2015 年「問題解決之研究方法(Research Methods for Problems-Solving)」夏令營活動
簡章

一、 **主辦單位**：臺北大學研發處

二、 **協辦單位**：臺北大學都市計畫研究所

三、 **參加對象**：有意願奠定研究基礎之全國各大專院校教師與碩、博士班研究生(含大學部三四年級特優培育學生)為原則。

四、 **活動內容與方式**：為提昇研究能量，特舉辦**『問題解決之「研究方法」（Research Methods for Problems-Solving）』夏令營活動(Summer Camp)**，由本校講座教授**曾國雄教授**(第四屆教育部國家講座、國科會傑出獎三次、國科會特約研究員兩次、暨國科會傑出特約研究獎等)親自主持活動與授課，課程之初會將『「問題解決(Problems-Solving)」之傳統至最新及未來可能發展的**"New Concepts and New Trends of Hybrid MCDM for Tomorrow"『問題解決之「研究方法(Research Methods for Problems-Solving)」』**』以及『如何投稿 SSCI/SCI 論文期刊之技巧與要點』精簡地加以深入淺出的介紹；爾後，邀請明星級師資與並搭配助教群以【個案討論】或【計算方法】或【軟體操作】等方式針對各研究方法進行深入探討，並以實例說明(如以曾國雄教授實際在 SSCI/SCI 期刊刊出之論文為例)，以帶動台灣各大學整體之學術研究風氣與提昇研究能量。一開始聽不懂不用怕，聽下去，多聽幾次，同時必須找題目實做(個案分析為以**【「實務之故事個案(Story Case in Practice)」+「解決問題之研究方法** Research Methods for Problems-Solving）」→**結果表達(Expression of results** 含**「寫作的技巧(Writing Skill)」**與**「講的技巧(Speech Skill)」**)，重點在於基本**邏輯之思考與推理】**)，一直做下去，試著投稿，就會有 SSCI/SCI 的研究成果，但此研究之成果是沒有白吃的午餐，要耐心，是一步一步的達成。

五、 **上課時間**：10:00 至 16:00。

六、 **活動地點**：臺北大學公共事務學院 6F-630 教室。

七、 **課程內容、日期與計畫**：

本次課程主軸為將何以累積多年(四、五十年)的研究經驗(如作業研究、統計與多變量分析、模糊理論與決策、約略集合理論、多評準決策(Multiple Criteria Decision Making, MCDM)，與許多實務研究案等經驗)為問題解決研究奠定基礎理論；曾教授並將 MCDM 分成相互關連之三大類型之「新觀念與新趨勢混合動態多評準決策模型」，基本觀念如下：

(1) **大數據資料處理方法(Data Mining methods for Big Data)**：約略集合 If-then Cause-effect Rule-based 大數據資料處理探勘面之「**多規則性決策(Multiple Rule-based Decision Making, MRDM)**」。本單元適合解決「資料處理」方面之問題進行一系列方法說明，其中包含支援向量機(Support Vector Machine, SVM)、約略集合(Rough set, RST)與 Dominance-based Rough Set Approach (DRSA)，建構結合 DEMATEL 之**因果關聯多規則性(Rule-based) Flow Graph 問題改善 MCDM 模型**。

(2) **多屬性決策方法(Multiple Attribute Decision Making, MADM)**：評估排序、選擇、與改善之「**改良型多屬性決策(Modified Multiple Attribute Decision Making, Modified MADM)**」。本單元適合解決「評估、選擇與改善策略」方面之問題進行一系列方法說明，其中包含屬性關聯性的結構法(DEMATEL)屬性權重訓練法(AHP/ANP/DANP)以及績效評估法，含加法型與非加法型(如 Fuzzy Integral)解決現今實際問題之評估法(Relax 或 Relieve 傳統方法的假設)，如修正式簡單加法型、TOPISIS(問題點)、修正式 VIKOR 法、修正式 Grey Relation Analysis、修正式 ELECTRE、修正式 PROMETHEE 等(如將傳統方案中各準則績效值以 Max-Min 找出相對好(relative good)之標竿值作為績效值整合排序與選擇之用，改為對解決問題的對象(方案可多個也可單一個)找出各準則之「渴望值與最差值(Aspired value and Worst value)」並分析方案各準則績效值距「渴望水準(aspiration level)」的差距或接進度之整合作為排序與選擇的基準，甚至可結合 DEMATEL 影響網路關連圖透過創新與創意找出改善策略使各準則的績效值邁向接近渴望水準。

(3) **多目標決策方法(Multiple Objective Decision Making, MODM)**：規劃面之「**可變空間多目標決策(Multiple Objective Decision Making Based on Changeable Spaces, MODM Based on Changeable Spaces)**」。本單元適合解決「規劃、設計與資源規劃」方面之問題進行一系列方法說明，其中包

含多目標規劃系列之方法、De Novo programming 及可變空間多目標規劃(Changeable spaces with multiple objective programming)，此新方法的基本觀念為思考如何改變「決策空間(decision space)」使「目標空間(objective space)」邁向「渴望水準(aspiration level)」。

以此些方法之理念，對管理等有關之各種領域主題，進行混何式整合性系統之理論與實務應用的社會網路研究(Social Network Analysis)；並且皆以臺灣問題為題材的研究計畫案（含產業合作案、國科會計畫案等）做為實際案例分析，並可將研究成果發表於 SSCI/SCI 國際各知名期刊。

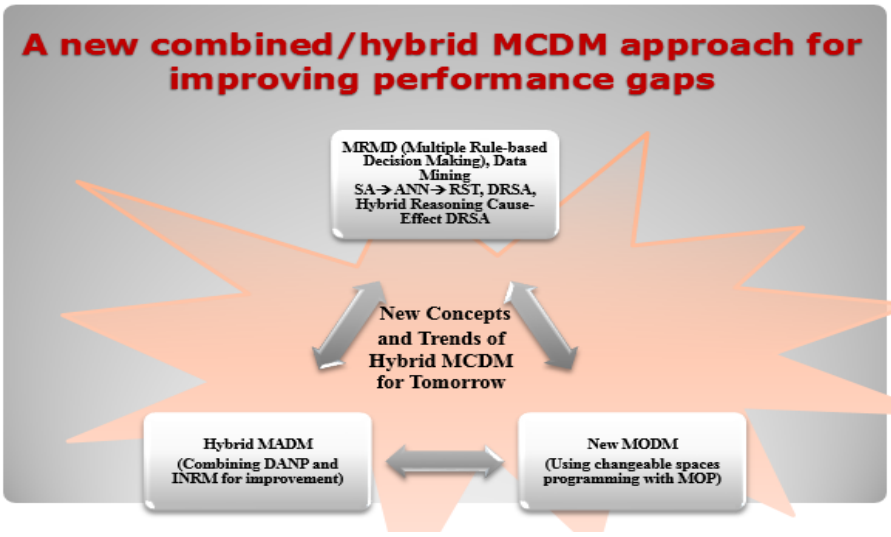


Fig.1. A new combined/hybrid MCDM approach for improving performance

本次課程日期、時間與課程計畫，如下表所示：

日期/星期		時間		
		10:00-12:00	**13:00-15:00**	**15:00-16:00**
Multiple Attribute Decision Making, MADM				
7 月 6 日	一	曾國雄老師講授 (明日的研究方法)	曾國雄老師講授 (MCDM Overview)	**論文發表 (曾老師學生)**
7 月 13 日	一	曾國雄老師講授 (AHP/ANP/DEMATEL/DANP)	曾國雄老師講授 (TOPISIS/VIKOR/Grey Relation)	**論文發表 (曾老師學生)**
7 月 20 日	一	曾國雄老師講授 (Review 與 Fuzzy Integral)	胡曙光老師講授(Fuzzy Integral/加法型績效評估法)	曾老師講授與討論 (該方法之未來)
7 月 27 日	一	**學員論文議題發表與討論**	陳亭羽老師講授 (PROMETHEE/ELECTRE)	曾老師講授與討論 (該方法之未來)
Multiple Objective Decision Making, MODM				
8 月 10 日	一	曾國雄老師講授(多目標規劃/De Novo programming)	丁世展老師講授 (多目標規劃)	曾老師講授與討論 (該方法之未來)
8 月 17 日	一	**學員論文發表與討論(初稿)**	衛萬明老師講授 (AHP 與整數規劃)	曾老師講授與討論 (該方法之未來)
Data Mining method for Big Data				
8 月 24 日	一	曾國雄老師講授 (RST 與 FCA/DRSA)	黃日鉦老師講授 (Data Mining/SVM)	曾老師講授與討論 (該方法之未來)
8 月 31 日	一	劉建浩老師講授 (RST 與 DRSA)	王日昌老師講授 (類神經演算法[分類/分群方法])	曾老師講授與討論 (該方法之未來)
9 月 7 日	一	**學員論文發表與討論(期末)**	沈高毅老師講授(MRDM)	曾國雄老師總結
暫定師資及講座內容，將視實際聯繫情形調整部分內容				

八、報名方式：為統計人數及其他相關作業之進行，欲參加者請至台北大學研發處系統報名網址。

九、備註：

1. **報名截止日期：**2015 年 7 月 3 日(星期五)。
2. **明星師資群：**

姓名	學校/系所	職稱	講座時間
胡曙光	開南大學企業與創業管理學系	助理教授	7 月 20 日
陳亭羽	長庚大學工商管理學系	教授	7 月 27 日
丁世展	臺灣海洋大學運輸科學系	助理教授	8 月 10 日
衛萬明	台北大學不動產與城鄉環境學系	教授	8 月 17 日
劉建浩	台北科技大學工業工程與管理系	教授	8 月 24 日
王日昌	長庚大學資訊管理學系	助理教授	8 月 31 日
黃日鉦	東吳大學資訊管理學系	副教授	8 月 31 日
沈高毅	中國文化大學財務金融系暨研究所	副教授	9 月 7 日
			將視實際聯繫情形調整

3.課程方面有任何問題，請洽聯絡同學，聯絡方式如下：

姓名	系所	年級	電話
黃三麟	台北大學都市計畫研究所	博士班二年級	0922-334-176

4. 助教群：

姓名	系所	年級
王榮薇	台北大學都市計畫研究所	碩士班二年級
楊凱寧	台北大學都市計畫研究所	碩士班一年級

Google Scholar

Gwo-Hshiung Tzeng

Distinguished Chair Professor

Research methods for problems-solving: Data Analysis (crisp sets, fuzzy set theory, rough set theory -> statistics and multivariate analysis, evolutionary computation, soft computing, etc.), multiple criteria decision making (MADM and MODM), and so on for applications in the real world problems

Citation indices	All	Since 2010
Citations	22340	15796
h-index	68	57
i10-index	189	171

Citations to my articles

June 18, 2015:

2009 (1584 times),

2010 (1769 times),

2011 (2641 times),

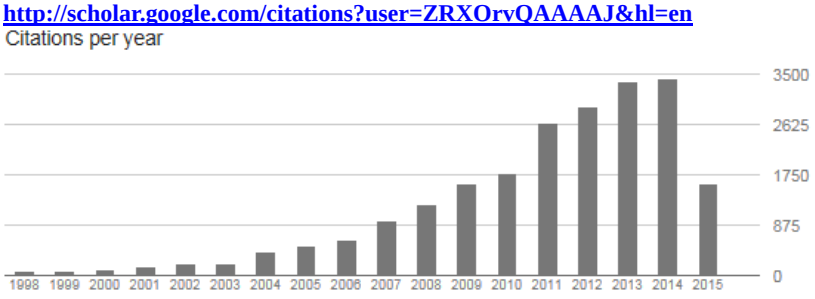
2012 (2922 times),

2013 (3359 times),

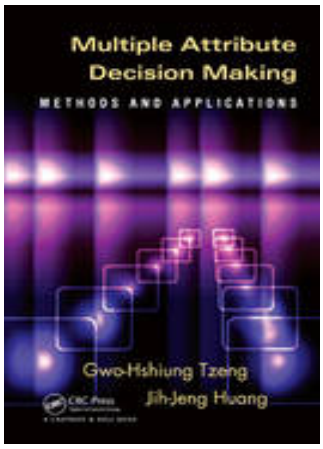
2014 (3417 times),

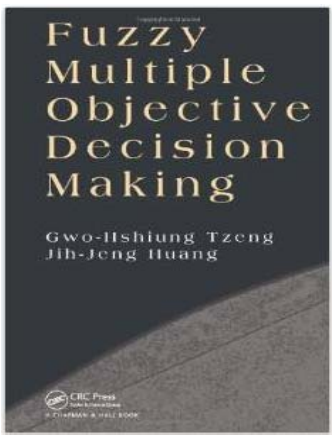
2015 (1593 times).

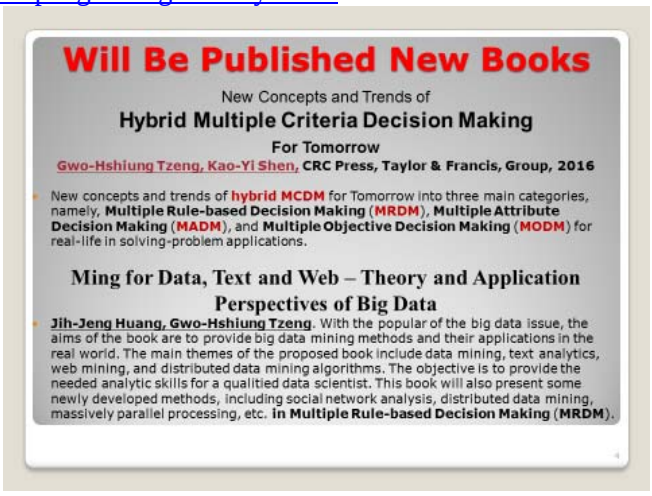
http://scholar.google.com/citations?user=ZRXOrvQAAAAJ&hl=en



http://scholar.google.com/citations?user=ZRXOrvQAAAAJ&hl=en, http://ghtzeng.weebly.com/







本課程包含曾教授提出六項在 MCDM 領域為「解決實際問題」的重要理念，「未來混合式多評準決策之新觀念與新趨勢(New Concepts and Trends of Hybrid MCDM for Tomorrow)」，此可歸納六項之貢獻與特色以淺顯方式說明如下：

(一)因果影響關係 If-then 規則之資料處理與探勘

現實「美好社會生活的追求」、「商業與經濟的活動」、「政府公部門行政的服務」等相互關聯錯綜複雜的環境，在現行『經濟與統計脫離現實(Economics and Statistics are unrealistic in the real world)』之問題的情況下，此問題常讓研究者或決策者難以理出好的頭緒，隨著大數據時代的來臨，更增加了分析的困難度。為解決以上難題，曾教授近期帶領研究團隊開拓新的研究方向，結合柔性計算(Soft Computing)的支配型約略集合演算法(Dominance-Based Rough Set Approach, DRSA)與 MCDM 中多種決策方法(如 DEMATEL, DANP, Modified VIKOR, Changeable Spaces with MOP 等)，嘗試探索複雜現象背後的核心影響變數與交互影響關係，突破傳統研究方法（例如統計分析）的限制，並提供決策者易於理解的規則與邏輯，將學術研究落實到解決並可以改善各種實際上的問題，邁向達到決策者所欲追求的「渴望水準(Aspiration level)」。

(二)所有問題都具有關聯性

過去因為受限於計算工具並不發達，研究中的假設變得十分重要，而所有的問題也都被假設是獨立發生的(獨立性)。但曾教授強調，就實際的層面來說，所有問題的發生都有其關聯性。他以幾年前全球性的金融風暴為例，包括油價上漲而引起建材原料上漲、緊接著房價飆漲，以及後續美國因房貸問題所發生的銀行倒閉事件，甚至延伸至歐洲、亞洲產生全球性的金融危機，足以證明問題與問題之間所引發的是連帶的效應及全面性的影響。因此針對單一問題，需要以全面性的觀點思考。傳統之「『經濟統計』為『脫離現實』」(商業週刊，1102 期 2009.1，p.119)。利用 DEMATEL 法建立影響關聯矩陣圖。

(三)渴望水準(aspiration levels)的追求

曾教授解釋，傳統觀念上，人們所追求的目標都是經過比較值之後所得出的相對「好」，但現在要追求的則應該提升至「渴望水準(aspiration levels)」。我們總是以可見的「最好(好要更好)」來做為自我實踐的標杆，但這只是所能比較的事物之中，相對之下被認知較「好」的部分。具體來說，如果以 0 至 100 分的觀念來解釋，aspires 若是 100 分，這裡所指的標杆水準可能只達到 60 分及格，顯現傳統觀念中所追求的品質，距離人們真正的渴望水準，仍有很大進步的空間。避免「由『爛蘋果中找出最好的蘋果』」，就是他為自己提出的觀點所下的最好注解。

(四)關聯性的問題，系統性的改善

如前所述，若所有問題都具有相關性，該如何解決呢？答案是：系統性的改善方案。曾教授解釋，當問題被發現時，絕非進行「選擇」或「排序」，因為即使是眼見的第一名，可能也離渴望水準還有一段距離。所以當關聯性的問題浮現時，追求系統性的改善、制定完整系統性的配套措施，才是問題解決之道。如果「頭痛醫頭、腳痛醫腳」，永遠只是抑制單一問題的發生，而非真正解決問題；此可根據 DEMATEL 法之**影響網路關聯圖(Influential Network Relation Map，簡稱 INRM)協助系統的改善**。

(五)實務的問題均非加法型

曾教授認為，加法型的問題很容易讓人掉入表象的陷阱中。例如現行大學的選課制度模式下，學生必須在修滿一定的畢業學分規則下安排單一學期的課程。於是為求達成學分數，課程本身的難易度、是否容易取得好成績，很自然地成為學生選課時優先參考的因素，最後一致性的選擇通常是「營養學分」。他認為，制度的設計應該讓學生能從課程與課程之間的影響性、重要性等方向做為修習考量，否則容易陷入只為達到成績好，而忽略學習過程中應具備的實際能力水準養成訓練。再者，踏出校門後，社會中實際待解決的問題也都是非加法型的，如果在學習過程就沒有獲得適當的訓練，影響所及就是工作上缺乏創新與創意(innovation and creativity)思考、影響自我價值。如實務上之決策者常希望追求產品屬性價值如何 1 加 1 大於 2 (Decision maker hopes “How can achieve one plus one larger than 2, i.e., 1+1 > 2)，此即為模糊積分(Fuzzy Integral)之非加法型的基本概念。

(六)突破過去不可變的資源限制因素下，達成多重目標

過去的環境因為設定資源條件有限(固定)，若同時需考量追求企業最大利潤化、消費者服務品質最佳化，但對社會及環境所造成的影響又需達到最小化，只能達到 Pareto 最佳化解，目標顯得不易同時達成。但現在各項環境的條件已與時俱進，過去以為不可變的條件因素／固定資源已轉為可變因素，接下來應該思考的就是如何改善資源，方可邁向達到各項「渴望水準(aspiration level)」的目標。吾人將此新多目標規劃方法稱之為「可變空間多目標規劃法(Multi-objective programing with changeable spaces programming)。

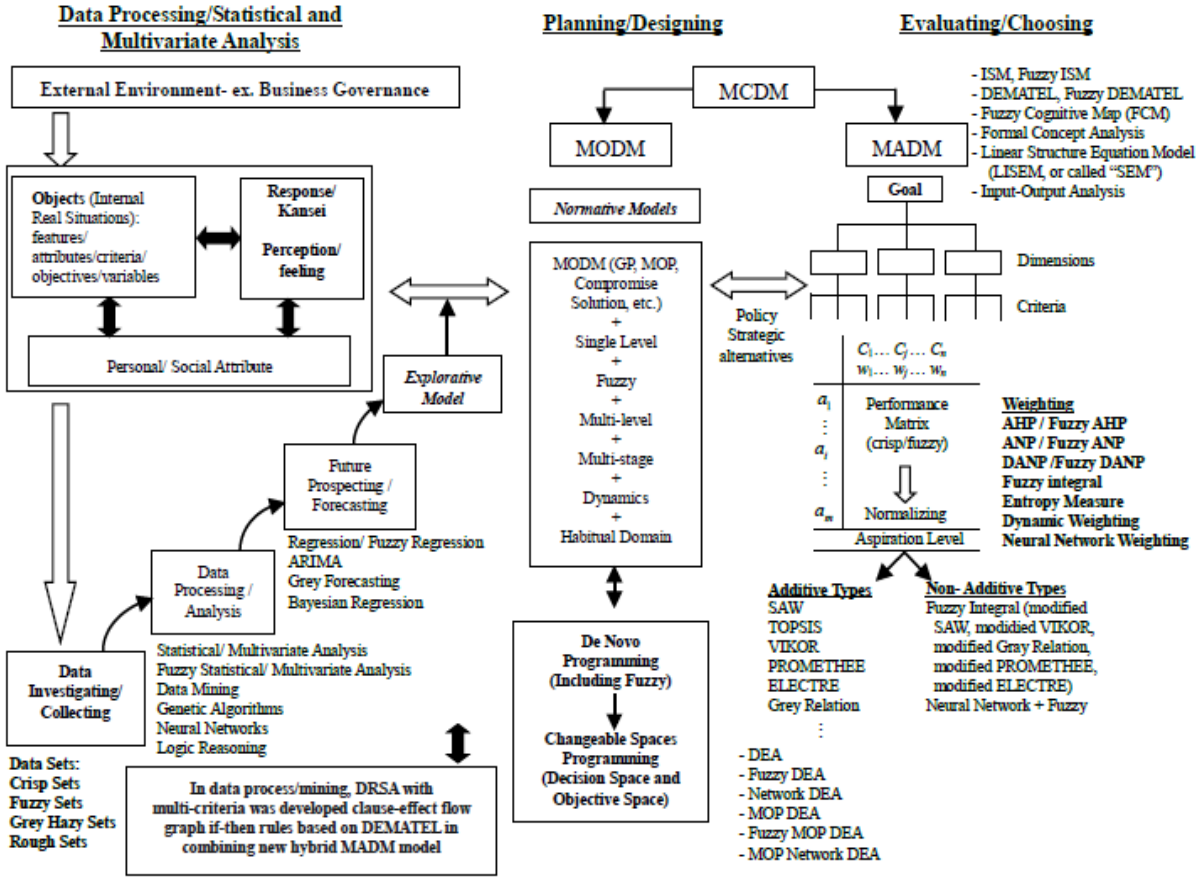


Fig.2. Basic Concepts of Overall Social Science "Research Methods" for Problem-Solving (Tzeng and Huang, 2011; Liou and Tzeng, 2012; Peng and Tzeng, 2013)

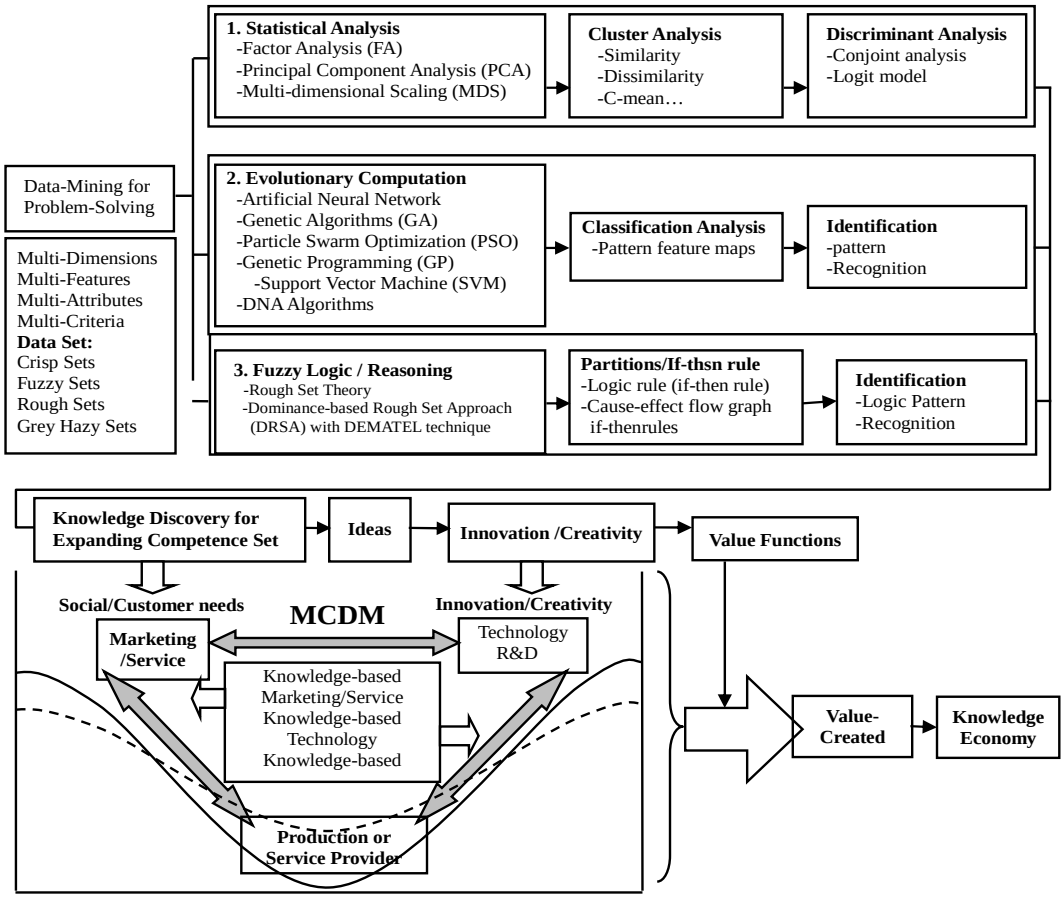


Fig.3. Data Mining Concepts of Intelligent Computation for Knowledge Economy (Tzeng and Huang, 2011; Liou and Tzeng, 2012; Peng and Tzeng, 2013)

Liou, James J.H. and Tzeng, G.H. (Corresponding author) (**2012**), Comments on "Multiple criteria decision making (MCDM) methods in economics: An overview", ***Technological and Economic Development of Economy***, **18(4)**, 672-695.

Abstract. This paper offers comments on a previously published paper, titled "Multiple criteria decision making (MCDM) methods in economics: an overview," by Zavadskas and Turskis (2011). The paper's authors made great efforts to summarize MCDM methods but may have failed to consider several important new concepts and trends in the MCDM field for solving actual problems. **First**, the traditional model assumes the criteria are independently and hierarchically structured; however, in reality, problems are often characterized by interdependent criteria and dimensions and may even exhibit feedback-like effects. **Second**, relatively good solutions from the existing alternatives are replaced by aspiration levels to fit today's competitive markets. **Third,** the emphasis in the field has shifted from ranking and selection when determining the most preferable approaches to performance improvement of existing methods. **Fourth,** information fusion techniques, including the fuzzy integral method, have been developed to aggregate the performances. **Finally**, the original fixed resources in multi-objective programming are divided such that both decision and objective spaces are changeable. In this paper, we add new concepts and provide comments that could be thought of as an attempt to complete the original paper.

Basic New Concepts and Trends of Two New Books for Tomorrow

The basic concept of changeable spaces for achieving aspiration level

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Invited review

NEW CONCEPTS AND TRENDS OF MCDM FOR TOMORROW – IN HONOR OF PROFESSOR GWO-HSHIUNG TZENG ON THE OCCASION OF HIS 70th BIRTHDAY

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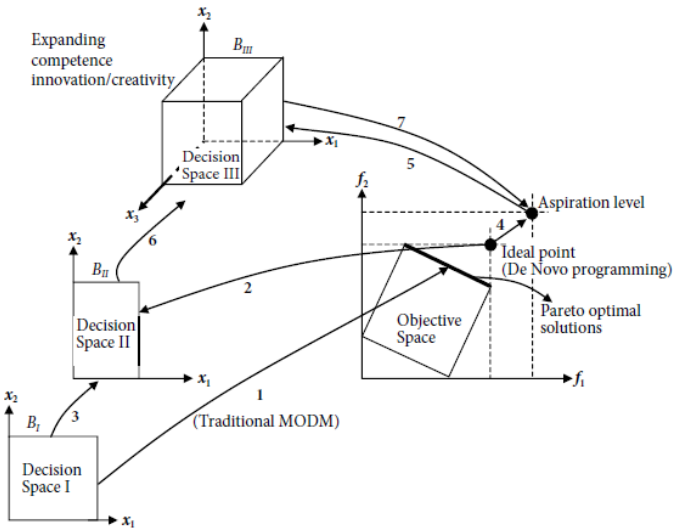
Abstract. This article introduces several new concepts and trends in multiple criteria decision making (MCDM) for solving actual problems, as proposed by Professor Gwo-Hshiung Tzeng. These new concepts are as follows: (1) interdependency in real-world problems; (2) replacing the relative good solution from the existing alternatives using aspiration levels; (3) shifting from ranking and selection to performance improvement; (4) information fusion/aggregation; and (5) changeable decision spaces. To honor Prof. Tzeng's contribution in the MCDM field and to commemorate his 70th birthday, this article also highlights his research career in MCDM and some publication list in the past 10 years.

Keywords: MCDM, MADM, MODM, DEMATEL, DANP, VIKOR, Changeable space, Aspiration level.

Reference to this paper should be made as follows: Liou, J. J. H. 2013. New concepts and trends of MCDM for tomorrow – in honor of Professor Gwo-Hshiung Tzeng on the occasion of his 70th birthday, *Technological and Economic Development of Economy* 19(2): 367–375.

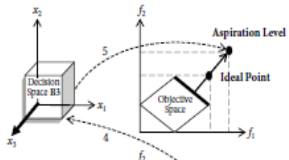
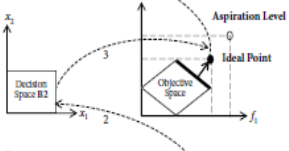
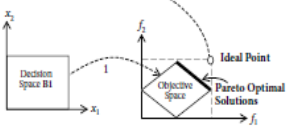


1. New trends and concepts in MCDM

Over the past two decades, the development of information technology (IT) has been characterized by a series of positive, but temporary, shocks. The alternate perspective is that IT in Internet communication has produced a fundamental change in the world, leading to a permanent improvement in fast growth-change prospects such as telephone, telegraph, Internet, smart phone, i-phone, i-pad, cloud computing, business, economy, society, and government. What are the prospects for future trends? Which problems will be solved regarding user/customer/societal needs in marketing situations, and how can overall problems in dimensions and criteria be resolved using aspiration levels? The traditional MCDM field ignored some important new concepts and trends and needed several assumptions to solve real-world problems. Therefore, Prof. Tzeng proposed some new concepts for facing tomorrow's world. First, the traditional model assumes that the criteria in value-creation are independent and hierarchical in structure; however, criteria are often interdependent in real-world problems because 'Some statistics and economics assumptions are unrealistic in the real world'. The Decision Making Trial and Evaluation Laboratory (DEMATEL) technique is an effective tool to find the interrelationship matrix and building an influential network relation map (INRM) for solving relationship problems in the real world. Second, the relatively good solution from existing alternatives is replaced by aspiration levels to avoid "Choosing the best among inferior options/alternatives", i.e. "Picking the best apple among a barrel of rotten apples". Third, the emphasis in the field has shifted from ranking and selection when determining the most preferable approaches to performance improvement of existing methods based on INRM because "we need a systematic approach to problem-solving; instead of addressing the systems of the problem, we need to identify the sources of the problem". Fourth, Kahneman and Tversky (Kahneman received the Nobel Prize in Economics in 2002) developed the basic concept of the non-additive (or super-additive) value-function aggregation in multi-criteria problems in 1973. Simon incorporated the basic concept of the "aspiration level" in his work, receiving the Nobel Prize in Economics in 1978. The question that arises is "How can we implement these two concepts (non-additive value function and aspiration level) within real-world inter-relationship (dependence and feedback) problems?" Information fusion or aggregation/integration such as fuzzy integrals (basically, a non-additive or super-additive model) has been developed to aggregate/integrate performances. Therefore, to overcome

Toward a MCDM New Era – Professor Tzeng's Roadmap

Philosophy
Taking True Responsibility,
Creating Added Value, and
Making Contribution through MCDM Knowledge to Global Society

concept	Graphical Representation	Approach
Value (Win-Win)		making aspired decisions by expanding competence sets through innovation
		Making Ideal decisions through re-allocating limited resources
Price (Win-Lose)		Making Pareto optimal decisions through traditional MOP methods

the defects of the conventional Multiple Attributes Decision Making (MADM) method, a new Hybrid Dynamic Multiple Criteria Decision Making (HDMADM) method has been developed for solving complicated and dynamic problems in the real world and application to improve real issues, e.g. Internet communication, government overall policy improvement, etc. Fifth, classical Multiple Objectives Decision Making (MODM) methods are used to pursue an optimal solution in a fixed feasible region (objective space) based on fixed conditions or resources (decision space). A new thinking of MODM models with changeable spaces can help decision-makers reach a win-win for planning/designing and achieve the desired point (aspiration level), which is better than pursuing the ideal point or Pareto optimal solution.

Huang, J. J., and Tzeng, G. H. (2014). New thinking of multi-objective programming with changeable space - In search of excellence, *Technological and Economic Development of Economy*, 20(2): 242–261.