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# Main Parameters of Value (MPV) Analysis: Where MPV Candidates Come From

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**Abstract.** Identifying the right MPV to implement in a new product is critical in any new product development (NPD) project and in projects related to Adjacent Markets Identification (AMI). One of the most challenging tasks in this process is to find MPV candidates from which to select the right MPV during the MPV analysis. In this paper the authors summarize the tools used for sourcing MPV candidates and evaluate the practical importance and contribution of each of these tools. This evaluation is based on an analysis of actual TRIZ NPD and AMI projects in which the authors were involved. The tools considered in this research are Function Analysis, Patent Analysis, Trends of Engineering System Evolution (TESE) analysis, Property Analysis and Voice of the Customer (VOC). The results of the research show that not all of these tools are equally important in various types of projects, which makes it possible to focus an MPV analysis on the most important ones. By using fewer and more focused tools, the existing procedure for MPV analysis will be faster and easier to perform, which in turn will make NPD and AMI projects more efficient.

**Keywords:** Function Analysis, Main Parameters of Value, MPV, New Product Development, NPD, TRIZ.

## 1 Introduction

### 1.1 MPV Analysis and its use in modern TRIZ

The Main Parameters of Value analysis (MPV Analysis) is an important tool in modern TRIZ that allows for connecting business challenges to technical problems in product or process innovation [1,2].

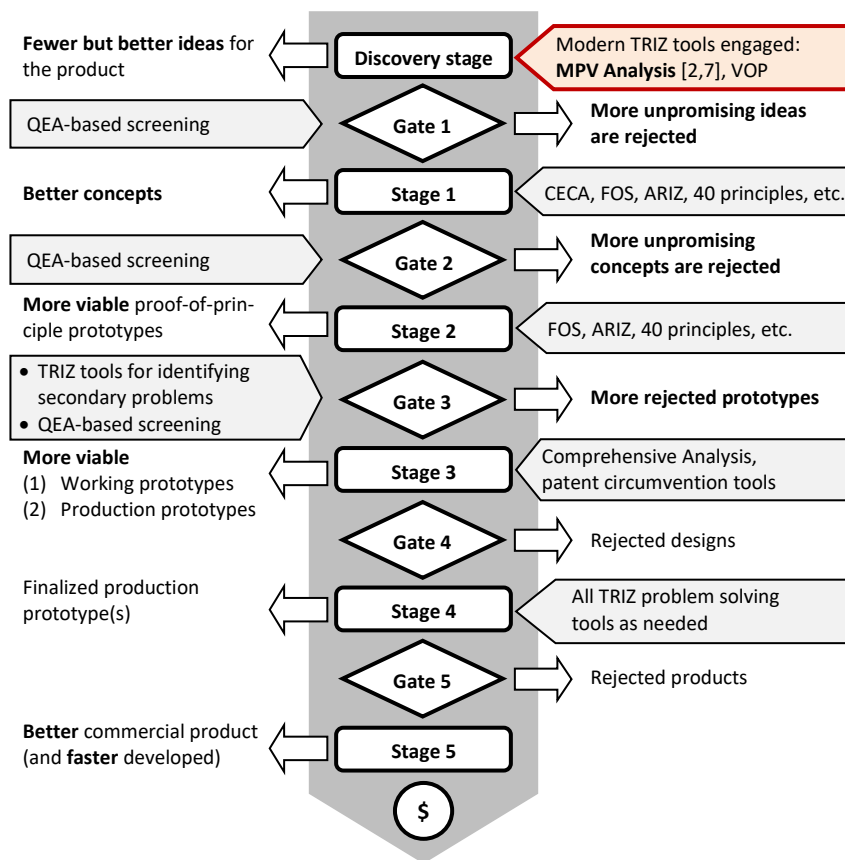
An MPV is defined as a key feature/outcome of a product or service that is both unsatisfied and important for making a purchasing decision [2]. Therefore, MPV Analysis, used to discover MPVs, is a critical tool for developing new products (NPD) [3,4], identifying adjacent markets (AMI) for existing products and technologies [5], and technology scouting to select a best technology [6].

In this paper, we will focus on applying MPV analysis in NPD and AMI projects because these activities are more frequent in TRIZ practice than Technology Scouting.

## 1.2 MPV Analysis in new product development

In NPD projects, MPV Analysis is used in the very initial stage (Discovery stage) of the stage-gate process [3,4] to discover better ideas for a new product (see Fig. 1). At this point, MPV Analysis represents a superior alternative to brainstorming and other less disciplined procedures for generating ideas about which key feature (that is, MPV) to implement in a new product.

The most attractive advantage of MPV Analysis is its ability to reveal all important but still unmet MPVs, including those serving latent customer needs [2,7,8].



**Fig. 1.** TRIZ-assisted Stage-gate NPD process [4].

Another important tool that the TRIZ-assisted NPD process employs at the Discovery stage is Voice of the Product (VOP), which is widely recognized by the TRIZ community [9,10] and adopted by Six Sigma experts [11] to supplement Voice of the Customer (VOC), which is often erroneously thought to be the single, key tool for a successful business [12].

At the beginning of NPD, using VOP in conjunction with VOC allows you to focus only on those MPVs that meet the Trends of Engineering System Evolution (TESE) [13] and, therefore, can be easily supported by a new product under development, increasing the chances that the new product will eventually be commercialized. At this point, VOP is used as a part of MPV Analysis and, more specifically, of Product-Oriented MPV Analysis [7].

### 1.3 MPV Analysis in AMI projects

The TRIZ roadmap for identifying adjacent markets [5] is shown in Fig. 2.

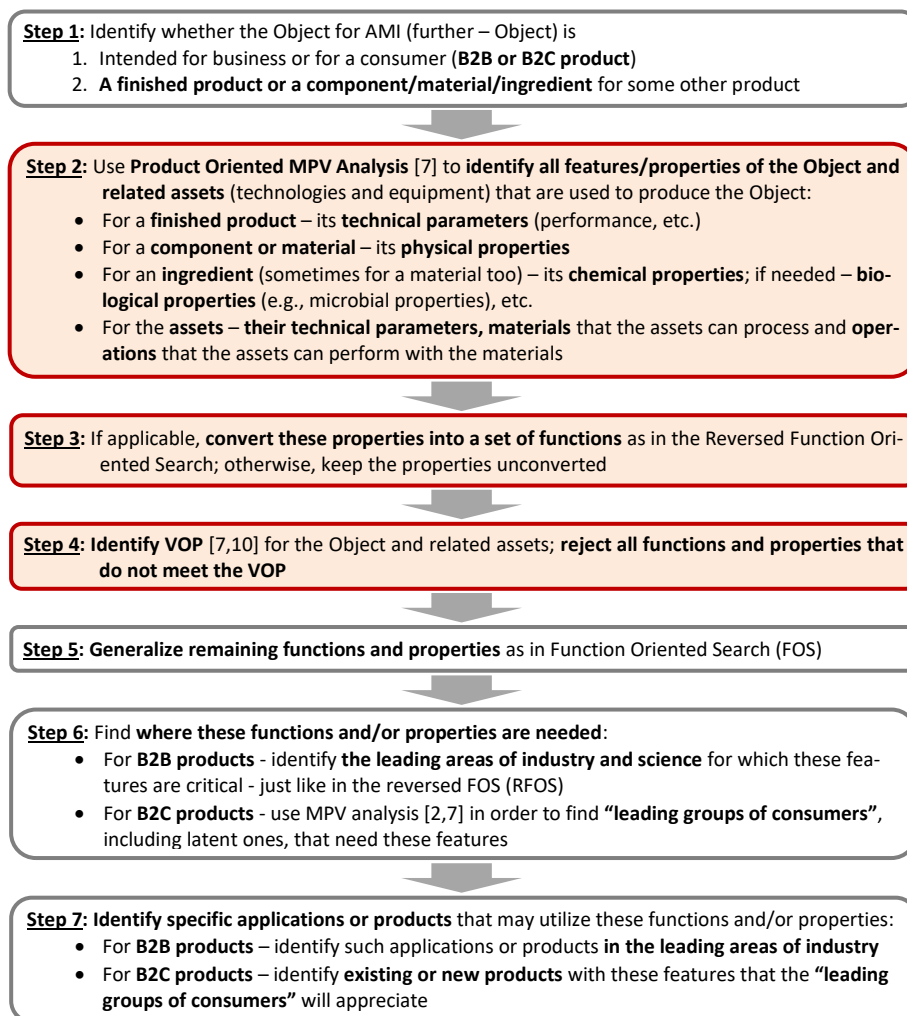


Fig. 2. TRIZ roadmap for identifying adjacent markets [5].

As can be seen from Fig. 2, MPV analysis in AMI projects, just as with NPD, is used in the initial steps:

- In Step 2 the analysis starts with determining all properties/features (that is, MPV candidates) of the product or technology for which adjacent markets can potentially be found. This will be further called Property Analysis.
- In Step 3, these properties and features are converted into a set of functions that can be implemented.
- In Step 4, the final pool of MPVs for which adjacent markets are to be found is formed by rejecting those MPV candidates that do not meet the VOP, previously identified through TESE Analysis.

#### **1.4 Challenges of MPV Analysis and the objective of this research**

Despite the obvious advantages of MPV Analysis such as being able to systematically identify all potential MPV candidates, including those serving latent customer needs, this analysis is quite challenging to perform.

In practice, the most difficult and time-consuming task in this analysis is to identify an exhaustive list of MPV candidates from which the most promising MPVs are then selected. For example, the original algorithm for MPV analysis [2] recommended for NPD suggests the following steps (fragment):

- Identify stages of life cycle, stakeholders, targeted market niches and typical use cases for the object.
- Build Function Models for each stage of life cycle, stakeholder, targeted market niche and typical use case.
- Perform TESE Analysis (including S-Curves) [13] for all important parameters of value (PVs) of the object.
- Compile a list of PVs resulting from Function Analysis and TESE Analysis.
- Select MPV candidates.

As seen from this list, identifying MPV candidates involves numerous Function Analyses (for each stage of the life cycle, targeted market niche, typical use case, etc.) and many TESE Analyses – for all of the object’s PVs.

Additionally, the algorithm for MPV analysis [2] suggests including initial MPVs that are normally expressed in VOC, and MPVs that are culled from industry trends (these MPVs can be found in patent documents). The need to identify VOC and perform patent analysis further complicates MPV analysis.

In the AMI projects, where VOC cannot be defined, initial MPVs are all known technical parameters as well as physical, chemical, biological, and other properties of the analyzed product. The large number of these MPV candidates makes analysis cumbersome and time consuming.

The objective of this article is to find out whether all sources of MPV candidates (Function Analysis, TESE Analysis, VOC, Property and Patent Analyses) are equally important and should be employed, or whether some of them can be skipped to speed up the MPV Analysis without significantly compromising its quality.

## 2 Method used and the data analyzed

In this research, the authors analyzed the process and outcome of MPV Analyses performed in sixteen actual TRIZ-consulting projects. These projects were chosen from the pool of projects in which the authors were involved.

An overview of the projects analyzed is presented in Table 1.

**Table 1.** Overview of the projects analyzed in this research.

Project name	Project type	Year	Object of MPV analysis
Wireless	NPD	2000	Wireless LAN and its components
G5	NPD	2006	Mobile phone
Fresh	NPD	2010	Device for delivering nicotine aerosol
Explore	NPD	2011	Tobacco heating device
NGN-2015	NPD	2011	Telecommunication systems and services
Naturel	NPD	2014	Toothpaste
Smart Watch	NPD	2015	Smart watch
Pets	NPD	2017	Cat litter
Sponge	NPD	2019	Kitchen sponge
New Oil	NPD	2020	Extra virgin olive oil
Can	AMI	2018	Tin cans for food
Glucan	AMI	2018	Beta-glucan
Asbestos	AMI	2019	Chrysotile asbestos
Black Mass	AMI	2019	Black mass from crushed used batteries
Hose	AMI	2019	Automotive hoses and associated manufacturing equipment
Tail	AMI	2019	Tailings left after kaolin ore processing

All NPD projects in Table 1 include the Discovery stage of the NPD process (Fig. 1), where using MPV Analysis is critical. NPD projects that started with an MPV identified independently by the client were not considered in this study. Also, projects aimed at solving the specific technical problems of a new product were not considered because an MPV analysis is not normally employed in such projects.

For the projects from Table 1, the authors have identified:

1. The sources for MPV candidates considered in each project: Function Analysis, TESE Analysis (VOP), VOC, Patent Analysis, Properties Analysis, or some combination of these sources.
2. The number of MPVs each of these sources yielded in the project. At this step we counted only those MPV candidates that were approved by the client and selected for further monetization. If the same MPV was obtained from different sources, that MPV was scored for each of those sources.

It is assumed that the more MPVs a source has yielded in real projects, the more important the source is.

### 3 Results and discussion

The results of our study are given in Table 2 below.

**Table 2.** Number of MPVs yielded by various analyses in the projects under consideration.

Project name	Project type	Number of MPVs discovered				
		Function Analysis	Properties Analysis	TESE Analysis	VOC	Patent Analysis
Wireless	NPD	1	Not used	1	0	0
G5	NPD	3	Not used	3	0	Not used
Fresh	NPD	5	Not used	Not used	5	Not used
Explore	NPD	4	Not used	Not used	4	Not used
NGN-2015	NPD	9	Not used	0	5	8
Naturel	NPD	4	Not used	Not used	2	Not used
Smart Watch	NPD	6	Not used	Not used	4	Not used
Pets	NPD	3	Not used	3	3	0
Sponge	NPD	4	Not used	0	3	0
New Oil	NPD	9	8	13	4	4
Can	AMI	4	2	3	0	0
Glucan	AMI	Not used	2	Not used	Not used	2
Asbestos	AMI	Not used	10	Not used	Not used	Not used
Black Mass	AMI	Not used	5	Not used	Not used	2
Hose	AMI	Not used	5	Not used	Not used	Not used
Tail	AMI	Not used	1	Not used	0	0

Please note that the indication “Not used” in Table 1 means only that this analysis was not used for discovering MPVs, but does not necessarily mean that the analysis was not used in the project at all. For example, Patent Analysis was used in all NPD projects in Table 1, but in most of them it was performed at the end of the project to make sure the new product did not infringe a third-party patent, and to evaluate its novelty.

As seen from Table 2, the Function Analysis, TESE Analysis, and VOC were rarely used in AMI projects, which can be explained by the following:

- Using Function and TESE Analyses assumes that the product under analysis has been fully defined, while in AMI projects the product considered at the beginning may be significantly changed by the end of the project in order to meet the requirements of a newly found market. Additionally, the object for which adjacent markets are to be found may be a part or component of some product rather than a finished product, as, for example, in project Hose.



- In most of our AMI projects, specifically in projects Glucan, Asbestos, Black Mass and Tail, the object of analysis was a chemical component that may be used as an ingredient for some other chemical product. For such an object, Function and TESE Analyses cannot be performed.
- Determining the VOC requires that you know the product's market and the consumer using the product, while in AMI projects neither the market nor the consumer have been defined and need to be discovered during the project.

Table 3 represents the relative importance of various MPV sources in each project considered. A score of '1' in the Table means that the source demonstrated higher performance than others in terms of the number of MPVs revealed; a '0' means that the source did not reveal any MPVs and, therefore, was useless.

To calculate the relative importance of MPV sources in Table 3, the number of discovered MPVs in Table 2 were normalized for each project to the maximum amount of MPVs yielded by the most productive source in that project. Sources that were not used in the project, were considered not to have yielded any MPVs.

**Table 3.** Relative importance of various sources of MPV in individual projects.

Project name	Project type	Number of MPVs discovered				
		Function Analysis	Properties Analysis	TESE Analysis	VOC	Patent Analysis
Wireless	NPD	1	0	1	0	0
G5	NPD	1	0	1	0	0
Fresh	NPD	1	0	0	1	0
Explore	NPD	1	0	0	1	0
NGN-2015	NPD	1	0	0	0,6	0,9
Naturel	NPD	1	0	0	0,5	0
Smart Watch	NPD	1	0	0	0,7	0
Pets	NPD	1	0	1	1	0
Sponge	NPD	1	0	0	0,8	0
New Oil	NPD	0,7	0,6	1	0,3	0,3
Can	AMI	1	0,5	0,8	0	0
Glucan	AMI	0	1	0	0	1
Asbestos	AMI	0	1	0	0	0
Black Mass	AMI	0	1	0	0	0,4
Hose	AMI	0	1	0	0	0
Tail	AMI	0	1	0	0	0

The relative importance of different MPV sources averaged separately over NPD and AMI projects is given in Fig. 3.

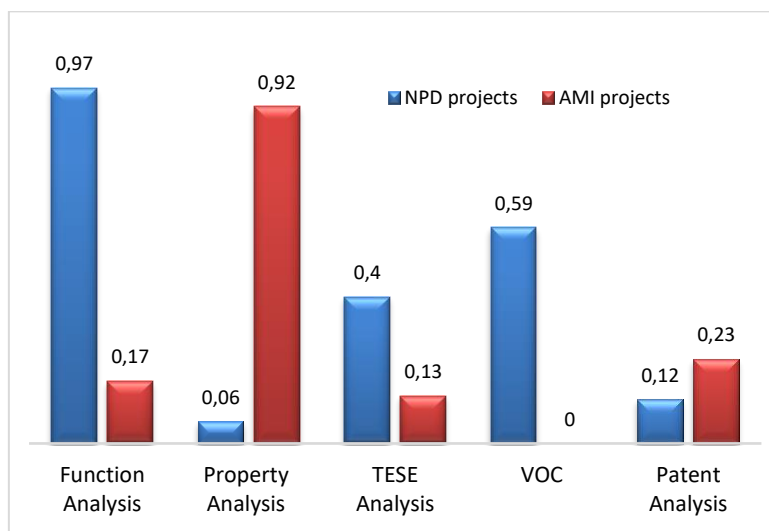
As seen from Fig. 3, the most productive tools for MPV analysis in NPD projects that should not be ignored are: Function Analysis, VOC and TESE Analysis.

Patent and Properties Analyses were much less useful for discovering MPVs and should have been skipped in the NPD projects considered in this research.

For all AMI projects, the Properties Analysis was a very useful tool. This was followed by a Patent Analysis, which was useful in two of six AMI projects considered (see Table 3).

Fig. 3 also shows that VOC is a useless tool in AMI projects and can be skipped.

Function Analysis was very useful only in one of six AMI projects; specifically, in project Can, whose object was a finished product, not a component or ingredient for some other product, and, therefore, a Function Analysis was possible.



**Fig. 3.** Relative importance of various sources of MPV in different types of projects.

Admittedly, the statistics in this study are based on a limited number of projects, so the results obtained in this paper need to be further refined by analyzing an extended pool of various types of projects where an MPV analysis was carried out.

However, this is not easy, because commercial projects from other TRIZ specialists are confidential and not publicly available. For the same reason, the authors do not provide the details of the projects analyzed in this paper<sup>1</sup>.

Despite these limitations, it is already possible to draw preliminary conclusions and give the following practical recommendations:

- To discover MPVs in NPD projects, the focus should be on Function Analysis and VOC; additionally, TESE Analysis is worth considering for this purpose.
- In most NPD projects, Patent and Property Analyses can be ignored as they are much less useful sources for MPVs.

<sup>1</sup> Individual researchers may be given access to this information under a nondisclosure agreement, provided that it is approved by the client.

- In all AMI projects, Property Analysis should be used, while VOC should be ignored.
- In AMI projects whose object is a finished product, Function and TESE Analyses should also be carried out.
- If time and resources allow, then a Patent Analysis in AMI projects could be used as a supplementary source of MPVs.

It is important to note that these guidelines apply only to NPD and AMI projects that use the respective roadmaps described in section 1 above.

## 4 Conclusions

The results obtained in this research show that the tools used in MPV Analyses are not equally important in NPD and AMI projects:

- In NPD projects, the most useful tools for discovering MPVs are Function Analysis, VOC, and TESE Analysis, while Patent and Property Analyses are less important.
- In AMI projects, VOC is unimportant and can be skipped, while Property Analysis is a critical tool, especially in those projects where the object is a substance/ingredient or a small component of some other product.
- In AMI projects where the object is a finished product, Function and TESE Analyses may be very useful.

Knowing this, it is possible to customize the MPV analysis toolbox to use only the most effective tools and skip others in any given project. This will reduce the time and resources required for analysis.

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