

# BLUMIL – SMART ELECTRIC WHEELCHAIR THAT OVERCOMES OBSTACLES

*Miłosz Krawczyk<sup>1</sup>, Milena Antosik-Panek<sup>2</sup>*

<sup>1</sup> Blumil, Giełdowa 4b/11, 01-211 Warsaw, Poland, info@blumil.com

<sup>2</sup> IT SCM Information Technology and Supply Chain Management Association, Chmielna 2, 00-020 Warsaw, Poland, milena.antosik@itscm.pl

**Abstract:** The purpose of this article is to present the specific situation of different wheelchairs users and their needs. There are numerous different disabilities that effect people of different ages. On top of that each person has a different physique. Additionally, each person has different needs and ambitions. If we join all of the above factors, we have an almost infinite number of combinations. This presents a huge challenge for wheelchair manufacturers. What makes the situation additionally harder is the financial status of each person, as some solutions, especially those tailor made, can end up being very pricey. Therefore, there are several main types of wheelchairs on the market that try to cater for their needs. The aim of this article is to present main types of users and wheelchairs that are used by them. We also present in detail the Blumil – a wheelchair that attempts to be most diverse and universal, using unique new technologies.

**Keywords:** wheelchair, wheelchair users, disability, wheelchair types, wheelchair accessories, Blumil.

## Introduction

The purpose of this article is to present the specific situation of different wheelchairs users and their needs. There are numerous different disabilities that effect people of different ages. Therefore, there are several main types of wheelchairs on the market that try to cater for their needs.

The numbers of wheelchair users differ around the world, but on average their numbers in each country do not exceed 2% of the entire population (Table 1). In 2010 more than four million wheelchairs were produced and their total retail value reached 3 billion dollars. The number of sold wheelchairs is largely influenced by the economic situation of a given country. The wealthier the country, the higher number of sold wheelchairs. Japan, Great Britain, and the USA are leaders among the countries with the highest numbers of wheelchair users. Each year for every 10 000 people, 59 wheelchairs are sold in Japan, 44 in Great Britain and 36 in the USA.

**Table 1.** Wheelchair users in the world

COUNTRY	Number of wheelchair Users	% of Population	Wheelchairs bought for every 10 000 people
USA	3 300 000,00	1,10%	36
Poland	565 000,00	1,50%	No Information
France	360 000,00	0,60%	15-17
Germany	1 560 000,00	1,90%	15-17

Source: own study based on [2].

The reason for using wheelchairs are various. They very often are related to geriatric diseases (mainly joint diseases), post-traumatic disabilities, incurable diseases and birth defects. There are 3 main groups of wheelchair users.

- People who are completely dependent on wheelchairs; they are not able to walk.
  - Self-reliant wheelchair users, who use active wheelchairs; they lead an independent life.
  - People with limited mobility – they use electric wheelchairs or require assistance if they use manual wheelchairs.
  - People with no mobility – they need constant assistance in everyday life.
- People who are partly dependent on wheelchairs on a long-term basis; their ability to walk is limited.
  - People with an alternating ability to walk – it depends on their health; a wheelchair can be necessary for some situations.
  - People who can walk short distances; heavily dependent on a wheelchair, it is necessary for everyday life.
- People with a limited mobility on a short-term basis – after injuries, the period of illness.

In general, wheelchair users’ mobility and reasons behind limited mobility are various, and therefore there are different types of wheelchairs to fit different needs and preferences. The most popular ones are manual wheelchairs (42,3% of all wheelchairs), passive manual wheelchairs (28,2% of all wheelchairs) and active wheelchairs (6,7% of all wheelchairs).

## Main wheelchair types and accessories

### *Manual wheelchairs*

Manual wheelchairs are mostly powered by your hands strength [1]. They are therefore generally used by people, whose hands movements are not

limited [3]. They are, by far, the most popular category of wheelchairs on the market. Their characteristics are small size and manoeuvrability.

### ***Electric wheelchairs***

There are many types of electric wheelchairs. They differ in many aspects: both visual and technical. There are wheelchairs, which have from 4 to 6 wheels. They're considerably heavy and they are not always suitable for all terrain adventures, though most of them are equipped to all-terrain escapades. They often have drive wheels in the front and are said to be easily configured to users' needs. They are often controlled by a joystick, which steers the vehicle.

### ***Beach wheelchairs***

Beach wheelchairs often have three wheels. They're designed to navigate easily on the sandy surface. Depending on the brand and needs' of a user, there are quite a few models to choose from. They can be either pushed by others or self-propelled, depending on one's abilities.

### ***Hand Bikes attached to wheelchairs***

Coming back to the main subject of the post – aside from different types of wheelchairs, there are many wheelchair accessories on the market. What's an interesting example of that? Handbikes!

Designed for outdoors fun, hand bikes are quite a nice option for manual wheelchair users. If you attach a handbike to your manual wheelchair, your mobility's higher and you can successfully explore the countryside. With the handbike, the wheelchair is not very compact, but definitely suitable for off-road trips.

## **Pros and cons of different types of wheelchairs**

Each type of wheelchair has its strong and weak spots. Manual wheelchairs, for example, are rather small and maneuverable, but they are not suitable for navigating in a difficult terrain, and their outreach is limited. Electric wheelchairs are suitable for all terrains, but they are big, difficult to maneuver and often lacking in design. How does Blumil electric wheelchair compare with most of the manual and electric wheelchairs? It is presented in Table 2.

**Table 2.** Blumil electric wheelchair. Comparison to different wheelchairs

why is it better than a manual wheelchair	why is it better than an electric wheelchair	why is it better than other segway adaptations
ease on all surfaces (pavement, grass, gravel, sand, snow, ice)		
ease downhill/uphill (over 30% inclines)		
	travels through standard doorways and into elevators, move from indoors to outdoors in a snap	
you will not get dirty (going through rain, mud, snow)		
travel at high speeds (20 km/h)		
		light
		heavy duty
		easy installation (4 screws)
		quick delivery (within a month)
		different sizes (perfect adjustment for different phsiques)
		range of colors
		low price
		simple and quick parking mechanism
		no additional batteries
		easy adjustment for different disabilities
	attractive design	

Source: own study.

### ***The Perfect Wheelchair***

For years people have been trying to create the perfect wheelchair. What would it be like? There are some of its features listed below [4]:

- It should be customised to each wheelchair user’s needs.
- It should be catered to all-year usage.
- It should be easy to assemble and disassemble for comfortable transport.
- It should be easy to navigate; using a wheelchair should not be tiring.
- It should fit in limited space, for example, door frames.
- It should be equipped with an electric drive to support the muscle power in the changing terrain conditions.

- Its price should be lower than the price of electric wheelchairs currently available on the market.

## **Blumil electric wheelchair**

The history of Blumil (Fig. 1), the electric wheelchair, started several years ago. I was utterly disappointed with the wheelchair market. It seemed to have a lot on offer, but nothing that would completely cater to my needs. I wanted to enjoy the mountains, stroll along the sandy beaches and breath in the winter air in snowy parks. All I needed was to experience freedom. The market didn't seem to support my idea. You could either get an enormous electric wheelchair that would fail every city test or give up your travel aspirations. Producing something relatively light, both indoors and outdoors-friendly? Well, that was a new idea. I was never the one to shy away from the challenge, so I took matters into my own hands. Since there was no wheelchair of my dreams. I would create it. That's how everything began – necessity is the mother of invention, as they say.

Ideas are beautiful, but until they are put into action, they are just that: ideas. I knew I needed to make Blumil reality, so I kept looking for somebody who would help me. I was lucky to have met wonderful people, whose passion and knowledge, brought Blumil into life. At first, it was supposed to be my private vehicle, a project that would enhance the quality of my life. As soon as I started to use it, though, I realized it was truly life-changing. It helped me to experience more, and I wanted others to discover the freedom I found. After 5 years of work, Blumil was no longer just an idea of mine – it was the reality. Since 2015 Blumil's part of the wheelchair market scene, and we constantly work to improve it – for the better future and the greater freedom. Since Blumil is an electric wheelchair based on Segway, Airwheel or Ninebot construction, it is very intuitive and easy to steer. Its relatively small size and weight make it perfect for both city and outdoors travel. The lightest model is 38 kilograms, which is the reason why it is so easy to navigate on Blumil. Two wheeled, equipped with gyroscopes and onboard computer, Blumil electric wheelchair has changed my life in profound ways. It allowed me to explore beautiful, hilly Lisbon, soak up the atmosphere in Barcelona and use public transport in busy, vibrant Warsaw. I've visited numerous places all around the world and to be honest, Blumil has made all the difference in my traveling experience. You can easily transport this wheelchair, it can handle about every surface and is small enough to fit in a very limited space. Ultimately, Blumil and freedom go together very well – just like intended.



**Fig. 1.** Blumil S5 on snow  
*Source: [5].*

Blumil is an all-terrain, off-road electric wheelchair. It is different to most of the wheelchairs on the market, thanks to its size and weight. While a vast majority of wheelchairs are heavy and big, Blumil's considerably light and small. It easily fits in narrow passages and is well-suited for both cities and the countryside. It's based on the Segway technology and thanks to its small size, it's compact and easy to navigate. You can easily control it yourself: no joysticks are needed. It's fast, too: 15-20 kilometers per hour is the speed it can go into if you wish to race through the city.

Actually, since I have Blumil my friends are the ones who stay behind. Before, I would have some problems navigating through busy cities, but with Blumil I am always ahead of everybody. The first time somebody was able to keep up with my pace was in Budapest – I took part in the Segway tour and my guide and I were the fastest guys in the town. Possibly!

## Types of Blumil

Blumil, just like other wheelchairs, has many models! Blumil S3 (Fig. 2) is a “city dweller” – perfect for park alleys, lawns and even for rainy days when everything's a bit too slippery.



**Fig. 2.** Blumil S3  
*Source: [5].*



**Fig. 3.** Blumil x2  
*Source: [5].*

On the other hand, the model x2 “Extreme adventure” (Fig. 3) will do perfectly well in every type of terrain: from cobblestone, sand to sand – to mention just a few.

Each model has specific features, which make it suitable for various types of terrain. They are all listed in the tables below (Table 3 and Table 4).

**Table 3.** Blumil model comparison. Surface

Surface	S3 City dweller	S5 Ultimate freedom	i2 Incredible range and comfort	x2 Extreme adventure
Cobblestone	X	✓	✓	✓
Park alleys	✓	✓	✓	✓
Lawn	✓	✓	✓	✓
Sand	X	✓	✓	✓
Rain	✓	✓	✓	✓
Snow or mud	X	✓	✓	✓

Source: own study.

**Table 4.** Blumil model comparison. Parameters

Parameters	S3 City dweller	S5 Ultimate freedom	i2 Incredible range and comfort	x2 Extreme adventure
Range (kilometers/miles)	25 / 15,5	30 / 18,6	38 / 23,6	19 / 11,8
Max. speed (kph/mpg)	15 / 9,3	15 / 9,3	20 / 12,4	20 / 12,4
Weight (kg/lb)	37,5 / 82,6	49 / 108	63 / 139	70 / 154
Width (centimeters/inch)	64 / 25	77 / 30	63 / 25	89 / 31

Source: own study.

There are a few companies, who produce Segway-based electric wheelchairs. Their prices differ: mainly because of the design and the parking mechanism. The parking mechanism is, by far, the most difficult element in creating and designing when it comes to Segway-based wheelchairs. As Segway is two-wheeled so a stabilizing mechanism is crucial to safe usage of a Segway-based wheelchair. In addition, the Segway has built-in sensors that respond to the pressure of the person if the person’s standing. To turn the machine on the sensor can’t be loaded. In contrast, it must be loaded to operate. In addition to the stabilization function, the parking mechanism must also press the sensors in the right moments. Due to the complexity of the motion, creating such

a mechanism is very difficult. The easiest way to do this is by using electrical systems. This solution, sadly, has a lot of disadvantages listed below:

- We need to charge an additional battery.
- The extra battery is protected from moisture as well as the Segway battery, so it is very like to fail.
- The weight of the whole device increases.
- The cost of air transport increases, due to tighter requirements regarding the transport of batteries.
- Each battery has a certain usage expectancy - after some time you have to buy a new one.
- Unlocking and locking the entire mechanism takes a lot longer than in the manual mechanism.
- Higher cost.

In Europe, Genny electric wheelchairs are the most popular option as of now. It costs more than 21 000 euros, and due to its high price, it is not widely accessible to the vast number of people. Ally Chair is another leading company on the market. It is based in USA and supports American war veterans with the foundation Segs4vets. The foundation recently bought the company. They don't have any dealers in the USA or worldwide. There are a few other companies, but they mainly operate on their national markets due to high costs of shipping the product internationally.

## Summary

The quest for a perfect wheelchair has started many years, and so far, perfection is yet to be reached. Each and every solution has its advantages and disadvantages and it is difficult to create something that would cater to everybody's needs. Light wheelchairs are often extremely expensive, cheaper ones – heavy and difficult to navigate. With Blumil, I aim to help others experience freedom and hopefully move closer to the definition of a perfect wheelchair. The best is yet to come, and hopefully a long-time dream will become the reality soon. At this stage I'm planning to develop a new versions of Blumil that will be suitable for the elderly and for children. To do so I will focus more on user's ergonomics to provide optimum riding position and comfort.

## References

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