

## The General Theory of Innovation (GTI) and Its Capabilities: An Overview

*In search for an answer, one would grope his way through a dark labyrinth - he may either find something useful, or hurt himself when bumping into a wall. Another would take a small flashlight along to guide him on his way. And that would shine brighter and brighter, turning into an enormous light source, which would leave not a spot unlighted or unexplained. I am asking you: WHERE IS YOUR FLASHLIGHT?*

**Dmitri I. Mendeleev**

### 1. Introduction: Why Do We Need a Theory of Innovation?

*If one does not know to which port one is sailing, no wind is favorable.*

**Lucius Annaeus Seneca**

The nature of success in the business world is almost self-obvious. The company that creates a greater value for its respective market will prosper while the competitors will only get what is left for them by the leader. Repeat creating this difference in value year after year, and success will be permanently associated with you and your organization. It seems so simple, but is it?

#### 1.1 The Key Problem of the Business World

According to a study conducted by Royal Dutch Shell [1], the average life expectancy of Fortune 500 firms is 40 to 50 years! The time of being a market leader is even shorter. Thus, the leaders continue rising and falling. The names of Kmart, AOL, Dell, and GM easily come to mind. Examples of failures abound; they are so overwhelming that after studying the history of business, professors W. Chan Kim and Renee Mauborgne (INSEAD) wrote: "...permanently excellent industries and companies do not exist." [2].

There are two aspects of the above data that raise the brows. First, the entities, unlike the human beings, are at least theoretically immortal. Second, the loss of leadership is universal; entities die too often. How come? There must be a fundamental Root Cause behind this phenomenon, which must be understood in order to find an effective solution to this problem. Without identifying the Root Cause, the risk of a failure is very high: no enterprise is immune, and no executive is safe.

#### 1.2 The Problem Analysis

Since products or services are purchased to solve the consumers' problems, the competition between entities can be presented as a competition between the Value Propositions which the entities offer to their customers. Every Value Proposition goes through the Lifecycle presented in the Figure 1, which is a process consisting of a sequence of stages. This universal process ends up with the market's judgment of our Value Proposition, which leads to its acceptance or rejection, resulting in the financial gain or loss, which we then perceive as either success or failure.

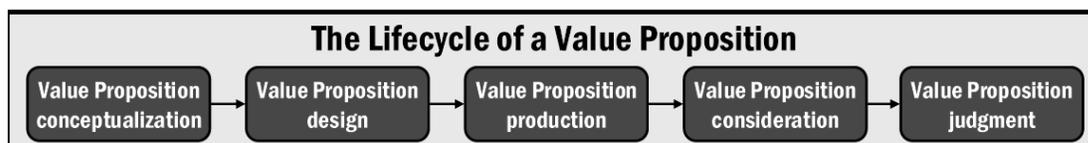


Figure 1. The Lifecycle of a Value Proposition

The goal of sustaining success can only be achieved if a company continually comes up with Value Propositions that are accepted by the market. To avoid variability of results (failures), as operation management teaches us, the process of competition MUST be controlled in its entirety. That is why the best run enterprises use all the methods that have been proven over time to cut variability in the results produced by such diverse corporate activities as procurement, manufacturing, distribution, marketing, design, sales, etc.

However, despite all their operational achievements, there is still one stage in the Value Proposition Lifecycle that lacks any control. It is the very first stage of the process, which forms the content of a future Value Proposition and thus called Value Proposition Conceptualization stage. Value creation is possible through both innovation and optimization. While both are valid approaches, innovation is the only one that creates new features and provides significant competitive advantage. Therefore, the first stage of the Value Proposition Lifecycle can be considered as the stage of innovation. This first stage in itself is a complex process consisting of a number of procedures depicted in the Figure 2: identification of market requirements for a future product (service); formulation of problems that need to be solved to meet the requirements; analysis and solution of the problems; solutions evaluation that also includes identification of potential consequences (both positive and negative) resulting from a planned change, and, finally, formulation of the future Value Proposition concept, which is the foundation for the rest of the production cycle. Depending on how sound the foundation is, the cycle results will vary greatly.



Figure 2. The content of the process of innovation

There is one very important observation that needs to be emphasized. Since the period from the inception of a Value Proposition until its presentation to the market in the form of a product or a service takes time (often years!), controlling innovation really means to know not what the market present needs are, but what they will be in the future. It is analogous to shooting a moving target; nobody tries to shoot at the location where the target is now but where the target will be. Currently, the enterprises do not have reliable methods to accurately identify the future of the market's needs, which makes control over the process of innovation impossible in principle.

Since the entire chain is as strong as its weakest link, our inability to control the first stage, innovation, automatically leads to the situation where no company can control the results of competition, which, in turn, results in a company's inability to continuously succeed and, ultimately, control its own destiny. The inability to control the process of innovation is the Root Cause behind the cessation of growth, market losses and eventual mortality of the business enterprises.

### 1.3 A Set of Requirements for a Scientific Theory of Innovation

There is only one reliable method to control any kind of activity known to the mankind; namely, through the creation and use of science. Science allows us to significantly improve our problem-solving capabilities, our forecasting capabilities and our objective judgment capabilities regardless of an area of application be it health, agriculture, economy, meteorology, etc. It enables better control of risk, more effective management, and more consistent results.

Before proceeding further, we need to define innovation and establish the criteria for judging such a theory. The logic introduced above provides an opportunity to create the following definition of innovation.

#### **Definition 1.**

*Innovation is a process of value creation, which consists in changing the composition of a set of variables describing a system.*

**Definition 2.**

*Innovation is an outcome out of the process that fits the definition 1.*

While the second definition enables alignment with a “typical” understanding of what innovation is, the first (the primary!) definition provides most of the benefits.

1. First, the definition breaks down the process of innovation into a rigid set of stages, each having its own unique goal, input and output. Thus, the further work can (and should) go in the direction of defining them, identifying the most effective tools, processes and best practices for each of the stages.
2. Acceptance of the innovation as a process clearly points at the need to control each separate stage of this process in order to avoid inconsistency (variability) of results, as it is prescribed by the operation management theory and various quality methodologies.
3. Defining innovation as a process and identifying the sequence of stages that constitute the process also enables to assign importance to each of the stages; the earlier a stage is, the more important it is because it predetermines a direction of the subsequent process.
4. One of the benefits of defining innovation as a process is the possibility to define a set of requirements that any theory of innovation must satisfy. Here they are:
  - A theory must have the capability to address identified issues; analyze and solve existing problems;
  - A theory must have predictive capabilities and identify future needs (future problems) of a respective system’s “Environment”;
  - A theory must provide objective criteria for judging novel concepts; especially, the theory MUST provide means to evaluate the upcoming innovations potential for their future success or failure in the marketplace;
  - A theory must be objective; maximally independent from its user;
  - A theory must be universal; work for a system of any nature.
5. Finally, there are many definitions of innovation that may (and, probably, will) be compared with the one proposed in this paper. For example, the definition that was accepted by PDMA [3] includes production (implementation) of the concept. I categorically disagree because production does not create value: what if a product (a service) is rejected by the marketplace? Moreover, if we follow the same logic, we must include sales, but then again value is still not created because the public can reject a product or service after only one use because of poor quality or any other reason. It seems absolutely logical to draw the boundary at the stage when the content of a value offer (proposition) is created; then it is the implementation phase (a typical product development process), which can only deteriorate the Value Proposition but cannot, in principle, make it better.

## **2. The General Theory of Innovation (GTI): the Foundation**

*Everything is determined, the beginning as well as the end, by forces over which we have no control. It is determined for insects as well as for the stars. Human beings, vegetables or cosmic dust, we all dance to a mysterious tune, intoned in the distance.*

*Albert Einstein*

*An invasion of armies can be resisted, but not an idea whose time has come.*

*Victor Hugo*

Guided by the above requirements, the author of this paper embarked on the road to create a theory satisfying them, which a few years later (the summer/fall of 1992) resulted in the creation of the theory that is now known as the General Theory of Innovation (GTI).

Right from the start, three crucial choices were made. First, the process of creating GTI was based on the historical analysis of evolutionary processes of real-world systems: products, processes, services, companies, markets. Second, the systems were deliberately chosen of different nature, both technology-based and not technology-based. Last but not least, the investigation focused on both the systems themselves and (mostly!) on the relationships the systems had with their respective Environments. This means that the investigation wanted to uncover the driving forces behind the process of evolution, including identifying those factors that cause the need for innovations/solutions as well as those conditions that caused emergence of the problems and determined subsequent success or failure of the proposed solutions. Here are a few examples of the systems that were investigated.

- Sound storage medium has evolved from Edison’s phonograph, to wax cylinders, to discs with lateral grooves, to double-sided discs, to reel-to-reel magnetic tapes, to 4- and 8-track tape cartridges, to compact cassettes, to CD, to DVD, to MP3.[4]
- The use of currency evolved from the barter of goods (cattle, grain, etc.), to silver ingots guaranteed by Cappadocian rulers (2200 BC), to the first crude coins made from naturally occurring amalgam of gold and silver (640 BC), to Chinese paper money (800 AD), to bank-backed notes (1633 – 1660), to the first credit card (1950s), to electronic money.[5]
- Message delivery evolved from sending a messenger on foot, to a messenger on horseback, to the creation of regular mail service, to mail service supported by cars, trains and planes, to fax, to the next day service, to e-mail.

Despite being very different, all three examples have a number of things in common.

- **Any product or service (process) is a system.**  
This means that each and every product or service represents the union of parts or procedures connected to each other in order to deliver value to the customers. No individual element of a system can deliver the same value on its own.
- **Systems (products, services, industries) evolve.**  
Systems evolve over time to adapt changes in customers’ needs and desires.
- **Systems evolve in the predominant direction.**  
The course of a system’s evolution coincides with the delivery of ever-increasing performance while requiring fewer resources for providing that performance

The predominant direction of evolution can be expressed as the ratio of the sum of the functions delivered by a system (an embodiment of performance) to the sum of connections the system needs to establish for obtaining the required resources for achieving the functionality.

While functioning (hence the term “functions”) is easily understood, the term “connections” requires more explaining. Without getting into great details, for the purpose of this article, we may perceive connections as the totality of Expenditures (sacrifices) required from the system’s Environment that assure delivery of a service provided by the system. The first major group of connections to be considered is the “customers expenditures” list (for example, effort needed for use a solution, time involvement, overall cost of ownership, space for storage, the need to learn something new, consequences of use, etc.), followed by the second group of connections (“production expenditures”) such as required materials, energy, number of manufacturing processes and suppliers, production time, space required for production as well as sub-categories and consequences such as scrap, wastes, pollution, etc. Through the relationship between function and connection, this ratio, entitled the Coefficient of Freedom (any function empowers a system and makes it freer while any connection increases its dependency and decrease freedom), embodies the business world concept of value. The greater the Coefficient, the greater the value delivered by a product or a service.

$$C_{Freedom} = \frac{\Sigma \text{ Functions}}{\Sigma \text{ Connections}}$$

Figure3. The Coefficient of Freedom

Historical analyses of the evolutionary process for various systems (those above, as well as bicycles, glass making, baking equipment, welding, shopping, banking, car, movie renting, publishing, the computer mouse, the car door hinge, safety airbags, etc.) clearly show the validity of the Coefficient of Freedom. It is universal, whether it is applied to products, processes, services, or various entities such as organizations (both for profit and not-for-profit), industries, markets, regions, etc. Moreover, these analyses lead firmly to the conclusion that systems do not evolve randomly; the evolutionary cycle of all systems, regardless of their specific nature, is governed by the same set of natural laws that are completely independent of human will and desire, which is the major postulate of the General Theory of Innovation (GTI), first defined in 1988. The natural law governing the process of evolution (growth, expansion) of various systems states that “the direction of a system’s evolution coincides with a continuously increasing degree of freedom of this system’s Environment” and is thus entitled the Law of an Increasing Degree of Freedom.

### 3. GTI Major Capabilities

*Knowledge of what is does not open the door directly to what should be.*

*Albert Einstein*

Acceptance of the GTI major axiom, which is existence of the Natural Laws governing the process of evolution, automatically leads to the following capabilities that are direct corollaries (natural consequences) of that acceptance.

#### 3.1 The nature of a challenge (problem, failure)

The nature of any challenge/problem/failure experienced by a system is in a deviation from the direction prescribed by the Natural laws of evolution. Consider an analogy of disobeying the natural laws of traffic on a freeway (driving against the traffic, changing lanes continually, driving with a speed that significantly differs from the one of the flow, etc.), which always elevates the risk and creates problems. Being able to efficiently identify the origins of problems, which are always a result of our choices, greatly improves our abilities to effectively address them by going to the root cause and restoring a “lawful” behavior.

#### 3.2 The nature of success

On another hand, the nature of success is in the obeying the “LAWS”. There is no exception from the rule. Just as we must follow the laws of physical science when designing products or services if we expect these products or services to work well, we must also follow the laws of evolution if we expect business success. Today’s executives, whether they know it or not, follow these laws when they succeed. However, they do so intuitively but not consistently or methodically, thus producing very mixed results. GTI articulates evolutionary laws and introduces a set of tools for working consciously and strategically within the laws.

#### 3.3 The capability to forecast the future of evolution

Knowledge of a system location on the evolutionary curve combined with knowledge of the evolutionary Laws allows any organization to forecast the system (product, process, service, etc.) future with a great degree of precision.

#### 3.4 The capability to objectively judge upcoming innovations

Existence of natural Laws of the evolutionary cycle has enabled creation of the objective criteria for evaluating proposed innovations, the importance of such criteria being self-evident. At the time of working on a direct-current motor, Thomas Edison, completely dismissed the efforts by George Westinghouse stating that alternating current was nonsense, which had no future. Every innovation improves a system, moving it along the evolutionary curve. Whether this move complies with the laws (or deviates from the laws) constitutes a criterion for evaluating the innovation.

3.5 The capability to control the process of innovation.

With above capabilities, one can control the entire process of innovation (as defined above) thereby greatly reducing risk and variability of results, increasing manageability of the process and ROI of R&D. Finally, while understanding that GTI (just as any other scientific theory) can be endlessly perfected, it, in principle, meets the criteria set at the beginning of this paper.

**4. GTI Applications and Tools**

*All theory, my dear friend, is gray; the golden tree of life springs ever green.*

*Johann Wolfgang von Goethe*

The capabilities discussed in the previous chapter have enabled the creation of various applications and tools. Depending on the nature of an Environment and its value system that are of interest for those who investigate them, all the GTI-based applications are divided into three major groups presented below (see the Figure 4).

	<b>Applications</b>	<b>Major Tools</b>
<p><b>Reactive Innovation (Defensive)</b> Value is Known</p>	<ol style="list-style-type: none"> <li>1. A performance-based challenge</li> <li>2. Cost reduction</li> <li>3. Quality / Reliability improvement</li> <li>4. Innovation assessment</li> <li>5. Failure prevention</li> <li>6. Patent circumvention / Patent protection against circumvention</li> </ol>	<ol style="list-style-type: none"> <li>1. RelEvent Diagram (Systems mapping)</li> <li>2. Problem-Solution Templates</li> <li>3. Conflict Strategies</li> <li>4. Algorithm for a Conflict Elimination (ACE)</li> <li>5. Failure Prevention Analysis</li> </ol>
<p><b>Proactive Innovation (Offensive)</b> Value is Unknown</p>	<ol style="list-style-type: none"> <li>1. System evolution forecasting</li> <li>2. Strategic Innovation Portfolio creation</li> <li>3. Business applications (for example) <ul style="list-style-type: none"> <li>• Growth opportunities</li> <li>• Corporate turnaround</li> <li>• Business strategy/business model</li> <li>• Increasing ROI (incl. R&amp;D)</li> <li>• Investment, incl. M&amp;A</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>1. Evolutionary Templates</li> <li>2. Generic Growth strategies</li> <li>3. Value Growth templates</li> <li>4. Value Matrix</li> </ol>
<p><b>'On-Demand' Innovation Capability</b></p>	<ol style="list-style-type: none"> <li>1. Creation of the capability of an entity (a unit) to innovate on demand</li> <li>2. Creation of the Innovation Management System for an entity</li> </ol>	<ol style="list-style-type: none"> <li>1. All of the above</li> <li>2. The program Template</li> </ol>

Figure 4. GTI-based Applications and Tools

The first group of applications relates to the situation when the value for its respective market is known, but an entity has not yet addressed it for the market's satisfaction, and a change in a system state (an innovation) is required. Since the need for a change is demanded by the market, and an entity must react to it; this group of applications is entitled "Reactive Innovation". The second group of applications relates to the situation when the market does not complain about specifics of an offering. The entity itself pursues a change in its offerings, so the prosperous future will be assured. In this case, the entity proactively seeks a change, thus this group of applications (primarily driven by the future business goals such as discovery of

strategic opportunities and threats; discovery of growth avenues, etc. is entitled the “Proactive Innovation”. The third group of applications relates to the need of the entities to innovate at each stage of the system life-cycle and to do it on-demand; i.e. when the need arises. They are aimed at the creation of the sustainable entity’s capability for the “On-Demand Innovation”. It is important to notice that while the majority of the applications (**and all the tools**) from the first two groups were tested and proven their effectiveness, the applications of the third group were tested only partially and remain largely theoretical.

#### 4.1 A performance-based challenge (Analysis and solution of system-related problems).

As we discussed previously, the essence of any problem is the fundamental conflict between the choices we made while pursuing our goals and the Natural Laws of evolution. The process essence is in identifying these choices that led to the conflict and correcting them. To accomplish these goals, the following tools were created up-to-date: RelEvent™ Diagram; Problem/Solution Templates™; the Algorithm for Conflict Elimination (ACE); Generic strategies for conflict elimination; and so on.

#### 4.2 Carrying out complex projects: cost reduction, quality/reliability improvement, so no.

When addressing a system-related problem, it is assumed that the nature of dissatisfaction is associated with a very specific aspect of the system performance: noise, strength, etc. Complex projects, as GTI defines them, relate to such important for every organization activities as cost reduction, quality, reliability, performance and productivity improvement as well as failure prevention. The reason for being called complex is that any of the above activities can be reduced to identification of those multiple (hence complex) problems, presence of which causes emergence of high cost (or low quality, reliability, etc.), and subsequent solution of the identified problems. All the tools, techniques and principles, which were used for analysis and solution of a single or stand-alone problem, will be also effective and valid for efficient achievement of the goals of a complex project.

#### 4.3 Innovation assessment and tools for decision-making.

Existence of natural Laws of the evolutionary cycle has enabled creation of the objective criteria for evaluating proposed innovations, the importance of such criteria being self-evident. Compliance with the evolutionary laws (or deviation from the laws) constitutes the foundation for evaluating an innovation.

#### 4.4 Patent circumvention or patent protection against circumvention.

At the heart of any patent, there is a solution for a problem. Patent circumvention then is finding an alternative solution for the same problem; or finding and solving an alternative problem for the same goal; or finding an alternative goal, followed by identification of a problem needed to be solved to reach the goal and subsequent solution of this problem, for which tools are available. The patent protection against circumvention is the opposite procedure and is carried out in the similar fashion.

#### 4.5 Forecasting the future of the evolution of a system.

Knowledge of a system location on the evolutionary curve combined with knowledge of the evolutionary Laws allows any organization to forecast the system (product or service) future with great degree of precision. The entire procedure of forecasting the future of a system consists of two major stages. First, by using the Laws future problems, which will cross the path of your system, are identified, and then they are solved by using the problem solving tools previously discussed.

#### 4.6 Strategic management (business applications).

GTI states that innovation in the area of strategic management (identification of a change required for repositioning an organization with the purpose of obtaining competitive advantage) is immeasurably more important than innovation in any other area of corporate activities such as product or process innovation. The reasoning behind this very firm position is simple: the history of business definitely shows that companies with inferior products but superior strategies beat their technically superior competitors. Examples abound: Microsoft vs. Apple; Dell vs. IBM and Compaq; Big 3 vs. Tucker Corporation (founded by Preston Tucker).

Knowledge of the evolutionary laws is applicable not only to such systems as technology-based products, services, processes but also to any business process within an organization, the organizations themselves, (both for-profit and not-for-profit), industries and markets, which are also the systems. Moreover,

application of GTI to the strategic management was enabled by the creation of specialized tools such as Generic Growth Strategies; Value Matrix; Value Growth Templates and others. If an organization can precisely forecast the future of its own products and processes as well as foresee where the market will go, this company can use this knowledge at any moment for creating new powerful strategies, finding new markets for products and services, finding new sources of revenue, generating and controlling growth. This company will have a substantial advantage comparing to its uninformed rivals, which is the solid foundation for continuous advantage and success.

#### 4.7 Strategic Innovation.

Not all innovations are born equal! Out of the minority that are financially successful, a very few are capable of moving the markets and increase the market share for their creators. The deliberate (on-demand) creation of these innovations is the essence of this application that involves analysis of such systems as the market, a respective company with the focus on its strategy and products (services) that the company delivers to the marketplace. The GTI-based process of creation of strategic innovations is shown below (Figure. 5). The process of Strategic Innovation was created in cooperation with Dr. Paolo Mutti (Milan, Italy).

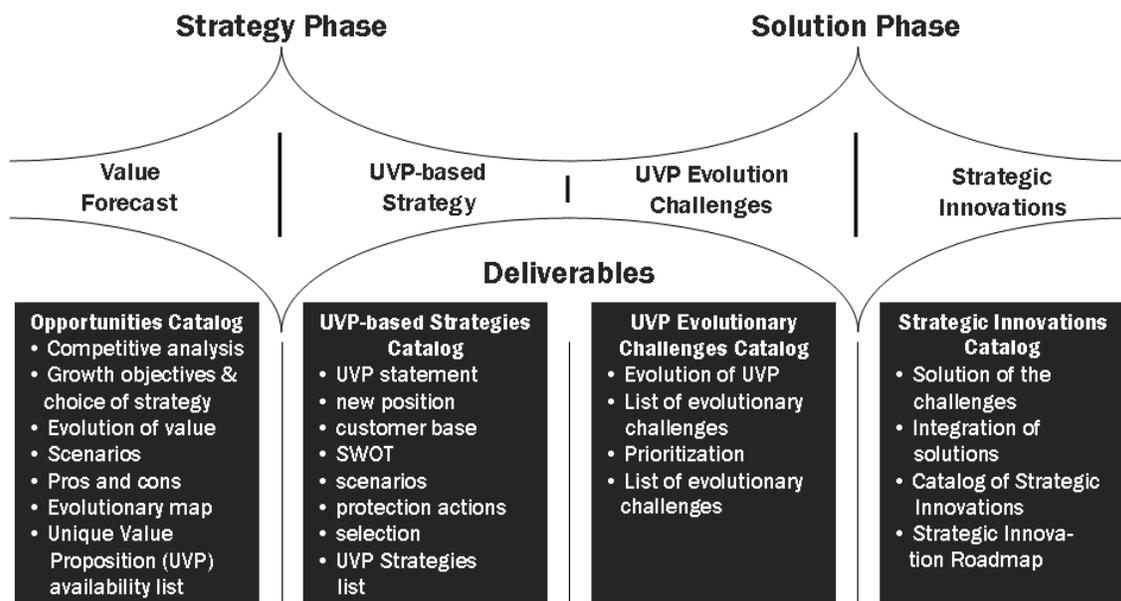


Figure 5. The Process of Creating Strategic Innovations (in cooperation with Dr. Paolo Mutti, Italy)

#### 4.8 The “On-Demand Innovation” corporate capability.

The beauty of any scientific theory is in the effectiveness of knowledge transfer. It was very difficult to build perfectly functioning ships and airplanes without knowing the laws of physics. Knowledge of the Laws of the Evolutionary Cycle combined with the GTI capabilities to forecast the future of both a system of interest and its respective market (called the Environment), enables any entity to develop its capability of continually producing commercially successful innovations and thus become the “Invincible Enterprise”.

#### 4.9 Investment opportunities, including M&A

The above described strategic capabilities of GTI enable very accurate identification of those entities that have strategic advantage over their competitors, which leads to an interesting opportunity to establish additional (objective!) criteria for investment decisions, including Merger and Acquisitions (M&A). I want to emphasize that GTI cannot predict timing of a change, which is very important for short-term investment activities.

## 5. Case Studies: Business Applications

*We don't ask consumers what they want. They don't know. Instead we apply our brainpower to what they need, and will want, and make sure we're there, ready.*

*Akio Morita  
co-founder and former CEO of Sony Corporation*

Let us follow two case studies, which are supposed to illustrate how GTI and its tools can assist in a system evolution forecasting and strategic decision-making. Not only do these two studies belong to unrelated businesses (movie rental and lawn mowing equipment) but the first represents a service while the other is a product.

Both case studies will heavily utilize the Principle of Time-to-value Reduction, which is a universal mechanism and can be used to identify problems any product or service will be facing in the future. The principle is a corollary of the Law of an Increasing Degree of Freedom, which can be increased by decreasing the Denominator. One of the most important connections from the “Customer Expenditure” list is the time that a customer has to spend to get what s/he wants; hence the title. To keep our examples simple, we will focus on this specific Principle throughout our case study analysis.

### 5.1 Case Study 1: The Movie Rental Market

*A preliminary remark:*

*This project started in June of 2003 when the USPTO granted a broad patent to Netflix Inc. the fact that captured my attention because GTI has the patent circumvention methodology. While analyzing the situation, I carried out the evolution forecasting for the industry, which was updated in October of 2004 and became a part of a white paper (2005). In December of 2004, I was approached by a consultant for an entity that was going to buy the Hollywood Entertainment (HLYW) movie rental chain; his client became familiar with the forecast and got interested. **This case study presents a certain portion of the old paper that was based on the original forecast (June 2003/October 2004), for which I was not paid, so it is not a part of any agreement.** Also, I periodically checked (the very last time in December of 2007) how my forecast faired against the reality; comparisons between the forecast and real facts will be made.*

The nature of a rental business is very simple; customers want to use a product that they cannot or do not want to buy. Movies, which are often watched only once, fit this requirement perfectly. In the fight for the customer’s movie-viewing dollar, the rental business competes with movie theaters (with only new titles but greater expense for the customer) and pay-per-view cable programs (also with fewer, fresher and more expensive titles). Since the 90s, the market has been dominated by Blockbuster Inc., the company that successfully wiped out most of its franchised and independent competition.

The typical movie-rental process (Fig. 6) involves numerous steps. A customer takes a trip to the store, browses the shelves, finds what he or she likes, checks it out, returns home, watches the movie, takes another trip to the store returning the movie, and returns home again. Of course, there is a penalty if the movie is returned later than its due date.

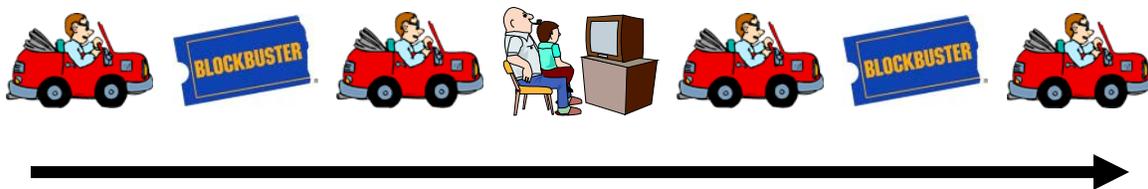


Figure 6. Sequence of procedures in a typical rental model (June of 2003)

The process is cumbersome, containing many redundant and no-value-adding steps such as multiple car rides, having to browse the available titles each trip, and late fees. What this means is that there is definitely the opportunity for improvement in delivering a service of greater value to the customer. Netflix, Inc. was able to create a new business model (Fig. 7) that solved many problems associated with the original rental model.

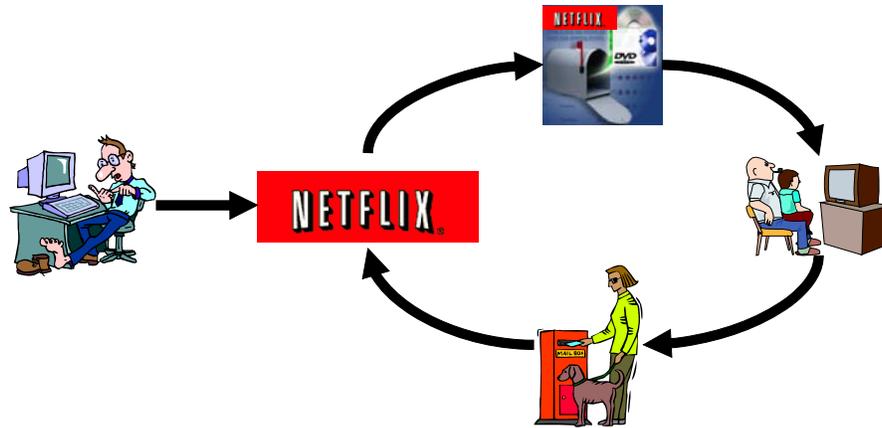


Figure 7. Netflix' business model

The Netflix model has no due dates or late fees and no repetitive trips to the store. Movies are selected via the Internet and are then delivered and returned free of charge by mail (usually a 24-hour turn around). To make the model financially viable, there is a subscription fee and restriction on a number of movies a customer can possess at any given time, but no restriction on the number of movies the customer can request in a month. As soon as a subscriber returns a movie, the next title from his or her saved selection list is immediately sent. This saved selection list keeps the customer from having to browse inventory every time a movie is requested.

The customer is clearly receiving greater value from the Netflix model, which is why Netflix was rewarded generously with 2.6 millions customers by the end of 2004, each paying about \$20.00 per month as a subscription fee. Where did all these customers come from?

Blockbuster tried to ignore Netflix for many years, but the bottom-line prevailed. In the summer of 2004, Blockbuster opened an Internet-based rental unit. By this time, however, Netflix had already established itself as the Internet-based market leader.



Figure 8. Competition in the Internet-based rental niche established by Netflix

Before forecasting the future of this market, let analyze the current situation. As always happens with any successful innovation, the Netflix model's initial success immediately attracted a number of copycats. Not

only did the existing players (such as Blockbuster) jump in, but also almost a dozen other companies that are presented in the Fig. 8 joined the market, including Wal-Mart and Amazon.

Even at this early stage of development, the market became overcrowded with competitors that offered the same service for a similar fee. There was little clear differentiation between competitors. This led to service commoditization with subsequent price war, which only benefits the consumer. Since its inception in August, the price of Blockbuster's subscription has gone down from \$21.00 to \$14.99 a month. It can be easily foreseen that the entire market could be captured (and thus competition could be eliminated) by a diversified competitor such as Amazon or Wal-Mart, who would provide the rental service free of charge as an incentive to buy other products or services that offer more value to the provider than the cost of the monthly service charge. Since people already buy products on-line from Amazon, such an incentive would be a logical and attractive proposition for both provider and customer.

So, what does the future hold for the movie rental industry? The Netflix model has a time delay between placement of an order and movie delivery (about one day). Based on the Principle of Time-to-Value Reduction, we can predict that when movies will be delivered to a customer's screen (via cable, Internet, satellite, etc.) at the moment they are requested and for the cost that he or she pays now for movie rent, the Netflix model will become obsolete. At that time, all of the companies that have adopted the Netflix model will have to accept the new model, switch to a different market, or go out of business.

Some of you might say that this was too obvious, too easy. But this simplicity is exactly why understanding of the predictable nature observable in the evolution of any product or service is such a valuable planning tool. Indeed, the concept of movies on-demand has been around for a number of years. Moreover, there are companies (Fig. 9) that already provide this service over the Internet. Certain technical challenges (such as minimization of download time and movie quality) still need to be addressed to make this model a viable reality, but we can easily predict that this will happen in the not too distant future.



Figure 9. Competition in the Internet-based movie on-demand niche

The emergence and evolution of movie-on-demand service raises additional problems, but in the application of GTI this is equated with more business opportunities. For example:

- Since the Internet has a limited capacity and is often overloaded, what alternative methods are there for downloading movies? The answer leads in the direction of cable, satellite and wireless communication, and also clearly indicates who the future competitors will be. Major telecoms, including cable and satellite television service providers, telephone companies and ISPs all have the resources necessary for providing this service and can be expected to join the competition.

- Stationary TV sets and computers will not be the only devices used to download and view movies. Cell phones (Fig. 10), PDAs, portable DVD players and even smart watches can be used. For this to work, these devices may need to periodically plug in and update their memory. This, in turn, will require a greater convergence of PDAs, cell phones and portable DVD players with computers, producing another new opportunity in this market.

*An update: Verizon Wireless introduced movie on demand download to its customer base in 2005.*



Figure 10. 2005, Sony Ericsson T637 (left) and T-Mobile Sidekick II World Phone (right)

- A great business opportunity is associated with providing movies on-demand to travelers. This is especially attractive in that you have a large, captive audience looking to add value to their under utilized travel time (again the Principle of Time Reduction is applied). The car market is especially big and, therefore, tempting. Related but somewhat different from this travelers' market are people waiting in restaurants, hospitals and hotels. Here a customer base of organizations instead of individuals can be developed.

Will these inevitable developments in the movie on-demand industry completely replace the traditional retail rental industry? No, it is an unlikely development. The market for traditional rental service will survive as a niche, but in a modified and shrunk form. It will be defined by circumstances where download service is impossible, inconvenient, prohibited, etc.

For example, if downloaded movies are prohibited during flights due to safety concerns, a new business opportunity emerges. A network of retail rental kiosks located in airports could rent movies, DVD players or both to customers about to board a plane, and returns would be made at the destination point. This service could also be ordered through an airline while booking a flight, with movies delivered directly to your seat after boarding.

*An update:*

*In 2004, 1 billion people worldwide flew. If only 10 percent of them (i.e. 100 millions) had given an innovative entity \$10.00 per rental event, it would have added \$1B dollars to this entity bottom-line.*

Another similar opportunity would be to provide a service for people who forget to download movies prior to their car trips. They could stop by a store and rent a movie, DVD player or both. However, this market will be small. Therefore, stand alone rental stores will again give way to the travelers' kiosk, this time in gas stations and convenience stores such as 7/11. Perhaps this type of rental will include DVD with timed, self-destruct mechanism so that returns are not an issue.

Another opportunity can be again identified by using the Time-to-Value Reduction principle. If the today business model requires a dedicated trip to a store, then bringing movies to the locations where people (customers) will be anyway represents an interesting opportunity. For example, locating rental stores at malls, supermarkets, office building, etc. would provide a major Value for the customers. Imagine,

positioning a few stores at the GM technical Center where tens of thousands of people work and delivering movies to their desks by the end of a working day.

In the meantime, due to the strength and direction of the competition for retail customers in the current market, Blockbuster recently dropped its late fees. For Blockbuster, this is probably too little too late. Emergence of the on-demand movie model, along with excessive competition and service commoditization in the Internet-based niche have created a situation where the entire industry stands on the brink of major change and the outcome for any particular competitor is unclear. The financial markets seem to be in agreement with this conclusion. While the general market trend was to rise in 2004, the entire movie rental industry was depressed (Fig. 11). Of course, the investment community does not like uncertainty, and it is uncertain whether future developments in the movie rental market will become opportunities or threats for the current competitors. This solely depends on the strategic decisions made by the leadership of each company.

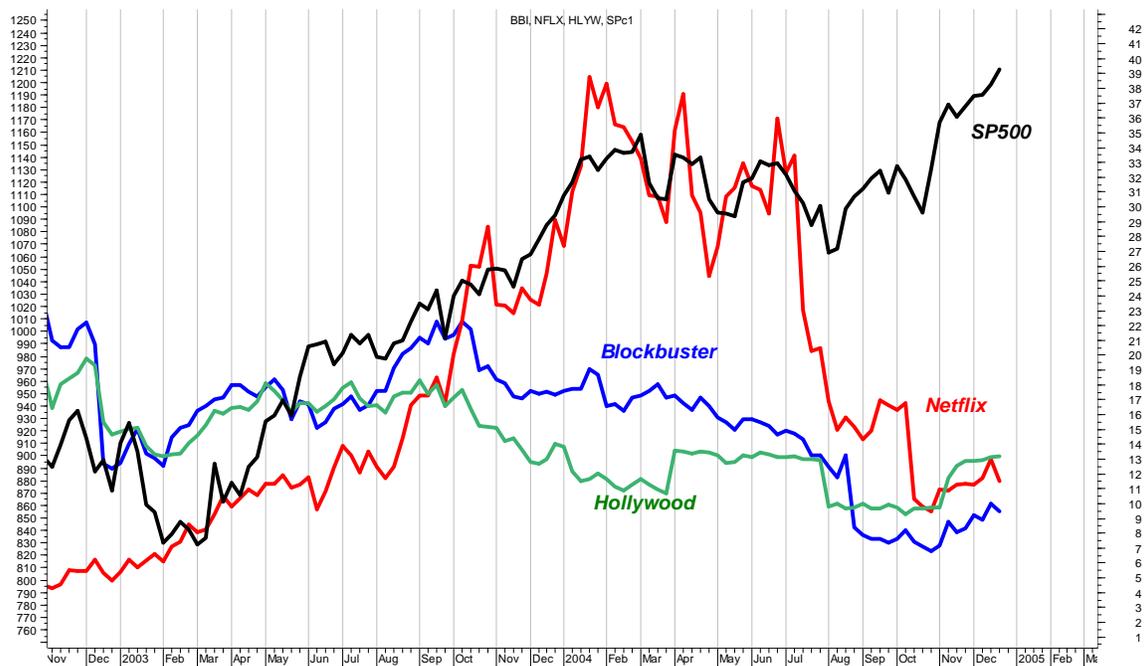


Figure 11. Market punished the movie rental companies in 2004

All of the above clearly indicates that for any traditional rental company gaining advantage lies through a significant change, which requires capital expenditures leading to a change in valuation. If such a company continues its business as usual, it is surely poised to continue sliding and losing to savvier rivals until the change prescribed by the Law of an Increasing Degree of Freedom is introduced; the sooner it will be, the better and more advantageous it will be for this entity.

#### An Update:

*The forecast played well with the client who decided to pass on the opportunity. The chart (Fig. 12) shown below clearly illustrates what happened to Blockbuster, the company that did not change and stuck to the old business model in 2005. Its stock dropped from \$9.30 to \$3.75, a huge loss for the investors. This slump continued through 2006 and until the summer of 2007 when the company CEO (John Antioco) was replaced. His successor, James Keyes, realized quickly the need for a change, and in August of 2007 Blockbuster entered the movie download-on-demand niche by purchasing the Movielink LLC. The same move was earlier (also in 2007) made by Netflix, which complies with our forecast. Meanwhile, Netflix truly enjoyed its online pioneer status. By 2007, its customer base grew to 6,613,000 through the years; Netflix still dominates the online market.*

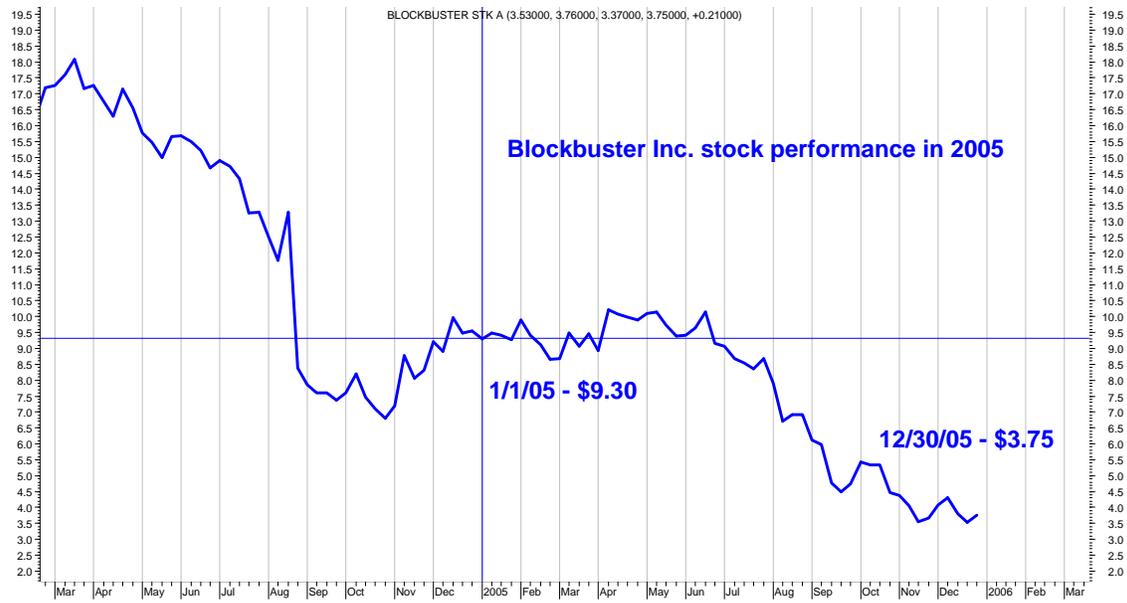


Figure 12. Performance of the Blockbuster Inc. stock in 2005

*On October 11 of 2007, Movie Gallery, the company that purchased Hollywood Entertainment in 2004, announced bankruptcy, which again validates the forecast results. The last strategic move was made by a drug store chain Walgreen. On October 28 of 2007, it announced that the customers will be able to buy movies of the DVDs that will be burned in stores. Creating a time bomb and entering the movie rental market is the next logical move, which means that brick-and-mortar stores are threatened, as predicted.*

## 5.2 Case Study 2: Lawn mowers (conducted in 2003)

The majority of homeowners in the US have a love/hate relationship with their lawns. It is the subject of either pride (if everything goes well) or continual irritation. In any case, people spend a lot of time and money making sure their lawn looks good. With this kind of interest, a huge industry has evolved to provide help.

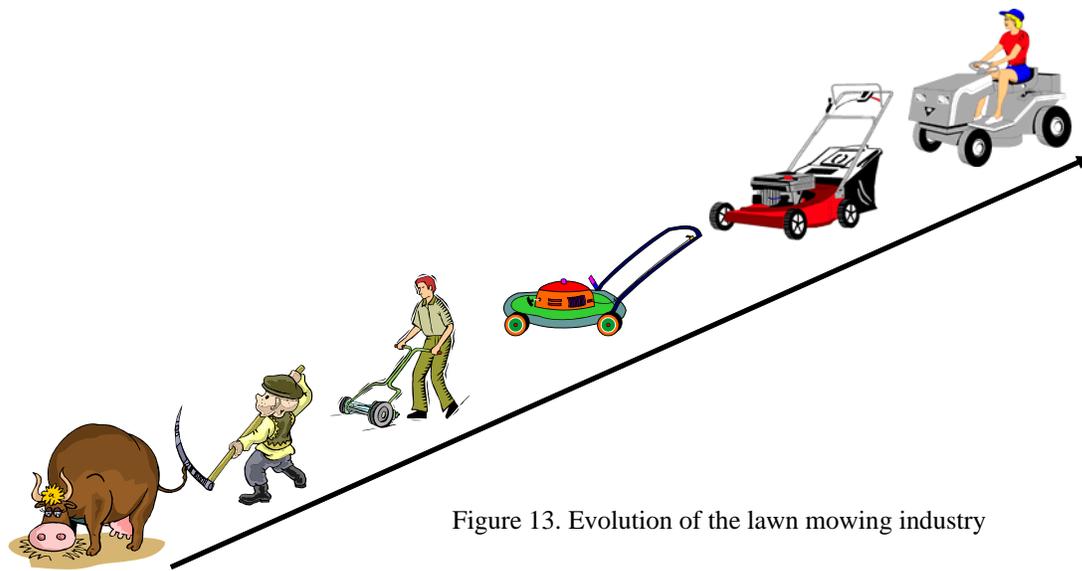


Figure 13. Evolution of the lawn mowing industry

To understand the future of the lawn mower, we need to analyze the past to see where we are on the continuum of evolution shown in the Figure 13 [6]. A comprehensive history should probably begin with animal grazing and the scythe, neither of which is very efficient by the standards of most lawn owners. So we have the development of the lawn mower. A drum with blades became the rotary lawn mower, then the power mower, self-propelled mower, riding mower (mini-tractor), and remote-control mower – all aimed at reducing the homeowner’s time involved in the lawn mowing process. Finally, a completely robotic machine was created to completely eliminate human labor from lawn mowing.

Does the progress stop? No, it doesn’t. It is fundamentally impossible to stop the natural process of evolution. There are always new problems arising and waiting to be solved. Consider the robotic machine, which is too expensive for a retail customer anyway. It still requires the owner’s involvement because it must be taken out of storage, checked for problems, filled with gas and oil, cleaned, put back into storage, etc. Besides, it requires maintenance, repair and so on. What can still be done to decrease the amount of time and energy required by the process of lawn mowing, while increasing the quality of the lawn? As long as this question arises, the evolution of lawn mowing will continue

As we look for ways to improve the lawn mower, the Principle of Time-to-Value Reduction may lead in the direction of the increased speed of mowing, which will surely save time of the customer. Using a more powerful motor or introducing a different transmission ratio might be a way to implement this concept. However, such a “bigger/more” approach, which is typical for the majority of companies, is not necessarily the best solution. By constantly choosing larger and more powerful mower, the homeowner is approaching the equivalent of professional mowing equipment, with all of its cost and safety issues, rather than addressing the value issues that are relevant to the lawn of a single-family home.

Another standard solution that saves time of the user would be to combine mowing with other operations. For example, a mower could introduce fertilizer or herbicide while mowing. Another alternative is to make the mower multifunctional. The mower could be capable of mulching debris or aerating the lawn. Having to buy only an attachment for these jobs instead of whole piece of equipment would save the customer money. This approach could lead to the idea of a modular lawn mowers design, requiring a base unit and a number of attachments. If this concept is taken further, the base unit could become the functional foundation for a number of devices used around the home and yard, such as a snow thrower, power generator, shredder, vacuum pump, etc., which would provide a great value for the customers who don’t need to buy multiple pieces or equipment but a base and attachments. An entity that decides to use this model will not be dependent on the mower market and will gain substantial advantages comparing to the rest of the companies.

Lawn mowing has one more major evolutionary avenue available. A significant time reduction associated with lawn mowing can be achieved if the lawn does not need to be mowed as often. This is possible if grass does not grow so quickly. By introducing growth inhibitors instead of fertilizers, we can create a slower growing lawn. Fertilizers are advantageous for the lawn mowing industry and homeowners whose grass does not grow well, but growth inhibitors could be advantageous for a typical homeowner with a healthy lawn. This idea for a new product could be either an opportunity or a threat for chemical companies, but is surely a threat for both the producers of lawn mowers and lawn care service providers. Again, does this mean that the progress has stopped? Only for those companies that do not evolve along with their product or service.

It should be mentioned here that slowing down the rate of grass growth could be achieved on a genetic level as well. If this concept is taken to its extreme, grass may become genetically modified so its length does not exceed a certain ideal height (3-4 inches). If this happens, no mowing will be necessary. Such a grass would have to go through rigorous testing to determine its impact on the environment, which would raise new problems and extend the evolutionary path of lawn care further.

## 6. CONCLUSION

*'Would you tell me, please, which way I ought to go from here?'*

*'That depends a good deal on where you want to get to,' said the Cat*

*'I do not much care where' said Alice*

*'Then it does not matter which way you go,' said the Cat*

*Lewis Carroll*

*People love chopping wood. In this activity one immediately sees results.*

*Albert Einstein*

The presented case studies clearly illustrate that GTI provides the universal theoretical foundation and a set of standard tools that are equally applicable to any industry and any company. We were able to effectively apply both theory and tools to the unrelated industries of movie rental and lawn mowers. You and your organization can just as successfully use the Principle of Time Reduction to assess the current position of your product or service within your industry, and then identify and articulate the problems that you will undoubtedly face in the future. These formulated problems will represent either your future opportunities or your future threats.

I would like to emphasize that GTI is not a quick fix for all your corporate problems and issues. It is, instead, a potent theory that is definitely capable of controlling the process of innovation, which would effectively work for any specific application. As a result, GTI is perfectly positioned to significantly contribute to any conceivable business objective, which requires a change of the status quo, and to enable your organization to confidently identify future changes in the marketplace, which is absolutely identical to precisely knowing future needs and desires of your customers. This advanced knowledge will reveal those future problems that will be faced by your product or service, which represents a solid foundation for continual creation of commercially successful products and services thereby enabling your company to attract and retain customers and achieve consistent performance and continuous business success.

### **Acknowledgements**

Before acknowledging contribution of individuals to the creation of GTI, it is my great honor and privilege to state that what is known today as GTI was started as a research project within the domain of the Theory of the Solution of Inventive Problems [7 - 9] presently known worldwide as TRIZ. Moreover, many of the TRIZ central concepts were used by me in the process of creating GTI, and even though the content of the majority of them has been ultimately changed, the author feels strongly that TRIZ influence must be recognized and acknowledged.

That said I would like to point out that despite having a number of overlapping applications such as problem solving, I strongly and sincerely believe that GTI and TRIZ are NOT competitive theories but complementary ones that will work in concert with one another especially after their seamless integration, which will take place sooner or later.

Now I would like to acknowledge contribution of the following individuals to the creation and development of the General Theory of Innovation; without them the results that have been achieved would be absolutely impossible.

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