

SYSTEMATIC WIN-WIN PRODUCTION STRATEGY, PHILOSOPHY AND MANAGEMENT

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Abstract

1500 person years of systematic innovation research has shown that the strongest solutions and ideas are the ones in which the problem or opportunity owner has successfully challenged the conflicts and trade-offs that others have assumed to be fundamental. The paper describes the creation and application of a new Contradiction Elimination tool aimed specifically at distilling the best win-win production oriented solutions from across all fields of human endeavour. The tool is believed to offer problem solvers the same ready access to the best of other business solutions, and as such offers a previously unknown problem solving and strategy definition capability. The new tool has been constructed from the analysis of a large proportion of the published knowledge on businesses that have successfully challenged the win-lose or lose-lose contradictions their competitors had not recognised or assumed were not challengeable. In all, several hundred win-win cases have been identified and included in the analysis. The paper describes some of the most well known of these cases - and how they have influenced the structuring and content of the new tool. A short final section of the paper describes how the tool is beginning to be used to systematically generate effective, deployable win-win solutions to real production strategy definition and management problems that would otherwise have been solved using traditional compromise-based methods.

Keywords: innovation, strategy, mass-customisation.

Introduction

Question. What have Cisco, Virgin, Schwab, GE Capital, Benetton, South West Airlines, Home Depot, Wal-Mart, America West, eBay, Barnes and Noble, Body Shop, Sephora, IBM (e-business), Sony Computer Entertainment, Shell, Dell, Disney, Harley-Davidson, IKEA, Tesco, Starbucks, Hotmail and Toyota have in common? Answer. Two things. One; non-linear growth patterns. Two; they have achieved their phenomenal business performance by successfully challenging the prevailing trade-offs and conflicts of their industry and 'eliminating' key contradictions their competitors assumed were inherent.

Most leaders and managers are at least beginning to recognize the inherent weaknesses of compromise-based thinking approaches. The idea of win-win solutions is, conceptually at least, highly appealing. The database of win-win solutions in a production environment is, however, sparse. It is also though highly revealing; win-win solutions pay enormous dividends in terms of business performance. Figure 1 illustrates three such examples taken from Reference 1 – one of the first published articles quantifying the benefits of win-win approaches.

Figure 1: Differences in Business Performance Between Contradiction-Breakers and Industry Average

	(%) Industry average growth '88-'95	(%) Industry -leader growth in same period
Securities Brokerage	90	520
US Domestic Airlines	80	370
Home Improvement Retailing	40	1500

In the production environment, win-win is commonly viewed from a 'nice to have, but there is no method, so we can't do it' perspective. There is probably also a considerable element of conditioning to several millennia of either/or thinking systems. One of the basic tenets of the systematic innovation method [2, 3] is that 'someone, somewhere has most likely already solved something like your problem'. One of the key elements of the philosophy is that different disciplines don't talk to each other, and consequently much re-inventing of wheels takes place. Another key finding of systematic innovation research – via the analysis of a considerable proportion of the world's most successful engineering solutions – is that the most effective solutions occur when a problem solver has identified and 'eliminated' a contradiction rather than accepting the trade-offs their prevailing contemporaries have taken to be inherent. The net result of this patent analysis is that there are – so far at least – just 40 different strategies available to help in this process of contradiction elimination. Subsequent research has confirmed that it is precisely the same 40 strategies that are being used in achieving successful contradiction-breaking, win-win solutions in any production context [4].

We explore here the codification of these strategies in their business context and the construction of tools to help problem, conflict or opportunity owners achieve win-win outcomes in systematically reproducible manners.

Contradiction Elimination Tool

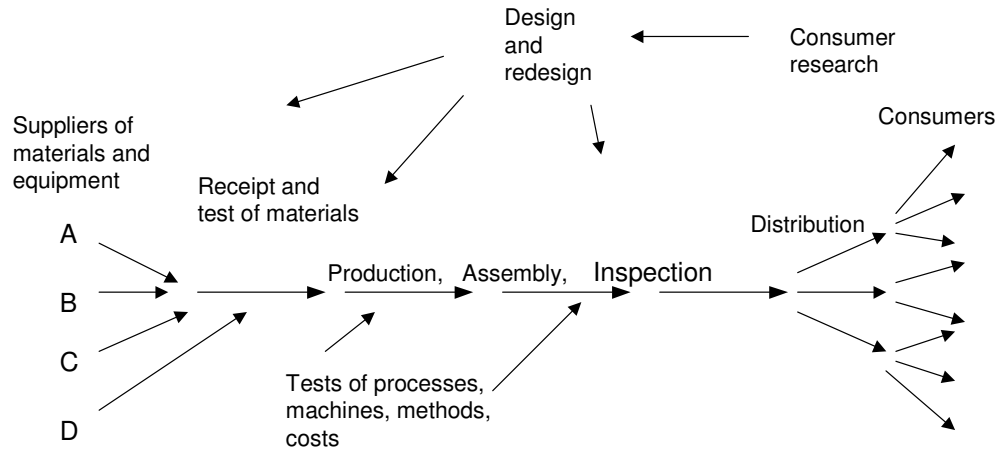
The Contradiction Matrix contained within classical systematic innovation methods [3] enables a user to identify pairs of conflicting parameters from a list of 39 most commonly used engineering parameters – length, weight, power, reliability, etc. The Matrix then provides the three or four Inventive Principles found by others to successfully challenge the particular conflict. The classical Matrix was compiled from an analysis of a substantial number of successful engineering solutions. Although the tool is now relatively old (albeit an updated version is currently in preparation – Reference 5), the concept is believed to be fundamentally sound.

While initial work has confirmed the validity of the Inventive Principles in a business environment, the parameters of the classical Matrix bear only passing relevance to the issues of relevance in a non-engineering context. One of the first tasks of the work to generate a business version of the Matrix, therefore, was to formulate a structure offering direct relevance to business issues. The business

environment is of course highly diverse, multi-dimensional and highly complex, and there were many possible ways of segmenting the total picture.

The pioneering thinking of W. Edwards Deming [6] in which the production of goods (and services) was drawn as a process for the first time was used as a start point – and resulted in a segmentation of problem areas in terms of the different fundamental parts of that process – initial research, development and ‘pre-production’ activities, the production process, the supply process and the post-supply ‘support’ activities – Figure 2.

Figure 2: Production Viewed As A System – W.E.Deming (1950)



Within each of those elements, then, the primary parameters of interest were segmented in terms of physical attributes (essentially specification, quality, capability, and means), time attributes, cost attributes, risk attributes and, in-line with emerging thinking [7] that it is often not the ‘things’ but the ‘thing between the things’ that are the important elements, ‘interface’ attributes. Added to this basic framework were then the other important attributes that we observed from the business literature that were commonly of interest in tackling business problem situations. In order to make the size of this list manageable, a degree of abstraction was performed similar to that done when the Matrix of classical TRIZ was formulated. The eventually selected list of 31 parameters is reproduced in Figure 3.

Figure 3: 31 Parameters of the Contradiction Elimination Tool

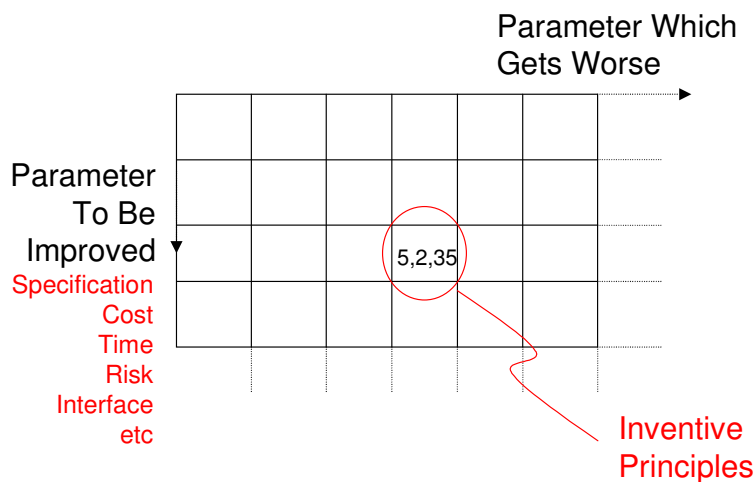
- | | |
|-------------------------------------|--------------------------------------|
| 1. R&D Spec/Capability/Means | 16. Product Reliability |
| 2. R&D Cost | 17. Support Cost |
| 3. R&D Time | 18. Support Time |
| 4. R&D Risk | 19. Support Risk |
| 5. R&D Interfaces | 20. Support Interfaces |
| 6.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

Throughout the subsequent process of identifying case studies that fitted the structure, and beyond to the present time, a philosophy of flexibility and amenability to change has been adopted. As it happens, the analysis has supported the segmentation structure used, but as with any new tool, the current version is very much viewed as a ‘useful start’ rather than a ‘definitive end’. The new Contradiction Elimination tool is intended to function in much the same way as the classical Matrix; the user is thus encouraged to think about what they are trying to improve and then what is stopping them from making the improvement. The numbers in the boxes representing the intersection of the improving and worsening parameters then represent the inventive strategies used by others who have successfully challenged the particular either-or trade-off under consideration. The idea is illustrated in Figure 4.

Unlike the original technical Matrix, this new one has been constructed in a symmetrical form (i.e. the same results are obtained by looking up an A versus B as a B versus A contradiction) in order to ease use. In the fullness of time, as more examples emerge, it is likely that the Matrix will be expanded to allow any dis-similarities in strategy between improving one of a pair of conflict parameters over another to be presented to the problem solver.

In constructing the new tool, each box was completed through a combination of two mechanisms; the first involving an equivalent of the original systematic innovation research – identifying successes from known existing solutions and abstracting the information they contain – the second involving simulation of hypothetical conflict scenarios and, one-by-one, identifying the Inventive Principles which generated the most effective solution directions. In this second scenario, ‘most effective’ was defined in terms of those solutions that generated a ‘wow’ response from the team involved in the synthesis process. With the total number of available published case studies numbering only in hundreds (as compared to several million patents), the current version of the Matrix is thus viewed as a first step towards eventual maturity as progressively more win-win conflict resolution cases emerge and become integrated into the framework, although it seems clear already from the analyses conducted that there a high degree of consistency and stability has already been achieved. The next section illustrates a few of the case studies used and the method of abstraction used during the construction of the new Contradiction Elimination tool:

Figure 4: Sample of Completed Matrix Highlighting Method of Operation



The number of different inventive strategies found to be present across all of the different boxes in the tool currently totals 40. This is not to say that there aren't more, rather that, so far, wherever the search takes place – whether it be engineering, science, business, nature – we see the same 40 strategies being used.

Figure 5: List of the 40 Known Win-Win Strategies

(more detail in Reference 12)

- | | |
|---------------------------------|-------------------------------|
| 1. Segmentation | 21. Hurrying |
| 2. Extraction | 22. 'Blessing in Disguise' |
| 3. Local Quality | 23. Feedback |
| 4. Asymmetry | 24. Intermediary |
| 5. Combination | 25. Self-Service |
| 6. Universality | 26. Copying |
| 7. 'Nested Doll' | 27. Cheap/Short Living |
| 8. Counterweight | 28. Another Sense |
| 9. Prior Counter-Action | 29. Fluidity |
| 10. Prior Action | 30. Thin & Flexible |
| 11. Prior Cushioning | 31. Holes |
| 12. Remove Tension | 32. Colour Changes |
| 13. 'The Other Way Round' | 33. Homogeneity |
| 14. Curvature | 34. Discarding and Recovering |
| 15. Dynamics | 35. Parameter Changes |
| 16. Slightly Less/Slightly More | 36. Phase Transitions |
| 17. Another Dimension | 37. Relative Change |
| 18. Vibration | 38. Enriched Atmosphere |
| 19. Periodic Action | 39. Calmed Atmosphere |
| 20. Continuity of Useful Action | 40. Composite Structures |

We will now examine some examples of win-win production solutions that have been used to help construct the new tool:

1) Benetton

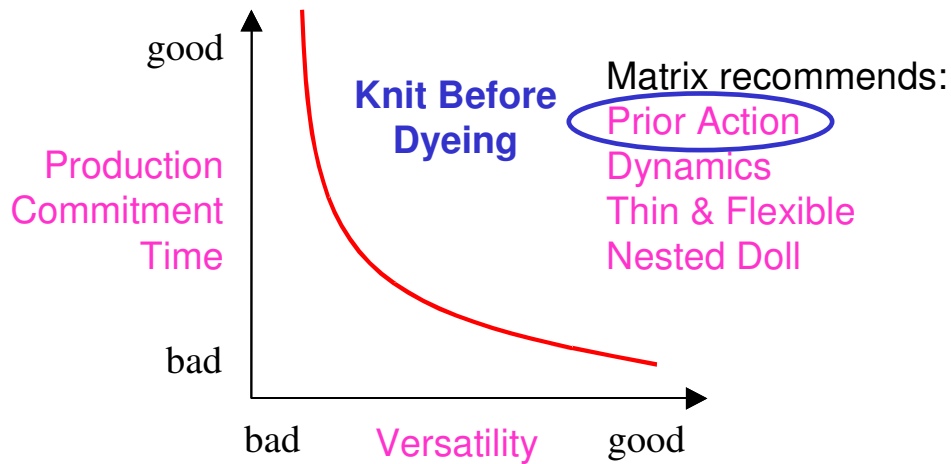
The fashion industry faces a challenge every year in the race to get the maximum amount of product to the customer once the season's colours have begun to demonstrate their popularity. Benetton's success is to a significant extent built from the way they have solved the conflict between the time available to commit a production decision versus the versatility of the clothes that get produced. Before Benetton's arrival, other clothing manufacturers adopted an essentially trade-off based approach to the problem, with often intricately calculated optimizations to achieve acceptable values of product match to fashion demands versus production commitment time. The net result of this traditional approach is usually piles of unsold stock made in the colours that did not sell, and an unsated demand for clothes made in the colours that turn out to be popular.

Benetton overcame the traditional trade-off by first recognizing that the greatest fashion uncertainty was colour and then working out the means to knit and assemble the clothes before they were dyed. In this way they were able to commit to the time consuming parts of the manufacture process early and then once the season's fashionable colours had emerged, the garments were already made and they only had to conduct the final dyeing operation. Thus Benetton used Principle 10 'Prior Action'.

The Benetton contradiction is located in the Matrix as the conflict between 'Production Time' and 'Versatility' – Figure 6. Analysis of other cases shows this use of 'prior action' to now be a common

strategy in solving this type of problem. The Matrix reflects this by placing Principle 10 as the most likely strategy.

Figure 6: Benetton's Contradiction Breaking Strategy



2) Mass Customization

The concept of Mass Customization – the economically viable creation of products or services tailored to the specific needs of individual customers – carries with it inherent contradictions between the versatility of the product or service and the cost of production. Traditional trade-off and compromise based business approaches offer little to help overcome this contradiction. Thus, while many organisations are beginning to recognise the need for Mass Customization, few actually know how to tackle the issues involved in turning the concept into profit-making reality. Previous work [8] has recorded many examples of contradiction-breaking strategies being used to generate significant business benefits across a wide range of different sectors. Examples extracted from [9] and elsewhere have abstracted the inventive strategies being deployed by these different sectors. To take a number of typical examples, we might consider the case of things like running shoes with suspension systems that the wearer is able to tailor to their own personal tastes (e.g. Nike Air – which uses Inventive Principles 3 – Local Quality – and 29 – Fluidity), or power-tools that come in a modularized form enabling the same basic power module to be used for many diverse functions (Inventive Principle 1 – Segmentation), or flexible travel packages that enable holidaymakers to mix and match a variety of different holidays into a unique whole that matches their precise desires (again Segmentation and Principle 40, Composite Structures), or Levi Strauss' individually tailored jeans production service – in which a purchaser has their measurements sent electronically to a Levi factory, where a pair of custom fit jeans are then fabricated and shipped directly to the customer. This solution takes advantage of Inventive Principles 28 and 2.

Again, all of the observed strategies fit within the context of the 40 known inventive principles contained within the systematic innovation toolkit. Figure 7 shows – in descending order of frequency of use – the most commonly applied mass-customization contradiction elimination strategies. This is the sequence adopted in the Contradiction Elimination matrix tool in the Adaptability versus Production Cost (or Means) box, and thus the recommendations that will be made for anyone facing this type of contradiction situation. Thus, the successful strategies of others are made available in an abstracted form to anyone else facing a similar contradiction-eliminating strategy. References 12 and 13 provide additional detail on each strategy.

Figure 7: Mass Customization Contradiction Breaking Strategies

- (15) Dynamics
- (17) Another Dimension
- (2) Taking Out
- (28) Mechanics Substitution
- (38) Enriched Atmosphere
- (3) Local Quality
- (40) Composite Structures
- (10) Preliminary Action
- (23) Feedback
- (35) Parameter Changes
- (21) Skipping
- (1) Segmentation
- (6) Universality
- (5) Merging
- (26) Copying

3) Lockheed Skunkworks

Lockheed Skunkworks is a world renowned centre of excellence in terms of its ability to complete leading edge aerospace R&D in uniquely low lead-times and costs [10]. Like many high-technology organisations, Lockheed faced the contradiction between the desire to effectively harness the R&D capabilities of the organization in a cost environment geared up to operate on a production line basis.

Compromise solutions to the conflict usually involve parallel operation of prototype and production facilities with prototype jobs done when there is capacity in the production side of the business.

Lockheed famously decided to completely separate out the R&D operation into what has now become a watchword in rapid, low-cost prototyping. Although again simplistic, in terms of the Matrix, they used Principle 2 ‘Taking out’ to successfully challenge the contradiction between R&D specification/quality and R&D cost.

4) ‘Just in Time’

This case is somewhat different from the previous three, being deliberately generic with the details abstracted in order to make it relevant to the widest possible audience.

Just in Time production strategies are close to ubiquitous across many industries. They have been shown to offer simple and effective means of minimising inventory and maximising the effectiveness of manufacturing systems. Less well understood is that in almost all cases, the achieved performance improvements have come merely by shifting a trade-off from one place to another. If we ask ourselves the question ‘what has become worse as supply time has been reduced to its absolute minimum?’ – a question that the Contradiction Elimination tool forces us to think about –

then it seems clear that in many instances, the improvements made by JIT have come at the expense of increased risk. That is risk in terms of the increased vulnerability of the production system when something unexpected happens. A classic example of this type of situation came in the UK in 2000 when lorry-drivers complaining about fuel prices blockaded fuel supply depots, and the whole country was brought to near standstill in around 48 hours. The problem occurred because fuel stations had shifted to a business model that used much lower stocks, and required two or three fuel deliveries per week.

Enlightened, risk-managing organisations, of course, recognise the potential threat and have developed strategies for countering such risks. In the large majority of cases, they have reduced their risk by increasing their inventory. In other words, they have shifted the time-versus-risk conflict to a different ‘optimum’. In systematic innovation terms, they have designed by conventional trade-off strategies. The Contradiction Elimination tool, on the other hand, suggests that there are inventive ways of avoiding the compromise. Inevitably, the suggestions made by the tool when we examine it to see how others have inventively solved ‘time versus risk’ contradictions will be generic in nature. Their real value comes when we translate those generic solutions into the specific solutions to a specific problem situation. Clearly, to do that here would be to diminish the generic value of the method. What we can do however is to examine the generic solutions and speculate on ways in which they could be applied to solve any number of JIT versus risk situations.

Figure 8: Inventive Strategies Most Likely to Resolve JIT versus Risk Conflicts
(based on Reference 11)



Let us examine some of these suggestions in a little more detail:

Prior Action – is the most commonly used strategy for inventively solving the contradiction. It is therefore perhaps the most obvious – ‘Introduce a useful action into an object or system (either fully or partially) before it is needed’, or ‘Pre-arrange objects or systems such that they can come into action at the most convenient time and place’ according to Reference 12. This is certainly the sort of strategy – in the form of creation of certain contingency measure – that the UK Government have thought about to prevent a reoccurrence of the 2000 incident. In essence, the prior action strategy is likely to involve some kind of pre-planning activity.

Dynamization (‘Allow a system or object to change to achieve optimal operation under different conditions’, or ‘Split an object or system into parts capable of moving relative to each other’ or ‘If an object or system is rigid or inflexible, make it movable or adaptable’ – from Reference 12) – likely to have several interpretations in a JIT-versus-risk context, most obviously, the idea of adapting the JIT strategy to suit changing external conditions – in other words shifting the inventory holding as a function of prevailing events.

Other Way Around - (Make movable objects fixed, and fixed objects movable) – typical examples include things like home-banking or park-and-ride transport schemes, where the traditionally fixed part of the system becomes the movable part.

Fluid – similar in some senses to the above Dynamization strategy, although intended to imply a somewhat stronger shift away from rigid structures, systems and relationships towards ones that are adaptive in a continuously changing, fluid sense.

Universality (‘Make an object or system able to perform multiple functions, eliminating the need for other systems’) – largely suggests solving the contradiction at the level of the individual; achieving the desired function by, for example, multi-skilling, ‘rapid-reaction-force’ strategies and related concepts.

The main point with all of these strategies is, of course, to translate them from their deliberately abstract form into the specific terms of the problem situation at hand. The new Contradiction Elimination matrix tool is intended to distill contradiction situations to discover ‘most likely’ inventive strategies. It is important to recognize, however, that the tool has been designed to offer a ‘good start’; in the final analysis, there are 40 known possible inventive strategies and any one could offer effective solutions. A full problem analysis, therefore, is likely to begin with the matrix recommendations, and possibly progress to looking at a rather wider range of the known strategies. It is also important to recognize the importance of combining the solution concepts identified from the individual inventive strategies at a later stage in the solution generation process. More detail on this overall process can be found in Reference 12.

The above four examples are but a tiny sample of the several hundred cases examined in constructing the Matrix. Reverse engineering of historical business success stories to help generate a knowledge framework and the subsequent application of that framework to solve as yet unsolved problems are of course two different things. The new Business Matrix has been validated in this application role over the last two years on a number of real business conflict issues. The majority of these cases are unfortunately not available for circulation in the public domain. A case – looking at a problem involving poor transition of research to market – is however available in Reference 13.

The full Contradiction Elimination tool is available in electronic form at Reference 11.

Final Thoughts And Future Work

The new Contradiction Elimination resolution tool has been borne of a desire to abstract the win-win strategies employed by the world’s most successful businesses. Although the benefits of win-win over either/or thinking strategies are apparent to many, the application of systematic innovation abstraction strategies to codify the established good-practice of business into a form that makes it generically applicable to organisations in other industries or fields, is only just beginning to emerge. The original systematic innovation Matrix was constructed from many thousands of examples of technical success. The equivalent database of ‘business success’ is thus far much smaller and so the new tool cannot hope to offer the same level of either authority or guaranteed effectiveness as the original tool. On the other hand, based on the growing database of business problems they have been used to successfully solve, it seems at the very least that they offer a ‘useful start’ – and very often it will have been the first time that production situations have been viewed as compromises and trade-offs. The medium and long-term aim is to expand the database to include more examples, and a programme of systematic research is underway to continue this process.

Further case study applications of the tool will be published in coming months in the CREAX newsletter [14] and on-line TRIZ Journal [15].

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