ENHANCING SWOT ANALYSIS USING TRIZ AND THE BIPOLAR CONFLICT GRAPH: A Case Study on the Microsoft Corporation

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ABSTRACT

In strategic planning, SWOT analysis is the most common technique for situation analysis of organizations. "SWOT" is an acronym for Strengths, Weaknesses, Opportunities, and Threats. However, the results of SWOT analysis, which are presented in a 2x2 matrix, are largely descriptive. The matrix contains a listing of organizational strengths, weaknesses, opportunities, and threats that are usually the outputs of brainstorming sessions. Traditionally, a SWOT-analysis matrix is not systematically and formally analyzed with a view to developing strategies for increasing the organization's "ideality", efficiency, or performance.

This paper presents a new framework for improving SWOT analysis and consequently, strategic planning for the "ideal organization" using TRIZ and the "Bipolar Conflict Graph." This new framework facilitates the systematic identification as well as elimination of physical and technical contradictions ("conflicts") in organizations. Continuously eliminating conflicts results in an organization steadily increasing its performance and competitive advantage.

As an illustration of the enhanced framework for SWOT analysis, TRIZ and the bipolar conflict graph are systematically applied to the Microsoft Corporation. The main results of this case study are numerous alternative strategies that could be tested and evaluated using hard data from Microsoft. The new framework, which mainly integrates SWOT Analysis and TRIZ, could be used to facilitate continuous improvement of organizations, products, services, and processes.

1 BACKGROUND ON SWOT ANALYSIS

SWOT Analysis is probably the most popular tool used in Strategic Planning and Organizational Problem Solving. **"SWOT"** refers to Strengths, Weaknesses, Opportunities, and Threats. The origin of the SWOT acronym, however, is obscure. Haberberg (2000) notes that Harvard Business School academics were using the concept in the 1960s. In contrast, Turner (2002) attributes development of the SWOT Analysis concept to Igor Ansoff (1987).

In spite of its uncertain origin, SWOT Analysis is used for many purposes and applied to diverse units of analysis. The main uses of SWOT Analysis include the following:

- providing situation analysis of an organization, enterprise, community, region, country, product, service, process, family, team, person, brand, project, or task
- providing background information for developing mission and vision statements as well as setting objectives and making strategic decisions
- identifying opportunities, resources, constraints, and strategic options
- developing an awareness of, learning about, and gaining insights into a system's position: strengths; weaknesses; opportunities; threats
- developing a "bottom-top"/"top-bottom" shared vision for an organization
- providing input for the development of scenarios and strategic plans.

There are many criticisms of SWOT Analysis. Koch (2000) contends that most criticisms of SWOT Analysis deal with its poor and inappropriate uses rather than inherent weaknesses of the method. Nevertheless, as a minimally structured (2x2) descriptive matrix tool, SWOT Analysis has several weaknesses. First, SWOT Analysis is predominantly carried out at an undifferentiated system level rather than at the level of system, sub-system, and super-system. Second, listed factors are neither weighted nor ranked in a traditional SWOT matrix so that critical constraints and resources are not explicit. Third, there is no quantitative index that summarizes the prospects and limitations of a system as well as provides an operational criterion for benchmarking, managing, and controlling identified strengths, weaknesses, opportunities, and threats. In fact, the majority of SWOT Analysis do not describe factors in terms of quantitative performance indicators.

Other limitations of SWOT Analysis include the subjectivity, integrity, and instability (over time) of listed strengths, weaknesses, opportunities, and threats. Information contained in a SWOT matrix may be biased and not reflect consensus reality for the system. Dynamic and structural changes at the level of system, sub-system, and super-system affect the validity of entries in a SWOT matrix. Consequently, entries in a SWOT matrix are time-dependent and influenced by the implementation of strategies, including those derived from information in the SWOT matrix. Finally, there is no formal method to deal with (physical) contradictions that may be revealed or inherent in a SWOT matrix, e.g., for an entry occurring as both a strength and a weakness. Constraining inter-dependencies such as technical contradictions (trade-offs) are not identified between listed factors of a SWOT matrix.

2 THE SWOT-RADAR SCREEN AND STRATEGIC SWOT-PLAN

The SWOT-Radar Screen™ refers to a nested SWOT Matrix at 3 levels: level of system, subsystem, and supersystem. For an organization, elements at the various levels include the following:

* Level of Supersystem (External Resources):

  - Market/Customers/Buyers (Segmented)
  - Competitors (Old/New/Potential)
  - Complementors (Strategic Alliances)
  - Suppliers
  - Sector/Industry
  - Environment (Local & Global P.E.S.T.L.I.E.D.: Political; Economic; Social; Technological; Legal; International; Environmental; Demographic)
  - Miscellaneous

* Level of System (Internal Resources - Mostly Intangibles):

  - Firm's Purpose/Mission/Values/Strategic Plans
  - Leadership/Management
  - Structure (Bureaucracy)
  - Finance/Capital
  - Brand
  - Knowledge/Experience/Learning
  - Culture/Motivation
  - Core Competencies
  - Innovation
  - Miscellaneous

* Level of Subsystem (Internal Resources - Mostly Tangibles):

  - Business Unit(s), Enterprise(s), or Department(s): Purchasing; Distribution; Sales & Marketing; Customer Service; Human Resources; Research & Development
  - Product(s): Functionalities/Features; Tools; Fields; Inputs; Outputs
  - Process(es): Functionalities/Features; Tools/Core Drivers; Fields; Inputs; Outputs
  - Service(s): Functionalities/Features; Tools/Core Drivers; Fields; Inputs; Outputs
  - Equipment
  - Technology
  - Staff/Workforce/Teams
  - Infrastructure
  - Location
  - Miscellaneous

The above multi-level perspective of a system mainly draws ideas from the concept of multi-screen in TRIZ, Value Chain & Five Forces (Porter, 1985), and Balanced Scorecard (Kaplan & Norton, 1996). For a **qualitative SWOT Analysis**, the above

description of elements would suffice for the listing relevant strengths, weaknesses, opportunities, and threats. For a **quantitative SWOT Analysis**, however, a hierarchy of SWOT-performance indicators could be derived for each element in the multi-level system. These indicators will make more specific the qualitative descriptions. In this article, a multi-level SWOT Matrix with qualitative descriptions for strengths, weaknesses, opportunities, and threats is called a **SWOT-Radar Qualitative Screen™**. When strengths, weaknesses, opportunities, and threats are quantitatively expressed, weighted, and aggregated the multi-level SWOT Matrix is called a **SWOT-Radar Quantitative Screen™**. Table 1 shows the format of a *SWOT-Radar Quantitative Screen*™.

In the *SWOT-Radar Quantitative Screen*™, the contents of strengths and weaknesses are summarized in an index, the **present degree of conflict**. Mathematically and using, for example **Multi-criteria Analysis**, the present *degree of conflict* could be expressed as:

Present Degree of Conflict
= Weighted Present Disadvantages/Weighted Present Advantages
= Weighted Weaknesses/Weighted Strengths
= "Harmful Effects + Costs"/"Useful Effects (Benefits)" = **1/Degree of Ideality**

The potential degree of conflict may be similarly expressed as:

Potential Degree of Conflict
= Weighted Future Disadvantages/Weighted Future Advantages
= Weighted Threats/Weighted Opportunities

It may be noted that the ideal value for the present and potential degree of conflict is nearly zero or tends to zero. The **ideal degree of conflict** is not zero, because two systems, each with almost no disadvantage but infinitely different levels of advantages, have not a zero level of conflict but significantly different levels of conflict. Due to economic and information linkages in the organizational space or value chain as well as between present and future events, spatial and temporal interdependencies exist between values of the *degree of conflict*.

In this article, it is assumed that the main function of management in an organizational system is to continually strive and manage for a **minimum (nearly zero) present and potential degree of conflict** at the level of system and subsystem. In the parlance of SWOT analysis, a **minimum present degree of conflict** could be obtained by a **minimization of weaknesses (Mini-Strategy) and/or a maximization of strengths (Maxi-Strategy)**; a similar idea applies for a *minimum potential degree of conflict*. Resources at the level of system, subsystem, and supersystem could be used to operationalize a typology of Mini- and Maxi-Strategies. These strategies could be documented in and translated to a **"Strategic SWOT-Plan"** that aims to achieve explicit and minimal degrees of conflict at various levels in the organizational hierarchy. The *Strategic SWOT-Plan*™ could be disaggregated into a set of **Action Plans and Programs** for each element at the level of system and subsystem.

Table 1: The SWOT-Radar Screen™ for System at Level "X"

Vision/Mission: ……..

Level of Focus: …….. Perspective(s)/Stakeholders: …… Date: ……..….

Level	TIME / SPACE		Past				Present						Future						Aggregated (Weighted) Index				Degree of Conflict (Contradiction)	
	Generic Structure	Organizational Structure (Inventory)	Adv.		Disadv.		Adv. -> S: Strengths			Disadv. ->W: Weaknesses			Adv. -> O: Opportunities			Disadv. -> T: Threats			Present		Future		Present	Short/ Medium/ Long-term
			S	O	W	T	S1	S2	S3	W1	W2	W3	O1	O2	O3	T1	T2	T3	S	W	O	T		
		Weighting: w					*w(s1)*	*w(s2)*	*w(s3)*	*w(w1)*	*w(w2)*	*w(w3)*												
3	**Supersystem (External Resources)?**	Customers?																						
		Competitors?																						
		Complementors?																						
		Suppliers?																						
		Sector/Industry?																						
		Environment?																						
		Miscellaneous?																						
2	**System (Internal Resources)?**	Firm's Mission?																						
		Leadership/ Management?																						
		Bureaucracy?																						
		Finance?																						
		Brand?																						
		Knowledge/ Learning?																						
		Culture?																						
		Core Competencies?																						
		Innovation?																						
		Miscellaneous?																						
1	**Subsystem (Internal Resources)?**	Business Unit(s)?																						
		Product(s)?																						
		Process(es)?																						
		Service(s)?																						
		Equipment?																						
		Technology?																						
		Staff/Teams?																						
		Infrastructure?																						
		Location?																						
		Miscellaneous?																						

Key
S: Performance Indicator for Strength **W:** Performance Indicator for Weakness **O:** Performance Indicator for Opportunity **T:** Performance Indicator for Threat

3 THE BIPOLAR CONFLICT GRAPH (BCG)

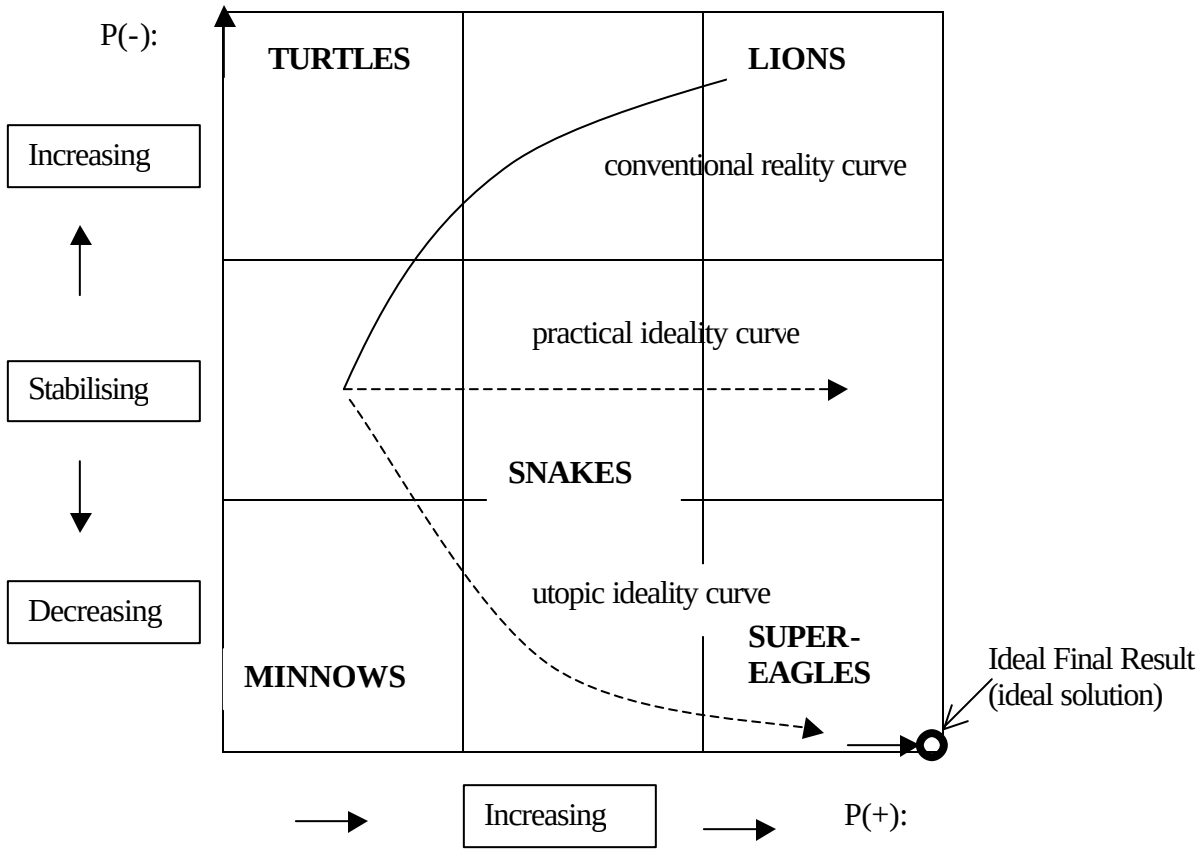
The **Bipolar Conflict Graph™** (King, 2003) refers to a graph depicting relationships between two variables that are usually described at a parametric or performance indicator level. Common sets of variables on a Bipolar Conflict Graph™ could be described as follows:

- Type I: Desirable Parameter [P(+)] vs. Undesirable Parameter [P(-)]
  With regard to SWOT Analysis, a "desirable" parameter refers to a "strength" or an "opportunity"-performance indicator. An "undesirable" parameter refers to a "weakness" or "threat"-performance indicator.

- Type II: Desirable Parameter [P(+)] vs. Desirable Parameter [P(+)]

A Type I - Bipolar Conflict Graph is shown in Fig. 1.

Fig. 1: Type I - Bipolar Conflict Graph (BCG)



Each axis of a Bipolar Conflict Graph™ decribes a functionality (verb+noun-object) rather than just a function (verb) or parameter (noun-object). Continuous relationships between the two variables are described by three families of nested curves: **"conventional reality" curve**; **"practical ideality" (straight line) relationship**; **"utopic ideality" curve**; see Fig. 1. The *conventional reality curve* illustrates a trend of increasing levels of technical contradictions between the two variables. In contrast, the *utopic ideality curve* shows an ideality trend of decreasing levels of technical contradictions ("disruptive solutions") until the Ideal Final Result or ideal solution is obtained. The *practical ideality curve* indicates a trend of optimal solutions when the system is assumed to be at its fundamental (saturation) limit for the pair of variables.

Five of the nine cells of the Bipolar Conflict Graph™ are metaphorically labeled for easy referencing, classification, and interpretation of objects. The labels in the Bipolar Conflict Graphs are: "Lions"; "Super-Eagles"; "Snakes"; "Turtles"; "Minnows." *Lions* refers to objects that are "powerful" and "fast" but are large and require "high maintenance" while *Super-Eagles* refers to "powerful", "agile", and relatively smaller and "low maintenance" objects. On the Bipolar Conflict Graph™, *Lions* and *Super-Eagles* could represent **anti-objects or bipolar states** of a physical contradiction. A line connecting diametrically opposite zones such as *Lions and Super-Eagles* is called a **bipolar gradient** and may represent one or a family of bipolar objects for a given variable. TRIZs **Separation Principles** relate to the bipolar gradient (line).

The above metaphorical labels facilitate not only intuitive classification and comparison of a set of apparently disparate objects but also the generation of ideas for analogical tools, devices, means, strategies, and principles that could eliminate technical and physical contradictions ("trade-offs"), especially in non-physical systems such as organizations. The majority of TRIZs Inventive Principles, for instance, are expected to fall near or below the *utopic ideality curve* and at best, in the *Super-Eagles zone* of the relevant Bipolar Conflict Graphs. A Bipolar Conflict Graph™ can therefore be regarded as a "general purpose and visual" cell for any pair of parameters in the **Contradiction Matrix**. In other words, the Contradiction Matrix is a master table of 39x39 or 1521 Bipolar Conflict Graphs. It is important to note that objects with the lowest degree of ideality are expected to be in the *Minnows or Turtles zone*.

By providing a visual framework for "plotting" technical and physical contradictions, one could transparently and more easily apply TRIZs classic ideas of **Contradictions, Contradiction Matrix, Inventive Principles, Functional Database, and Ideal Final Result** to both physical and non-physical systems. This transparency is especially important for situations where no Contradiction Matrix exists or the classic Contradiction Matrix is not considered useful, or even relevant. Another advantage of the Bipolar Conflict Graph™ is that it could be related to graphs in other domains such as in business; graphs such as the **Boston Consulting Group Matrix, General Electric's Strength-Attractiveness Matrix, and Ansoff's Product-Market Box** may be regarded as special cases of the Bipolar Conflict Graph™. The Bipolar Conflict Graph™ will therefore be useful when mapping contradictions (trade-offs) and generating strategies for eliminating inherent trade-offs in a SWOT Analysis matrix.

4 STRATEGIC ANALYSIS OF THE MICROSOFT CORPORATION USING THE SWOT-RADAR SCREEN, BIPOLAR CONFLICT GRAPH, AND TRIZ

4.1 A Sketch of the Microsoft Corporation

Established in 1975 by Bill Gates and Paul Allen, the Microsoft Corporation is currently the world's largest software provider and perhaps, the most "valuable" company in the world. Microsoft produces many and diverse software for personal computers including the Windows™ operating system and Internet Explorer™ browser. Microsoft's vision is: "A computer on every desk and in every home (*all running Microsoft software*)."

Microsoft has dominated the landscape of software development for over two decades. Microsoft seems to be continuously eliminating the technical contradiction of "size (growth)" vs. "rigidity" as well as the physical contradiction of "big size" vs. "small size." Using the metaphors of the Bipolar Conflict Graph™, one could say that Microsoft is continually riding near or on the *utopic ideality curve* while approaching the *Super-Eagles zone*. Microsoft is one of the largest companies in the world but it has the agility, flexibility, and nimbleness of a small company. Many would agree that valuable lessons could be learnt from the continued hyper-success of Microsoft, especially how Microsoft manages to eliminate existing as well as emerging technical and physical contradictions in its organizational space.

Several questions are of interest when strategically examining Microsoft. For instance, what makes Microsoft tick? What are its core strengths and weaknesses? What most threatens Microsoft? And what are Microsoft's prospects or opportunities, especially in the landscape of hyper-competition, high technology, and globalization? These strategic issues of Microsoft are cursorily addressed in this paper mainly using the tools of SWOT Analysis, the Bipolar Conflict Graph™, and TRIZ.

4.2 The I-CCEM Framework for Crisis Problem Solving and Planning

The framework, within which SWOT Analysis, the Bipolar Conflict Graph™, and TRIZ are integrated, is referred to as **I-CCEM™**. The acronym, I-CCEM, stands for "Ideal-Conflict Creation, Elimination, and Management." The principal tools of the I-CCEM™ framework are the CD-MAGIC cycle, SWOT-Radar Screen™, and Creative Web Template™. Central to the structure of CD-MAGIC cycle and Creative Web Template is the Creative Web model.

The **Creative Web** (King, 2002; King, 2003) is a generic model and macro-framework for creative problem solving. At a meso-level, the Creative Web could roughly be translated to "**C**D-MA**G**IC" cycle. The acronym, **"CD-MAGIC"**, is an extension of "DMAIC", a process that has been popularized by the **Six Sigma methodology**. A "C" and "G" have been added to "DMAIC" to emphasize the modules of **"C**ollect**"** and **"Generate"**; the "Generate-module" subsumes the process of "Evaluate/Select." Further details of the Creative Web and

"CD-MAGIC" cycle are presented in Table 2. The Creative Web Template™ exists at a micro-level and is used to document, explore, and generate ideas.

Table 2 also contains tools of TRIZ that have been structured according to modules of the Creative Web. The I-CCEM™ framework is generally applied to the Microsoft Corporation. The main aim is to illustrate basic application of the tools rather than to produce a detailed strategic analysis of the Microsoft Corporation. Also, *present and potential degree of conflict* are not quantified. Consequently, discussions regarding Microsoft's conflicts are based on a qualitative assessment of the *degree of conflict*.

4.3 Multi-level SWOT-Radar Screen for the Microsoft Corporation

A SWOT-Radar Screen™ was prepared for Microsoft after obtaining information from books and other literature on Microsoft and Bill Gates. A fully completed SWOT-Radar Screen™ provides a comprehensive view of a system's strengths, weaknesses, opportunities, and threats at the level of the system, subsystem, and supersystem as well as in the past, present, and future. Due to limitations of space as well as the objective of basically illustrating the enhanced framework for SWOT Analysis, (i.e., I-CCEM™), a simplified version of the SWOT-Radar Screen™ is presented in this section. This section focuses on truncated and nested SWOT matrices at the level of subsystem, system, and supersystem. The relevant SWOT matrices are contained in Tables 3, 4, and 5.

Table 3 focuses on the level of Microsoft's subsystem. Performance indicators and weights could be developed for the SWOT factors of specific organizational elements in Table 3. But, as mentioned earlier, this work is not carried out in this article. Although *Multi-criteria analysis* is not applied to Table 3 to obtain present and potential *degree of conflict* for each element of the subsystem, the highest present *degree of conflict* probably relates to "Technology." The lowest present *degree of conflict* would occur with regard to "Equipment", "Infrastructure", and "Location"; weaknesses of these items are regarded as not significant. In contrast, the future *degree of conflict* for Products seems higher. In a more detailed study, management would focus on specific means and plans for significantly reducing the *degree of conflict* in Products.

Analysis of Tables 4 and 5 is similar to that of Table 3. At the system level, the highest present *degree of conflict* is probably Microsoft's brand, while the future highest *degree of conflict* is in Microsoft's culture. At the level of the supersystem in Table 5, highest *degrees of conflicts* present a contradiction. Some high *degrees of conflict* are to the advantage of Microsoft, e.g., for Competitors, while other high *degrees of conflict* such as in Microsoft's value chain could constrain elements at system and subsystem level. From Microsoft's point of view, current and "desirable" conflicts relate to competitors' style of management. An "undesirable" weakness is Microsoft's dependency on hardware manufacturers for pre-installing its software. In future, the highest ("undesirable") *degree of conflict* will occur in the organizational space of Competitors such as Linux, Sony, and Nintendo; the Sector/Industry of high-end computing and web servers; imitation and piracy as well as security of Microsoft's software.

Table 2: I-CCEM Framework for Crisis Problem Solving, Conflict-Elimination, and Change Management

Creative Web	**CD-MAGIC Cycle**	**Tools of Enhanced SWOT Analysis, Bipolar Conflict Graph, and *TRIZ***
Problem-definition Space	**C**: Collect Data & Information on Conflicts **D**: Define Conflicts **M**: Measure Conflicts	Players-Radar Screen™: Players in Organizational Space SWOT-Radar Screen™: Multi-level Qualitative Matrix Bipolar Conflict Graph™ Business Criteria and Performance Indicators ***Conflict Zone*** ***Multi (9)-screen Approach*** ***39 Parameters*** ***Contradiction Matrix*** ***Ideal Final Result (IFR)***
Methods-Space	**A**: Analyze Conflicts	Creative Web Template™ Core Drivers-Analysis Root-Cause and Conflict Analysis Bipolar Conflict Graph (BCG)™ Impact (Bipolar Conflict/Contradiction) Matrix SCAMPER-DUTION™ Matrix Ideal Benchmarking Map™ Multi-Criteria Analysis ***Conflict Zone*** ***Substance-Field analysis*** ***Database of Physical Effects*** *(Functional & Best-Practice Knowledge Base)* ***Modeling of Miniature Dwarves*** ***Size-Time-Cost (STC) Operator***
Solutions-Space	**G**: Generate Conflict-Elimination Strategies *(E: Evaluate Strategies* *S: Select Strategies)*	Creative Web Template™ SCAMPER-DUTION™ Matrix Ideal Benchmarking Map™ "Ideal" Solutions: Utopic/Practically Ideal/Best-practice Success Criteria: Utopic/Practically Ideal/Best-practice ***Ideality & Ideal Final Result (IFR)*** ***4 Separation Heuristics*** ***40 Inventive Principles*** ***76 Standard Solutions*** ***Levels of Inventions*** ***Patterns of Technological Evolution*** ***[Subversion (Failure Anticipation) Analysis]***
Implementation-Space	**I**: Implement Strategies **C**: Control Conflicts	Strategic SWOT-Plan™; Action Plans; Program SWOT-Radar Map™: Multi-level Quantitative Matrix "X"-Conflict-Elimination Team(s): Uni-/Bi-/Multi-level
Creative Life Space	(Form and interact with with members from Conflict-Elimination Teams at the level of subsystem, system, and supersystem)	Creative Web Template™ Best-Practice Documentation, Exploration, and Learning "X"-Conflict-Elimination Team(s): Uni-/Bi-/Multi-level Scenario Learning

Table 3: Simplified SWOT-Radar Screen™ for the Microsoft Corporation at Level 1

Vision/Mission: "A computer on every desk and in every home (*all running Microsoft software*)"

Level of Focus: Subsystem Perspective(s)/Stakeholders: Observer (Dr. Rod Kuhn King) Date: January 2004

Level	TIME / SPACE		Present		Future	
	Generic Structure	**Organizational Structure (Inventory)** *Weighting: w*	**Adv. -> S: Strengths**	**Disadv. ->W: Weaknesses**	**Adv. -> O: Opportunities**	**Disadv. -> T: Threats**
1	**Subsystem (Internal Resources)?**	**Business Unit(s)?**	Rapid growth Access to large financial base	Male-dominated	"Survival of the fittest"	Frequent reorganization Adapting to local culture in overseas units
		Product(s)?	Bundle of products: MS-Office etc. High quality, compatible, and easy-to-use software "Free" products such as Internet Explorer and Hotmail	Bugs in products Irritating "smart" features Incompatibility of Microsoft's products with other desktop applications Small share in electronic games market	"Smarter" software Regular upgrades Workers use Microsoft's products Competitive pricing of Microsoft's products	Initially many bugs in first releases of products Unachievable dates and deadlines for release of products Incompatibility of Microsoft's products with other desktop applications Netscape Linux; Novell Word Perfect; Adobe Reader etc. Intuit; Quattro Pro etc. Game Boy; Play Station
		Process(es)?	Streamlined processes Fast decision-making	Misalignment of processes due to rapid change and reorganization	Outsourcing to cheaper labor markets	Outsourcing to cheaper labor markets
		Service(s)?	Customer-focused solutions Immediate and online feedback from customers	Incompatibility of other products with those of Microsoft	Web-focused response to customers complaints and problems	The customer is not always right
		Equipment?	Cutting-edge equipment	*Not significant*	Paperless office	Wireless and solar-energy based products
		Technology?	Access to the latest technology	Late entrant in some technologies	Leader in technological breakthroughs	Competitors may have superior technology
		Staff/Teams?	Supersmart: highly qualified, talented, and creative problem solvers as well as technophiles High salaries Loyalty High energy and competitiveness Small and autonomous teams "Only performance counts" Transparency Minimal job losses Good communication	Stress "Burn-outs"	Buying of stock options Self-actualization Egalitarian atmosphere	"Burn-outs" Unfair deal with contingent workers: "permatemps"
		Infrastructure?	"Digital Nervous System" Good product distribution "Learning organization"	*Not significant*	"Learning organization" Rapid development of Information Superhighway	Slow development of Information Superhighway
		Location?	Headquarter has good access to largest software market	*Not significant*	America is largest market for software	
		Miscellaneous?				

Table 4: Simplified SWOT-Radar Screen™ for the Microsoft Corporation at Level 2

Vision/Mission: "A computer on every desk and in every home (*all running Microsoft software*)"

Level of Focus: System Perspective(s)/Stakeholders: Observer (Dr. Rod Kuhn King) Date: January 2004

Level	TIME / SPACE		Present		Future	
	Generic Structure	**Organizational Structure (Inventory)** *Weighting: w*	**Adv. -> S: Strengths**	**Disadv. ->W: Weaknesses**	**Adv. -> O: Opportunities**	**Disadv. -> T: Threats**
2	**System (Internal Resources)?**	**Firm's Mission?**	Clear statement for alignment	Focus on the personal computer	Global market domination	Inadequate focus on handheld devices as well as wireless and distributive computing
		Leadership/ Management?	Highly adaptive and flexible Effective "Digital Nervous System" Technically capable managers Hiring of "supersmart" employees	Domination by Bill Gates	Leadership/Management is relatively young	Failure to anticipate potentially profitable markets such as in the debacle with the Internet
		Structure?	Relatively flat organization	*Not significant*	Speed in decision-making	Increase in levels of management may slow decision-making
		Finance?	High growth rate of revenue & profit Large market capitalization	Falling sales in operating system and server applications	Fast growth and expansion of firm	Shares in the stock market could significantly drop Focus on 100% market share may not yield quick profit Frugal (penny-pinching) philosophy
		Brand?	Global and local recognition Strong reputation as world leader in software "Best company to work for" "Most admired company"	Microsoft as predatory, unfair, arrogant, and unethical Many bugs in first releases of products	Microsoft as recognizable name and key player in the convergence of TV, personal computing, and home devices	Sending out false "vaporware" could lead to distrust "Microsoft is Bill Gates and Bill Gates is Microsoft"
		Knowledge/ Learning?	Strong Research and Development Center Good knowledge sharing, brokerage, and management	*Not significant*	Translating great research into great products Microsoft as center for technological breakthroughs and best-practices	*Not significant*
		Culture?	Focus on 100% market share; winning in every market that Microsoft enters Self-organization Transparency/Openness Fun and play at work	No place at work for "burn-outs" "Technocentric"	Self-actualization or fulfillment of potential "Technocentric"	Extreme competition could be divisive Egocentrism & "Survival of the fittest" Inadequate representation of women and other minorities, especially in leadership and management "Justified" failures and risk-taking are expected "Bill is always watching"
		Core Competencies?	Developing software for personal computers Selling software for personal computers	*Not significant*	Expanding market for personal computers due to Internet explosion	Outsourcing jobs overseas to cheaper labor markets, e.g., to India
		Innovation?	Highly innovative and customer-focused company	Technology brokerage increases time-to-market for products	Frequent reorganization exposes new opportunities	Frequent reorganization, which are due to fast growth, could lead to chaotic (uncoordinated) innovation
		Miscellaneous?	Diversified portfolio of acquisitions			

Table 5: Simplified SWOT-Radar Screen™ for the Microsoft Corporation at Level 3

Vision/Mission: "A computer on every desk and in every home (*all running Microsoft software*)"

Level of Focus: Supersystem Perspective(s)/Stakeholders: Observer (Dr. Rod Kuhn King) Date: January 2004

Level	TIME / SPACE		Present		Future	
	Generic Structure	**Organizational Structure (Inventory)** *Weighting: w*	**Adv. -> S: Strengths**	**Disadv. ->W: Weaknesses**	**Adv. -> O: Opportunities**	**Disadv. -> T: Threats**
3	**Supersystem (External Resources)?**	**Customers?**	Brand loyalty Willingness to purchase upgrades and bundle of products	Relatively small market for many new products	Global growth of personal computing and the Internet Increasing business-to-business transactions and applications	Boycott of Microsoft products because of negative "branding" of Microsoft and Bill Gates by some of the media
		Competitors?	More collaboration and alliances between competitors Dominance of niches like software for design and personal finance Technically better products in some areas	"Old" style, bureaucratic, and "Theory X" management Fear of 'failure' Individually smaller companies Slower reaction to changes in market and technology	Emerging markets for software use Eliminating "organizational inertia"	Linux; IBM Apple; Dell Hewlett Packard Netscape; America on Line; Google; Yahoo Oracle; Sun Microsystem; Novell Sony; Nintendo More and stronger strategic alliances between competitors Establishment of new "standards" by competitors Cheaper but functional software, e.g., from India
		Complementors?	Partnership with Apple	Dependency on alliances	Rapid growth with Microsoft	Strategic alliances with Microsoft's competitors Intel
		Suppliers?	Strong partnership with hardware manufacturers	Relatively little bargaining power	Larger market share with Microsoft	"Poaching" of talented employees at Microsoft
		Sector/Industry?	Partnership with Intel ("Wintel")	Reliance on Microsoft's pre-installation of Windows software by hardware manufacturers	Convergence of voice, video, and data	UNIX's domination of high-end computing Ownership and dominance of web servers Evolution from personal computers to hand-held computing devices Internet security could slow down business-to-business expansion of Internet Hackers & spammers Free software Open system development of software Slow development of computing infrastructure and hardware
		Environment?	Fast-paced evolution of technology	Relatively small market for personal computers in developing countries	Strong global economy	US Government anti-trust litigation "Permatemps" litigation International competition especially from India and China Local and global recession Fluctuating and unpredictable international exchange rates Geopolitical events and changes Increasing outsourcing of software development jobs to cheaper labor markets Distributive (grid) computing Research and Development Center in Cambridge, UK Software imitation and piracy
		Miscellaneous?				

5 STRATEGIES FOR ELIMINATING AND MANAGING CONFLICTS IN THE ORGANIZATIONAL SPACE OF MICROSOFT CORPORATION

The foregoing section generally discusses present and future *degrees of conflict* in the organizational space of Microsoft. But, what are Microsoft's major conflicts, now and in the future? In the absence of quantitative determination of the *degree of conflict* at subsystem, system, and supersystem levels as well as lack of direct information from personnel at Microsoft, the author presents a hypothetical answer. This answer should be subject to verification, especially from the management at Microsoft, in a more realistic study.

Looking at the SWOT-Radar Screens in Tables 3, 4, and 5, the author of this paper assumes that one of the major challenges facing Microsoft is the conflict (contradiction) of "Market share" vs. "Number of employees." In every market for its products, Microsoft would like to rapidly increase its market share. However, a rapid market increase usually comes with a rapid growth of the workforce as well as increase in the number of levels of management. A large increase in payroll costs and slower decision-making in a 'bureaucracy' tend to make staff increases undesirable. The question now is: How could Microsoft reduce and manage the conflict of "Market share" vs. "Number of employees", especially using TRIZ and the framework of the I-CCEM™ in Table 2.

Based on Table 2, **TRIZs heuristics** as well as the **Creative Web Template™** and **SCAMPER-DUTION™ matrix** (King, 2003) could be used to generate **conflict-elimination strategies**. The assumed major conflict of "Market share" vs. "Number of employees" and an outline of conflict-elimination strategies are summarized in Table 6.

The conflict of Opportunity ("Market share") vs. Threat ("Number of employees") could be reduced using two main categories of strategies: **closed-system solutions** and **open-system solutions**. *Closed-system solutions* focus on using internal resources, i.e., organizational elements at subsystem and system levels. In contrast, *open-system solutions* use closed-system resources and external resources that occur at the level of supersystem. If more creative solutions are desired, then scarcer internal and external resources should be leveraged to reduce or eliminate identified conflicts.

In Table 6, two approaches are used for generating more specific conflict-elimination strategies in the solution space of the Creative Web. The first approach involves the Bipolar Conflict Graph™, in which the conflict of "Market share" vs. "Number of employees" is modeled in Fig. 2. The second approach attempts to use the Contradiction Matrix and TRIZs heuristics, especially the Inventive and Separation Principles.

Table 6: Creative Web Template™ for Generating Conflict-Elimination Strategies for the Microsoft Corporation

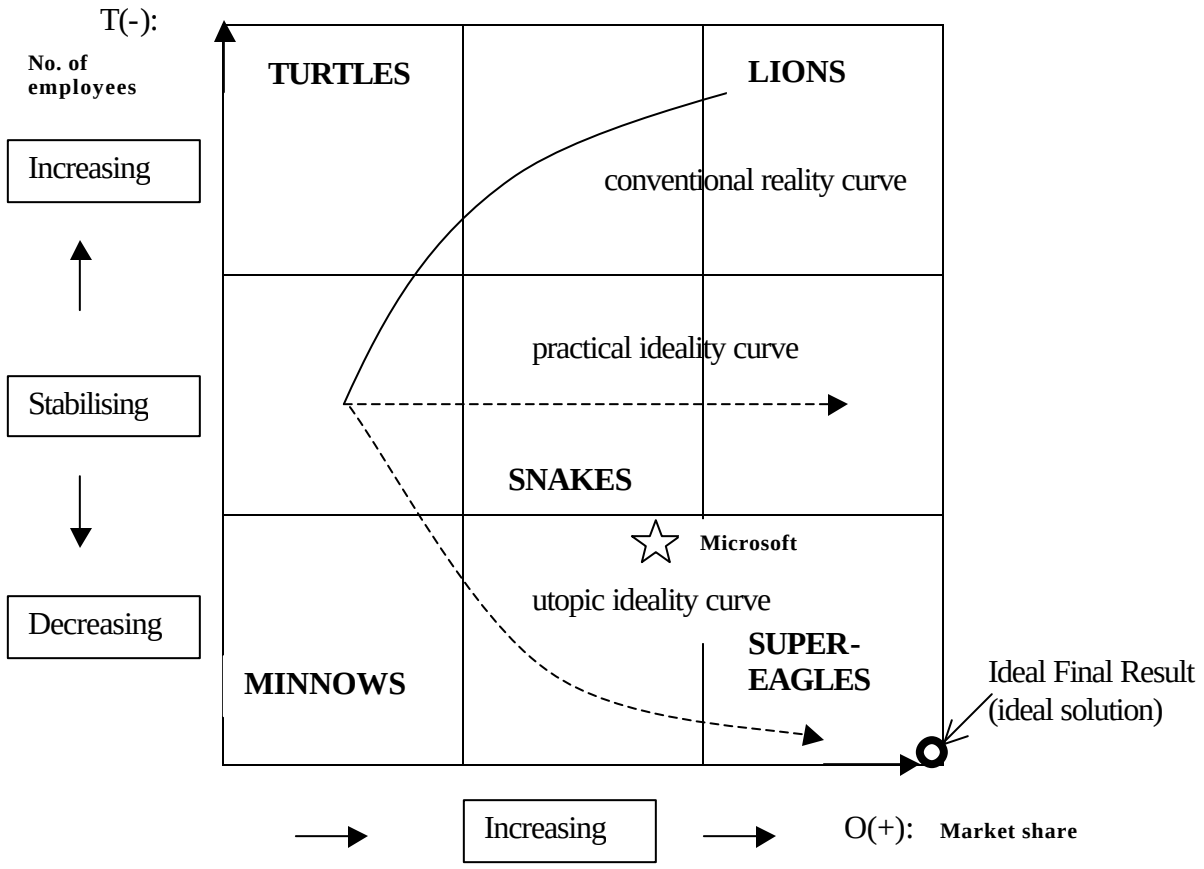
Innovation Project/Question: Applying Enhanced SWOT Analysis and I-CCEM™ Framework to Microsoft Sheet 1 of 1

System(s) of Focus: Microsoft Reference: Dr. Rod Kuhn King Date: January 2004

PROBLEM-DEFINITION SPACE: ***What are the problems?*** *(Problem-focus: Conventional & Radical Present/Past/Future)*				METHODS-SPACE: ***How to solve problem(s)?*** *(Prompting, Templates, and Resources-foci; Explanation-focus)*				SOLUTIONS-SPACE: ***What are (ideal) solutions?*** (*Solution-focus: Conventional & Radical Future)*		
Unacceptable Situation: Customers Problems/ User-Bugs/ Best Practice (Ideality)- Disadvantage or Weakness/ Threat (& Core Causes)	**Elements of (Present) Core Conflict** (Operational, Physical, Attribute, Parametric, and/or Atomic Level)			**Analogies/ "Bipolar Conflict" Objects, Activities, Resources in Local Environ-ment or Global Life Space**	**Idea Prompters or Checklists for More "Means" To Satisfy Objective/ Function and to Release Constraint**			**Generated Ideas/Proposals/Solution-Paths/ Concepts/Hypotheses/Opportunities**		
	(Decision) Objective/ Task/ Function: Practical/ Ideal/ Best-practice/ Critical	**Means/ Strate-gies/ Tools:** Practical/ Ideal/ Best-practice/ Critical	**Constraints/ Obstacles/ Negative Impacts/ Contradictions/ Assumptions:** Multiple Perspectives/ Critical		Description of Probable Innovation Strategies/ Principles/ Techniques/ Methods/ Patterns	Core Drivers: Root-Causes & Con-straints/ Fields/ Critical Variables	Categories of Variables: Resources & Constraints	**Right-brain:** "Intuitive" Alternative Proposals/ Wild Means/ Evolutionary States/Free Association/ Vision	**Left-brain:** "Logical" & "Idea-prompted" Alternative Proposals/ Constraint-Releases/ Disruption	**Selected:** *Practical/Ideal/ Best Practice* - Opportunities/ Specifications/ Success Criteria/ Bipolar Conflict Resolution(s)
Tendency for staff to increase with rapid growth of market share as well as revenues and profits	**To maintain or reduce number of employees as market share increases**	**Closed System Solutions:** use internal (SWOT) resources in the present and future **Open System Solutions:** use internal and external (SWOT) resources in the present and future		See Bipolar Conflict Graph of: Market share vs. No. of employees	*Why not-* *Find ways to Modify/Use* *SCAMPER-DUTION* *Separation: in Space in Time on Condition in Structure* *Asymmetry (4) Discarding (34) Periodicity (19)* *Bipolarity*	*Manual Mechan. Pressure Hydraulic Thermal Optical Acoustic Magnetic Electrical Chemical Nuclear Biologic. Olfactory Gustato-ry Kinesthe-tic*	*Business Units? Products? Processes? Services? Technology? Staff/Teams? Infrastructure? Location/Plans? Leadership? Management? Brand/Finance? Knowledge? Culture? Competencies? Innovation? Customers? Competitors? Suppliers? Environment?*	Use: Restructuring Re-organization Process Re-enginering Automation Digital Nervous System Virtual Organiza-tion Self-organization Autonomous teams Productivity-related bonuses	Separate geographical space units; processes/ Implement 24x7 shifts around the globe Focus on using virtual teams Separate technical and administrative decision-making Introduce weird-ness, chaos etc. Employ workers on project-based contracts Introduce surprises at work	

Fig. 2 indicates that the conventional approach is to allow increases in number of employees as a business rapidly grows as a result of increased market shares. Pursuance of this strategy leads to businesses ending up as *Lions*: powerful but relatively inefficient. The ideal solution lies in the *Super-Eagles* zone, where key assets are power, agility, and nimbleness. Attempting to move from the *Lions* zone to the *Super-Eagles* involves the use of strategies like **downsizing, delayering, trimming, and "segmentation"** of the organization.

Fig. 2: Bipolar Conflict Graph (BCG) for Market share vs. No. of employees



Based on information in Table 4, Microsoft's plotted position or "star" is in the zone between the *practical ideality curve* and *utopic ideality curve*; in other words, between the *Snakes* and *Super-Eagles* zones. Using examples of best practices, including Microsoft's experience, the author suggests, for reducing the conflict of "Market share" vs. "Number of employees", the following strategies: **restructuring (re-organization); process re-engineering; automation (Digital Nervous System/Virtual organization); self-organization**. These strategies are by themselves not new. However, they are qualitatively different from strategies for an organization that is transitioning from the *conventional reality curve* to the *practical ideality curve*. Nevertheless, a

paradigm shift is always involved in moving from one curve to another or from one labeled zone to another. What the Bipolar Conflict Graph™ in Fig. 2 does is to illustrate this paradigm shift as well as create focus for strategies that are required to move an organization to the *Super-Eagles* zone and ultimately, to the **ideal solution**.

It may be worth noting that Fig. 2 visually displays the **physical contradiction** when the aim is to obtain the highest market share: there is almost a natural tendency ("momentum") for the organization to be in the *Lions* zone, although the organization would like to be in the *Super-Eagles* zone. In the language of TRIZ, the physical contradiction is: a high number of employees vs. little number of or no employees. TRIZs separation principles indicate the following **separation strategies**:

- **Separation in space:**
  - e.g., separate in geographical space Microsoft's business units, processes, services, equipment, technology, and infrastructure
  - decentralize leadership, management, and innovation
  - transfer or outsource jobs to highly productive but cheaper labor markets
- **Separation in time:**
  - e.g., carry out "24x7" shift-work around the globe
  - prioritize and do work in phases such as previous "idle" or "slack" time
  - separate time for work and play
  - separate processes and services in time
- **Separation on condition:**
  - E.g., focus on autonomous and self-organized teams
  - disaggregate or operationalize core competencies
  - assemble and disassemble teams according to volume of available work
  - managers to do technical jobs and vice versa, as the need arises
- **Separation in structure (within system, subsystem, and supersystem):**
  - e.g., separate technical and administrative decision-making
  - segment or re-classify customers, sales, finance, suppliers, employees, complementors, competitors, sector/industry, and the environment

The above are suggestions, or more specifically, "hypotheses" that should be tested and evaluated using hard facts or data. The author's main purpose is to illustrate how the separation principles could be used to facilitate the generation of ideas such as in a **brainstorming session** for reducing an identified conflict in an organization.

In order to use the Contradiction Matrix, the performance indicators of "Market share" and "Number of employees" should be translated to parameters in TRIZs list of 39 (engineering) parameters. This translation and consequently, suggested inventive principles will be subjective especially as none of the 39 parameters is described as "Market share." This author takes the description of "Power" (parameter number 21) as synonymous with "Market share." Thus, *Power* is the improving ("desirable") parameter. The worsening ("undesirable") parameter is parameter number 26, "Quantity of substance", which is regarded as equivalent to "Number of

employees." Thus, the conflict in terms of the Contradiction Matrix is: **Parameter number 21 (*Power*) vs. Parameter number 26 (*Quantity of substance*)**.

From the Contradiction Matrix, the following inventive principles are obtained: Inventive Principle #4 – **Asymmetry**; Inventive Principle #34 **Discarding and Recovering**; Inventive Principle #19: **Periodic Action**. These principles are recorded in Table 6. This set of principles could also be regarded as a shortlist from the population of idea prompters of the SCAMPER-DUTION™ Matrix, which includes idea prompters from TRIZ as well as from the literature on creativity and business development; see Table 7. The SCAMPER-DUTION™ Matrix could be used for obtaining descriptions that are more meaningful to business people as some descriptions of TRIZs inventive principles may not immediately be understood in a business environment. TRIZs inventive principles, which originally focused on technical systems, include descriptions like "Mechanical vibration", "Pneumatics and hydraulics", and "Flexible shells and thin films."

With regard to eliminating the contradiction of *Power* vs. *Quantity of substance* (i.e., *Market share* vs. *Number of employees*) the suggested inventive principles could be elaborated as follows:

- **Asymmetry (#4) -** *Change the shape of an object or system from symmetrical to asymmetrical*:
    - e.g., introduce "weirdness","chaos", or risk-taking in an organization
    - encourage out-of-the-box, "disruption", or reversal thinking
- **Discarding and Recovering (#34) –** *Make portions of an object that have fulfilled their functions go away or modify them directly during operation*:
    - e.g., employ workers on project-based contracts and recall them when similar projects arise
    - forget about past success and peak experiences but use them, when necessary, to empower employees and management
- **Periodic Action (#19) –** *Instead of continuous actions, use periodic or pulsating actions*:
    - e.g., segment processes in time
    - carry out upgrades not continuously but in concentrated phases

Some of these suggestions are summarized in the "left-brain" solution space of the Creative Web Template™ in Table 6. All strategies could be disaggregated further to an operational and domain-specific level. As with the strategies that are based on the separation principles, the suggestions in Table 6, should be regarded as hypotheses to be tested and evaluated using hard facts from Microsoft.

Table 7: SCAMPER-DUTION Matrix™ of Idea Prompters for Crisis Problem Solving, Conflict-Elimination, and Planning

"Standard (INCISE) Solutions" Acronym	1: Ideal Nothingness: lean change; decrease in elements	2: Ideal Infinity:significant increase in elements	3: Ideal Efficiency & "automaticity": lean changes	4: Ideal Conflict resolution & unity: mixed changes	5: Ideal Simplicity, variety, & beauty: lean (and mixed) changes	6: Ideal Identification, detection, & branding	Targeted Resources in Organizational Space
S	*Segmentation (1)* *Separation/"Self-X"* *Stacking/Smoking* *Squeeze/Substitute* ***Subtraction**/Switch* *Submerge/Suction*	*Segmentation (1)* *Separation* *Stretch* *Substitution* *Serialization* *Superposition*	*Spheroidality (14)* *Skipping (21)* *Self-service/Self-organisation (25)* *Substitution (28)* *Shells (30)*	*Separation: in space/time/level* *Synthesising* *Synchronise* *Structuring* *Satisficing*	***Symmetry/"Self-X"*** *Standardisation* *Simplify/Scale/Shape* *Surprise/Serenity* *Specialisation* *Superposition*	*Stabilize* *Substitute* *Separate* *Simulate* *Store* *Synthesize*	**Sector/Shares** **Services/Solns** **Staff/Suppliers** **Strengths** **Structure** **System**
C	*Control/Compress/* *Compact/Cancel* *Concentrate/Cease*	*Continuity (20)* *Copying (26)/Clone* *Combine*	*Combining (5)* *Converting (22)* *Composites (40)*	*Cushion beforehand (11)* *Compensate*	*Change: colour (32);* ***parameters** (35)* *Copy; Concentration*	*Change* *Cartoon* *Copy*	**Competitors** **Competencies** **Customers**
A	*Anti-weight (8)* *Anti-gravity*	*Add/Attract* *Aggravate/Attach*	*Automate* *Accelerate*	*(Anti-) action (9/10)/Alignment*	***Asymmetry** (4)* *Adaptive/Abstraction*	*Additive* *Assemble*	**Actions** **Advantages**
M	*Minimize/Modify* *Miniaturize/Melt*	*Maximize/Modula-rise/**Multiplication***	*Merging (5)* *Mixing/Multiplex*	*Maxi-mini* *Mirroring*	*Modify/Morph* *Manipulate/Mismatch*	*Magnetic/* *Move/Model*	**Management** **Market**
P	*Periodicity (19)* *Porosity (31)*	*<u>Pluralization</u>* *Production*	*Pneumatics (29)* *Pruning*	*Preparation* *Partial (16)*	*Put to other use* *Provocation*	*Protect* *Picture*	**Products/Profits** **Processes**
E	*Extraction (2)/Equi-potentiality (12)*	*Exaggerate/Expand* *Exploit/Extend*	*Expansion: thermal (37)*	*Eliminating Excessive (16)*	*Elegant/Echo* *Extreme/Escape*	*Extract* *Experiment*	**Environment** **Equipment**
R	***Removal** (2)/Repel*	*Recovering (34)*	*Reengineering*	*Reduce/Reframe*	*Reverse(13)/Random*	*Replace*	**Resources**
D	***Division** (1)* *Discarding (34)* *Decrease/Decay*	*Division (1)* *<u>Dimensionality</u> (17)* *<u>Distribution</u>*	*Dynamism (15)* *Downsize* *Differentiation*	*Displacement* *Differentiation* *Distance*	*Distorting; Diversify* *Differentiate* *Decomposition*	*Destroy* *Decompose* *Direct*	**Disadvantages:** **Weaknesses** **Drivers: Value**
U	*Undercut/Uniform*	*Ubiquitous*	*Universality (6)*	***Unification***	*Uniform/Uniqueness*	*"Unusality"*	**Units: Business**
T	*Trimming; Transi-tion phases (36)*	*Tilt (17)/Transpose/* *Telescopic*	*Transition: phases (36)*	*Transformation* *<u>Transduction</u>*	*Transition; Twist* *Turn off/Tranquility*	*Transfer* *Transform*	**Teams/Threats** **Technology**
I	*Inexpensive (27)* *Inert (39)/Inactivate*	*Increase* *Improve*	*Integration* *Innovation*	*Intermediary (24)* *Integrate*	*Invert/Interrupt* *Idealise/Interlocking*	*Introduce* *Imitate*	**Infrastructure** **Innovation**
O	*Orientation (17)*	*Orientation (17)*	*Oxidant (38)*	*Optimising*	*Opposite; Order*	*Observe*	**Opportunities** **Organization**
N	*Nesting (7)/Nullify*	*Nebulous*	*Nesting (7)*	*Negotiating*	*Non-uniformity (3)*	*Nature*	**Networks**
Misc.	*Homogeneity (33)/* *Free/Heat/Void*	*Net/Novelty* *Bi-; Poly-; Multi-*	*Feedback (23)* *Localisation (3)*	*Win-win/BATNA*	*Vibration (18)/Field/* *Void/Heterogeneous*	*Vary/Field/* *Frequency*	**Leadership** **Finance/Brand**
Problem Archetype/ relationship	**Undesirable Presence: Harm; Waste; Excess**	**Undesirable Absence: Void; Deficit**	**Undesirable Inefficiency/ Sub-optimality**	**Undesirable Conflicts/ Contradictions**	**Undesirable Complexity/ Sameness**	**Undesirable Identifica-tion/Detectn**	**Core Drivers/ SWOT Factors/ Problems**

Note: Numbers in brackets indicate the numbers associated with corresponding inventive principles of TRIZ

6 CONCLUSIONS

In this paper, an enhanced framework for SWOT Analysis is presented. The enhanced framework includes the tool of SWOT-Radar Screen™. In the SWOT-Radar Screen™, TRIZs concept of Multi-screen is used to present a framework for a system's strengths, weaknesses, opportunities, and threats not only at the level of the system but also at the level of subsystem and supersystem. The elements at each level are then described especially using concepts from Porter's value chain and Five Forces, and Kaplan & Norton's Balanced Scorecard. Also introduced is an operational definition for the degree of conflict which relates to strengths and weaknesses on the one hand and opportunities and threats on the other hand. The degree of conflict could be regarded as the reciprocal of TRIZs degree of ideality. The framework of the SWOT-Radar Screen™ and the criterion of the degree of conflict make superfluous many previous criticisms of SWOT Analysis.

An overarching framework, I-CCEM™, is then introduced. In the framework of I-CCEM™, the enhanced tools of SWOT Analysis, Bipolar Conflict Graph™, and TRIZ are integrated. This framework is then applied to the Microsoft Corporation not only to describe its current position and prospects but also to identify its present and future degree of conflict. Based on Microsoft's SWOT-Radar Screen™, a major conflict ("Market share" vs. "Number of employees") is hypothesized and corresponding strategies generated using the Bipolar Conflict Graph™ in addition to TRIZs Contradiction Matrix, Separation Principles, and Inventive Principles. The numerous generated strategies are presented as hypotheses to be detailed, tested, and evaluated using hard data from Microsoft. Going through this process will enable an analyst to obtain valuable insights for eliminating the conflict or contradiction of Market share vs. Number of employees.

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