

MARKETING STRATEGY APPLICATION IN ENGINEERING PRODUCT DESIGN

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The specific target of this work is to emphasize the importance of marketing tools in each stage of a technical product design. The users have needs and the product should be designed in order to answer these needs. Marketing strategy has an important task to accomplish in this stage of the product design.

In this work, marketing tools (such as analysis of needs, market segmentation, competitors analysis, marketing mix) are applied for the development of a personal water slide.

Key words: market, marketing strategy, need analysis, functional analysis

1. Introduction

This work is aimed to apply the marketing concepts and tools to the development and design of a technical item answering to a specific need on the market. Engineering design of technical products is not sufficient to get a market success. It should be accompanied by a well developed marketing strategy even from the beginning of its design process, not only in the final stage of product launch on the market. The engineer is intended to design the product and its functions but he should be aware of the fact that the product has to have users. This is the most important information when starting its design. The users have needs and the product should be conceived in order to answer these needs. Marketing strategy has an important task to accomplish in this stage of the product design. Technical functions of the new product should be designed accordingly to the user needs.

The specific target of this work is to emphasize the importance of marketing tools in each stage of a technical product design. These will be applied

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to the development of a personal water slide, as example of complex technical product. It is an incremental innovation, as it will not bring an absolute novelty to the industrial branch, but will propose improvements of existing similar products. This choice was made in order to focus more on the product and less on the process. Alexe [1] presented in a very clear way the difference between incremental and radical innovation, its associated risks and implications.

Similar links between the two fields (marketing management and engineering) have been published in technical literature, some related to different sectors of activity [2], others regarding risk management in the development of innovative products [3]-[4]. In these works, the authors treated the preliminary identification of risks [3] at strategic, project and product levels impacting not only the company, but also the design process. They have also proposed the implementation of a process of risk assessment in the design stages for the success of a new product on the market [4].

The present work is focused more on the development of the product related to client needs, interacting with marketing tools and emphasizing their importance and application in the design stage.

The work starts with the need analysis and a small marketing study focusing on marketing environments, such as similar products and competitors, potential clients, distributors, etc. The study of the product lifecycle allows completing the functional specification by searching the major functions the product should accomplish in use and not in use. Technical design is presented in close relation to the need analysis. The water slide consists in three blocs all answering to a different technical need. The lifting structure brings the user in a safety place waiting his turn to enjoy. The slides achieve the main purpose of the product; they make the user slide on water. The third part is the pumping bloc; it is pumping the water from the pool to eject it on the slide.

In conclusion, fully functional and modulable slide water is proposed and developed from idea stage to final product.

2. Marketing strategy tools

The elaboration of the marketing strategy passes through four main steps [5]: external analysis (market analysis, internal analysis of the company and diagnosis), objectives statement, priorities selection, formulation of marketing mix. This methodology will be applied step by step for the development of the water slide functions.

2.1. Documentation on the subject

The very first step is to check for the product need. One should put himself the question: "is there any need for my future product?". If the answer is positive,

than a detailed market analysis should be undergone. In case of a negative answer, either one changes the product main features and purpose or one gives up at the “smart” idea. A product that disturbs nobody has no future [11]-[12].

2.1.1. Checking for the need existence on the market and opportunities

We try to identify where this product could be used, when and by whom. We actually are in a modern world where people have less and less time for spare-time activities. Everybody has to have maximum fun in minimum time period. The authors took the example of Brittany, a French region, for which they had an easy access to market data to start gathering the needed information. Brittany is composed of four departments: Côtes d'Armor, Finistère, Ille-et-Vilaine, Morbihan. According to the published data by National Institute of Statistics and Economic Studies [6], for the spare time activities, most tourists prefer camping to well thought-out campings. There were around 1,500,000 tourists between May - September 2012, while the average stay was for 5 nights. The number of homologated campings is very high in comparison to hotels in the region; there are 726 homologated campings (1-5 stars) offering 84,668 places for tourists in comparison to 608 1-5 stars hotels and 285 0-stars hotels offering 26,171 rooms. When comparing the number of spent nights in these locations, the published data revealed that there are 6,798,279 registered nights in hotels and 8,395,295 registered nights in homologated campings (reference year 2012) [6]. One may deduce that **there is a preference for camping locations**. Meanwhile, the statistics show **a preference for 3 stars campings**. People look for open air locations, but also for comfort and good conditions for their holidays. The grading of the camping locations is supposed to strict rules [7]- [8]. For example, a 3 stars camping should provide well-equipped play zones for children, while a 5 stars one should have a waterpark available for tourists or a swimming-pool.

The **new tendencies** for camping locations are oriented towards 4 and 5 stars and water-sporting facilities [9]: “There are great opportunities that can be exploited in the Tourism Sector. ... There are vast stretches of beautiful coastline available for the building of hotels and other tourism facilities in the Tourism Development Area. In this area, hotels of 4 and 5 star class will be given preference and high class complementary facilities such as congress and convention centers, sports and recreational facilities, eco-tourism, river cruising, professional game fishing and water-sporting facilities.” [9].

Unfortunately for tourists, but fortunately for this small business, most of the campings have a small size pool but don't have the financial means to buy a big water-park which would bring them more clients or for a longer period. Lots of them are looking for new fun activities to offer their clients.

As a partial conclusion, the product that we intend to develop could find use on the market as option in camping areas to increase the tourists' pleasure and stay. Or it could be a relative cheap way for a 5 stars option camping.

Checking for regulations and threats

Before proceeding to the product design intended for the above mentioned purpose, one may look at the environments in which the product will be used. By *environment* one should understand any type of external factor acting on the same market (political, social, environmental, technological, etc).

Unfortunately, during summer, when everybody wants to take a rest or have fun in a swimming pool, there are often water restrictions in France and in Europe. Reuters and L'Express have published maps with water restrictions in France [10]. There are three levels of water restrictions: level 1 – one day weekly, level 2 – more than one day weekly and level 3 – total restriction, no allowance for swimming pool or car wash. Almost the entire oust part of France was in 2010 under level 3 of water restrictions. Part of central France was under level 2 and the rest was indented to enter under water restrictions.

This is why, it is so important to design a product that doesn't use a lot of water or that will pick up the needed water from the swimming pool.

Obviously different countries have different laws. The main laws and rules we have to take into account are European laws, such as:

- water exposure;
- person transportation in height;
- norms about water pumping;
- European norm for the water slide - NF EN 1069-1 &2
- European norm for the outside games - NF-EN 1176 (1 to 7)

2.1.2. Similar products

A lot of companies manufacture water slides, especially in sunny countries (Inter Fab, Aqua action, SR Smith, Dallet Jacques S.A.S, Edsun Loisirs etc), but very few of them use water pumps. When they use it, it is with a closed pumping circuit thanks to the pool circuit. All the companies have developed their own products, and they are fixed; once they are built on a location, it becomes very difficult to move them. These products are very customizable but not adjustable since they are not composed by modules.

The major part of water slides companies come from Australia or USA. They sell similar products with same prices. The sale system is often online.

Many different personal water slides can be found on the market (inflatable slide, slide in one). They can be separated in two types:

- big ones fixed to the ground, produced by unit and usually very expensive (order of tens of thousands of Euros);
- small ones, in plastic, that are not expensive and can be easily moved.

In order to offer a different product on the market, we intend to develop a funny modularly water slide, so that it could be mounted anywhere, very easy and fast.

2.1.3. Potential client

In fact there are four types of potential clients:

- Owners of drilling swimming pool;
- Camping with drilling swimming pool;
- Hotels;
- Pool accessories renters.

All of them have a common behaviour: they want their clients to have fun.

Actually, in France, most of campings and hotels have a pool, but it became difficult to attract people with “just” a pool. The problem is that they are afraid to invest lot of money in a giant water attraction because the maintenance costs are high and if the pool is not warmed, it would be unused half of the year. Thus, the product that is to be developed should make them change their minds: low investment, low maintenance, and the possibility to store it when the pool is closed, which avoids problems due to out-of-season conditions (snow, rain, etc).

2.1.4. Pricing

The prices of this type of product can't be really defined. It depends on what product we talk about, materials, purpose, dimensions. But they vary between 250 euro for children fun purpose up to 150000 euro for water parks slides.

2.2. Objectives statement in terms of product features

As one may see, this procedure allows us fixing some product features in order to be sold on the market among the competitors' products. One needs to develop some new and different features, which will make this new product better for the target client, for their specific needs. In Table 1 one might imagine the reason for purchasing the new product.

We have to distinguish between buyer and user. Buyer's objective is to have a nice, easy-install water slide in his place. The user's objective is to enjoy his leisure time.

Finally, based on this analysis, one might establish the needs and functions for this product. Examples: customers need safety, easy maintenance, movable product, etc. Figure 1 reveals the main selected functions to be ensured by the product.

For each expressed need, one should decide the characterized need. The producer needs numbers instead of attributes. Table 2 presents an example of the characterized need for “movable product”.

Table 1. Clients' purchasing reasons [13]

Client	Purchase purpose	Purchase condition	Product usage
Camping	Want to improve their activity, image and grading scale, to attract tourists.	Fun, easily storable, and cheap	Use: half of the year but a lot during this period. Move: twice a year.
Hotels	Want to improve their level of standing, to attract tourists.	Fun and easily storable.	Use: all the year, every day. Move: have to be stored when special cocktails are organized around the pool
Public or private small size pools	Want their clients to like them and come back.	Fun and cheap.	Use: few hours daily. Move: quite never or twice a year for exterior pools.
Renter of aquatic accessories	Want to improve their accessories choice.	Fun, easily movable, and very resistant.	Use: depends on the rent. Move: very often because of its purpose.

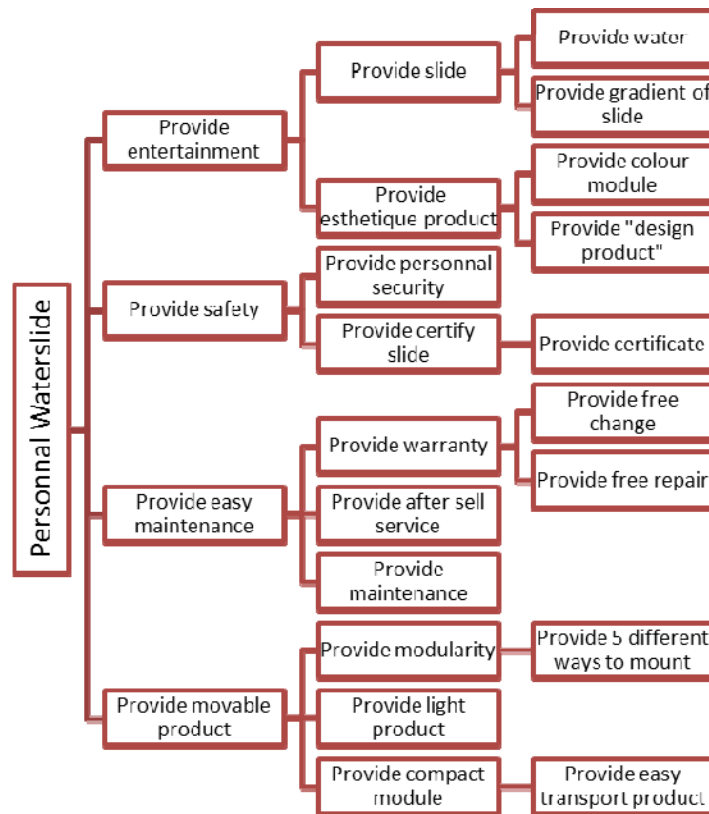


Fig 1. Basic functions of the new product

Table 2. Characterized need for “movable product”

Customers need a movable product	Values or characteristics
Weight	less than 30kg/part
Bulk (compact enough)	0.5x0.5x1m ³ /part
Modularity	spare parts, 5 different ways to mount

From this analysis, the main features of the product have been determined.

3. Technical development of the product

All the above analysis helped finding the product’s main purposes and characteristics. In order to design it for these purposes, the product technical functions should be conceived for each phase of the product lifecycle.

For “In use” phase, the elements of exterior environment have been imagined (figure 2).

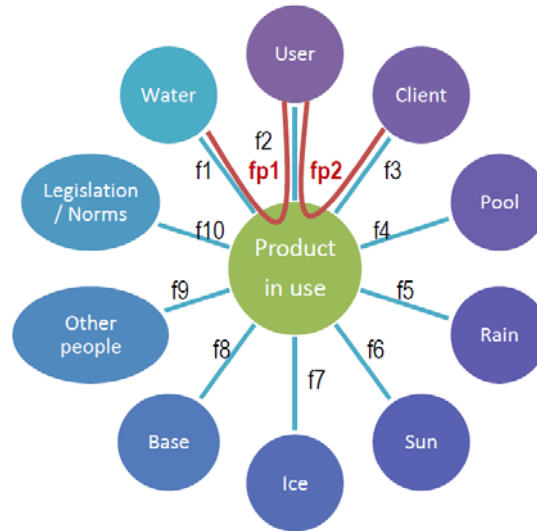


Fig.2. Elements of exterior environment for the product in use; diagram of interactions.

The functional analysis tool is applied for this situation, so that a series of service functions are determined between these elements of exterior environment. These are emphasized in Figure 2 and detailed in Table 3. For each function, a set of measurable physical parameters are established and their corresponding levels. In this way, the characteristics of the product components are decided.

The next step is to apply the functional technical analysis and to establish the relation functions between the components of the product. A numerical

Table 3. Service functions for the product in use.

TABLE OF SERVICE FUNCTION				
N°	Expression	Criterion	Level	Limit
Fp1	Make the user slide on the water.	Can slide.	Gradient	< 30°
			Roughness	< 50
		Carry water on the top	Flow	400 L/h
Fp2	Make the user like the client (place, person ...)	Be fun	Look fun	Have different colours
			Number of bend	>2 x 90°
		Be cheap	Price	Less than 5 000€
F1	Not modify the water property	Let the water like it was in the pool.	Chlorine	Not modified
			Temperature	$\Delta T < 3^\circ$ when $T_{\text{outside}} = 10^\circ\text{C}$
F2	Warranty the safety for the user.	Norm	N-EU-1069	Respect all
F3	Make publicity to the client.	Visibility of the object	Size of the placard.	>50x20cm
F4	Be adaptable to standards pools.	The slide can be put in the pool park	Size	Can be modulable in length or in square.
		To can drop the user in a digged pool.	Height of the waterfall	0,5m
			Length of the slide over the pool	0,3m
F5	Resist to the rain.	The rain fall	Protection to the rain	IP57
F6	Resist to the sun.	The sunshine	Resistance to UV by sun test	For 5 years outside.
F7	Resist to the ice.	The freezing	Resistance of the material to freezing.	-10°
			Purgation operation	Be able to purge more than 95% of the system.
F8	Be implanted on an adapted base.	Characteristics of the base	Gradient	Gradient < 5%
			Resist to the weight of the slide, the water and two users without moving.	$200 + 50 + 2 \times 100 = 450$ kg.
		Be implanted on a base non vulnerable to water.	Permeability or gradient	Can absorb 2L/min OR Gradient > 2%
F9	Warranty the safety for other users of the pool	Be visible	Appearance	Larges tapes of fluorescent paint OR the underside of the slide filled
		Forbid the access to the side of the slide	Fences	1m height 1,5m from the slide.
F10	Respect the law	Verify that the slide respect the law and the rules.	Norms	N.E.1069

simulation in CATIA V5 is provided. Figure 3 presents the general view of the proposed product. It is composed by: slides, structure and water circuit, including elements like fences, all necessary devices for the water circuit (pump, pipes, etc.), platforms and stairs, etc. A functional view was generated in order to let us

characterizing the technical functions, which model the interactions between system components (figure 4).

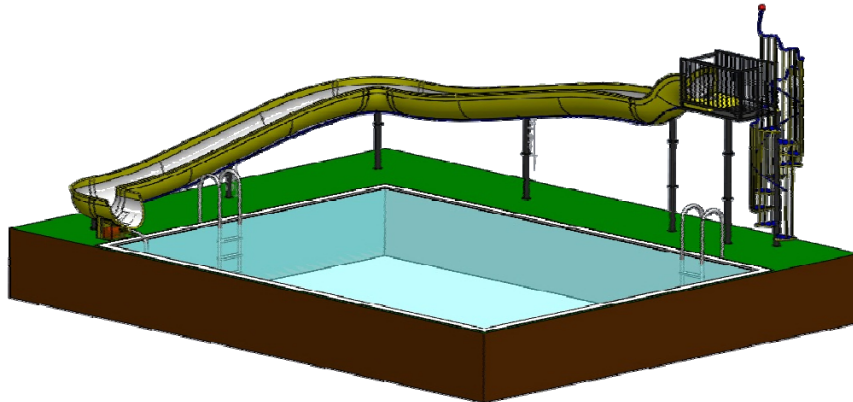


Fig.3. Proposed water slide (CATIA drawing)

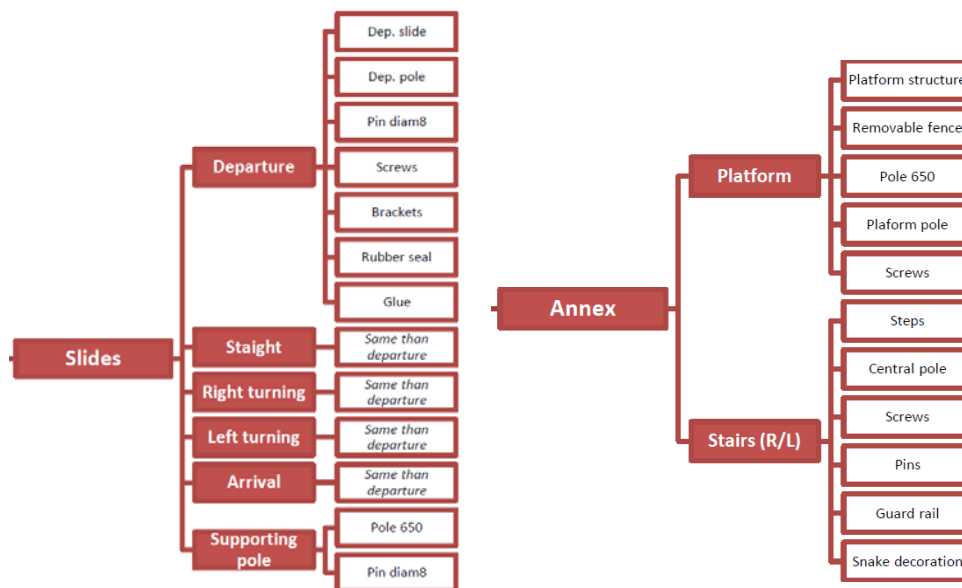


Fig 4. Functional view for slides and annex parts

Then, a physical solution is imagined so that all these components are linked and connected by relations. These relations are called technical functions giving information about coupling between elements, efforts, stresses, materials, etc.

The three main groups of components (slide, structure and water circuit) is treated separately. These 3 groups are decomposed into components and every component is computed by its function, its manufacturing process, its design, its material. Some examples are provided here.

The first part of the water slide is the *lifting structure*. This part permits the user to reach the beginning of the slide and wait in security. As the rest of the slide, every part of this bloc can enter a small truck to be moved easily.



Fig 5. Lifting structure

This bloc is composed of: 1 stair, 1 platform, 1 removable fence, 1 starting/watering seat, 1 adapted pole, 1 pipe hook, 2 “650” poles. The only permanent fastening is the one between the seat and the platform. The others are fastened on place. The stairs are characterized by 9 steps in plastic, each of them of dimension 196 cm according to the law. They are set on the central galvanized steel pole. Total diameter of 74 cm according to the minimum width of steps. Total height: 3.5m due to the security fence.

The second bloc is the *slide bloc*. This bloc achieves the main function of the water slide. This is the part on which the user will drag. The total length of the basic part of the slide is 12m because the maximum height of the water slide is limited by the law at 2m at the starting point (framing the product to be considered as a game and not as a professional structure, which would be much more constraint about the certification). It is composed of a starting part, an arrival part; between these two parts one may fix the selection he wants of straight and turning slides. This is according to “adjustable” characteristic of the user need. A version of the water slide could be composed of: 1 starting slide bloc ; 2 straight slide blocs ; 2 turning slide blocs ; 1 arrival slide blocs ; 4 “650” poles. Every generic slide bloc is composed of: slide; fixing brackets ; adapted pole; 3 pipe hooks; 3 rivets and spring pins (see figure 6). The width of the slide profile is 68 cm. This width comes from the European norms.

All the slides can be assembled together whatever they are because the connecting section is straight and flat. To connect two slides together, one must first slide the

2 profiles, put rivets and pins in the 2 upper holes and another rivet and pin in the fixing bracket holes.

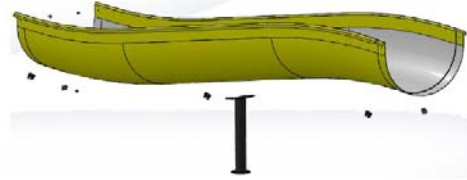


Fig.6. Generic slide bloc

In a similar manner, all system components are designed, starting from the characteristics found by applying the functional analysis tool.

4. Economic approach

The production cost is evaluated in order to be compared to the price of other similar products. This is the final decision that should weight on or against fabrication. If it is worthy from result point of view, one may proceed to a detailed technical analysis and afterwards to fabrication. The production cost represents the sum between raw materials costs (purchase costs), manufacturing and other indirect costs. Table 4 presents an evaluation of the production cost for the water slide. The fixed costs have to be added in order to find the total cost.

Table 4. Production cost

	Details	Stuff	Quantity	Unit Price	Sell price	
Pump bloc	Pump UltraFlow 30m3/h - PiscineShop + Pipes	Pump	Part	1	398,14 €	398,14 €
Slides profiles	Mold amortization	Polyester	Number of part	5	35,00 €	175,00 €
	Raw material		kg/per element	4,5	2,21 €	9,95 €
	Transportation		Number of km	50	0,82 €	41,00 €
Metallic beam	Beam diameter 70 mm, galvanized beam	Stainless steel	Number of meter	9,5	7,00 €	66,50 €
Other metallic element	Screw, nuts, rivet and spring pin	Stainless steel	Number of pieces	200	0,10 €	20,00 €
	Circular cover	Stainless steel	Number of pieces	70	1,40 €	98,00 €
Starting seat	Rotational molding	Polyethylene	Part	1	45,00 €	45,00 €
Pipe hooks	Molded plastic	Polyethylene	Part	10	0,50 €	5,00 €
Plateform	Non skid surface	Stainless steel	Surface (m ²)	2	55,00 €	110,00 €
Fence	Beam 45x45 and 30x45	Stainless steel	Length (m)	15	6,00 €	90,00 €
Step	Raw material	Polyethylene	kg/element	18	2,21 €	39,78 €
	Mold amortization	Polyester	Numer of part	15	20,00 €	300,00 €
Labour force	Welding and assembly		Number of hours	28	24,28 €	679,84 €
TOTAL HT						2 078,21 €

On a rough estimation, a total cost of 5000 euro is estimated.

6. Conclusions and discussions

The present paper presented the influence of applying the marketing concepts and tools to the development and design of a technical item answering to a specific need on the market. A water slide was proposed as application. The analysis started with a market analysis in order to find a real need, a real customer, competitors on the market and their strategy, pricing and market potential. The needs were characterized into technical items (numbers) for producer. A second phase of the product development was presented, dealing with components of the product and connections between these. Starting from the user needs, the functions and characteristics for the new product were conceived and afterwards, the pure technical design procedure should be applied (in terms of materials to be used, assembly parts and procedures to be applied, etc.).

The aim was to emphasize how the result of a market analysis is used in the design procedure of a product.

The present work was developed by a team of brilliant ERASMUS students who spent one semester in UPB and devoted to this project.

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