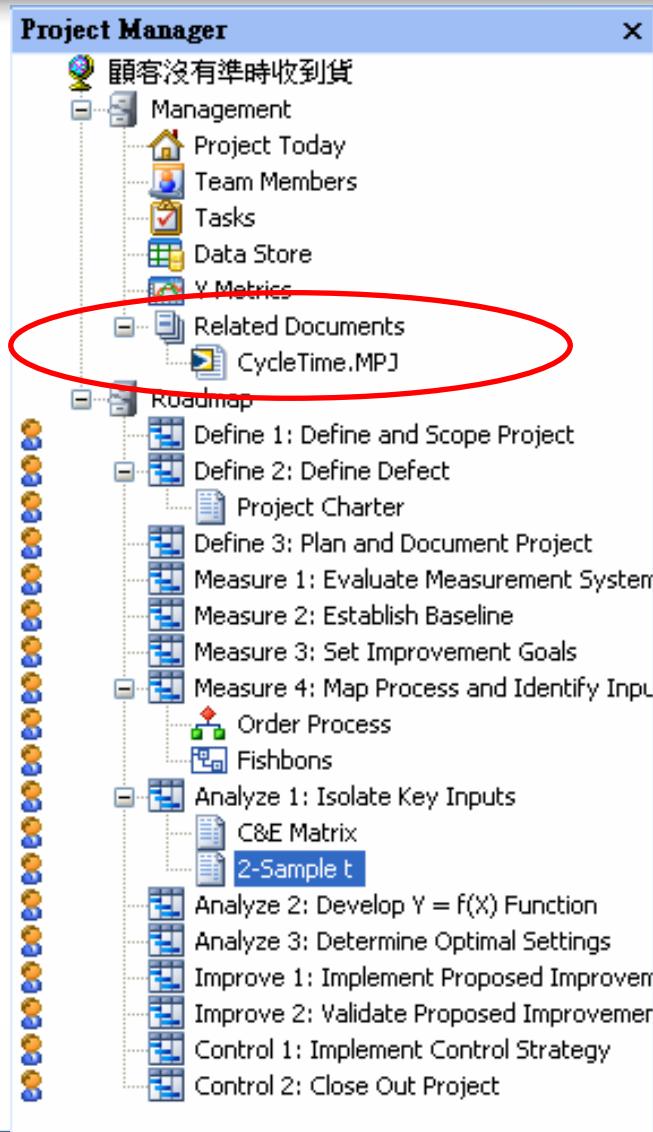


Conclusion

Observations:

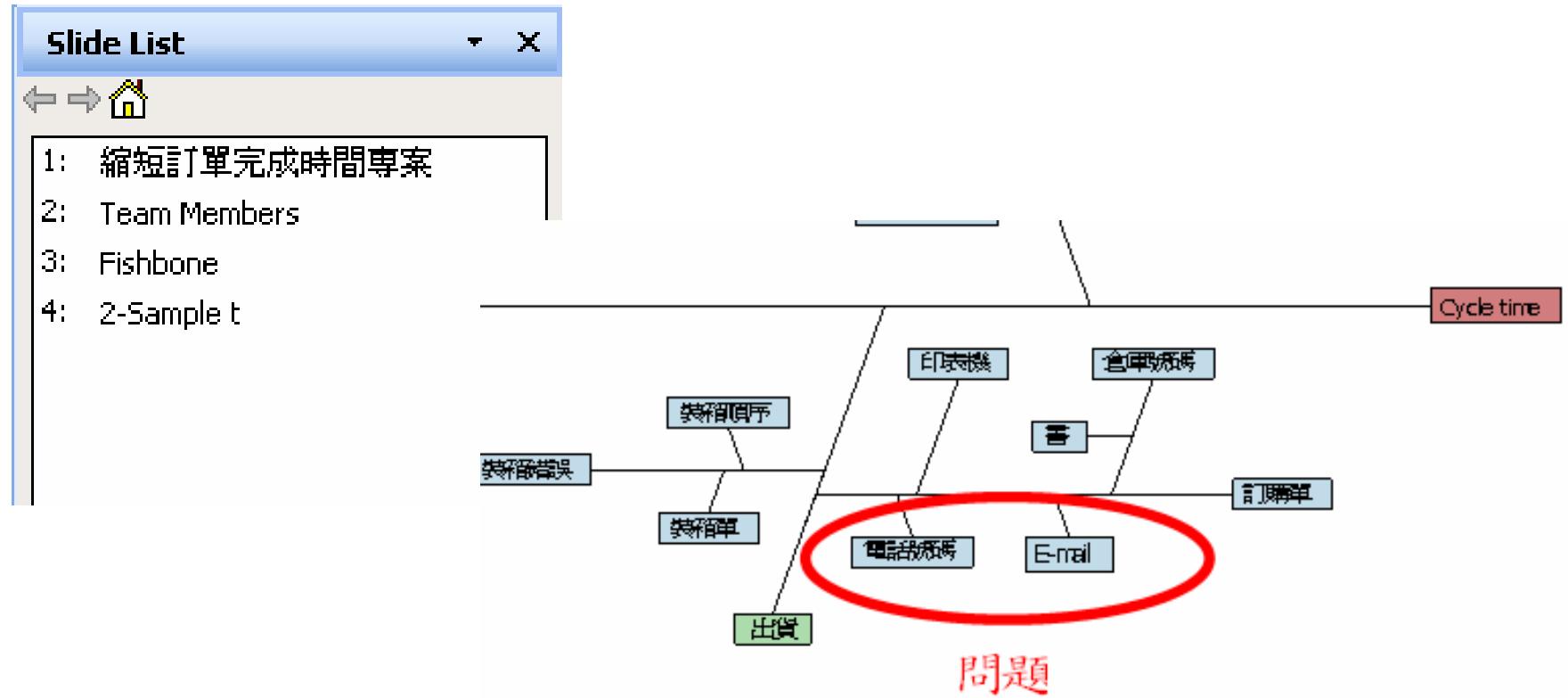
P值接近0，代表重新設計的訂單有顯著的縮短cycle time

相關檔案



簡報管理員 (Presentation Manager)

- ▶ 能夠匯出至 Powerpoint



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 Updated: 2:09 PM on 5/18/2009 Filter: None ▾ Edit | New

8 projects in folder list. 8 of 8 projects match filter.

Summary

Projects	Finance (Estimate) (\$)	Finance (Final) (\$)
All Projects	In Progress Avg over 12 mos	Completed Projects Avg over 12 mos
Total	Hard Savings 1,800,000	Hard Savings 20,000,000
Completed:	Self-Services 21,000	Self-Services 30,000
In Progress:	Implementation Costs 122,200	Implementation Costs 182,000
Past Due:	Net Savings 1,669,800	Net Savings 26,193,000
Average Duration (days):	75.67	Final - Estimated Net Savings: 22,026,000

Expand All | Collapse All

Projects

Project Name	①	Due Date	Champion	Zbench(ST) Goal	Hard Savings (Estimate)	Hard Savings (Final)
CT Scan Throughput	①	1/26/2008	Leland Palmer	2.50	250,000	375,000
Customer Identity Verification	①	12/31/2008	Sandy Williams	2.00	750,000	0
Damaged Inventory	①	1/31/2008	Peter Lorangean	3.00	200,000	0
Electric Load Forecasting	①	1/31/2008	Sandy Williams	1.25	250,000	20,000,000
Improving Engine Disassembly	①	1/26/2008	Leland Palmer	2.00	3,000,000	6,000,000
Membership Renewal Rate	①	1/26/2008	Catherine Lenox	1.00	12,000	0
Wave solder process improvement	①	4/26/2008	Mill Danaher	4.00	200,000	0
Website Response Time	①	1/26/2008	Rowland Howard	2.00	546,000	0

Expand All | Collapse All

Q & A