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Identifying Buyer-Supplier Conflict in Collaborative Process New Product Development

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ABSTRACT

Every organizational entity, whether operated for profit or not, must purchase goods and/or contract for services to meet the needs of its customers, clients, and stakeholders. As a result of the dynamics that occur in this process, the potential for buyer-supplier conflict is extremely high and is in fact a very common occurrence. Proper identification, assessment, and management of buyer-supplier conflict can lower the cost of conflict and improve the efficiency and effectiveness of an alliance.

The costs associated with buyer-supplier conflict include lost productivity, strained relationships, poor resource utilization, and unfulfilled potential of the joint activities undertaken by the buyer and supplier in support of the relationship. This paper applying a methodology, extending the concept of TRIZ (XTriz), to discover supply chain conflict before they occur and cause detrimental effects to system performance. The approach involves specifically focus on extending TRIZ with Root Conflict Analysis, which allows us to extract and map the contradictions arising in supply chain that are the root cause of certain problems. We applied the proposed methodology on new product development (NPD) to illustrate the validity of the tool. Although, further research is needed to fully explore this method of conflict detection, we believe that this research does indeed provide some much needed insight into the daunting task of conflict discovery and therefore proactive handling of these potentially negative occurrences in the supply chain.

1. Introduction

Over the last decade, the competitive business atmosphere has pushed companies to compete not solely on their own capabilities but with their entire supply chain and suppliers [1]. Moreover, increased customer requirements and globalization have forced managers to ensure that their organization's resources are well aligned not only across all functional areas but also throughout the entire supply chain [2]. At the present time, an effectively managed supply chain is one of the main requirements because the efficiency of companies is heavily

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dependent on their suppliers and supply chain partners. Thus, the supply chain, its processes and supply chain management have been begun to be implemented increasingly by companies as an important strategic option for pursuing their strategies. Many companies have undertaken initiatives to coordinate the efforts and activities of the various functional areas and supply chain members—clearly coordination is a key component of successful supply chain management specifically in new product development ((NPD). Recent literature has widely addressed the importance of client–supplier collaborative new product development (NPD) and extensive efforts have been devoted to study the management of the collaboration [3,4].Client–supplier collaboration is rather a complicated and difficult issue. While collaboration can result in significant mutual benefits, many collaborative efforts often produce less than desired outcomes. Clients (some authors call it buyers) and suppliers are facing a number of problems in managing collaborative NPD [5]. Many of these problems surface from conflicts inherent in supply chains. Conflicts can result from the incompatibility of goals by different entities, role incongruence and dysfunctional domain definitions and differences of perceptions of reality used in joint decision making such as the lack of accurate information sharing and trust [6,7].Although conflict can occur at anytime and anywhere in the human life, there are some differences between human life-based conflict and the supply chain-based conflict. Thus, it is important for the supply chain to manage conflict effectively so that the positive consequences of conflict can be realized. Coordinating and managing distributed entities in a supply chain is a challenging task due, in part, to conflicts present in such systems. If not handled effectively, the conflict can degrade the performance of the system [8].

Ideally, supply chain partners could discover potential conflicts before they occur and work together discover and preempt conflict would be a valuable asset to the management and design of supply chains, there is little insight found in the literature on how to accomplish this. The intent of this paper is to take an initial step forward in this area. Specifically, the paper intends to provide a systematic approach via the Root Conflict Analysis, which allows us to extract and map the contradictions arising in supply chain system that are the root cause of certain problems. The methodology based on the concept of Extending TRIZ (XTriz) through Root Conflict Analysis to detect conflicts prior or after to occurrence in a supply chain system.

The remainder of this paper is organized as follows: since our proposed approach to conflict detection is based upon the concept of XTriz, we briefly discuss Conflict detection in supply chain in the literature and other Conflict detection methodologies and TRIZ applications in business and management in Section 2. We present the systematic approach in Section 3 and provide an empirical example that provides support for the approach in Section 4. and enumerate future research needs and provide some concluding remarks in Section 5.

2. Conflict detection in supply chain/distributed systems applications

Whenever people or companies work together, conflict in a team, company or among companies are inevitable [9], and a ubiquitous phenomenon that covers all activities among companies. Researchers, in different fields, have recognized conflict as an important issue

that affects organizational and supply chain performance [10].For example, there is a negative relationship between conflict intensity and performance of supply chain in terms of product quality, delivery time, meeting of target development costs and etc. The effects of conflict in the workplace are widespread and costly. Its prevalence, as indicated by three serious studies, shows that 24-60% of management time and energy is spent dealing with conflict. This leads to decreased productivity, increased stress among employees, hampered performance, high turnover rate [11].

In the literature, conflict can be termed in many ways. For example, conflict can be defined as the interaction of interdependent people who perceive opposition of goals, aims, and values, and who see the other party as potentially interfering with the realization of these goals[12],as disagreement between two or more individuals, groups or parties[13], any situation in which two or more parties feel themselves in opposition[14], as a process that begins when company or people perceive that another company or person has negatively affected, or is about to negatively affects, something that the first party cares about[15] and as the behaviors or feelings of interdependent parties in response to potential or actual obstructions that impede one or more of the parties achieving their goals[16].

There are many studies about conflict in different areas. For example, Geyskens et al[17] studied conflicts in channel relationship and retailing. Shaw and Shaw analyzed conflicts between engineers and marketers from engineer's perspectives. Rahim [18] asserted that conflict has both functional and dysfunctional outcomes. Functional outcomes include stimulating innovation and creativity, and better decision making, whereas dissatisfaction, mistrust, damaged commitment and relationship are the common dysfunctional outcomes. Bradford et al. [10] researched supply chain based conflict and how affect company performance. They analyzed (1) inter-personal conflict and (2) task conflict in the retailing industry because retailers increasingly were becoming involved with groups of other firms to improve their effectiveness in performing business activities. The results of their research show that conflict can have negative effects on network outcomes. Lam and Chin [19] analyzed conflicts in new product development process. Kozan et al.[20] analyzed conflict management in Turkish buyer-supplier relationships, and studied buyer-supplier relations from a conflict management perspective capturing data from 50 buyers in automakers and 72 suppliers. In sum, conflict has been studied in terms of conflict among departments, ideas, companies and individuals.

Specifically, the area of supply chain-based conflict is particularly important due to importance of supply chain management.

Conflicts in supply chain systems put a firm's supply chain at risk and thereby, increase its level of vulnerability. These conflicts can disrupt the operation of a supply chain and affect customer metrics such as on time delivery and quality. Conflicts affecting supply chains may manifest themselves in a variety of forms from transportation delays, port stoppages/border issues, accidents, natural disasters, poor part shortages, quality issues, dependency on a single supplier/unreliable suppliers, IT system breakdowns/poor communication labor disputes to terrorism/war [21].With the plethora of conflicts having the potential to shut down the supply chain, managers struggle with how to understand and deal with these disruptive events.

However, although the need for conflict detection is noted in previous research, effective methods to realize detection are still needed. Therefore, a methodology to detect conflicts in a supply chain before they occur (or at least before the effects of a conflict can propagate far-reaching areas of the supply chain) would be of benefit to practitioners. However, this is a difficult task due to the size, complexity, distributed nature, and lack of information and goal sharing in supply chains.

The next sub section describes TRIZ applications.

A. TRIZ applications

In recent years, a number of TRIZ researchers and practitioners have been experimenting with extending TRIZ to a range of non-technical areas, including business and management systems [22-24]. The basic premise behind such experiments is that the TRIZ methodology for solving complex and difficult problems - which demand "out-of-the-box" thinking – is independent from the area of application and can address all kinds of problems arising in artificial systems, e.g. technological, social, business, cultural, artistic, and so forth. To show that this is in fact the case; TRIZ is evolving into a general methodology that can be effectively applied to many domains of problem solving, many studies have been done and acquired extensive experience using TRIZ to help resolve business and management conflicts [26].

In general, regardless of an application area, TRIZ methods and techniques can be used in four situations:

1. To solve a specific problem, which is formulated as a negative or undesired effect (a product degrades too fast, engine breaks, projects fails, sales drop, and so forth).
2. To explore a system (business or technological), and find existing bottlenecks and undesired effects which can be further improved with TRIZ tools and techniques.
3. To analyze evolutionary potential of technological or a business system and propose next generations of the system.
4. To predict potential failures in new products and processes and help with their prevention[34].

During the last years, TRIZ experts developed a process-based method titled "XTRIZ" (where 'x" stands for "extended TRIZ") which helps to analyze business and supply chain management problems, to identify root conflicts and causes, to select the problems to solve, to generate new ideas and solution strategies, and evaluate the final results[27]. The approach organizes the use of both basic and advanced TRIZ tools and can be applied to both technological and business systems. In addition to standard TRIZ tools, the process includes additional techniques to enhance the problem solving and decision making process, such as; Root Conflict Analysis, a Comparative Ranking Scorecard and Multi-Criteria Decision Matrix. In this paper, we want to present application of the XTRIZ process and particularly RCA+ for conflict detection in supply chains.

3. Proposed systematic supply chain conflict detection approach

The basic process of the XTRIZ for business applications are shown in Fig. 1[27]. Each step of the process is supported with techniques intended to systematically process input information from the previous process step and provide output for the next step. This is an iterative process where wrong assumptions or decisions made in earlier stages can be corrected by creating a feedback loop back to the step where the assumption or decision was initially made.

In case when the basic XTRIZ process does not result in viable ideas and solutions, more advanced TRIZ techniques can be used(for example ARIZ); however we do not present them due to the scope of this paper.

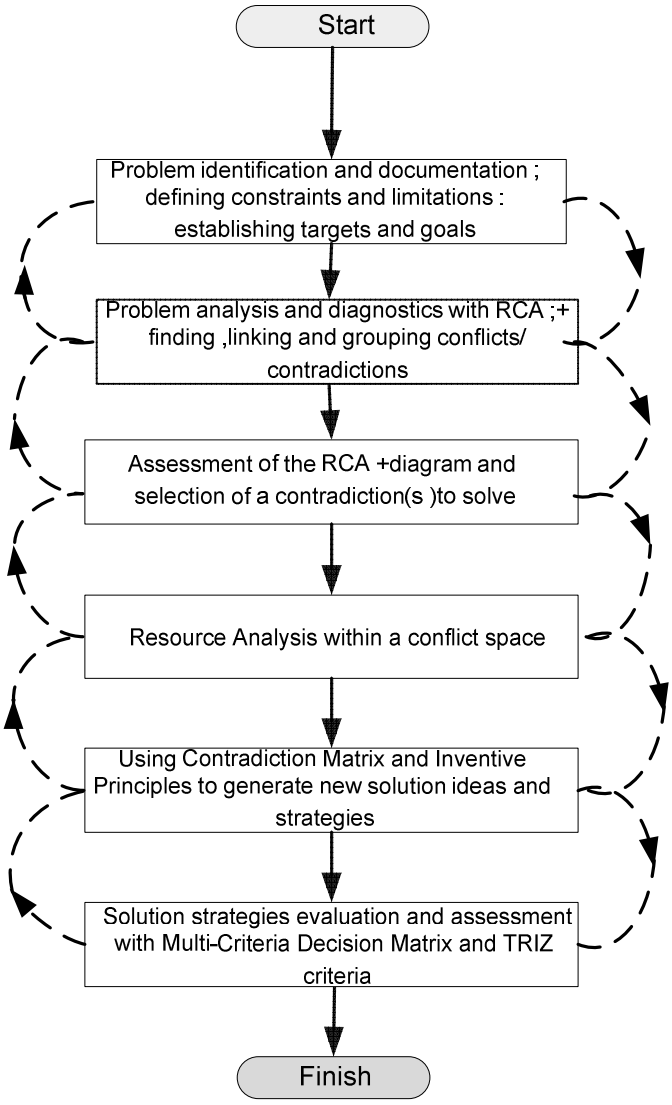

Figure 1. XTriz process for conflict solving

XTriz, first developed by Valeri Souchkov in 2000, is a six-step process to support a problem solving process with TRIZ for Business and Management:

1) Situation Analysis: Understanding customer needs and demands, documenting a problem, defining solution criteria, constraints, goals, and targets.

2) Problem Mapping and Decomposing: Application of RCA+ to decompose a general problem and create a map of manageable contradictions.

To define problems in terms of contradictions, TRIZ specialists at ICG T&C introduced a technique called "Root-Conflict Analysis" (RCA+). The technique helps with top-down decomposition of a general problem defined as a negative effect to a tree of interrelated contradictions [27,28].

Depending on a problem, a resulting RCA+ diagram can include from 1 to 20-30 and even more contradictions. RCA+ also includes specific recommendations how to select contradictions to solve the problem in most effective and efficient ways. Although RCA+ was introduced only few years ago, it has been already successfully applied to almost hundreds of real-life projects from both technological and business areas.

3) Root Conflict Selection: Identifying what conflicts (contradictions) should be resolved to achieve the expected results.
4) Using TRIZ Patterns to Generate Solution Ideas: application of TRIZ techniques, such as Contradiction Matrix and Inventive Principles to eliminate selected conflicts, generation of new solution ideas.
5) Building Ideas Portfolio: composing a tree of generated ideas.
6) Scoring and Selection of best Solution Candidates: applying Multi-criteria Decision Matrix to evaluate the Idea Portfolio and identify best solution candidates.

4. The systematic approach: an empirical example

Throughout the rest of the paper we will present how can detect potential conflict in a supply chain with the two first steps of XTRIZ process in a case study. We selected the following case:

A company with a core competence in developing and manufacturing software packages for field hardware testing invested a considerable effort in creating sophisticated software as a new product development, which was embedded in the device to collect and analyze data to produce actual reports and forecasts. The company wants to detect potential buyer-supplier conflict for this problems: the actual sales volume much less than would be expected due to they unable to convince most of its customers to pay a higher price for new product.

The XTRIZ process was used to identify core problems and explore what could be done to solve these problems. The entire process was performed by a TRIZ expert together with the company's project team including managers and professionals familiar with different aspects of the problem.

B. Problem Analysis

At this stage, the problem is documented and major targets, constraints, and limitations, are identified can used as criteria for evaluating and assessing new ideas generated in step 5 of the XTRIZ process.

C. Applying RCA+ to reveal and map contradictions

To understand and diagnose the problem, we perform Root Conflict Analysis (RCA+) of the situation given. RCA+ is a technique for analyzing inventive problems and situations developed as a result of combining the methods for causal problem decomposition such as Root Cause Analysis [29], Theory of Constraints [30,31], and TRIZ philosophy of problem definition [32,33]. The difference with traditional cause-effect approaches is that RCA+ is targeted at extracting and presenting contradictions that contribute a general problem in a structured tree-like way rather than explore negative causes only in a random manner. One of the main advantages of RCA+ is that one can stop at the level were a cause is found which significantly contributes to the problem at hand, without having to explore every possible cause. In more detail, RCA+ for technology applications is presented in [27].The starting point for composing the RCA+ diagram was the main negative effect “Sales volume is low”. Our goal was to explore all factors that have been contributing to this main negative effect by revealing and presenting all interrelated contradictions. An RCA+ diagram is built in a top-down manner by presenting a cause and asking a series of control questions to understand whether the presented cause is a contradiction or not, whether it needs other conditions or not, and what the underlying causes leading towards this specific cause are. The resulting diagram (shown in a simplified form for optimal clarity) is presented in Figure. 2.

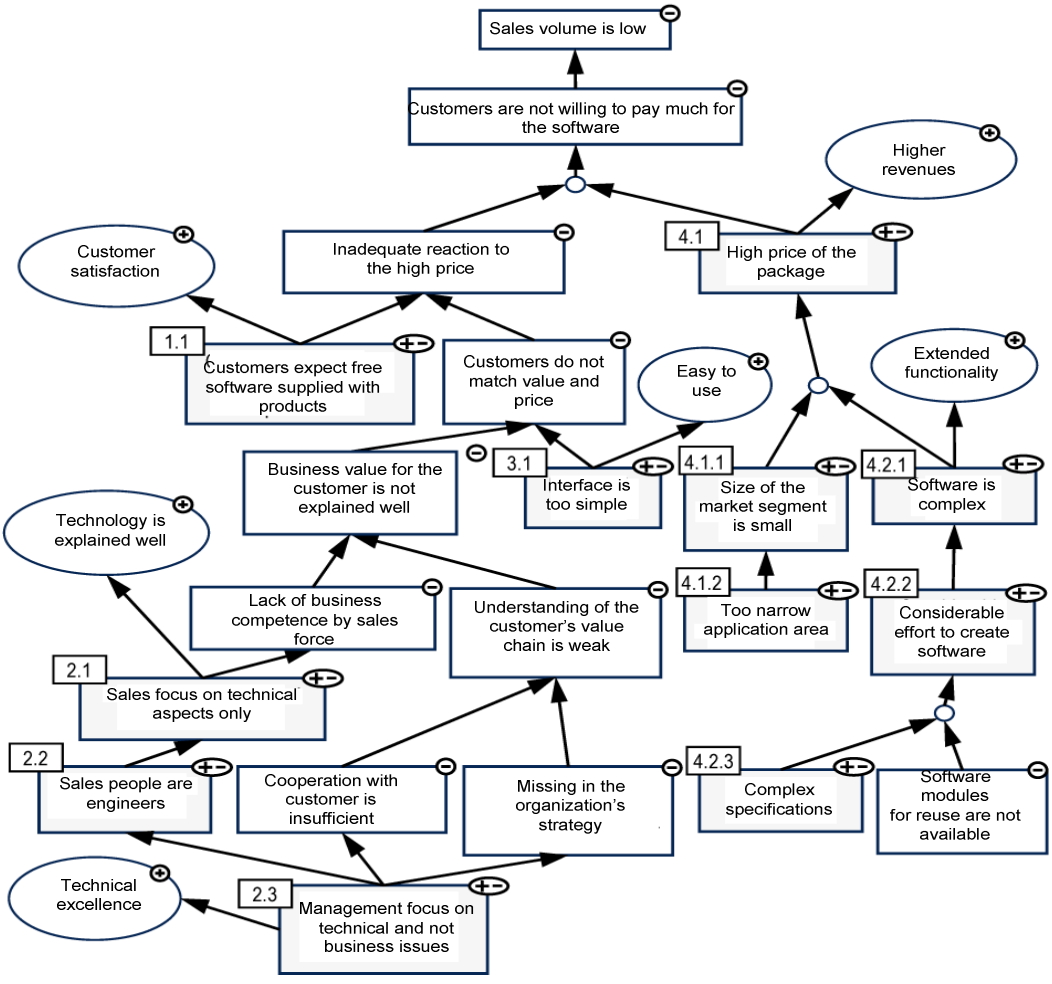

Figure 2. Resulting Root Conflict Analysis (RCA+) diagram

All negative causes are tagged with a minus (-) sign, all positive effects with a plus (+) sign. Causes with both positive and negative effects are identified as contradictions. A cause of a contradiction is tagged with a combined "plus-minus" (+-) sign.

In this case, the overall complexity of the problem is caused by a number of contradictions all in some way contributing to the general negative effect. Contradictions that are closer to the top-level problem contribute more strongly to that problem. For this reason focusing on the top-level contradictions would eliminate the main negative effect with more limited scope. The bottom-level contradictions (root contradictions) usually express problems solutions to which have a broader range of consequences for the entire system. Experiences has shown that solving bottom-level contradictions leads to long-term solutions with potential side benefits and solving top-level contradictions helps to obtain faster but short-term solutions. The danger of causing unwanted effects in related systems by solving bottom level contradictions is eliminated by using a holistic approach to the whole system and by iteration of solutions that do not survive evaluation [25].

The diagram involves two types of relationships between causes: "OR" when a certain effect is caused by two or more independently acting causes (shown as several arrowhead lines from two or more different causes towards the same effect at the diagram), and "AND" relationship, when both causes act together to provide a negative effect (shown as a circle at the diagram). For instance:

1. The effect "Customers are not willing to pay much for the software" is caused by both "High price of the software" and "Inadequate reaction to high price". A high price alone does not cause an inadequate reaction; this happens only in our particular case, where customers are not willing to pay a higher price. If we remove any one of these two causes, no matter which one, the negative effect will cease to exist.
2. "Inadequate reaction to high price" is caused by two causes acting independently:

i) "Customers used to free software supplied with the device", and ii) Customers do not match value of software and its price". Even if we remove one of the causes, the effect will still be present.

An important observation is that once we identify a contradiction and study its roots, it is very probable that other causes contributing to this particular contradiction will be contradictions as well because there is an inheritance effect.

These contradictions might be coupled with other negative effects via OR/AND relationships or caused by non-changeable conditions that lead to the creation of conflicts, such as local and international policies, legal obligations and so forth.

D. Contradiction Analysis

The next step is to select the contradiction to analyze and solve which will have the greatest impact on the main negative effect.

In "AND" relationships, where two different causes are linked, it is enough to solve any one of the contributing contradictions and the general effect will disappear. In "OR" relationships the whole chain of causes that contribute to a negative effect should be eliminated. It is not always the case that solving a single contradiction eliminates the negative effect, because

several independent contradictions may be creating the negative effect from different parts of the system.

In our case, the main negative effect is caused by two contradiction chains linked by the relationship “AND”, which means that selecting either the cause “High price of the software” or the cause “Inadequate reaction to high price” will solve the problem.

1) The first strategy is to select the highest contradiction(s) in a chain which contributes to the main negative effect. Usually solving such a contradiction results in solutions that solve a very specific problem.

2) To obtain a strategic solution within a broader scope, another strategy is to select a root contradiction.

3) The third strategy is to combine both approaches, and perform comparative ranking of all contradictions along the entire selected chain of contradictions to select the most “promising” contradiction.

In the case under consideration, the combined strategy was used. We have two sub-trees of contradictions which contribute to the same cause “Customers are not willing to pay much for the software”: the first sub-tree is comprised by contradictions from 1.1. to 3.1, and the second sub-tree is comprised by contradictions from 4.1 to 4.2.3. Note that contradictions 1.1, 2.1 (including the contradictions causing them), and 3.1 are linked by the “OR” relationship which means that they independently contribute to the negative effect. To reduce the complexity of solving each problem independently, all three chains of contradictions are included in the comparative ranking.

As a definition of the negative effect in the table of contradictions below, we take the closest negative effect to the contradiction. The same contradiction can contribute to several positive and negative effects; therefore we select those effects that are closest to the context of the problem (Table 1).

Table 1. Contradictions within a sub-tree

	Cause	Positive effect	Negative effect
1.1	Customers expect free software supplied with products	Customer satisfaction	Inadequate reaction to high price
2.1	Sales focus on technical aspects only	Technology is explained well	Lack of business competence by sales force
2.2	Sales people are engineers	Technology is explained well	Lack of business competence by sales force
2.3	Management focus on technical and not business issues	Technology is explained well	Understanding of the customer’s value chain was not included to organization’s strategy
3.1	Interface is too simple	Easy to use	Customers do not match value and price

5. Conclusions

While collaboration can result in significant mutual benefits, efforts often produce less than desired outcomes. Many of these shortcomings surface from conflicts inherent in supply chains. Ideally, partners could discover potential conflicts before they occur and work together to resolve the issue and redesign the supply chain to avoid future conflicts. In this paper, we have proposed a method for accomplishing this task and demonstrated it on a client–supplier collaborative for new product development. Although XTRIZ is a Six-step process for problem solving. However, we have performed three first steps for conflict detections and further research is needed to fully explore this method of conflict detection, this research provides some required insight into the daunting task of conflict discovery and therefore proactive handling of these potentially negative occurrences in the supply chain.
In summary, using XTRIZ for supply chain management:
1) provides a systematic, reproducible and context independent approach to solving SCM problems.
2) provides a common platform for teams to:
a. perform consistently;
b. be able to backtrack without having to start all over;
c. iteratively improve; and,
d. communicate results transparently throughout the entire process.
3) Provides supporting techniques to each step of the problem solving process; for mapping problems, selecting the most promising sub-problem(s) to solve, and evaluating the results.
4) Provides a systematic approach to creating consensus within teams through a common agreement on how to model the problem, identifying conflict and selecting the most promising conflict to solve.
Additionally, the RCA+ representation is relatively simply to computerize and, therefore, may be easily applied to large-scale systems. Future work in this area will include use of other XTriz steps for solving the conflict which detected using inventive principles and TRIZ techniques.

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