創意思考與應用

- 創新手法 -- TRIZ 簡介
  - CREAX Innovation Suite 特色與各模組介紹
  - CREAX Innovation Suite 範例說明
- 專利搜尋與分析工具 -- CREAX Creation Suite 簡介
  - CREAX Creation Suite 查詢案例說明(以著名上市公司(Acer、ASUS….)爲例)

系統性創新發明 TRIZ– CREAX

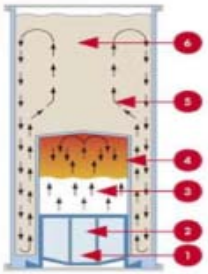
TRIZ 是由前蘇聯發明家**Genrich Altshuller**經不斷研究，並且分析超過二百萬件專利後，歸納發展出一套科學系統化的創新發明手法。

CREAX創新創意研發軟體，完整地遵循**TRIZ**的發明手法，從最基礎的『運算元』、『理想化』等原理與觀念出發，經由需求描述、**IFR**等確定創新標的與問題分析後，透過資源應用、衝突矩陣、物質-　能場分析**...**等解決工具，達到科學系統化創新發明的目的。

Genrich Altshuller
(1926-1998)

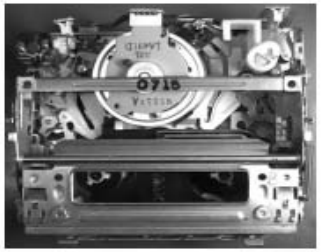
TRIZ

Теория Решения Изобретательских Задач
Teoriya Resheniya Izobretatelskikh Zadatch
Theory of Inventive Problem Solving



自動加熱飲料罐

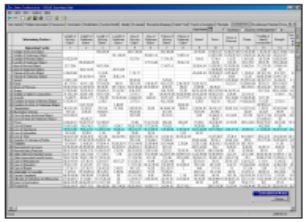
腳踏車座椅設計



三星攝錄影機機構改善

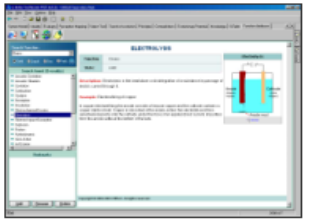
與創新標的相關之各領域實例

結合產品名稱與特性之專利地圖與專利查詢



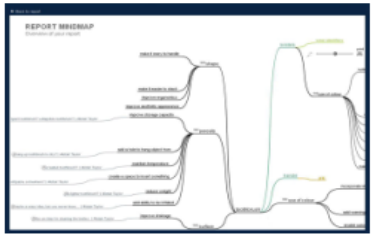
CREAX 技術衝突矩陣

CREAX 演進趨勢



CREAX 科學效應資料庫

現有產品與靈感改善後相關特性比較雷達圖



整合名稱、特性、靈感與建議，自動建立之創新心智地圖

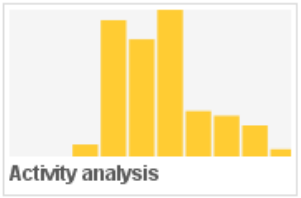
全球策略性專利搜尋分析工具

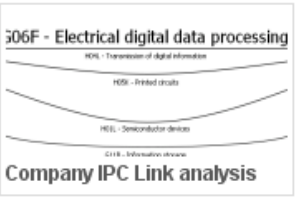
CREAX Creation Suite

ACER ▾ Add report

Clear analyses Export ▾

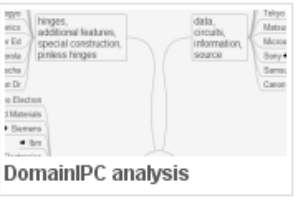
- BIBLIO
- TEXT
- OVERLAYS
  - Players vs problems
  - Players vs time
- UNITS


Activity analysis

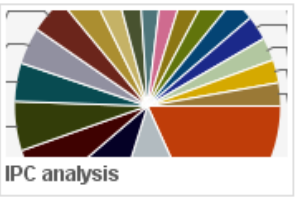


Company IPC Link analysis


Country analysis


DomainIPC analysis

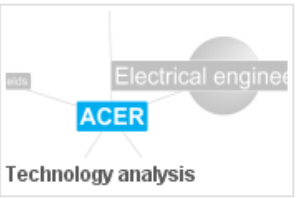
Inventor analysis


IPC analysis


Patent value analysis

Player analysis

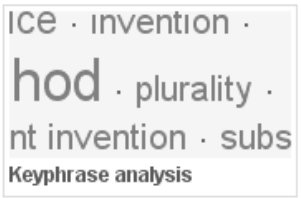

Prefix analysis



Technology analysis

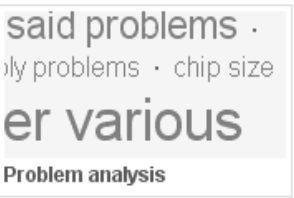

Evolutionary potential


Field analysis

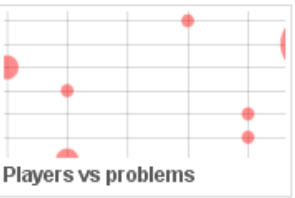


Keyphrase analysis

Modifier analysis



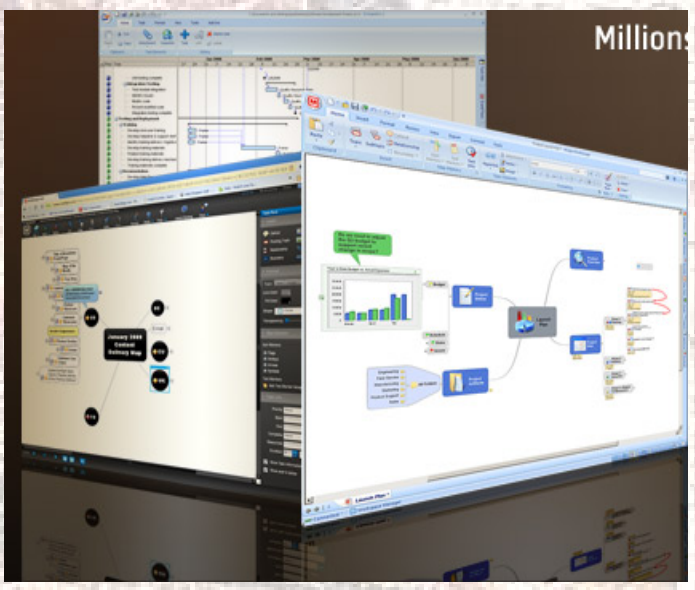
Problem analysis


Players vs problems

心智地圖開發軟體– MindMana

心智地圖是一種圖像式思維的工具，利用圖像式思考輔助，來表達思維。

- 可幫助商務人士和小組執行更有效率會議，增加企劃成功率和加速判斷結論。
- 腦力激盪會議。快速記錄、發展和傳達清晰地視覺格式的資訊
- 制訂企劃。集中在企劃的腦力激盪和觀察階段，以更快的速度的完成。
- 會議組織。給每一個人相同資料，更快做決定
- 結合其他的應用軟體分享成果
  與**Microsoft® Office**完整結合，快速轉移成果至其他應用軟體，增力效率和快速提出企劃。



一、心智圖法的定義：

（一）、概念性定義爲：

「以圖像爲基礎的擴散（放射Radiant）性思考」（孫易新，2004）。

（二）、操作性定義以表2-1 說明：

(三)心智圖的理論基礎與創造力基本元素：敏覺力、流暢力、變通力、獨創力與精進力，有相互輝映之處

(四) Mind Map 中文譯名

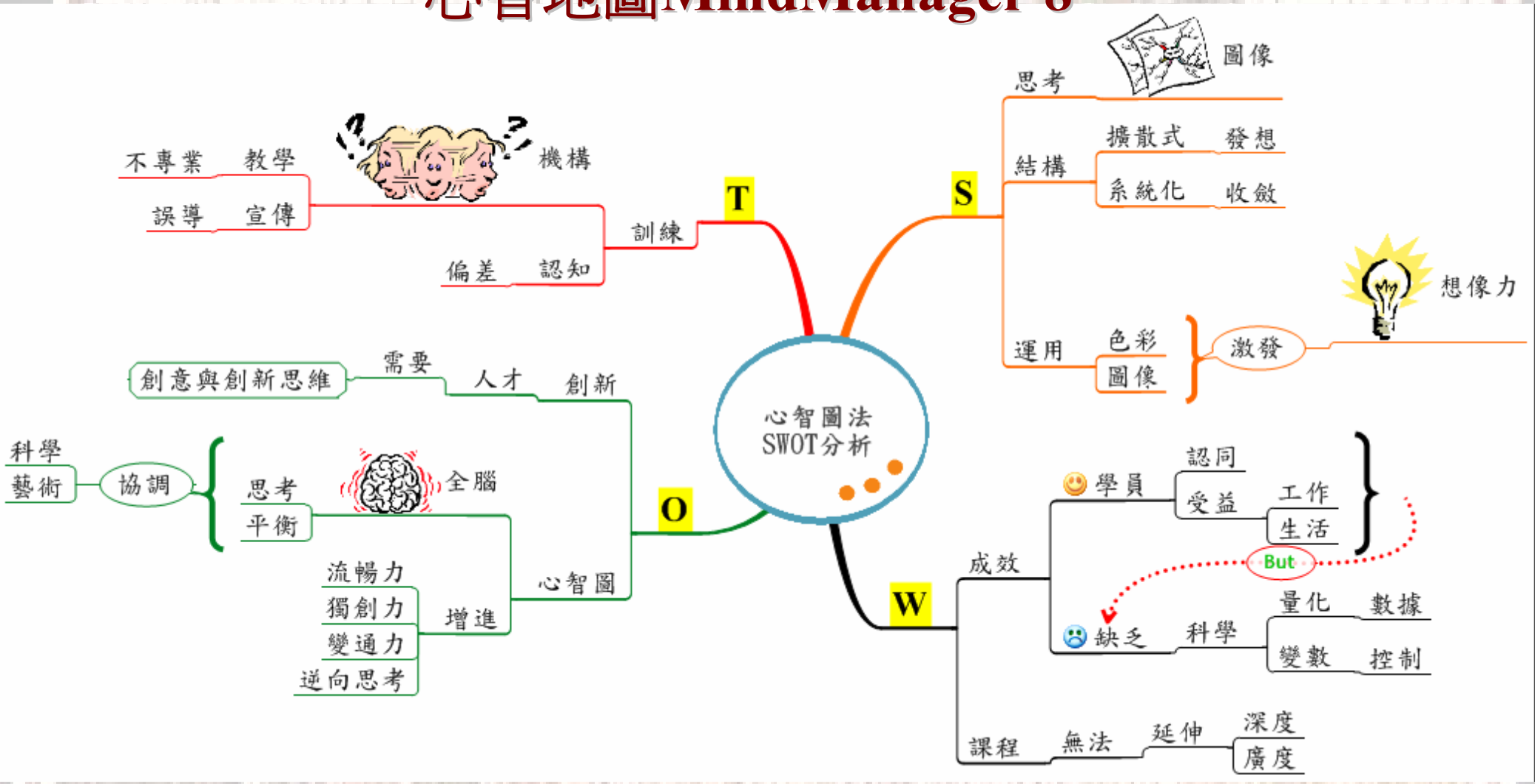
創意思考與應用

Mind Map 中文譯名

譯者	Mind Map 中文譯名
孫易新（1998，2001）	心智圖、心智繪圖
羅玲妃（1997）	心智繪圖
李田樹（2003）	心圖
郭俊賢 陳淑惠（1999）	思緒構圖
林麗寬（1997）	心靈藍圖
李斯 周作宇 張學文（2005）	思維導圖
戴保羅（1999）	學習地圖
彭真（1997）	心智思考圖
彭真（1997）	心象圖

創意思考與應用

心智地圖MindManager 8

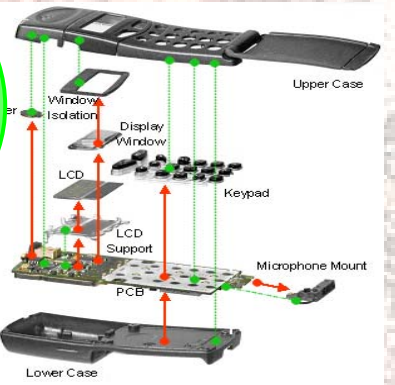


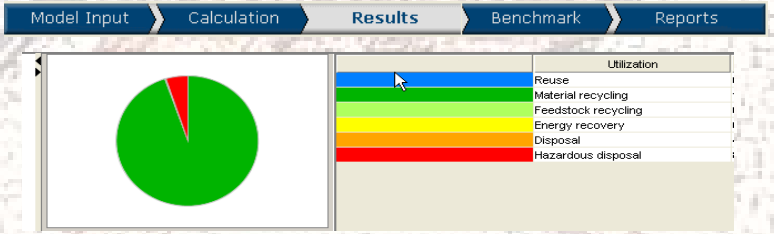
綠色產品評估 WEEE 分析軟體 -- ProdTect

歐盟制訂之重要環保指令：**RoHS**、**WEEE**、**EuP**。

耗能產品**(EuP)**，是直接或間接造成地球污染及資源與能源消耗的主要因素之一，源頭做法是從生態設計**(Eco-Design)**著手，朝向產品永續發展的目標。

綠色產品評估與分析軟體 **– ProdTect** 提供電子電機產品符合**WEEE** 之 **3R** 回收率**(Reuse、Recycling、Recovery)** 的拆解報告，分析評量產品易拆解，程度，並以**19**項評量因子，提供設計人員對電子電機產品創新及改善之依據。





創新TRIZ在企業/商業模式的關鍵思維

TRIZ商管模式的創新思維

- 創新是將創意轉換成價值，特別是經濟上價值。
- 創新可出現在企業不同流程構面，在產品開發上、製程改善上、市場行銷上、商業模式上、組織架構上，當然也可從更高層級的公司治理（Corporate Governance）或是經營策略（Business Strategy）上的創新

創新理論TRIZ的簡介

Why TRIZ

- 創新是難以捉摸的一門藝術
  - 沒有一個程序來產生創意
  - 沒有一個方法來有效的評估且過濾創意
- 使用者常耗費力氣在解決「錯」的問題
  - 治標不治本，或是花時間在次要的問題之上，並不能達到長期及有效的解決方法，研發者缺乏有效的工具來找出核心問題。使用者應該跳脫舊有思維來解決新的問題
- 使用者應該跳脫舊有思維來解決新的問題
  - 假設以及心理上的惰性會盲目視野
- 創新者受限於自身的經驗和手邊的資源和知識
  - 超過百分之九十五的創意專利是從跨領域的知識所解決的

WHY TRIZ

專利歸納系統化的創新方法

Theory of inventive problem solving

- 縮短創新的過程
- 產品製造過程的改善
- 透過問題分析和知識檢索技術，在最短的時間產生更多的產品構思和問題解決方案。
- 透過分析競爭環境以及技術發展趨勢，創造出技術先進、引領市場的新產品。

TRIZ簡介

- 一種系統改良的方法
- 一種自覺性演化的技術系統和解決工程問題的方法
- 一種消除工程衝突而不抵消妥協的工具
- 分享無數發明家的知識與經驗來增加工程人員知識創造力和解決問題技巧的方法

TRIZ簡介

- TRIZ之可用是因為經顯示工程人員所面對的90%的問題已於其他地方被解決過
- 若我們能利用此資訊，則研發將更加有效
- 主要焦點是浮現、了解、強化與刪除衝突
- Altshuller已証明發明可系統化地導出，而不必源自嚐試錯誤

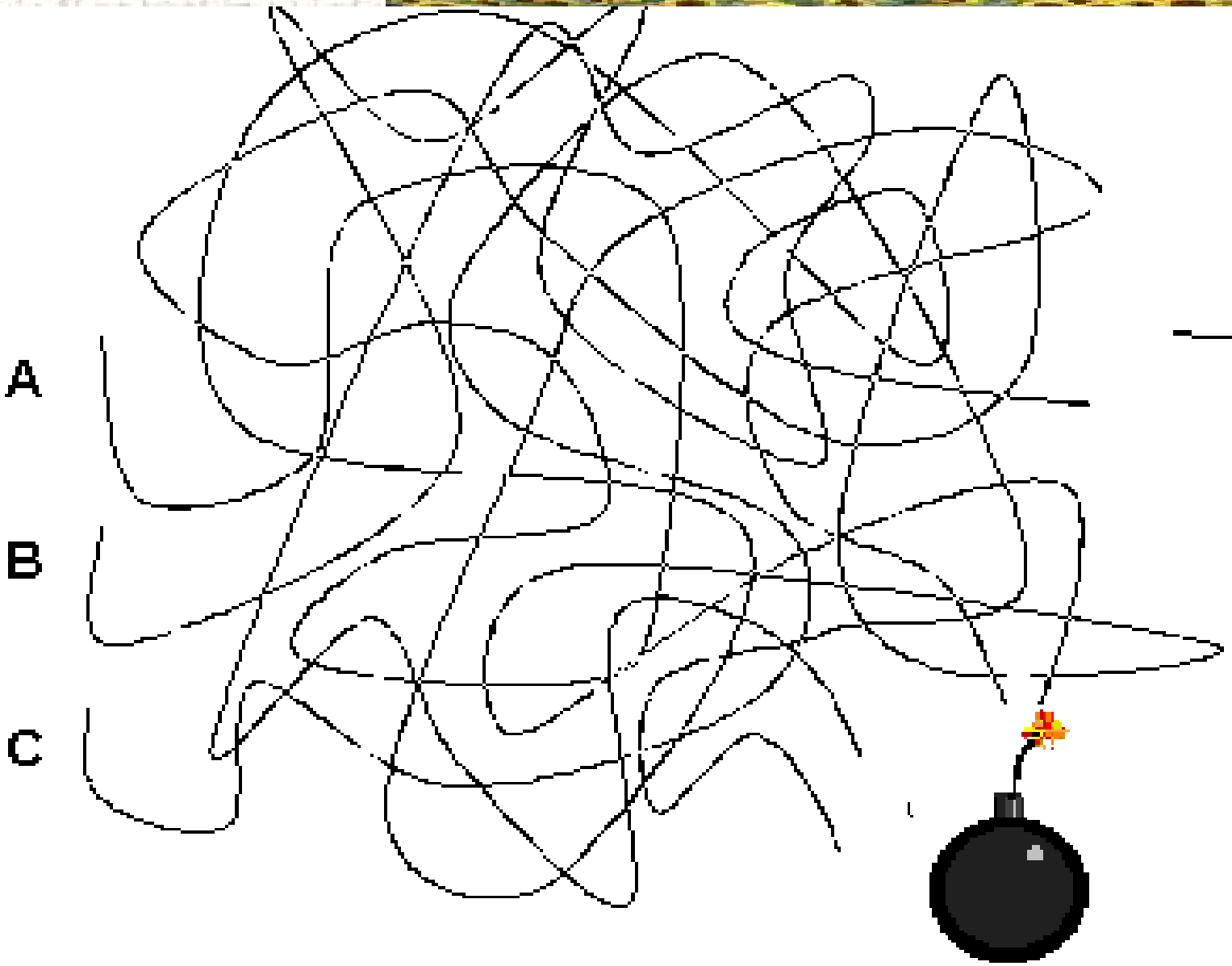
TRIZ應用的領域

- 製造創新、製程創新
- **Predictive Failure Analysis預測失效分析, Hazard Analysis危害度分析, and Business Continuity Planning營運持續計畫**
- **Human Factors Design 人因設計and Ergonomic Contradictions人因衝突**
- **Pharmaceutical Processing配藥學流程 and Drug Delivery藥品的運送**
- **Software problems軟體介面問題**

世界TRIZ研討會及企業導入

- **Annual ETRIA(歐盟的TRIZ學會) world conference**
- **Samsung , Siemens, LG , Unilever , Agilent , Hitachi , Dow Chemical , Johnson & Johnson , Delphi**
- **Volkswagen of Mexico, Philip Semiconductors of Germany, ENSAM Paris, Peugeot Citroen of France.**

創意思考與應用



- 在十四歲時作品獲得第一個專利證明。
- 於1946年開始研發TRIZ，並為俄國海軍研究專利。
- 於1947著手撰寫理論，被送入古拉格集中營七年。.
- 於1954-85 間不斷研究，分析了超過二十萬筆的專利。
- 於1985年後轉向心理學領域，於1946-1990年間，平均每年研究1500人次。
- Altshuller某些研究夥伴，在蘇聯鐵幕瓦解後轉西方陣營。

Genrich Altshuller
(1926-1998)

TRIZ

Теория Решения Изобретательских Задач

Teoriya Resheniya Izobreatatelskikh Zadatch

創意問題解決理論

四項主要發現

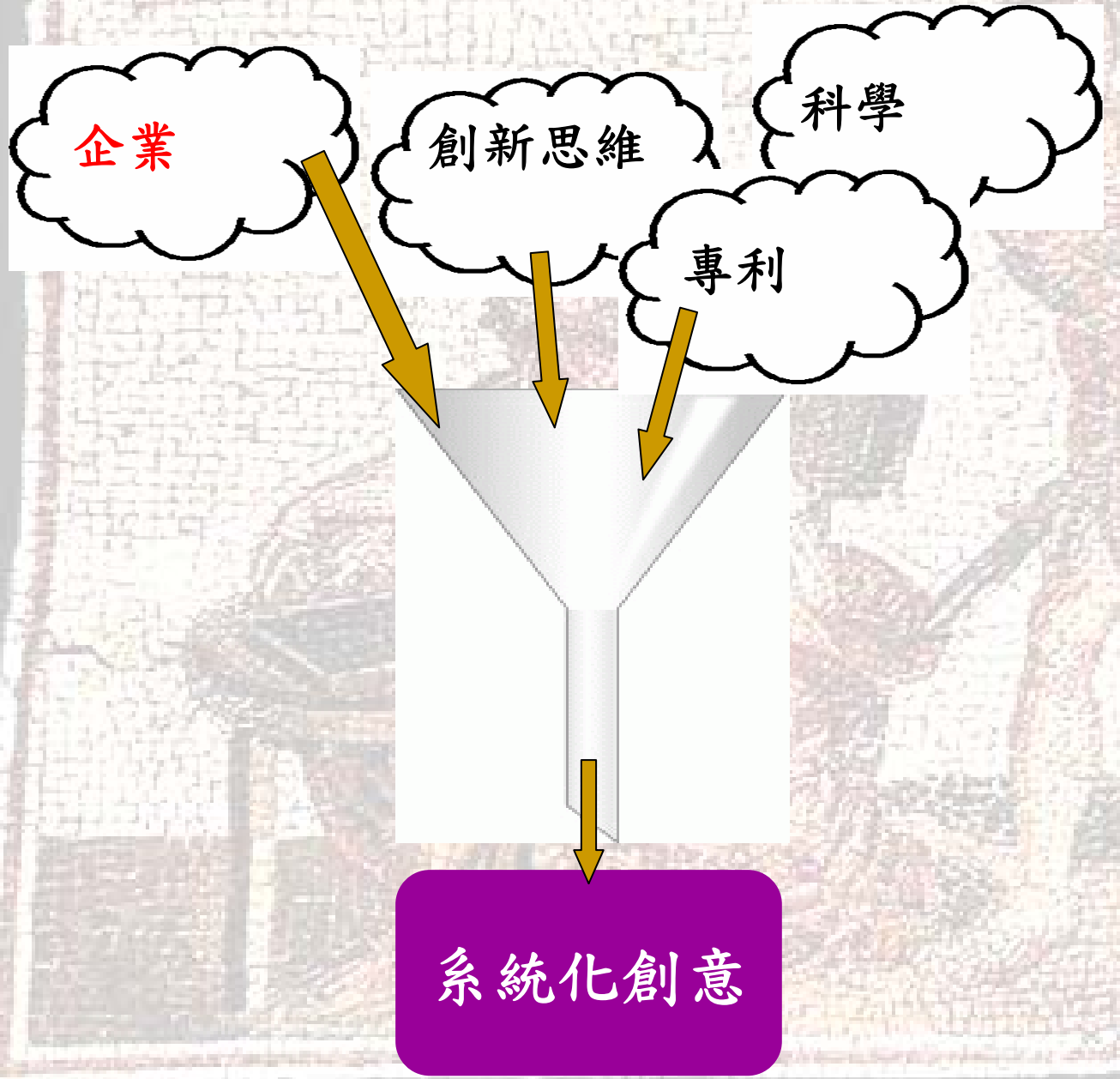
1. 在不同的領域和職場中，同樣的問題總是一再的發生。
2. 最好的解決方法能點出及消除衝突點。
3. 最好的解決方法能將不利的因素轉為有用的資源。
4. 市場和科技的走向是能被預測的。

Genrich Altshuller
(1926-1998)

TRIZ

Теория Решения Изобретательских Задач
Teoriya Resheniya Izobreatatelskikh Zadatch

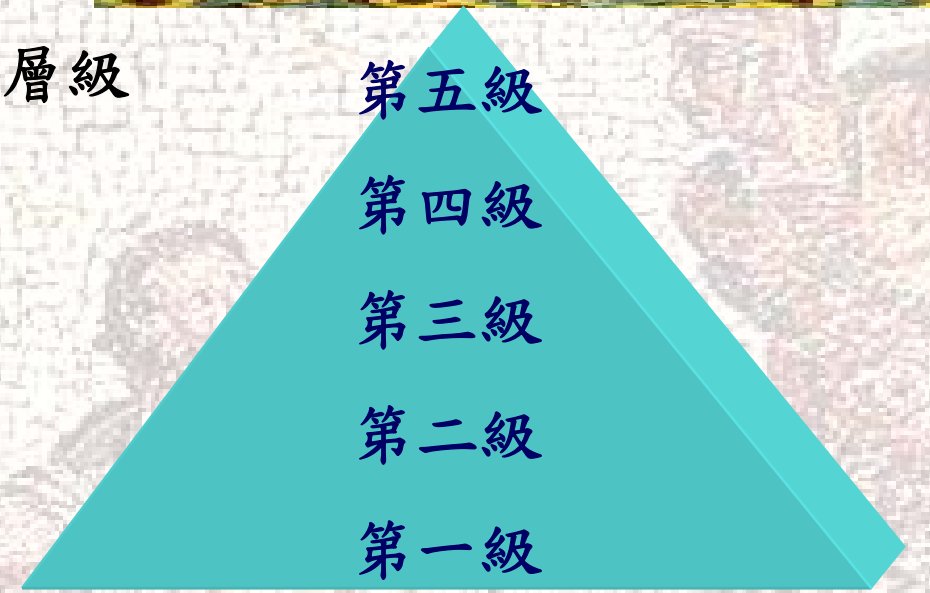
Theory of Inventive Problem Solving



在各個專業的領域中，選擇出最好的方案

創意思考與應用

發明的層級



發明的層級	解決的內容	知識領域	百分比	例子
第一級	改良	相關工作	32%	隔熱牆的厚度
第二級	技術矛盾	相關工業	45%	可調方向盤
第三級	物理矛盾	其他工業	18%	自排變速器
第四級	重大發明	新科學	4%	記憶合金、超音波
第五級	新發現	新的現象	<1%	雷射、電晶體

古銅膚色乳液 ↔ 調味醬

用量控制系統
DOSING SYSTEM

Mars 巧克力 ↔ Pritt 膠帶

易開設計
EASY OPENING

輪胎 ↔ 洗衣機

自行平衡
SELF BALANCING

United States Patent

Lego + Snacks

+

92

Pacifier + Thermometer

+

93

全球策略性專利搜尋分析工具

CREAX Creation Suite

ACER ▾ Add report

Clear analyses Export ▾

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Players vs problems

Players vs time

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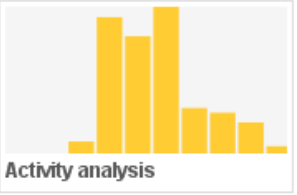
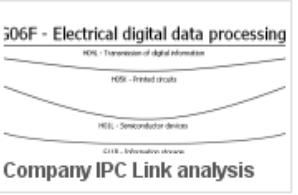

Activity analysis

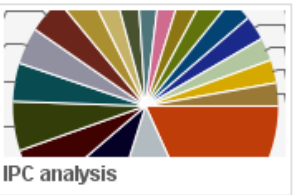


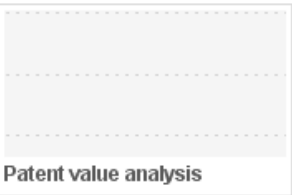
Company IPC Link analysis


Country analysis


DomainIPC analysis

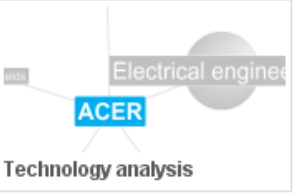
Inventor analysis


IPC analysis


Patent value analysis

Player analysis

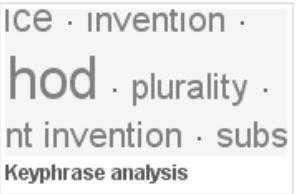

Prefix analysis



Technology analysis

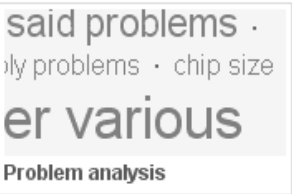

Evolutionary potential


Field analysis

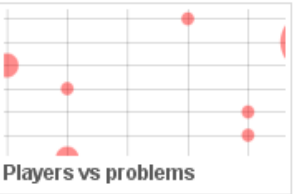


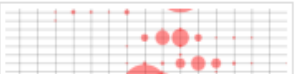
Keyphrase analysis

Modifier analysis



Problem analysis


Players vs problems



全球策略性專利搜尋分析工具 -

CREAX Creation Suite（ 以知名筆記型電腦廠商為例 ）

全球策略性專利佈局的重要性

美法院裁定／創意電子友達大勝韓 LGD

自由時報 2010/05/03

〔記者陳梅英／台北報導〕友達與韓國樂金顯示器（LGD）互控專利侵權案，友達獲得全面性勝利，不僅 LGD 控告友達四篇專利侵權遭判敗訴，美國法院反而裁定 LGD 侵犯友達四篇專利；這是繼二〇〇六年奇美電捍衛客戶權益，跨海打官司勝訴後，首宗台灣科技業主動在專利侵權反擊獲得勝訴者。

友達表示，美法院裁定 LGD 侵權後，友達將聲請禁制令，制止 LGD 出口及銷售侵犯友達專利技術的產品至美國，且因法院已同時裁定 LGD 誘使其客戶侵犯友達專利，基於此裁定，友達希望 LGD 客戶立即停止自 LGD 購買未經許可侵權產品於美國銷售或使用，以免訟累。

友達將聲請禁制令 阻對手產品輸美

同時，LGD 在當年提起對友達侵權告訴時，還向友達要求超過六．九億美元（約二一六．四億新台幣）損害金，如今情勢大逆轉，友達也將透過律師要求高額賠償金，預料將不低於當初 LGD 所要求的金額。

310億

美法院裁定／台控侵權 友達大勝韓 LGD

自由時報 2010/05/03

友達與 LGD 的專利訴訟案始於二〇〇六年十二月，南韓 LGD 在美國向台灣友達及奇美電提出專利侵權訴訟；友達隨後向 LGD 提起反訴，案件於二〇〇九年六月進入審理。

今年二月十六日美法院裁定，LGD 全數侵犯友達主張的四篇專利，美同一法院再於四月卅日裁定，友達未侵犯 LGD 在訴訟審理主張的四篇專利，消息傳來，友達相當振奮。

企圖逼退台灣面板廠 韓廠踢到鐵板

友達表示，法院裁定 LGD 全數侵犯四篇友達專利包括：美國專利號碼 6,778,160、6,689,629、7,125,157、7,090,506，各該專利技術分別協助改善液晶反應時間、改善液晶顯示器可靠度、解決顯示畫面瑕疵、以及提供小尺寸手持裝置所用之薄型結構。

LGD 侵權產品應用廣泛，包括供電視、顯示器、筆記型電腦、公用資訊顯示器及手機液晶面板。

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全球線上專利搜尋、統計、分析，及創新輔助工具 - CREAX Creation Suite

INNOVATION RESEARCH

- ❑ What are the innovation opportunities for your product or process?
- ❑ What are new applications for your technology?
- ❑ Which industries and companies have solved problems similar to yours?

TECHNOLOBY MAPPING

- ❑ What are technological trends in a certain domain?
- ❑ Which technologies can realize your ideas?
- ❑ Which universities and institutes specialize in my technology?

COMPETITIVE ANALYSIS

- ❑ What are possible open innovation partners across industries?
- ❑ On which problems are your competitors working?
- ❑ Who are new players in the market?

CREAX Creation Suite
-Acer Case Study

創意思考與應用

ACER reports

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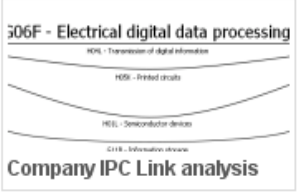
Clear analyses | Export

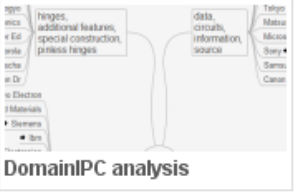
- BIBLIO
- TEXT
- OVERLAYS
  - Players vs problems
  - Players vs time
- UNITS


Activity analysis

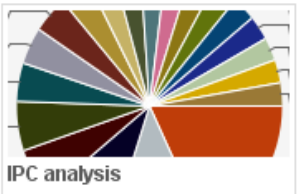


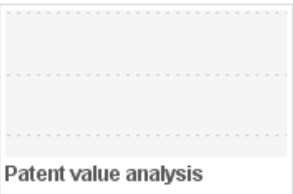
Company IPC Link analysis


Country analysis


DomainIPC analysis

Inventor analysis


IPC analysis


Patent value analysis

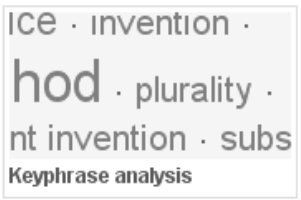
Player analysis


Prefix analysis

Technology analysis

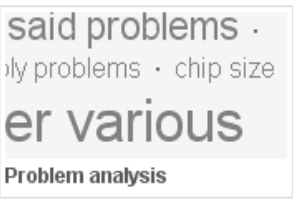

Evolutionary potential


Field analysis

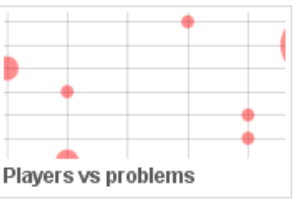


Keyphrase analysis

Modifier analysis



Problem analysis


Players vs problems

創意思考與應用

ACER 歷年全球申請之專利查詢

SELECT A FILTER

- Applicant filter
- Classification filter
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- Number filter

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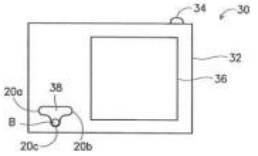
Disposition device for auto-detecting the holding condition of a digital camera

Abstract

The invention provides a digital camera with a disposition device for automatically converting a picture to an appropriate image meeting the vision via the viewfinder, wherein the disposition device for auto-detecting the holding condition of a digital camera comprises: an insulating envelope having a cavity which is formed by an insulating bottom and side wall, wherein the cavity is divided into a plurality of concave regions; a conductive plate covering the cavity of the insulating envelope and connected to the power source; a plurality of conductive pads selectively located on the insulating bottom; and a conductive ball rolling in the cavity by the influence of gravity, wherein the movable sensor touching



Claims | Description | Citations | Family

	Number	Title	Published	Applicant
	JP2002112107A	ARRANGEMENT DEVICE FOR AUTOMATICALLY DETECTING HOLD STATE OF DIGITAL CAMERA	12/04/2002	ACER COMM & MULTIMEDIA INC
	TW521521B	Positioning device for automatically correcting the image display direction	21/02/2003	BENQ CORP
	US6819362B2	Disposition device for auto-detecting the holding condition of a digital camera	16/11/2004	BENQ CORP

	TW267742B	Portable peripheral device having an embedded	1/12/2006	ACER LAB INC
		isolation		ACER INC
	GB222335		12/08/1992	ACER INC
	HK1	A primary controlling right arbitration device and method of a data processing system	21/01/2004	WISTRON CORP
	JP11261835A	Electric field elimination device for eliminating ac electric field in front of monitor	24/09/1999	ACER PERIPHERALS INC
	JP2002230913A	Viterbi detector for processing partial	16/08/2002	ACER LAB INC

Activity analysis

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Activity analysis on 2123 patents

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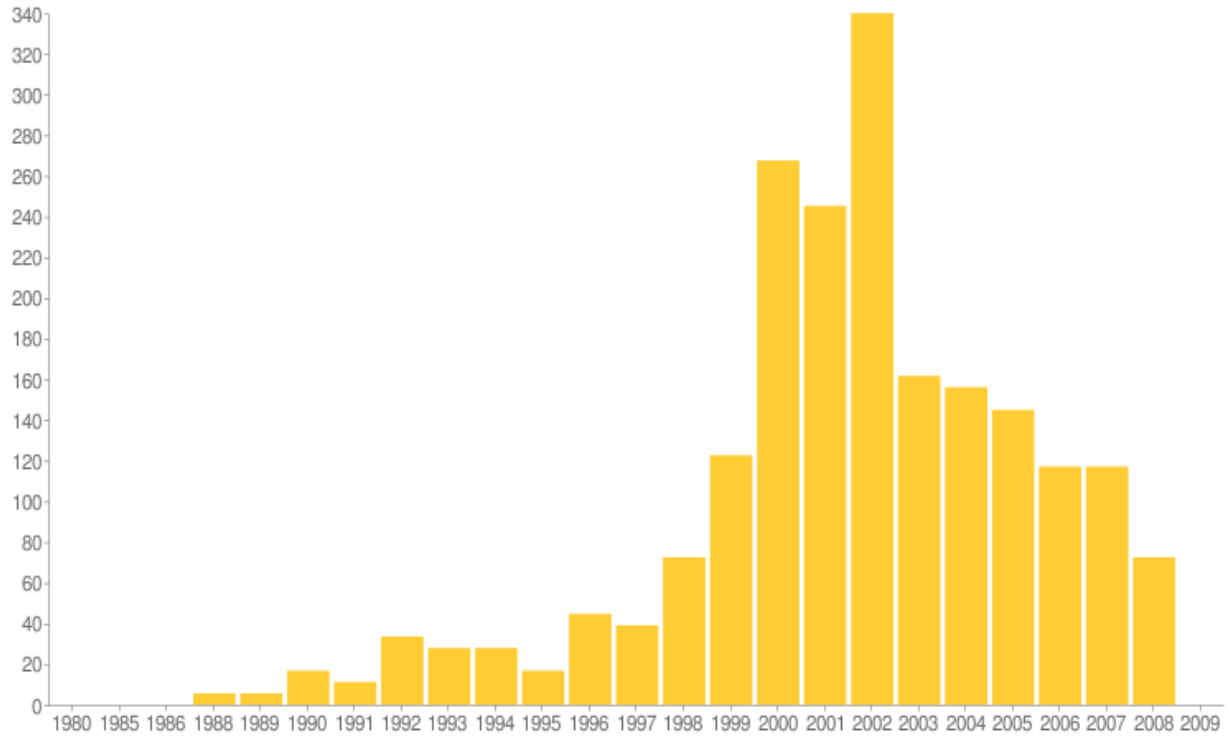

Country analysis

Type a report name | Add report

Country analysis on 2123 patents

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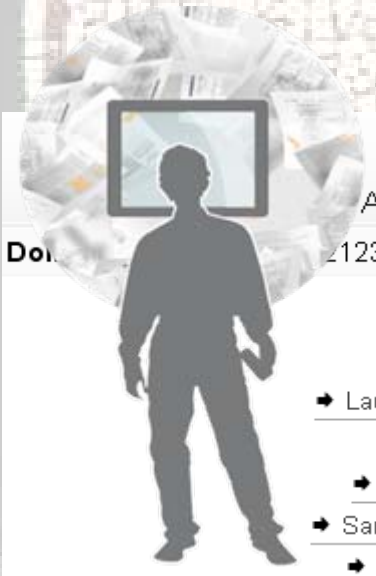
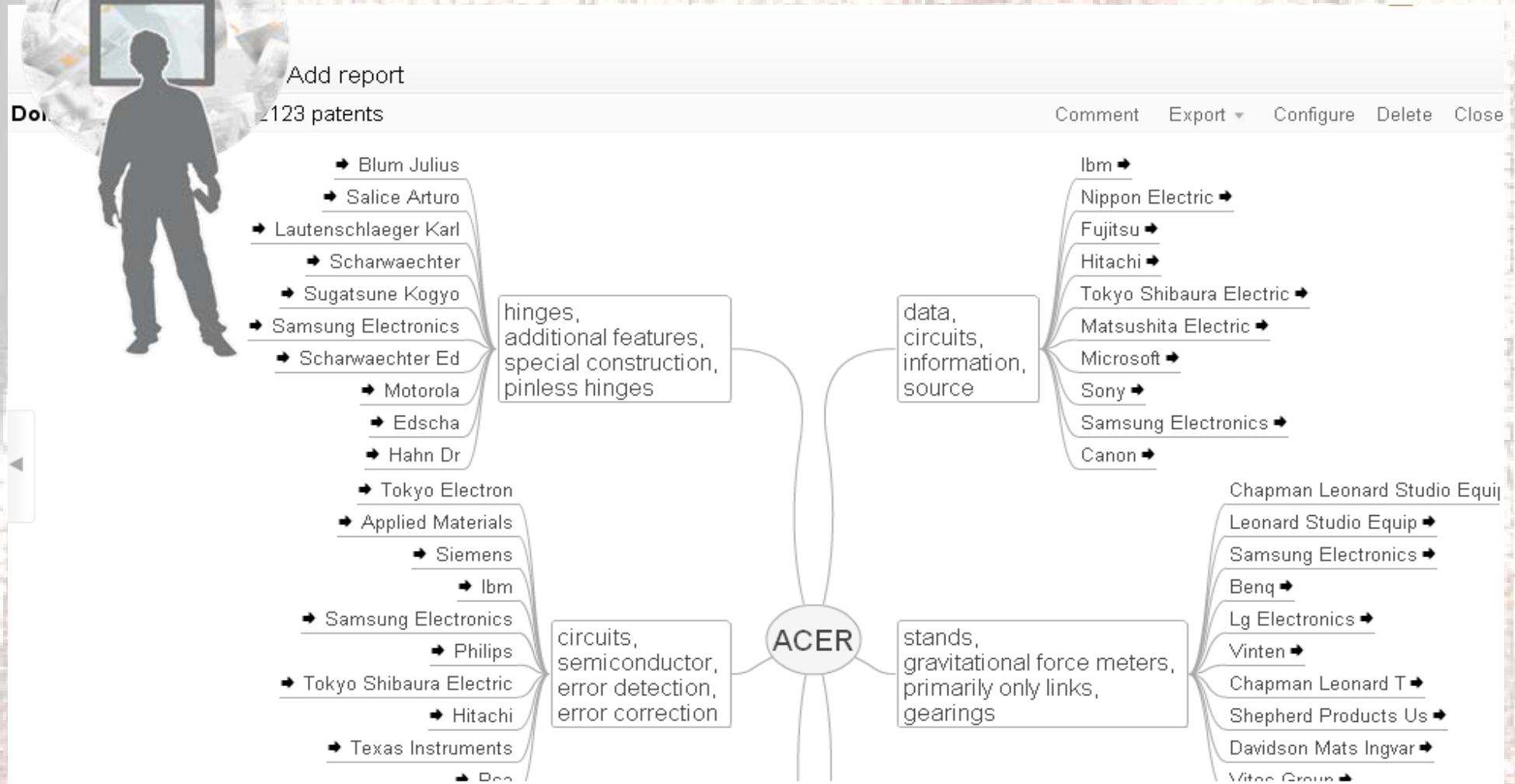
View:

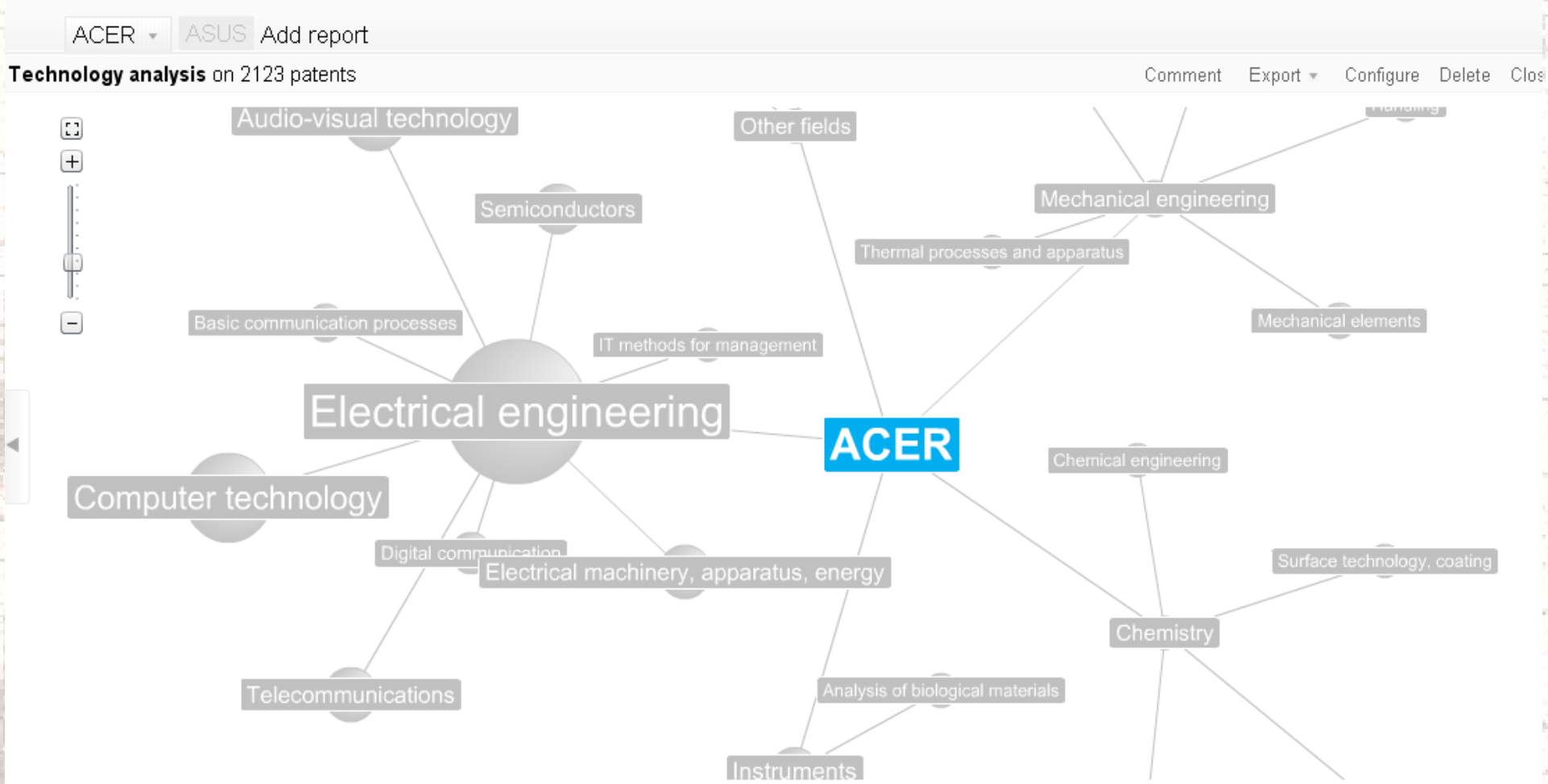
創意思考與應用

Domain IPC Analysis





Technology analysis



Patent value analysis

ACER ASUS Add report

Patent value analysis on 2123 patents

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Add all top patents to briefcase

	PatentNumber	Title	Published	Applicant
100,0	US5455927A	Dual socket upgradeable computer motherboard with automatic detection and enablement of inserted upgrade cpu chip	3/10/1995	ACER INC
98,8	US5764903A	High availability network disk mirroring system	9/06/1998	ACER AMERICA CORP
98,5	US5410713A	Power-management system for a computer	25/04/1995	SMITH CORONA ACER
82,8	CA2174432A1	Apparatus for measuring characteristics of a liquid	27/04/1995	ACER CONSULTANTS LTD
77,5	US5903765A	Power management system for a computer	11/05/1999	SMITH CORONA ACER
76,2	US5870613A	Power mangement system for a computer	9/02/1999	SMITH CORONA ACER
68,1	US6397232B1	Method and system for translating the format of the content of document file	28/05/2002	ACER INC
67,9	US5511184A	Method and apparatus for protecting a computer system from computer viruses	23/04/1996	ACER INC
67,5	US5390301A	Method and apparatus for communicating device-specific information between a device driver and an operating system in a computer system	14/02/1995	ACER INC
67,1	US5884087A	Power management system for a computer	16/03/1999	SMITH CORONA ACER
	US2002000553A1	Thin film transistor liquid crystal display and manufacturing method	3/01/2002	ACER DISPLAY

Inventor analysis

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Inventor analysis on 2123 patents

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View:

Appleford David Eric · Cai Zhujia · Chao Chi Mou · Chao Shih Hung · Chen Chih Ching · Chen Po Cheng · Chen Tse Min · Cheng Yin Shiang · Chuang Te Chih · Elkins Erich · Fang Yu Fan · Huang Chao Shih · Huang Jih Fon · Hwang Ching Tung · Kao Chih Hung · Kao Kent · Ko Ming Chih · Kuo Ying Hsien · Lai Alexander I Chi · Lai Yiji · Lee Keh Houng · Lee Sheau Jiung · Li Chien Hsing · Li Yung Yi · Liao Ben · Lin Chi Cheng · Lin Ker Wei · Lin Rung De · Lin Tsung Te · Lin Wei · Lin Yongsen · Lin Yung Sen · Lu Cheng Hsien · Lu De Jen · Lu Jih Yung · Lu Yu Yang · Maskatia Arif · Owens Daniel Richard · Pan Long Jyh · Peng Hsueh Chih · Shieh Jia Horng · Su Yao Ching · Syring Harold · Tang Chien Hsing · Wu Jiun Han · Wu Shie Lin · Wu Shye Lin · Wu Tsung Hsun · Wu Win

Prefix analysis

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Prefix analysis on 2123 patents

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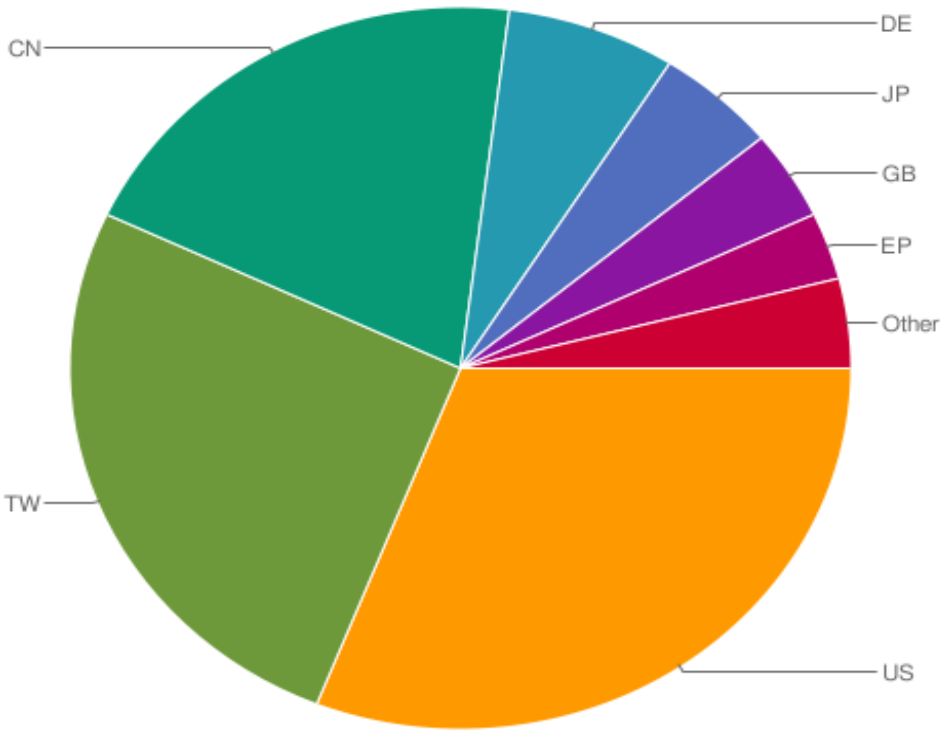

View:

PREFIX	TOTAL
US	668
TW	562
CN	423
DE	149
JP	100
GB	79
EP	69
CA	18
KR	12
HK	7
WO	7
AU	5
ES	5
IE	3
CZ	2
FI	2
FR	2
HU	2
NO	2

IPC analysis

ACER ASUS Add report

IPC analysis on 2123 patents

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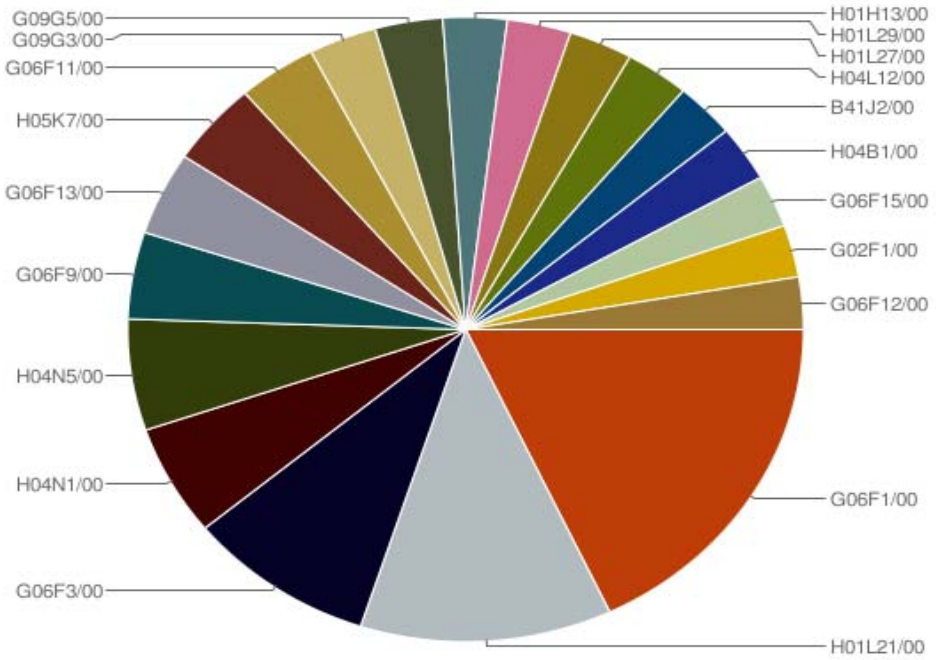

View:

- **G06F1/00** Details of data-processing equipment not covered by groups G06F3/00 to G...
- **H01L21/00** Processes or apparatus adapted for the manufacture or treatment of semic...
- **G06F3/00** Input arrangements for transferring data to be processed into a form cap...
- **H04N1/00** Scanning, transmission or reproduction of documents or the like, e.g. fa...
- **H04N5/00** Details of television systemsscanning details or combination thereof wit...
- **G06F9/00** Arrangements for programme control, e.g. control unitprogramme control f...
- **G06F13/00** Interconnection of, or transfer of information or other signals between,...
- **H05K7/00** Constructional details common to different types of electric apparatus
- **G06F11/00** Error detection
- **G09G3/00** Control arrangements or circuits, of interest only in connection with vi...
- **G09G5/00** Control arrangements or circuits for visual indicators common to cathode...
- **H01H13/00** Switches having rectilinearly-movable operating part or parts adapted fo...
- **H01L29/00** Semiconductor devices adapted for rectifying, amplifying, oscillating or...
- **H01L27/00** Devices consisting of a plurality of semiconductor or other solid state ...
- **H04L12/00** Data switching networks

Field Analysis

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Field analysis on 2123 patents

Comment Export Delete Close

Company IPC Link analysis

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Company IPC Link analysis on 2123 patents

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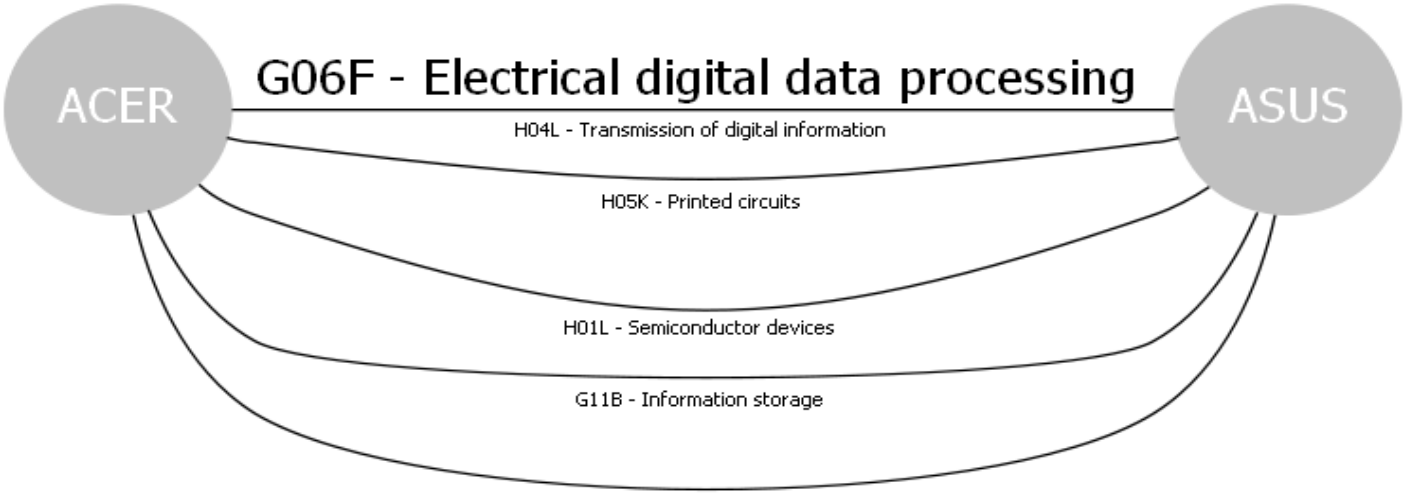

Evolutionary potential analysis

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Evolutionary potential analysis on 2123 patents

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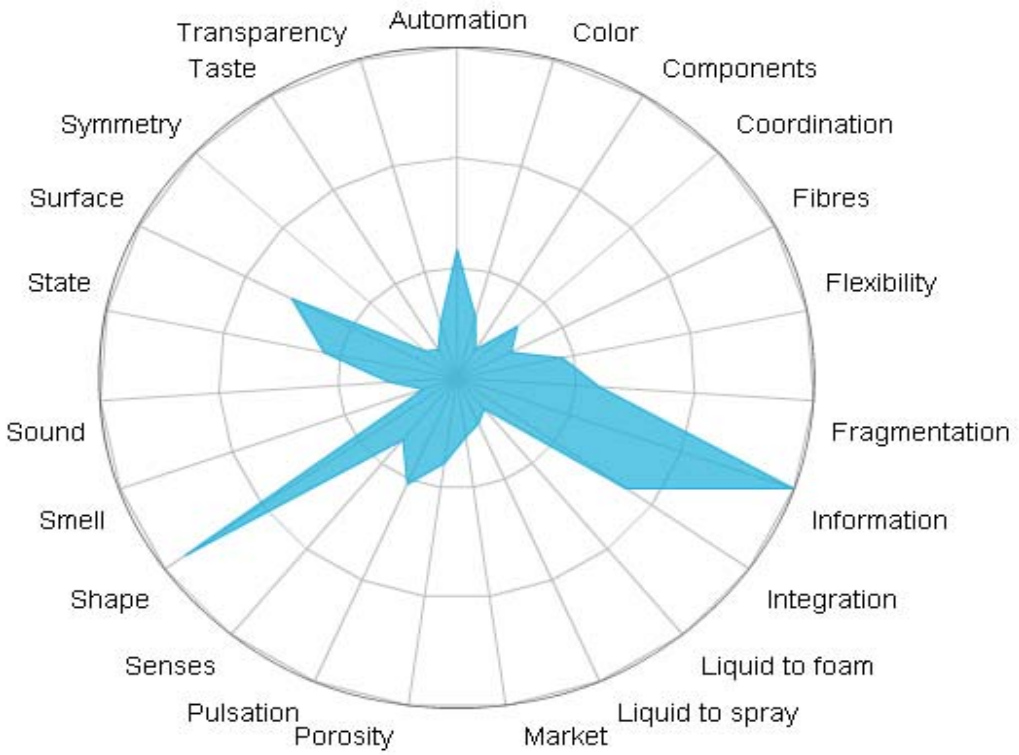

Value Equation analysis

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Value Equation analysis on 2123 patents

Comment Export Delete Close

$$Value=P-(H+I+C)$$

performance	*harm*	*interface*	*cost*
short channel effect	complication	automatic operation	power consumption
control	counterweight beam	stability	life
signal	discharge	increase	unnecessary power consumption
auxiliary electrode	adverse effects of noise	instability	cost of circuit
block of signals	circuit	instability of backpressure	generated light
computer system from a single processor system	coupling member	mis operation of another function button	service life
edges	fluid flow	self-aligned	
inadvertent opening	heat loss	self-erase	
internal backpressure	such effects	self-contained	
multiplication of clock signal	viruses	self-diagnostic	
oxide layer	bulging	self-align	
second arm portion	creel improper distortion	self-elasticity	
through hole	detachment resistant capability	self-replication	
tracking loop gain	errors	self-shrinking	
transmission rate	expansion	self-test	
abrupt changes of image brightness	gate wrap around	self-biased	
	ink leakage from the print	self-luminant	

創意思考與應用

1. Value and function

What VALUES do we want?

2. Out of the box in time and space:

What RESOURCES do we have?

3. Analogy across domains

Where do we look for INSPIRATION?

4. Variation of properties for new or improved functions

What do we change, what do we GAIN?

TRIZ手法

- 問題求解的技法
  - 理想化（Ideality， 1956）
  - 進化模式（Patterns of Evaluation， 1969-1985）
  - 矛盾、衝突（Contradiction）
    - 技術矛盾：39個參數及40個原理（1956-1971）
    - 物理矛盾（1979）
  - 物質-場的分析（Substance-Field Analysis， 1974-1979）

- ARIZ(創新求解問題的方法)（1959-1985）

What CREAX can offer?

- 具重覆性、制式化的研發流程
- 系統化的問題分析解決工具
- 協助找出關鍵的問題點
- 在思考創意過程中提供更多且即時的輔助資源
- 簡易操作介面、擁有多種圖示化及動畫範例之TRIZ工具
- 適合從事TRIZ教學、初學者及從事創新研發人員所採用。

創意思考與應用

CREAX

問題解決流程

問題定義

- 問題描述(Problem description)
- 限制(Constraints)
- 資源(Resource)
- 問題再定義(Redefinition)
- 系統模型(System model)

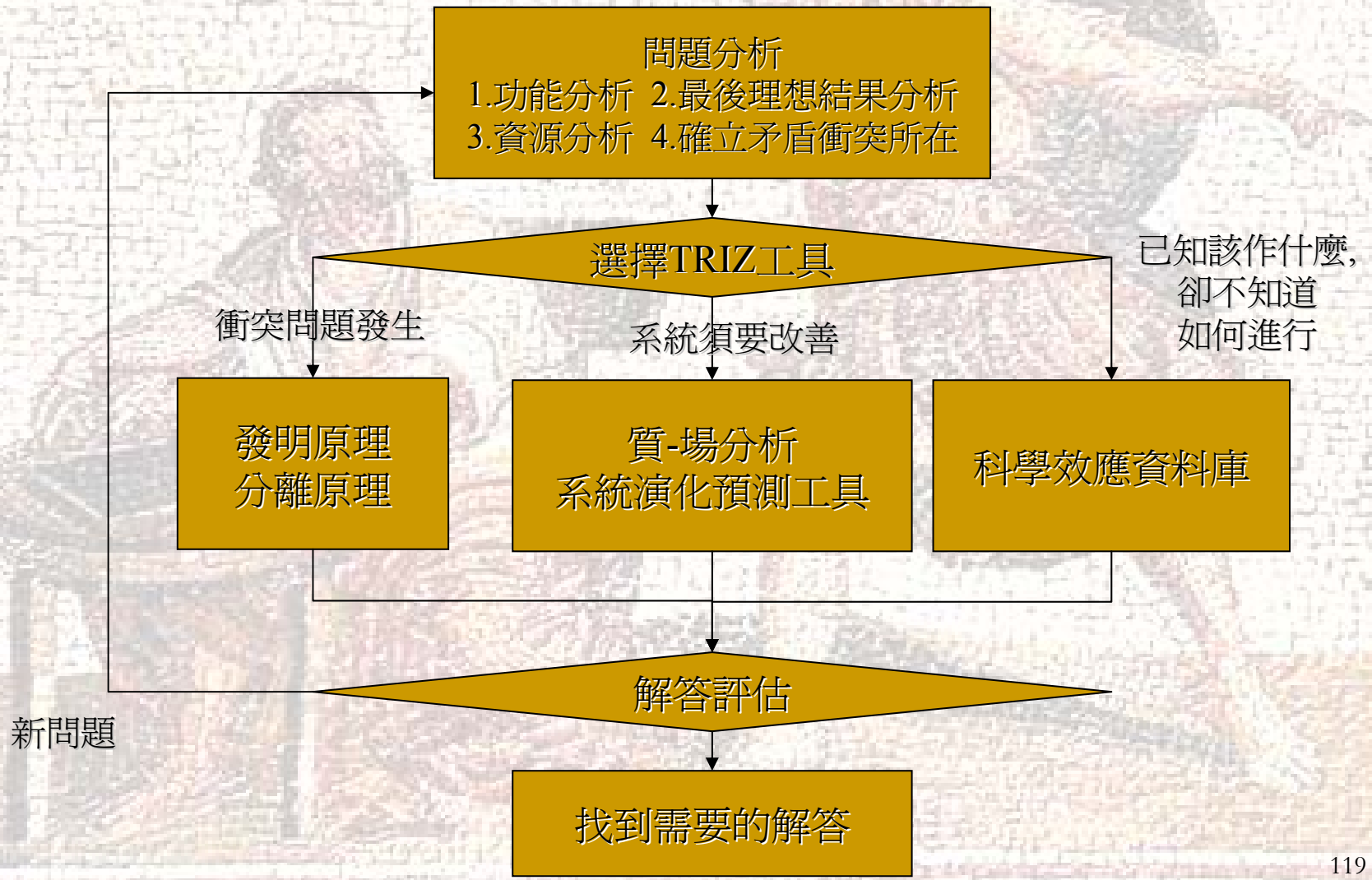
解決問題

- 理想化(Ideality)
- 選擇工具(Select Tools)
- 衝突矩陣(Contradiction)
- 發明原則 (Principles)
- 質場分析(Su-Field Analysis)
- 演進趨勢圖(Trend of Evolution)
- 演進潛能圖 (Evolutionary Potential)
- 知識搜尋工具(Knowledge)
- 科學效應資料庫 (Functional Databaes)

評估

- 創意管理簿(Idea Manager) & 報告(Report)
- 評估(Evaluate)

TRIZ解題流程圖


問題分析
1.功能分析 2.最後理想結果分析
3.資源分析 4.確立矛盾衝突所在
選擇TRIZ工具
衝突問題發生
系統須要改善
已知該作什麼,
卻不知道
如何進行
發明原理
分離原理
質-場分析
系統演化預測工具
科學效應資料庫
解答評估
新問題
找到需要的解答

創新手法TRIZ的分析手法：
矛盾矩陣表分析

(1) 矛盾定義

- 技術矛盾：要改進一參數特性，造成另一參數特性惡化
- 物理矛盾：同一參數特性相互矛盾
  - “起飛時”和“飛行時”的起落架 （矛盾）

    ➔利用時間將矛盾分離

TRIZ的矛盾技法

- 物理矛盾
  - 利用時間將矛盾分離
  - 利用空間將矛盾分離
- 技術矛盾:矛盾矩陣
  - 利用39個參數
  - 透過 Contradictions Table衝突表
  - 40個發明原則(Principles)

39 個工程參數

39 個工程參數：

1.移動件重量
2.固定件重量
3.移動件長度
4.固定件長度
5.移動件面積
6.固定件面積
7.移動件體積
8.固定件體積
9.速度
10.力量
11.應力或壓力
12.形狀
13.物體組成的穩定性
14.強度
15.移動物件耐久性
16.固定物件耐久性
17.溫度
18.亮度
19.移動件消耗能量
20.固定件消耗能量
21.動力
22.能源損失
23.物質損失
24.資訊損失
25.時間損失
26.物質數量
27.可靠度
28.量測精確度
29.製造精密度
30.影響物體之有害因子
31.物體產生之有害因子
32.製造容易性
33.操作容易性
34.維修容易性
35.可適性與多功性
36.裝置複雜性
37.偵測與量測之困難度
38.自動化程度
39.生產力

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40 個發明原則

40 項發明原則：

1. 分割
2. 分離抽出
3. 局部品質
4. 非對稱性
5. 整合
6. 多功能性
7. 重疊放置
8. 反重力
9. 預先反作用
10. 預先作用
11. 預先補救
12. 均衡潛能
13. 反置
14. 球型-曲率
15. 動態性
16. 不完全或過量作動
17. 其他維度
18. 機械振動
19. 週期性動作
20. 連續性的有用動作
21. 快速作動
22. 轉變害處爲益處
23. 回饋
24. 中間介質
25. 自我服務
26. 複製
27. 便宜且用後即丟
28. 取代機械系統
29. 氣壓或液壓
30. 可撓性薄板或薄膜
31. 使用多孔性材料
32. 改變顏色
33. 均質性
34. 丟棄與回收
35. 改變參數
36. 相變化
37. 熱膨脹
38. 使用強氧化劑
39. 惰性氣體
40. 複合材料

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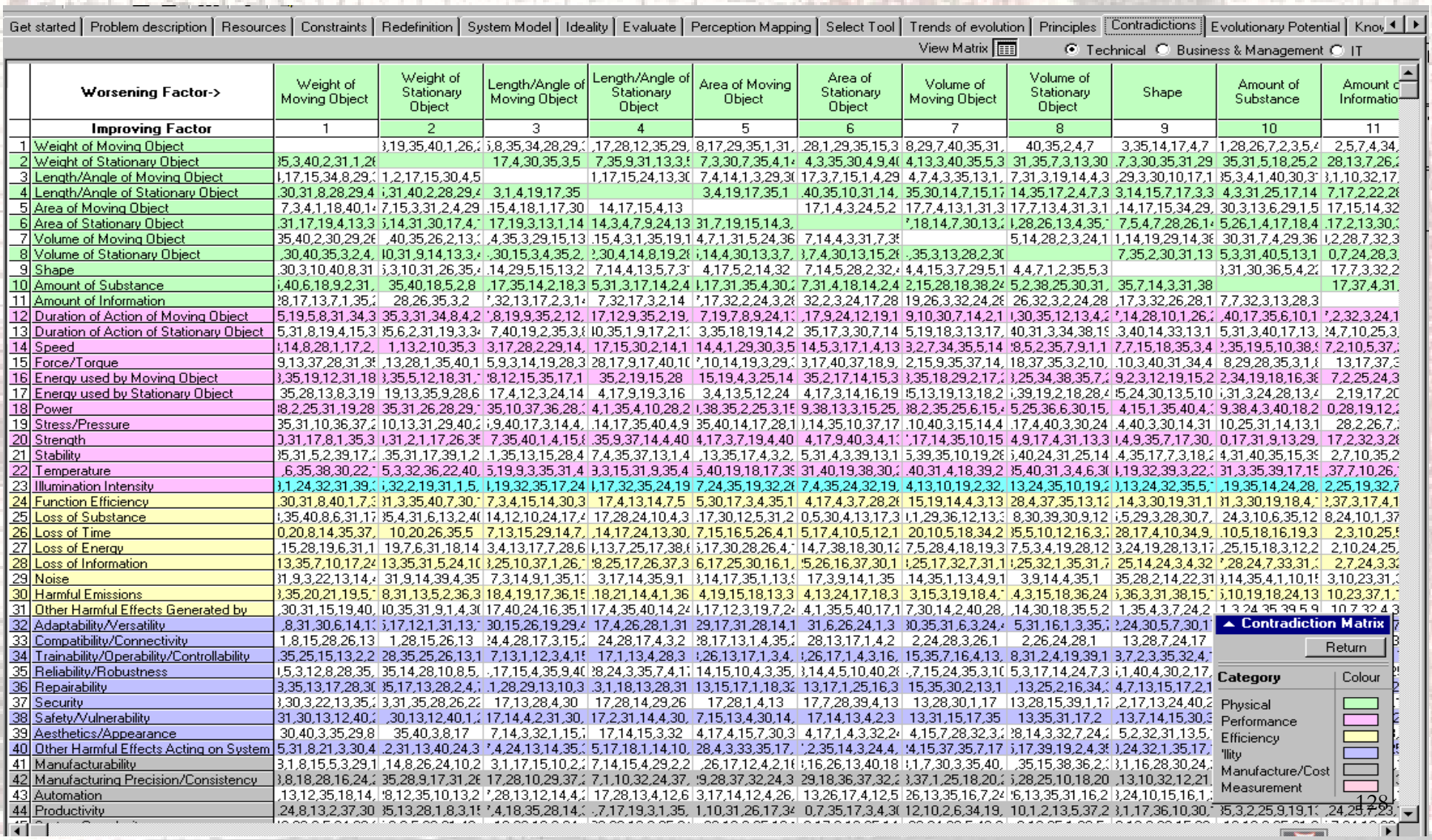
Matrix 2003
技術衝突矩陣

創意思考與應用

註：Matrix 2003 衝突矩陣



Get started | Problem description | Resources | Constraints | Redefinition | System Model | Ideality | Evaluate | Perception Mapping | Select Tool | Trends of evolution | Principles | Contradictions | Evolutionary Potential | Knov

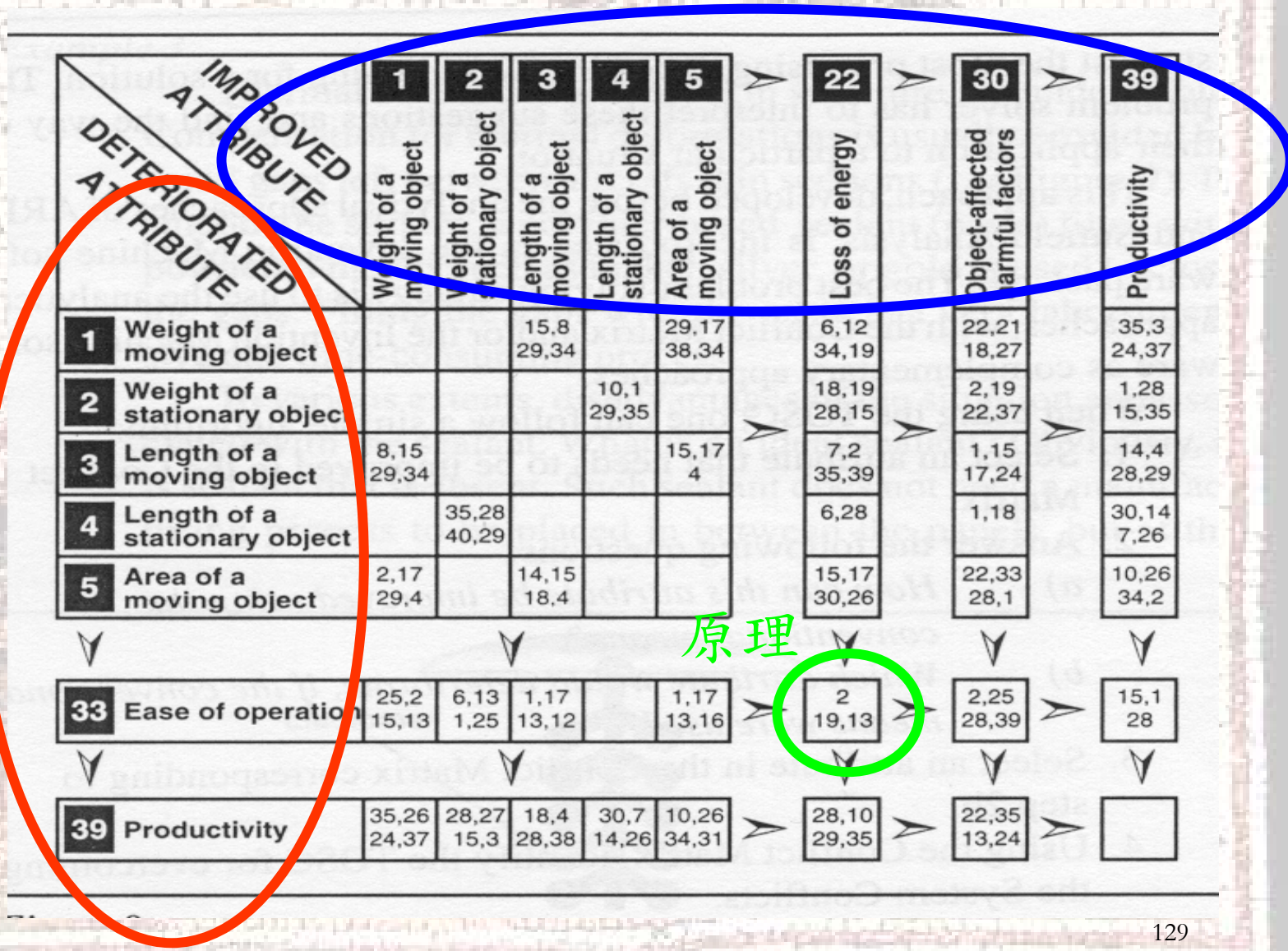
View Matrix | Technical | Business & Management | IT

	Worsening Factor->	Weight of Moving Object	Weight of Stationary Object	Length/Angle of Moving Object	Length/Angle of Stationary Object	Area of Moving Object	Area of Stationary Object	Volume of Moving Object	Volume of Stationary Object	Shape	Amount of Substance	Amount of Information
	Improving Factor	1	2	3	4	5	6	7	8	9	10	11
1	Weight of Moving Object		3,19,35,40,1,26,	5,8,35,34,28,29,	,17,28,12,35,29,	8,17,29,35,1,31,	,28,1,29,35,15,3	8,29,7,40,35,31,	40,35,2,4,7	3,35,14,17,4,7	1,28,26,7,2,3,5,	2,5,7,4,34,
2	Weight of Stationary Object	35,3,40,2,31,1,2		17,4,30,35,3,5	7,35,9,31,13,3,	7,3,30,7,35,4,1	4,3,35,30,4,9,4	4,13,3,40,35,5,3	31,35,7,3,13,30	7,3,30,35,31,29	35,31,5,18,25,2	28,13,7,26,
3	Length/Angle of Moving Object	1,17,15,34,8,29,	1,2,17,15,30,4,5		1,17,15,24,13,3(	7,4,14,1,3,29,3(	17,3,7,15,1,4,29	4,7,4,3,35,13,1,	7,31,3,19,14,4,3	,29,3,30,10,17,1	35,3,4,1,40,30,3	3,1,10,32,17,
4	Length/Angle of Stationary Object	,30,31,8,28,29,4	1,31,40,2,28,29,	3,1,4,19,17,35		3,4,19,17,35,1	40,35,10,31,14,	35,30,14,7,15,17	14,35,17,2,4,7,3	3,14,15,7,17,3,3	4,3,31,25,17,14	7,17,2,22,2
5	Area of Moving Object	7,3,4,1,18,40,1	7,15,3,31,2,4,29	,15,4,18,1,17,30	14,17,15,4,13		17,1,4,3,24,5,2	17,7,4,13,1,31,3	17,7,13,4,31,3,1	,14,17,15,34,29,	30,3,13,6,29,1,5	17,15,14,32
6	Area of Stationary Object	,31,17,19,4,13,3	3,14,31,30,17,4,	17,19,3,13,1,14	14,3,4,7,9,24,13	31,7,19,15,14,3,		,18,14,7,30,13,	1,28,26,13,4,35,	7,5,4,7,28,26,1	5,26,1,4,17,18,4	17,2,13,30,
7	Volume of Moving Object	35,40,2,30,29,2	,40,35,26,2,13,	4,35,3,29,15,13	,15,4,3,1,35,19,1	4,7,1,31,5,24,36	7,14,4,3,31,7,3		5,14,28,2,3,24,1	1,14,19,29,14,3	30,31,7,4,29,36	1,2,28,7,32,3
8	Volume of Stationary Object	,30,40,35,3,2,4,	0,31,9,14,13,3,	,30,15,3,4,35,2,	2,30,4,14,8,19,2	1,14,4,30,13,3,7,	3,7,4,30,13,15,2	,35,3,13,28,2,3		7,35,2,30,31,13	5,3,31,40,5,13,1	0,7,24,28,3,
9	Shape	,30,3,10,40,8,31	5,3,10,31,26,35,	,14,29,5,15,13,2	7,14,4,13,5,7,3	4,17,5,2,14,32	7,14,5,28,2,32,	4,4,15,3,7,29,5,1	4,4,7,1,2,35,5,3		3,31,30,36,5,4,2	17,7,3,32,2
10	Amount of Substance	1,40,6,18,9,2,31,	35,40,18,5,2,8	,17,35,14,2,18,3	5,31,3,17,14,2,4	1,17,31,35,4,30,	7,31,4,18,14,2,4	2,15,28,18,38,2	5,2,38,25,30,31,	35,7,14,3,31,38		17,37,4,31,
11	Amount of Information	28,17,13,7,1,35,	28,26,35,3,2	,32,13,17,2,3,1	7,32,17,3,2,14	,17,32,2,24,3,2	32,2,3,24,17,28	19,26,3,32,24,2	26,32,3,2,24,28	,17,3,32,26,28,1	7,7,32,3,13,28,3	
12	Duration of Action of Moving Object	5,19,5,8,31,34,3	35,3,31,34,8,4,2	,8,19,9,35,2,12,	17,12,9,35,2,19,	7,19,7,8,9,24,1	,17,9,24,12,19,1	9,10,30,7,14,2,1	1,30,35,12,13,4,2	,14,28,10,1,26,	,40,17,35,6,10,1	,2,32,3,24,1
13	Duration of Action of Stationary Object	5,31,8,19,4,15,3	35,6,2,31,19,3,3	7,40,19,2,35,3,8	10,35,1,9,17,2,1	3,35,18,19,14,2	35,17,3,30,7,14	5,19,18,3,13,17,	40,31,3,34,38,19	,3,40,14,33,13,1	5,31,3,40,17,13,	4,7,10,25,3,
14	Speed	1,14,8,28,1,17,2,	1,13,2,10,35,3	3,17,28,2,29,14,	17,15,30,2,14,1	14,4,1,29,30,3,5	14,5,3,17,1,4,13	3,2,7,34,35,5,14	8,5,2,35,7,9,1,1	7,7,15,18,35,3,4	2,35,19,5,10,38,	7,2,10,5,37,
15	Force/Torque	9,13,37,28,31,3	,13,28,1,35,40,1	5,9,3,14,19,28,3	28,17,9,17,40,1(	,10,14,19,3,29,	3,17,40,37,18,9,	2,15,9,35,37,14,	18,37,35,3,2,10,	,10,3,40,31,34,4	8,29,28,35,3,1,	13,17,37,
16	Energy used by Moving Object	3,35,19,12,31,18	3,35,5,12,18,31,	8,12,15,35,17,1	35,2,19,15,28	15,19,4,3,25,14	35,2,17,14,15,3	3,35,18,29,2,17,	3,25,34,38,35,7,	9,2,3,12,19,15,2	2,34,19,18,16,3(	7,2,25,24,3
17	Energy used by Stationary Object	35,28,13,8,3,19	19,13,35,9,28,6	17,4,12,3,24,14	4,17,9,19,3,16	3,4,13,5,12,24	4,17,3,14,16,19	5,13,19,13,18,2	,39,19,2,18,28,	5,24,30,13,5,10	,31,3,24,28,13,	2,19,17,2(
18	Power	8,2,25,31,19,28	35,31,26,28,29,	35,10,37,36,28,	4,1,35,4,10,28,2	1,38,35,2,25,3,1	9,38,13,3,15,25,	8,2,35,25,6,15,	5,25,36,6,30,15,	4,15,1,35,40,4,	9,38,4,3,40,18,2	0,28,19,12,
19	Stress/Pressure	35,31,10,36,37,	10,13,31,29,40,	9,40,17,3,14,4,	,14,17,35,40,4,9	35,40,14,17,28,1	0,14,35,10,37,17	,10,40,3,15,14,4	,17,4,40,3,30,24	4,40,3,30,14,31	10,25,31,14,13,1	28,2,26,7,
20	Strength	0,31,17,8,1,35,3	1,31,2,1,17,26,3	7,35,40,1,4,15,	35,9,37,14,4,40	4,17,3,7,19,4,40	4,17,9,40,3,4,1	,17,14,35,10,15	4,9,17,4,31,13,3	1,4,9,35,7,17,30,	0,17,31,9,13,29,	17,2,32,3,2
21	Stability	35,31,5,2,39,17,	,35,31,17,39,1,2	,1,35,13,15,28,4	7,4,35,37,13,1,4	,13,35,17,4,3,2,	5,31,4,3,39,13,1	5,39,35,10,19,2(	3,40,24,31,25,14	,4,35,17,7,3,18,	4,31,40,35,15,3(	2,7,10,35,2
22	Temperature	,6,35,38,30,22,	5,3,32,36,22,40,	5,19,9,3,35,31,4	3,3,15,31,9,35,4	5,40,19,18,17,3(	31,40,19,38,30,	,40,31,4,18,39,2	35,40,31,3,4,6,3(	1,19,32,39,3,22,	31,3,35,39,17,15	,37,7,10,26,
23	Illumination Intensity	1,1,24,32,31,39,	1,32,2,19,31,1,5,	1,19,32,35,17,24	1,17,32,35,24,19	7,24,35,19,32,2(	7,4,35,24,32,19,	4,13,10,19,2,32,	13,24,35,10,19,2	1,13,24,32,35,5,	,19,35,14,24,28,	2,25,19,32,7
24	Function Efficiency	,30,31,8,40,1,7,3	31,3,35,40,7,30,	7,3,4,15,14,30,3	17,4,13,14,7,5	5,30,17,3,4,35,1	4,17,4,3,7,28,2(	15,19,14,4,3,13	28,4,37,35,13,12	,14,3,30,19,31,1	31,3,30,19,18,4,	2,37,3,17,4,1
25	Loss of Substance	1,35,40,8,6,31,17	35,4,31,6,13,2,4(	14,12,10,24,17,4	17,28,24,10,4,3	,17,30,12,5,31,2	0,5,30,4,13,17,3	1,1,29,36,12,13,	8,30,39,30,9,12	5,29,3,28,30,7,	24,3,10,6,35,12	8,24,10,1,37
26	Loss of Time	0,20,8,14,35,37,	10,20,26,35,5	7,13,15,29,14,7,	,14,17,24,13,30,	7,15,16,5,26,4,1	5,17,4,10,5,12,1	20,10,5,18,34,2	35,5,10,12,16,3,	28,17,4,10,34,9,	,10,5,18,16,19,3	2,3,10,25,5
27	Loss of Energy	,15,28,19,6,31,1	19,7,6,31,18,14	3,4,13,17,7,28,6	1,13,7,25,17,38,	5,17,30,28,26,4,	14,7,38,18,30,12	7,5,28,4,18,19,3	7,5,3,4,19,28,12	3,24,19,28,13,17	,25,15,18,3,12,2	2,10,24,25,
28	Loss of Information	13,35,7,10,17,24	13,35,31,5,24,10	3,25,10,37,1,26,	8,25,17,26,37,3	6,17,25,30,16,1,	5,26,16,37,30,1	1,25,17,32,7,31,1	1,25,32,1,35,31,7	25,14,24,3,4,32	,28,24,7,33,31,	2,7,24,3,3
29	Noise	1,9,3,22,13,14,	31,9,14,39,4,35	7,3,14,9,1,35,1(	3,17,14,35,9,1	3,14,17,35,1,13,	17,3,9,14,1,35	,14,35,1,13,4,9,1	3,9,14,4,35,1	35,28,2,14,22,31	3,14,35,4,1,10,15	3,10,23,31,
30	Harmful Emissions	3,35,20,21,19,5,	8,31,13,5,2,36,3	18,4,19,17,36,15	,18,21,14,4,1,36	4,19,15,18,13,3	4,13,24,17,18,3	3,15,3,19,18,4,	,4,3,15,18,36,24	3,36,3,31,38,15,	5,10,19,18,24,13	10,23,37,1,
31	Other Harmful Effects Generated by	,30,31,15,19,40,	0,35,31,9,1,4,3(	17,40,24,16,35,1	17,4,35,40,14,2(	1,17,12,3,19,7,2(	4,1,35,5,40,17,1	7,30,14,2,40,28,	,14,30,18,35,5,2	1,35,4,3,7,24,2	1,3,24,35,39,5,9	10,7,32,4,3
32	Adaptability/Versatility	,8,31,30,6,14,1(	3,17,12,1,31,13,	30,15,26,19,29,(	17,4,26,28,1,31	29,17,31,28,14,1	31,6,26,24,1,3	0,35,31,6,3,24,(	5,31,16,1,3,35,	3,24,30,5,7,30,1	Contradiction Matrix	
33	Compatibility/Connectivity	1,8,15,28,26,13	1,28,15,26,13	4,4,28,17,3,15,	24,28,17,4,3,2	8,17,13,1,4,35,	28,13,17,1,4,2	2,24,28,3,26,1	2,26,24,28,1	13,28,7,24,17	Return	
34	Trainability/Operability/Controllability	,35,25,15,13,2,2	28,35,25,26,13,1	7,13,1,12,3,4,1(	17,1,13,4,28,3	1,26,13,17,1,3,4,	1,26,17,1,4,3,16,	15,35,7,16,4,13,	8,31,2,4,19,39,1	3,7,2,3,35,32,4,	Category	Colour
35	Reliability/Robustness	1,5,3,12,8,28,35,	35,14,28,10,8,5,	,17,15,4,35,9,40	8,24,3,35,7,4,1(	14,15,10,4,3,35,	3,14,4,5,10,40,2(	,7,15,24,35,3,10	5,3,17,14,24,7,3	1,40,4,30,2,17,	Physical	
36	Repairability	3,35,13,17,28,3(	35,17,13,28,2,4,	,1,28,29,13,10,3	3,1,18,13,28,31	13,15,17,1,18,32	13,17,1,25,16,3	15,35,30,2,13,1	,13,25,2,16,34,	4,7,13,15,17,2,1	Performance	
37	Security	3,30,3,22,13,35,	3,31,35,28,26,22	17,13,28,4,30	17,28,14,29,26	17,28,1,4,13	17,7,28,39,4,13	13,28,30,1,17	13,28,15,39,1,17	,2,17,13,24,40,2	Efficiency	
38	Safety/Vulnerability	31,30,13,12,40,	,30,13,12,40,1,	17,14,4,2,31,30,	17,2,31,14,4,30,	7,15,13,4,30,14,	17,14,13,4,2,3	13,31,15,17,35	13,35,31,17,2	,13,7,14,15,30,	'Ility	
39	Aesthetics/Appearance	30,40,3,35,29,8	35,40,3,8,17	7,14,3,32,1,15,	17,14,15,3,32	4,17,4,15,7,30,3	4,17,1,4,3,2,4	4,15,7,28,32,3,	8,14,3,32,7,24,	5,2,32,31,13,5,	Manufacture/Cost	
40	Other Harmful Effects Acting on System	5,31,8,21,3,30,4	,2,31,13,40,24,3	4,24,13,14,35,	5,17,18,1,14,10,	28,4,3,33,35,17,	,2,35,14,3,24,4,	4,15,37,35,7,17	3,17,39,19,2,4,3	1,24,32,1,35,17,	Measurement	
41	Manufacturability	3,1,8,15,5,3,29,1	,14,8,26,24,10,2	3,1,17,15,10,2,	7,14,15,4,29,2,2	,26,17,12,4,2,16	16,26,13,40,18	1,7,30,3,35,40,	,35,15,38,36,2,	3,1,16,28,30,24,		
42	Manufacturing Precision/Consistency	8,18,28,16,24,2	35,28,9,17,31,26	17,28,10,29,37,2	7,1,10,32,24,37,	9,28,37,32,24,3	29,18,36,37,32,2	3,37,1,25,18,20,	3,28,25,10,18,20	,13,10,32,12,21,		
43	Automation	,13,12,35,18,14,	8,12,35,10,13,2	28,13,12,14,4,	17,28,13,4,12,6	3,17,14,12,4,26,	13,26,17,4,12,5	26,13,35,16,7,2(	6,13,35,31,16,2	3,24,10,15,16,1,		
44	Productivity	,24,8,13,2,37,30	35,13,28,1,8,3,1	4,18,35,28,14,	,7,17,19,3,1,35,	1,10,31,26,17,3(	0,7,35,17,3,4,3(	12,10,2,6,34,19,	10,1,2,13,5,37,2	3,1,17,36,10,30,	35,3,2,25,9,19,1	,24,25,7,23,

- 矛盾矩陣
  - 39個參數
  - 40個原理

改善的參數

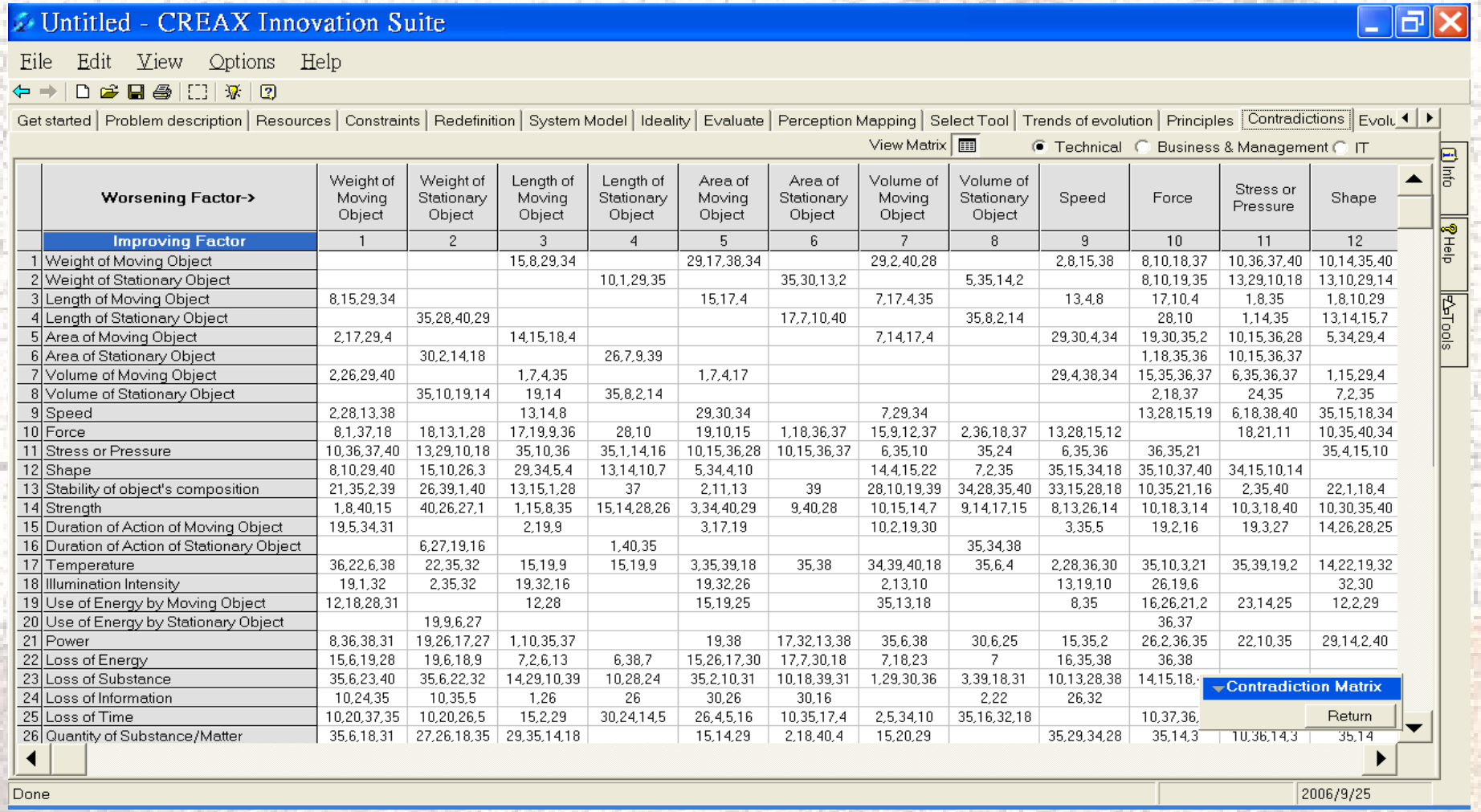
不希望變壞的參數



IMPROVED ATTRIBUTE / DETERIORATED ATTRIBUTE	1 Weight of a moving object	2 Weight of a stationary object	3 Length of a moving object	4 Length of a stationary object	5 Area of a moving object	22 Loss of energy	30 Object-affected harmful factors	39 Productivity
1 Weight of a moving object			15,8 29,34		29,17 38,34	6,12 34,19	22,21 18,27	35,3 24,37
2 Weight of a stationary object				10,1 29,35		18,19 28,15	2,19 22,37	1,28 15,35
3 Length of a moving object	8,15 29,34				15,17 4	7,2 35,39	1,15 17,24	14,4 28,29
4 Length of a stationary object		35,28 40,29				6,28	1,18	30,14 7,26
5 Area of a moving object	2,17 29,4		14,15 18,4			15,17 30,26	22,33 28,1	10,26 34,2
33 Ease of operation	25,2 15,13	6,13 1,25	1,17 13,12		1,17 13,16	2 19,13	2,25 28,39	15,1 28
39 Productivity	35,26 24,37	28,27 15,3	18,4 28,38	30,7 14,26	10,26 34,31	28,10 29,35	22,35 13,24	

原理

創新軟體Creax的矛盾矩陣分析



	Worsening Factor->	Weight of Moving Object	Weight of Stationary Object	Length of Moving Object	Length of Stationary Object	Area of Moving Object	Area of Stationary Object	Volume of Moving Object	Volume of Stationary Object	Speed	Force	Stress or Pressure	Shape
	Improving Factor	1	2	3	4	5	6	7	8	9	10	11	12
1	Weight of Moving Object			15,8,29,34		29,17,38,34		29,2,40,28		2,8,15,38	8,10,18,37	10,36,37,40	10,14,35,40
2	Weight of Stationary Object				10,1,29,35		35,30,13,2		5,35,14,2		8,10,19,35	13,29,10,18	13,10,29,14
3	Length of Moving Object	8,15,29,34				15,17,4		7,17,4,35		13,4,8	17,10,4	1,8,35	1,8,10,29
4	Length of Stationary Object		35,28,40,29				17,7,10,40		35,8,2,14		28,10	1,14,35	13,14,15,7
5	Area of Moving Object	2,17,29,4		14,15,18,4				7,14,17,4		29,30,4,34	19,30,35,2	10,15,36,28	5,34,29,4
6	Area of Stationary Object		30,2,14,18		26,7,9,39						1,18,35,36	10,15,36,37	
7	Volume of Moving Object	2,26,29,40		1,7,4,35		1,7,4,17				29,4,38,34	15,35,36,37	6,35,36,37	1,15,29,4
8	Volume of Stationary Object		35,10,19,14	19,14	35,8,2,14						2,18,37	24,35	7,2,35
9	Speed	2,28,13,38		13,14,8		29,30,34		7,29,34			13,28,15,19	6,18,38,40	35,15,18,34
10	Force	8,1,37,18	18,13,1,28	17,19,9,36	28,10	19,10,15	1,18,36,37	15,9,12,37	2,36,18,37	13,28,15,12		18,21,11	10,35,40,34
11	Stress or Pressure	10,36,37,40	13,29,10,18	35,10,36	35,1,14,16	10,15,36,28	10,15,36,37	6,35,10	35,24	6,35,36	36,35,21		35,4,15,10
12	Shape	8,10,29,40	15,10,26,3	29,34,5,4	13,14,10,7	5,34,4,10		14,4,15,22	7,2,35	35,15,34,18	35,10,37,40	34,15,10,14	
13	Stability of object's composition	21,35,2,39	26,39,1,40	13,15,1,28	37	2,11,13	39	28,10,19,39	34,28,35,40	33,15,28,18	10,35,21,16	2,35,40	22,1,18,4
14	Strength	1,8,40,15	40,26,27,1	1,15,8,35	15,14,28,26	3,34,40,29	9,40,28	10,15,14,7	9,14,17,15	8,13,26,14	10,18,3,14	10,3,18,40	10,30,35,40
15	Duration of Action of Moving Object	19,5,34,31		2,19,9		3,17,19		10,2,19,30		3,35,5	19,2,16	19,3,27	14,26,28,25
16	Duration of Action of Stationary Object		6,27,19,16		1,40,35				35,34,38				
17	Temperature	36,22,6,38	22,35,32	15,19,9	15,19,9	3,35,39,18	35,38	34,39,40,18	35,6,4	2,28,36,30	35,10,3,21	35,39,19,2	14,22,19,32
18	Illumination Intensity	19,1,32	2,35,32	19,32,16		19,32,26		2,13,10		13,19,10	26,19,6		32,30
19	Use of Energy by Moving Object	12,18,28,31		12,28		15,19,25		35,13,18		8,35	16,26,21,2	23,14,25	12,2,29
20	Use of Energy by Stationary Object		19,9,6,27								36,37		
21	Power	8,36,38,31	19,26,17,27	1,10,35,37		19,38	17,32,13,38	35,6,38	30,6,25	15,35,2	26,2,36,35	22,10,35	29,14,2,40
22	Loss of Energy	15,6,19,28	19,6,18,9	7,2,6,13	6,38,7	15,26,17,30	17,7,30,18	7,18,23	7	16,35,38	36,38		
23	Loss of Substance	35,6,23,40	35,6,22,32	14,29,10,39	10,28,24	35,2,10,31	10,18,39,31	1,29,30,36	3,39,18,31	10,13,28,38	14,15,18,		
24	Loss of Information	10,24,35	10,35,5	1,26	26	30,26	30,16		2,22	26,32			
25	Loss of Time	10,20,37,35	10,20,26,5	15,2,29	30,24,14,5	26,4,5,16	10,35,17,4	2,5,34,10	35,16,32,18		10,37,36,		
26	Quantity of Substance/Matter	35,6,18,31	27,26,18,35	29,35,14,18		15,14,29	2,18,40,4	15,20,29		35,29,34,28	35,14,3	10,36,14,3	35,14

範例

- 如何節省用電而不會變暗？
- 矛盾：要改善耗能量(20)，卻會使亮度變 差(18)
- 發明原則：
  - 19：Periodic action
  - 2 ：Extraction
  - 35 ：Transformation properties
  - 32 ：Changing the color

管理衝突的矩陣參數：

1. R&D Spec/Capability/Means
2. R&D Cost
3. R&D Time
4. R&D Risk
5. R&D Interfaces
6. Production Spec/Capability/Means
7. Production Cost
8. Production Time
9. Production Risk
10. Production Interfaces
11. Supply Spec/Capability/Means
12. Supply Cost
13. Supply Time
14. Supply Risk
15. Supply Interface
16. Product Reliability
17. Support Cost
18. Support Time
19. Support Risk
20. Support Interfaces
21. Customer Revenue/Demand/Feedback
22. Amount of Information
23. Communication Flow
24. System affected harmful effects
25. System generated side effects
26. Convenience
27. Adaptability/Versatility
28. System Complexity
29. Control Complexity
30. Tension/Stress
31. Stability

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Creax Business&Management Matrix

A Better Toothbrush.ctz - CREAX Innovation Suite

File Edit View Options Help

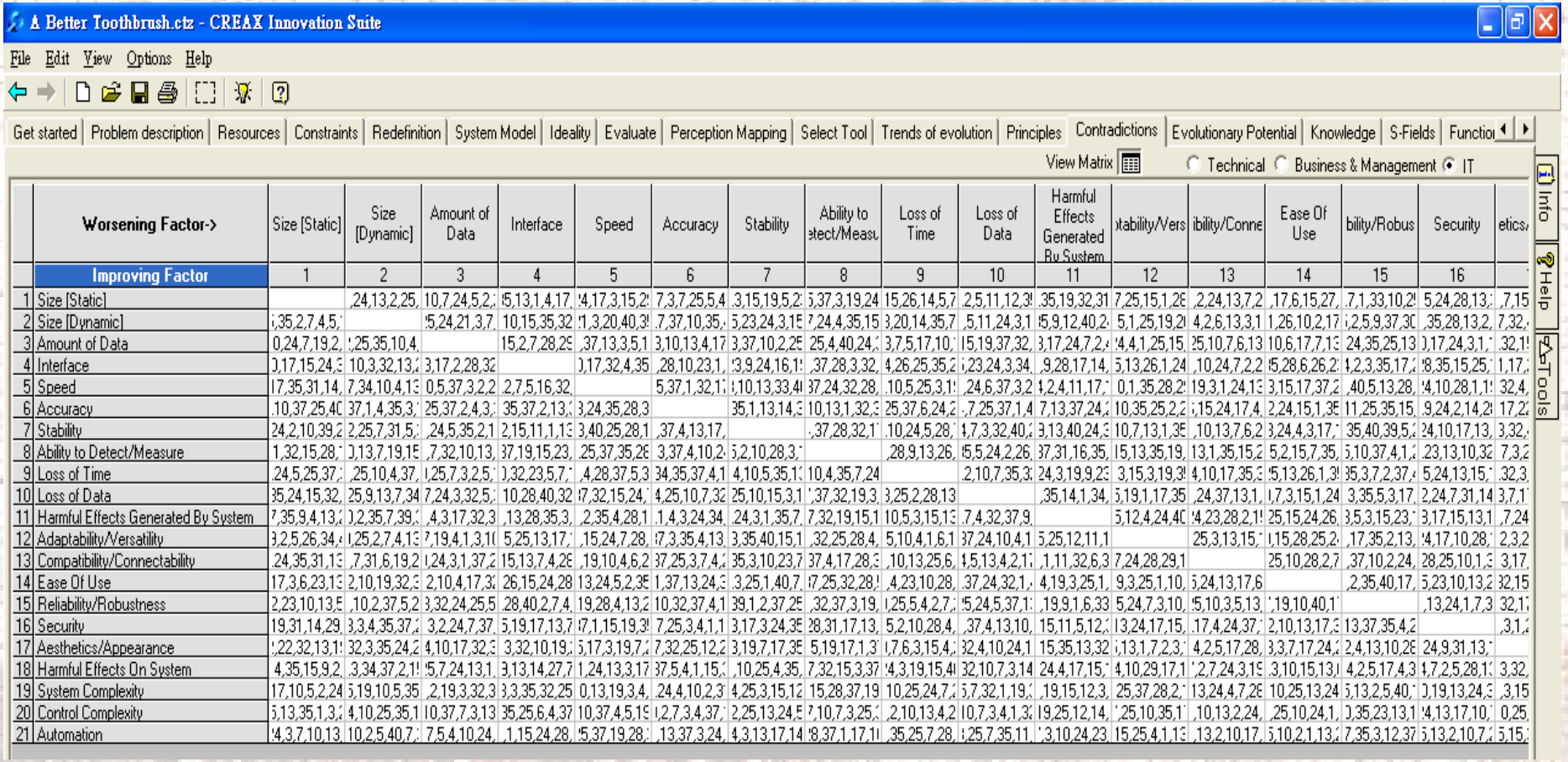
Get started | Problem description | Resources | Constraints | Redefinition | System Model | Ideality | Evaluate | Perception Mapping | Select Tool | Trends of evolution | Principles | Contradictions | Evolutionary Potential | Knowledge | S-Fields | Functio

View Matrix | Technical | Business & Management | IT

Info | Help | Tools

	Worsening Factor->	R&D Spec/ Quality/ Capability	R&D Cost	R&D Time	R&D Risk	R&D Interfaces	Production Spec/ Quality/ Means	Production Cost	Production Time	Production Risk	Production Interfaces	Supply Spec/ Quality/ Means	Supply Cost	Supply Time	Supply Risk	Supply Interfaces	Product Reliability	Su C
	Improving Factor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	R&D Spec/ Quality/ Capability		2,4,15,38	1,38,35,23,1	9,24,23,36,	13,24,33,38,	23,29,35,4	37,35,10,6	35,6,10,20	3,5,10,11	5,37,14	6,2,35	15,6,1,5	2,3,12,26	11,39,30,31	11,26,2,5	36,11,2,35	15,
2	R&D Cost	2,4,15,38		26,34,1	27,9,34	13,26,35,1	5,2,27,1	6,35,1,27,3		6,7,23,26	15,35,25	23,6,11,28				10,38	27,6,1,10	6,1,
3	R&D Time	1,38,35,23,1	26,34,1		1,29,10,11	15,25,35,1	5,6,20,35	5,29,35		6,15,7,37	25,23,35,29	1,6,23,19,1				11,7,40,38	6,10,3,35	7,15
4	R&D Risk	9,24,23,36,	27,9,34	1,29,10,11		,29,15,14,1	4,35,10,3,1	5,35,40,23	5	1,23,39,7,3	7,3,17,23	5,6,35	1,11,2	1,2,11,38		13,22,25	6,1,26,37	1
5	R&D Interfaces	13,24,33,38,	13,26,35,1	15,25,35,1	,29,15,14,1		5,6,17,40,33	15,23,29,5	15,40,23	7,5,3,37	28,40,6,29	6,35,13,14	2,33,3	5,2,35	5,35,13,40	8,40,6,15,2	6,1,3,35	6,7,
6	Production Spec/ Quality/ Means	23,29,35,4	5,2,27,1	5,6,20,35	4,35,10,3,1	5,6,17,40,33		15,25	1,35,21,15	6,27,35,22	3,25,17,35	7,13,22,6	15,35,13,22	35,5,13,22	15,16,3,2	10,25,3,33	35,23,1,24	13,1
7	Production Cost	37,35,10,6	6,35,1,27,3	5,29,35	5,35,40,23	15,23,29,5	15,25		1,24,19,27,3	26,10,1,3	1,24,19,27,3	26,1,37,2	5,2,30,35	5,35,31	2,35	12,3,35,5	1,35,10	
8	Production Time	35,6,10,20			5	15,40,23	1,35,21,15	1,24,19,27,3		3,27,15,6,3,2	15,38,20,27	5,17,16,3	5,2,35	3,10,23,40		23,12,3	1,35,10,38	
9	Production Risk	3,5,10,11	6,7,23,26	6,15,7,37	1,23,39,7,3	7,5,3,37	6,27,35,22	26,10,1,3	3,27,15,6,3,2		5,6,23,20,7	5,25,3,35	5,35,23,25	13,22	5,26,35,2	5,10,40,2,4	13,35,2,15	
10	Production Interfaces	5,37,1,4	15,35,25	25,23,35,29	7,3,17,23	28,40,6,29	3,25,17,35	26,1,37,2	15,38,20,27	5,6,23,20,7		6,2,37,40	5,30	3,35,6,13,17	23,33,5,26,2	33,5,2,26	23,11,40,2	
11	Supply Spec/ Quality/ Means	6,2,35	23,6,11,28	1,6,23,19,1	5,6,35	6,35,13,14	7,13,22,6	5,2,30,35	5,17,16,3	5,25,3,35	6,2,37,40		7,35,19,1	35,1,13,2	7,8,11,10,24	6,30,15,40	11,23,35,1	2
12	Supply Cost	15,6,1,5			1,11,2	2,33,3	15,35,13,22	5,35,31	5,2,35	5,35,23,25	5,30	7,35,19,1		24,38,10,1	27,3,19,24,8	1,28,6,38,4	35,24	
13	Supply Time	2,3,12,26			1,2,11,38	5,2,35	35,5,13,22	2,35	3,10,23,40	13,22	5,35,6,13,17	35,1,13,2	24,38,10,1		10,29,15,13	5,19,3,15		
14	Supply Risk	11,39,30,31				5,35,13,40	15,16,3,2			5,26,35,2	23,33,5,26,2	7,8,11,10,24	27,3,19,24,8	10,29,15,13		5,25,37		
15	Supply Interfaces	11,26,2,5	10,38	11,7,40,38	13,22,25	8,40,6,15,2	10,25,3,33	12,3,35,5	23,12,3	5,10,40,2,4	35,5,2,26	6,30,15,40	1,28,6,38,4	5,19,3,15	5,25,37		10,31,24,35	5,1
16	Product Reliability	36,11,2,35	27,6,1,10	6,10,3,35	6,1,26,37	6,1,3,35	35,23,1,24	1,35,10	1,35,10,38	13,35,2,15	23,11,40,2	11,23,35,1	35,24			10,31,24,35		2
17	Support Cost	15,29,35	6,1,10,25	7,15,40,26	11,7	6,7,40,38	13,10,17,2				23	23,11				5,10,26,1	2,25	
18	Support Time	5,2,6,27	6,1,10,27	7,40,1,26		6,38,20,10	5,6,10,12				23	23,11				29,30,2,5	22,25	5,4,2
19	Support Risk	15,27,40			0,36,6,10,2	5,35,40,13	6,10,2			7,5,3		11,23,24,2			24	5,10,9,2	13,22	27,3
20	Support Interfaces	11,2,5,9,26	6,1,10	6,10,26	6,10,7,26	28,40,6	6,40			5,35,33	40,33,6	23,11,2	24	24,5	5,35	5,6,38,40	28,25,5,7	6,25,
21	Revenue/ Demand/ Feedback from	14,13,22,7	7,25,30,21	19,21,29,3	36,13,25,22	4,7,25,40	15,35,25,3	7,13,1	13,1	13,22	7,5,10,40,4	10,3	2,35,13,25	35,13,25	25,22,2,35	13,25,39,24	28,25,7,22	24,2
22	Amount of Information	37,13,25,39	37,25,28,32	7,2,37,20	1,3,4,10	1,6,3,40	2,15,23,24,1	26,27,25,34	13,15,23	5,25,3,37	2,37,4,13	13,4,28,17	8,35,2,37,3	28,2,32,35	5,37,15,6,32	3,6,37,28,32	10,28,3	28,3
23	Communication Flow	6,25,31,29	6,18,37	26,18,19,4	30,6,31	2,6,35,3	6,2,13,25	6,35,37,18	2,37,18,19	5,38,3,26,1	2,28,3,37,32	5,25,23	35,6,1,27	6,31,16,35	6,16,13,35	2,3,13,4,12	10,28,37,3	25,1
24	System Affected Harmful Effects	11,25,2,26,3	35,27,3,28	26,2,35,24	35,2,15,26,3	3,26,35,28	24,35,13,24	2,35,5,34	22,35,13,24	35,2,26,34	3,26,35,28	13,17,29,2	11,35,2,3	35,3,29,2	2,13,35	3,35,13	7,35,34,2,4	1,35
25	System Generated Harmful Effects	5,29,2,37,1	28,26,2,22,8	6,2,15,19,3	2,3,35,15	1,26,35,37,4	35,22,18,39	1,35,27,10,2	5,22,18,10,2	25,10,39,24	3,26,35,29	0,1,34,35,1	0,35,2,12,3	25,10,29,13	15,19,23,4	2,30,40,22	35,40,24,26,	2,2
26	Convenience	15,35,25,16	25,2,6,5,40	1,2,15,19,28	26,3,11,24	16,13,25	5,28,7,10,1	1,25,2,27	19,2,35,26	3,26,6,11	5,19,28,32	35,3,13,2	30,2,3,5	24,35,28,1	5,16,10,13	5,25,3,40	27,17,40,8	25,1
27	Adaptability/ Versatility	30,25,29,1	35,28,8,1	15,1,35,14,4	1,40,31,28,3	9,37,40,1,1	15,17,2,28,2	1,30,10,38	10,15,30,7	1,40,38,30,3	9,1,17,40,3	13,17,7,15	1,17,40,3	15,1,10,27	15,17,40,3	29,28,30,3	35,13,8,24	17,3
28	System Complexity	17,25,1,19	5,2,35,1	5,6,25,2	28,30,35,1	25,28,1,3	27,26,1,28,	35,5,1,2	25,28,2	25,2,26,5	10,18,28,2	9,30,35,17,	35,19,1,25,2	38,24,16,15	2,4,15,28	28,5,3,37,40	13,35,1	35,
29	Control Complexity	25,15,19,35	5,19,2,37,3	25,28,15,2,6	25,1,3,37,40	6,28,1,3,40	28,1,13,16,	6,3,25,32	25,37,3,13	0,12,25,40,	28,19,15,4	6,5,28,37,3	22,2	28,32,2,37	2,28,15,24	5,8,22,28,3	11,13,2,35	15,2
30	Tension/ Stress	3,2,25,35	1,19,35,27	2,39,24,10	1,23,2,25	35,3,37,32	35,1,3,10,16	1,35,2,25	2,20,25,3	25,9,24,39	3,40,19,1,24	2,23,5,30	10,3,7,40	1,10,15,24	1,19,13	5,3,17,29	11,35,24,19	35,2
31	Stability	36,25,15,29	11,25,27	10,27,35,22	9,1	15,17,36,3,4	3,19,13,11,	10,1,35,27	0,15,29,2,1	9,1	11,25,1,3,4	15,5,10,35	19,3,10	35,3,5,27	9,13,1	3,15,23,17,		1,3

Creax IT Matrix



	Worsening Factor->	Size [Static]	Size [Dynamic]	Amount of Data	Interface	Speed	Accuracy	Stability	Ability to Detect/Measu	Loss of Time	Loss of Data	Harmful Effects Generated By System	tability/Vers	ibility/Conne	Ease Of Use	bility/Robus	Security	etics/
	Improving Factor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	Size [Static]		,24,13,2,25,	10,7,24,5,2,	15,13,1,4,17,	4,17,3,15,2	7,3,7,25,5,4	3,15,19,5,2	5,37,3,19,24	15,26,14,5,7	2,5,11,12,3	35,19,32,31	7,25,15,1,28	2,24,13,7,2	17,6,15,27,	7,1,33,10,2	5,24,28,13,	,7,15
2	Size [Dynamic]	,35,2,7,4,5,		5,24,21,3,7,	10,15,35,32	1,3,20,40,3	7,37,10,35,	5,23,24,3,15	7,24,4,35,15	3,20,14,35,7	5,11,24,3,1	5,9,12,40,2	5,1,25,19,2	4,2,6,13,3,1	1,26,10,2,17	2,5,9,37,30	,35,28,13,2,	7,32,
3	Amount of Data	0,24,7,19,2,	,25,35,10,4,		15,2,7,28,25	,37,13,3,5,1	3,10,13,4,17	3,37,10,2,25	25,4,40,24,	3,7,5,17,10,	15,19,37,32,	3,17,24,7,2,	4,4,1,25,15,	25,10,7,6,13	10,6,17,7,13	24,35,25,13	0,17,24,3,1,	32,1
4	Interface	0,17,15,24,	10,3,32,13,	3,17,2,28,32		0,17,32,4,35	,28,10,23,1,	3,9,24,16,1	,37,28,3,32,	4,26,25,35,2	,23,24,3,34,	,9,28,17,14,	5,13,26,1,24	,10,24,7,2,2	5,28,6,26,2	1,2,3,35,17,	8,35,15,25,	1,17,
5	Speed	17,35,31,14,	7,34,10,4,13	0,5,37,3,2,2	,2,7,5,16,32,		5,37,1,32,1	1,10,13,33,4	37,24,32,28,	,10,5,25,3,1	,24,6,37,3,2	1,2,4,11,17,	0,1,35,28,2	19,3,1,24,13	3,15,17,37,2	,40,5,13,28,	4,10,28,1,1	32,4,
6	Accuracy	,10,37,25,40	37,1,4,35,3,	25,37,2,4,3,	35,37,2,13,	3,24,35,28,3		35,1,13,14,3	10,13,1,32,3	25,37,6,24,2	,7,25,37,1,4	7,13,37,24,	10,35,25,2,2	,15,24,17,4,	2,24,15,1,35	11,25,35,15,	9,24,2,14,2	17,2
7	Stability	24,2,10,39,2	2,25,7,31,5,	,24,5,35,2,1	2,15,11,1,13	3,40,25,28,1	,37,4,13,17,		,37,28,32,1	,10,24,5,28,	4,7,3,32,40,	3,13,40,24,3	10,7,13,1,35	,10,13,7,6,2	3,24,4,3,17,	35,40,39,5,	24,10,17,13,	3,32,
8	Ability to Detect/Measure	1,32,15,28,	0,13,7,19,15	,7,32,10,13,	37,19,15,23,	,25,37,35,26	3,37,4,10,2	5,2,10,28,3,		,28,9,13,26,	5,5,24,2,26,	37,31,16,35,	15,13,35,19,	13,1,35,15,2	5,2,15,7,35,	3,10,37,4,1,	,23,13,10,32	7,3,2
9	Loss of Time	,24,5,25,37,	,25,10,4,37,	1,25,7,3,2,5,	1,32,23,5,7,	,4,28,37,5,3	34,35,37,4,1	4,10,5,35,1	10,4,35,7,24		2,10,7,35,3,	24,3,19,9,23	3,15,3,19,3	4,10,17,35,3	5,13,26,1,3	35,3,7,2,37,	5,24,13,15,	32,3,
10	Loss of Data	35,24,15,32,	25,9,13,7,34	7,24,3,32,5,	10,28,40,32	7,32,15,24,	4,25,10,7,32	25,10,15,3,1	,37,32,19,3,	3,25,2,28,13		,35,14,1,34,	5,19,1,17,35	,24,37,13,1,	1,7,3,15,1,24	3,35,5,3,17,	2,24,7,31,14	3,7,1
11	Harmful Effects Generated By System	7,35,9,4,13,	0,2,35,7,39,	,4,3,17,32,3	,13,28,35,3,	,2,35,4,28,1	1,4,3,24,34,	,24,3,1,35,7	7,32,19,15,1	10,5,3,15,13	,7,4,32,37,9,		5,12,4,24,40	4,23,28,2,1	25,15,24,26,	3,5,3,15,23,	3,17,15,13,1	,7,24
12	Adaptability/Versatility	3,2,5,26,34,	1,25,2,7,4,13	7,19,4,1,3,10	5,25,13,17,	,15,24,7,28,	7,3,35,4,13,	3,35,40,15,1	,32,25,28,4,	5,10,4,1,6,1	37,24,10,4,1	5,25,12,11,1		25,3,13,15,	1,15,28,25,2	,17,35,2,13,	4,17,10,28,	2,3,2
13	Compatibility/Connectability	,24,35,31,13	,7,31,6,19,2	1,24,3,1,37,2	15,13,7,4,28	,19,10,4,6,2	37,25,3,7,4,	35,3,10,23,7	37,4,17,28,3	,10,13,25,6,	4,5,13,4,2,1	,1,11,32,6,3	7,24,28,29,1		25,10,28,2,7	,37,10,2,24,	28,25,10,1,3	3,17,
14	Ease Of Use	17,3,6,23,13	2,10,19,32,3	2,10,4,17,3,	26,15,24,28	13,24,5,2,35	1,37,13,24,3	3,25,1,40,7,	7,25,32,28,1	,4,23,10,28,	,37,24,32,1,	4,19,3,25,1,	9,3,25,1,10,	3,24,13,17,6		,2,35,40,17,	5,23,10,13,2	32,15
15	Reliability/Robustness	2,23,10,13,5	,10,2,37,5,2	3,32,24,25,5	,28,40,2,7,4,	19,28,4,13,2	10,32,37,4,1	39,1,2,37,25	,32,37,3,19,	1,25,5,4,2,7,	5,24,5,37,1,	,19,9,1,6,33	5,24,7,3,10,	5,10,3,5,13,	,19,10,40,1,		,13,24,1,7,3	32,1
16	Security	19,31,14,29,	3,3,4,35,37,	3,2,24,7,37,	5,19,17,13,7	7,1,15,19,3	7,25,3,4,1,1	3,17,3,24,35	28,31,17,13,	5,2,10,28,4,	,37,4,13,10,	15,11,5,12,	13,24,17,15,	,17,4,24,37,	2,10,13,17,3	13,37,35,4,2		,3,1,
17	Aesthetics/Appearance	,22,32,13,1	32,3,35,24,2	4,10,17,32,3	3,32,10,19,	5,17,3,19,7,	7,32,25,12,2	3,19,7,17,35	5,19,17,1,3	1,7,6,3,15,4,	32,4,10,24,1	15,35,13,32	,13,1,7,2,3,	4,2,5,17,28,	3,3,7,17,24,	2,4,13,10,28	24,9,31,13,	
18	Harmful Effects On System	4,35,15,9,2,	,3,34,37,2,1	5,7,24,13,1,	3,13,14,27,7	1,24,13,3,17	37,5,4,1,15,	,10,25,4,35,	7,32,15,3,37	4,3,19,15,4	32,10,7,3,14	24,4,17,15,	4,10,29,17,1	,2,7,24,3,19	3,10,15,13,	4,2,5,17,4,3	1,7,2,5,28,1	3,32,
19	System Complexity	17,10,5,2,24	5,19,10,5,35	,2,19,3,32,3	3,3,35,32,25	0,13,19,3,4,	,24,4,10,2,3	4,25,3,15,12	15,28,37,19	10,25,24,7,	5,7,32,1,19,	,19,15,12,3,	25,37,28,2,	13,24,4,7,28	10,25,13,24	5,13,2,5,40,	0,19,13,24,3	,3,15
20	Control Complexity	5,13,35,1,3,	4,10,25,35,1	10,37,7,3,13	35,25,6,4,37	10,37,4,5,19	1,2,7,3,4,37,	2,25,13,24,5	7,10,7,3,25,	,2,10,13,4,2	10,7,3,4,1,3	19,25,12,14,	,25,10,35,1,	,10,13,2,24,	,25,10,24,1,	0,35,23,13,1	4,13,17,10,	0,25,
21	Automation	4,3,7,10,13,	10,2,5,40,7,	7,5,4,10,24,	,1,15,24,28,	5,37,19,28,	,13,37,3,24,	4,3,13,17,14	8,37,1,17,11	,35,25,7,28,	1,25,7,35,11,	,3,10,24,23,	15,25,4,1,13	,13,2,10,17,	5,10,2,1,13,	7,35,3,12,37	5,13,2,10,7,	5,15,

衝突矩陣於資訊管理
案例分享

案例研究

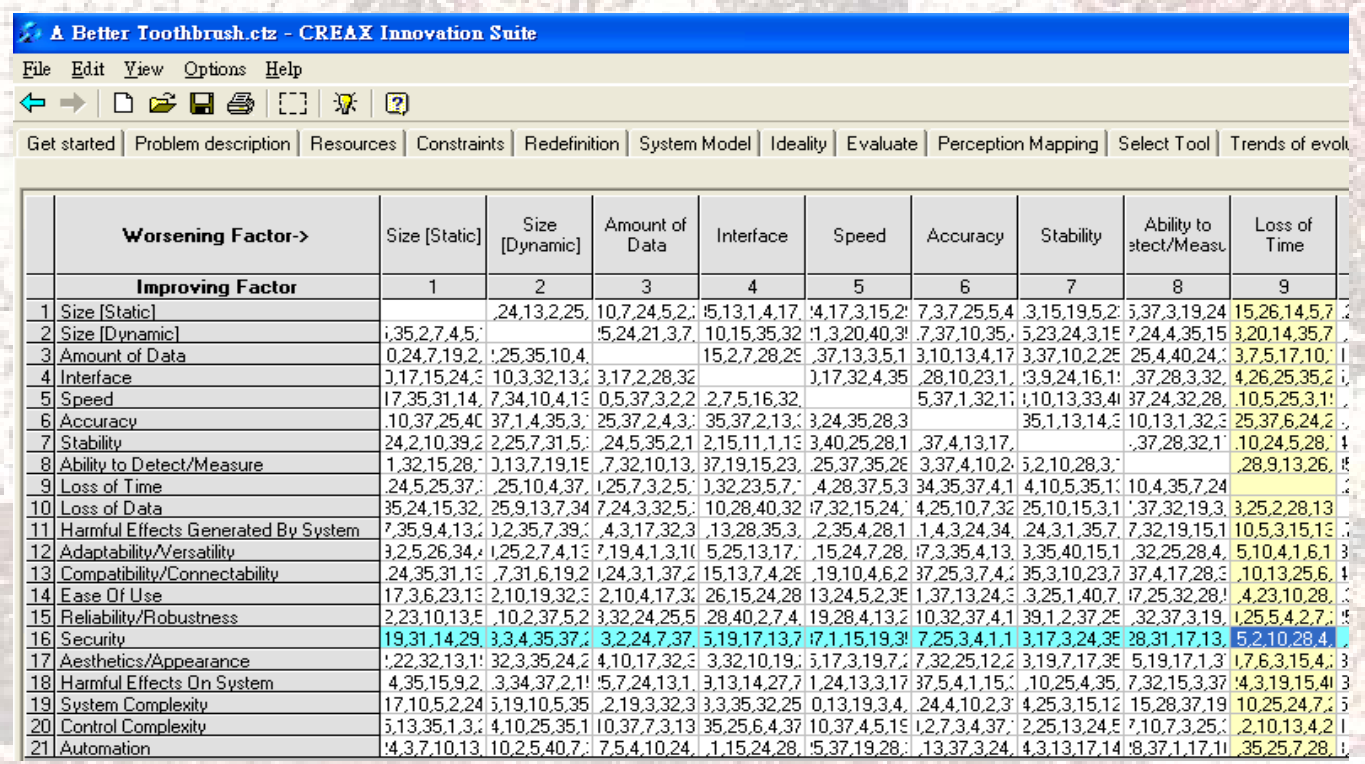
- 一般的會員登入系統：

現況分析

- 現行系統缺點：
  - 帳號密碼易被盜取和入侵(破解密碼程式/機器人)
- 現行系統改善方式
  - 系統管理者需耗費大量的心力/時間來驗證註冊者資訊，由系統管理者判斷註冊者資料是否被入侵

使用TRIZ手法

- 使用矛盾衝突矩陣分析手法：
  - 改善的參數(Improving Factor)：Security
  - 惡化的參數(Worsening Factor)：Loss of time



A Better Toothbrush.ctz - CREAX Innovation Suite

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	Worsening Factor->	Size [Static]	Size [Dynamic]	Amount of Data	Interface	Speed	Accuracy	Stability	Ability to etect/Measu	Loss of Time
	Improving Factor	1	2	3	4	5	6	7	8	9
1	Size [Static]		,24,13,2,25,	10,7,24,5,2,	5,13,1,4,17,	4,17,3,15,2	7,3,7,25,5,4	,3,15,19,5,2	5,37,3,19,24	15,26,14,5,7
2	Size [Dynamic]	,35,2,7,4,5,		5,24,21,3,7,	10,15,35,32	1,3,20,40,3	,7,37,10,35,	5,23,24,3,15	7,24,4,35,15	3,20,14,35,7
3	Amount of Data	0,24,7,19,2,	,25,35,10,4,		15,2,7,28,25	,37,13,3,5,1	3,10,13,4,17	3,37,10,2,25	25,4,40,24,	3,7,5,17,10,
4	Interface	0,17,15,24,3	10,3,32,13,	3,17,2,28,32		0,17,32,4,35	,28,10,23,1,	3,9,24,16,1	,37,28,3,32,	4,26,25,35,2
5	Speed	17,35,31,14,	7,34,10,4,13	0,5,37,3,2,2	,2,7,5,16,32,		5,37,1,32,1	,10,13,33,4	37,24,32,28,	,10,5,25,3,1
6	Accuracy	,10,37,25,40	37,1,4,35,3,	25,37,2,4,3,	35,37,2,13,	3,24,35,28,3		35,1,13,14,3	10,13,1,32,3	25,37,6,24,2
7	Stability	24,2,10,39,2	2,25,7,31,5,	,24,5,35,2,1	2,15,11,1,13	3,40,25,28,1	,37,4,13,17,		,37,28,32,1	,10,24,5,28,
8	Ability to Detect/Measure	1,32,15,28,	0,13,7,19,15	,7,32,10,13,	37,19,15,23,	,25,37,35,26	3,37,4,10,2	5,2,10,28,3,		,28,9,13,26,
9	Loss of Time	,24,5,25,37,	,25,10,4,37,	1,25,7,3,2,5,	0,32,23,5,7,	,4,28,37,5,3	34,35,37,4,1	4,10,5,35,1	10,4,35,7,24	
10	Loss of Data	35,24,15,32,	25,9,13,7,34	7,24,3,32,5,	10,28,40,32	7,32,15,24,	4,25,10,7,32	25,10,15,3,1	,37,32,19,3,	3,25,2,28,13
11	Harmful Effects Generated By System	7,35,9,4,13,	0,2,35,7,39,	,4,3,17,32,3	,13,28,35,3,	,2,35,4,28,1	1,4,3,24,34,	,24,3,1,35,7	7,32,19,15,1	10,5,3,15,13
12	Adaptability/Versatility	3,2,5,26,34,	1,25,2,7,4,13	7,19,4,1,3,10	5,25,13,17,	,15,24,7,28,	7,3,35,4,13,	3,35,40,15,1	,32,25,28,4,	5,10,4,1,6,1
13	Compatibility/Connectability	,24,35,31,13	,7,31,6,19,2	1,24,3,1,37,2	15,13,7,4,28	,19,10,4,6,2	37,25,3,7,4,	35,3,10,23,7	37,4,17,28,3	,10,13,25,6,
14	Ease Of Use	17,3,6,23,13	2,10,19,32,3	2,10,4,17,3,	26,15,24,28	13,24,5,2,35	1,37,13,24,3	3,25,1,40,7,	7,25,32,28,1	,4,23,10,28,
15	Reliability/Robustness	2,23,10,13,5	,10,2,37,5,2	3,32,24,25,5	,28,40,2,7,4,	19,28,4,13,2	10,32,37,4,1	39,1,2,37,25	,32,37,3,19,	1,25,5,4,2,7,
16	Security	19,31,14,29,	3,3,4,35,37,	3,2,24,7,37,	5,19,17,13,7	7,1,15,19,3	7,25,3,4,1,1	3,17,3,24,35	28,31,17,13,	5,2,10,28,4,
17	Aesthetics/Appearance	,22,32,13,1	32,3,35,24,2	4,10,17,32,3	3,32,10,19,	5,17,3,19,7,	7,32,25,12,2	3,19,7,17,35	5,19,17,1,3	1,7,6,3,15,4,
18	Harmful Effects On System	4,35,15,9,2,	3,34,37,2,15	5,7,24,13,1,	3,13,14,27,7	1,24,13,3,17	37,5,4,1,15,	,10,25,4,35,	7,32,15,3,37	4,3,19,15,4
19	System Complexity	17,10,5,2,24	5,19,10,5,35	,2,19,3,32,3	3,3,35,32,25	0,13,19,3,4,	,24,4,10,2,3	4,25,3,15,12	15,28,37,19	10,25,24,7,
20	Control Complexity	5,13,35,1,3,	4,10,25,35,1	10,37,7,3,13	35,25,6,4,37	10,37,4,5,19	1,2,7,3,4,37,	2,25,13,24,5	7,10,7,3,25,	,2,10,13,4,2
21	Automation	4,3,7,10,13,	10,2,5,40,7,	7,5,4,10,24,	,1,15,24,28,	5,37,19,28,	,13,37,3,24,	4,3,13,17,14	8,37,1,17,1	,35,25,7,28,

矛盾衝突矩陣分析手法

- 針對第25個發明原理：Self Service(自我服務)的尋找創新方向/solution

改善後的新會員登入系統

- 利用“自我服務”的創新理念，改善登入方式：
  - 使用者登入時，需輸入隨機產生的驗證碼

改善後的新會員登入系統

- 改善後的優點：
  - 避免破解“密碼程式/機器人”入侵
  - 將驗證登入者的工作，由系統維護者轉由登入者自行來執行，節省了系統維護者大量人力成本