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Helmet Charger Based Solar Power: A Review of Business Prospect

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Abstract

Solar power based helmet charger is a product developed by the author and his team that was funded twice by the Ministry of Research and Technology of Higher Education in 2013 and 2014 for 'Karsa Cipta' (creative plan) program and 'Kewirausahaan' (enterpreneurship) program, respectively. This product has participated in several scientific agendas such as conferences or contests from 2013 to 2015, and is processing the proposal for patent with several claims distinguishing it from other similar innovations. This paper is contained with invention profile and achievement of qualification fulfillment of a superior innovation as well as several considerations of technopreneurship based opportunities or business prospects as a follow up research and development.

Keywords*: technopreneurship, business prospect, helmet charger based solar power, Indonesia*

1. Introduction

Technologies we see and use daily are a result of innovations that was accumulated and commercialized through technopreneurship, such as laptops, lamps, televisions, smartphones to name a few. Technopreneurship is a commercial incubator of findings of research and development which takes the profitable way. This way of commercializing technology takes one of the following actions, such as (a) having a partnership, (b) obtaining license, and (c) selling the product to commercial party. In fact, technopreneurship can be beneficial economically, socially and environmentally [1]. Technopreneurship is formed by a strong fundamental of technology possessed by the inventor, fused with the power of art and adjusted to meet the need of the relevant market.

In order to think of a great innovation several strategies and processes are there to follow: (1) Access to continuous research funding, (2) Socialization of the innovation through media to the society and through scientific forums, as well as chances for industrial cooperation intensively and continuously, (3) Protection of intellectual property (IP) in order to produce meaningful innovations for many parties and to be professionally yet proportionally managed, and (4) Appreciation of the innovation as a form of rewards [2].

The author has developed the product of solar power based helmet charger since 2013. The invention of solar power based helmet charger (henceforth it is mentioned as helmcharger) holds fine potential for further improvement and development in technopreneurship based business. Such aforementioned potential can be best viewed from today's phenomenon, in which the amount of motor vehicle is increasing, since it makes Industries of supporting or accessory products are motivated to create innovations, which in this case is the head protector or helmet.

From the latest data obtained, in 2012 there were 15 million units of helmets were sold in a year [3]. Based on the review of literature related to the development of technopreneurship, such invention of helmet has gone through some of the procedures of fulfilling qualifications of superior innovations and sale worthy in industry scale, like having access for research funding, protection of IP, appreciation of the innovation, and scientific forums as well. Actually, some other procedures are still in the process like being discussed in this paper.

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2. The Current Helmet Trends

Helmet is known to be one of the compulsory equipment for motorcyclists of motor vehicles like motorcycles. The police officers, therefore, admonish anyone riding motorcycles who are not wearing a standard helmet. This implies that helmets are to be worn by those riding motorcycles anytime for long, medium, and short travelled distance.

Observing such a chance, there have been plenty of ideas invented of helmets for motorcyclists for three years, from 2013 to 2015. The author has reviewed inventions under the topic of helmet funded by the Ministry of Research and Technology of Higher Education (KEMRISTEK-DIKTI) in a grant program of Student's Creativity Program (in Indonesia is Program Kreativitas Mahasiswa) [4-6]. Some of the inventions are, as follows: (1) a vibrator helmet to prevent motorcyclists from sleepiness on the street, (2) a helmet with aromatherapy, (3) talkie helmet for two-way communication between the rider and the other person on the motorcycle, (4) a helmet with mask to prevent dangerous substances while riding, and (5) a helmet with transition glass that can adjust the sun light. Other innovation of helmet are clear reported by several author in the world such as [19-22] and etc. Adding functions to helmets make them serve motorcyclists not only to protect their heads but also to provide comfort for them.

The development of helmet to the extent of its security has also become technology researchers' concern recently, as in the innovation of anty-theft system on helmet which has been implemented by several methods, some of which are the security based ASCI code technology, security based mechanical code and GPS technology. Not only the innovation of helmet is seen as a space for technology researchers but also the innovation of helmet is brought to a profitable space of business in adding ornaments to helmet, like (1) helmet with printed *hijaiyah* letters, or (2) with characters of *wayang* or batik, or (3) characters of famous cartoon such as spongebob, Naruto, one piece, frozen, spider man, dora, kamen rider, dragon ball, gundam and etc., (4) helmet added with raincoat, (5) glowing helmet in the dark, and many more creative innovation on helmet. Such innovation indicates the interest of the today's youth that take helmets as a part of fashion.

Therefore, solar power based helmet charger, branded as 'helm charger tenaga surya' or helmcharg, is a product of innovation of helmet in technology which is potential to be developed into other aforementioned domains of innovation such as security and fashion.

We have been reviewed clearly about helmet charger innovation based solar power which sold in the market such as [30]. This invention has a specific difference with the previous invention, especially photovoltaic placement aspect. In previous invention, the photovoltaic taped with a gluten on the helmet body. Meanwhile, in this innovation a photovoltaic is placed in specific box then taped on the helmet body. Then at completeness aspect views, this innovation contains a power bank an electronic system which not found in previous innovation (the electicity produced are connected directly to the mobile phone).

3. The Profile of Helmet Charger based Solar Power

The world uses more energy consumtion than ever before recently. Photovoltaic cells are a growing market in renewable energy sector [23]. The photovoltaic cells have been widely applied in various engineering fields and helps to improve human life quality, such as an application on the boat device which has a potential to assist the fishermen [24] or to provide main power supply for tourism spot and public facility, e.g. museum-park [25] and many other applications. In Indonesia case, the utilization of solar energy as an energy source is strongly supports massively applied because strategic position and eco-friendly technology. There are several example of application, i.e, public facility: street lamp [26], mosque [27], university labor [28] and then in home appliances [29]. In particular month, the effective time of harvest the energy is not always stable especially in rain season. When the condition is cloudy, clouds always blocked the sunlight. However, it isn't a barrier in order to harvest the energy using solar cells device. It will be Arised an initiative to design a various strategies, such as algorithm optimization, good devais of solar cells of selection criteria and etc.

The purpose of inventing the product of helmcharger is for enabling motorcyclists to generate electrical power that can be used for charging low power electronics like cell phones. The development of this invention has started in 2013 through 'PKMKC grant'. Helmet can generate electrical power in two alternatives; they are solar cell and mini pinwheel. In the case

of generating power through helmet solar cell device is considered more advantageous than the other alternative because although the motorcyclists stop riding, charging can still proceed by directing the helmet towards the sun light. Additionally, this alternative is preferable due to the ergonomic factor, for mini pinwheel may cause wind turbine in backward which can be disruptive for motorcyclists.

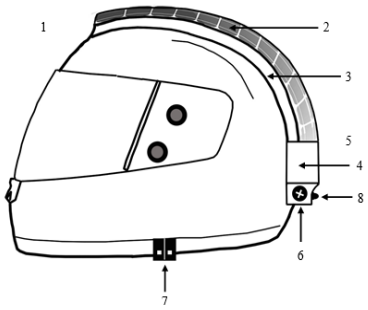


Figure 1. The Product Architecture of Helmet Charger Based Solar Power

The helmcharger developed by the author holds the following characteristics: (1) the helmet is light despite the additional solar panel on it, therefore the motorcyclists can still feel comfort, (2) the helmet holds two functions, namely as the head protector while riding and as a power generator; the generated power is saved in power bank that can be used when necessary, (3) it is harmless for the brain because it is constructed with a partition made of isolator material of electric charge [7], (4) it is friendly user, the helmet can be worn by every one for its charging function, and (5) it is eco-friendly.

This particular helmcharger is an alternative for people who are taking journeys by motorcycles thus they find trouble of charging their cell phones. By the solar power based technology added to the helmet motorcyclists shall not be troubled no more to find a place for recharging their cell phones. Figure 1 is the anatomy of helmet charger based solar power invention, A photovoltaic cells or solar cells (nomenclature 2) which placed in a specific box (nomenclature 3) is the main power supply supply for producing electricity. Therefore the electricity processed in electronic system that located inside the specific box (nomenclature 4), this is a voltage regulator with manual adjuster and indicator lamp. Then the electrical power saved in power bank device (nomenclature 5). The voltage controller circuit which used in this invention can be setting according to the needs, for example: $3V_{DC}$ to $5V_{DC}$, $12V_{DC}$ to $5V_{DC}$ and etc. The needs referred here is an environmental conditions recently, cloudy or brightness. Based on the theorem that "*the output voltage which produced by solar cels is increasing when the sunlight is brighter condition and vice versa*". By tunning or manually adjuster facility in this invention (nomenclature 6), the user can conditioned the input voltage in power bank is stable with $5V_{DC}$. The distribution of electrical power from the power bank to the user's phone is by the cable with size of 1mm which installed inside the helmet. Therefore connected to a USB connector (nomenclature 7). During charging process, the lamp indicator wil be blinking (nomenclature 8).

4. The Invention Socializations

The invention socialization has taken the start in 2013 to 2015 in front of the team of monitoring and evaluation from the State University of Malang (in internal monitoring and evaluation) and from DIKTI (in external monitoring and evaluation agenda). Invention socialization was also conducted internally by the Institute of Research and Dedication to Society of UM (LPPM-UM) in a HKI workshop and patent drafting of 2014 [8]. The product of *helmcharger* has also socialized in several scientific forums and contests, aiming at captivating relevant part(s) namely related industries, institutions of research and development, as well as printed and electronic media in order to build cooperation. The following are details of other socialization of the helmet innovation.

a. Invited to a forum of *New Renewable Energy and Energy Conservation Conference and Exhibition* (EBTKE-CONEX) 2013 [9, 18], bringing a paper entitled "*Study in Developing A Charger Helmet as Power Bank of Mobile Phone for Travelling*". This forum was held by the Directorate General of New Renewable Energy and Energy Conservation (Jakarta, 21-23 August 2013)
b. Invited to Indonesian Young Scientist Conference (KIMI) of *MIPA Untuk Negeri* (MUN) [10], organized by the Faculty of Mathematics and Science of Indonesian University (UI) in 2013 (Jakarta, 1-7 September 2013).
c. Invited to a National Seminar of Engineering of Energy, Mechatronic, and Technology (RIMTEK) for Vehicles 2013 held by the Research Center of Electrical Power and Mechatronic of the Indonesian Academy of Sciences (LIPI) [11] with a paper title of 'Studi Awal Pembuatan *Helm charger* Helm Penghasil Listrik DC dengan Memanfaatkan Energi Matahari (*Photovoltaic Cells*) dan Angin' (Bandung, 18 September 2013).

Figure 2. The Product of Helmet Charger Based Solar Power Generation I

(a) **(b)**

Figure 3. **(a)** A report of invention by www.merdeka.com. Available at URL: http://www.merdeka.com/peristiwa/hebat-orang-indonesia-buat-helm-yang-bisa-charger-hp.html, **(b)** A report of invention by www.brilio.net. Available at URL: http://www.brilio.net/news/hebatnya-3-anak-muda-ini-dalam-2-jam-jadikan-helm-sebagai-charger-hp-150507n.html. (Page as displayed on September, 26th 2015).

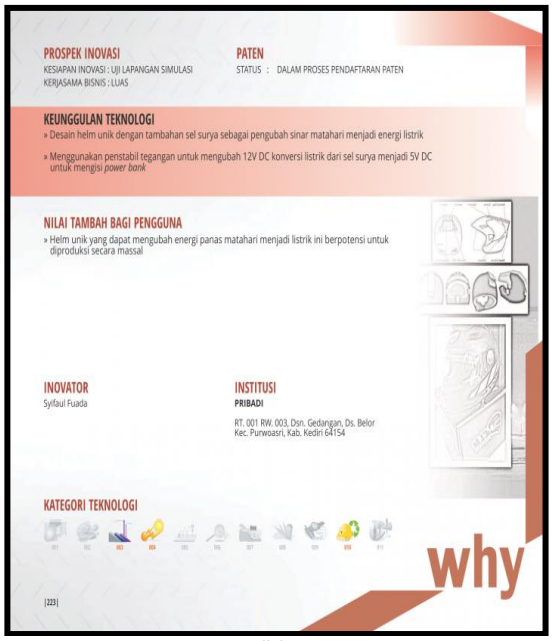
5. The Protection of Intellectual Property (IP)

Taking precise publication steps shall eventually result in widely and well-socialized invention, like the printed and electronic media publication. Socialization of product on media is important in building positive mindset within society's mind that a fine product is a result of scientific research which is conducted continuously. Thus, publication on media may be associated with the worthiness of the product. The following are several major online media that appreciated the product of *helmcharge*r (Figure 3), namely www.merdeka.com [12] and www.brilio.net [13]. These two websites attract other media in publishing the work of helmet

charger (to check validity of the data, please check in google with the keyword 'Syifaul Fuada helm charger'). Not only appreciated on line, this *helmcharger* was also appreciated by the printed media (off line) (Figure 5 & 6), such in newspaper of Surabaya Tribunnews [14] dan a campus magazine 'Komunikasi' of State University of Malang (UM) [15].

(a)

Figure 4a. Review on this product is written on a book entitled '106 Innovator Indonesia' published by BIC KEMRISTEK in 2014. It contains creative works of Indonesian's innovators. Book in Online version is available at http://www.bic.web.id/login/inovasi-indonesia-unggulan/1137-helm-sekaligus-charger



(b)

Figure 4b. Review on this product is written on a book entitled '106 Innovator Indonesia' published by BIC KEMRISTEK in 2014. It contains creative works of Indonesian's innovators. Book in Online version is available at http://www.bic.web.id/login/inovasi-indonesia-unggulan/1137-helm-sekaligus-charger

The Ministry of Research and Technology of the Republic of Indonesia cooperated with Business Innovation Center (BIC) in 2014 in selecting the innovation contest from hundreds of proposal from around Indonesia. Eventually, 106 proposals of innovation were selected under the consideration that these inventions have the most prospect and then were compiled in a book of '106 Inovasi Indonesia'. The selection process involved 35 juries; 33 of 35 were juries of 11 technology categories while the other two juries were expert reviewers from entrepreneurs and head of executive of a number of companies from a variety of industrial sectors. The juries were selected following their business competence and high commitment towards the advancement of business innovation in Indonesia. Under 5 scoring criteria namely: authenticity of idea, extra value for users, technology special quality, innovation prospect (readiness of innovation and business cooperation), and patent status, the proposals of innovative ideas were selected [16].

In such tight selection of the innovation contest, that the invention of helmcharger was admitted as one of the most prospect innovation and the most innovative work (Figure 2). The book of '106 Inovasi Indonesia' was published and printed as many as 3000 copies and these copies were distributed to all departments of Indonesia, such as Ministries, Research and Development Institutions of the national government, the Governors, the Regents, and the Mayors in Indonesia Research Universities and entrepreneur and business organization around Indonesia.

Moreover, this innovation of helmet was one of the 12 finalists in the Technology Creative Contest of the Army of Indonesian Army (TNI AD) held by the Division of Research and Development in November 2013. Beating hundreds of other innovative ideas, the present innovation was presented with a title "*Helm Charger*: Inovasi Teknologi Baru Pada Helm Sebagai Suplai Daya Listrik Untuk Keperluan Peralatan Elektronik TNI Angkatan Darat".


Syaiful Fuada Penemu Helm Charger Ponsel
Namanya Sejajar dengan Penemu Bergelar Profesor

Figure 5. A publication on newspaper entitled '*Syifaul Fuada Penemu Helm Charger Ponsel: Namanya Sejajar dengan Penemu Bergelar Professor*' Surabaya Tribunnews, Malang Blitz, on Sunday November, 23rd 2014.


info

Wamen ESDM Apresiasi Karya Mahasiswa UM

Suatu kebanggaan tersendiri bagi Fendy Hananta (FT/2010), Syifaul Fuada (FT/2010), dan Arya Kusumawardhana (FT/2010) atas karya mereka yang diapresiasi oleh Wakil Menteri Energi Sumber Daya Mineral (ESDM). Mereka diundang untuk mempresentasikan karya yang bertajuk *Road to Energy Security and People's Welfare* dengan judul "Study Awal Rancang Bangun Prototype Helm Charge sebagai Power Bank Ponsel saat Travelling" dalam acara Energi Baru Terbarukan dan Konservasi Energi Conference & Exhibition (21-23/08) di Jakarta International Community Center (JICC). Acara itu dibuka oleh Wakil Presiden Budiono.

Menurut Fendy, gagasan itu bermula dari pemikiran untuk memanfaatkan energi matahari yang terbuang percuma. Terlebih, energi matahari yang digunakan untuk karya itu tidak berpolusi dan merupakan energi yang tidak akan pernah habis. Dengan menggunakan sel surya yang dipasangkan di permukaan helm bagian atas dan diberikan rangkaian penyearah tegangan dihubungkan ke baterai atau power bank barulah masuk ke ponsel. Memang terdengar sederhana, tetapi apabila semua itu dilakukan oleh semua masyarakat di Indonesia, dapat dipastikan Negara Indonesia akan dapat menghemat energi listrik yang digunakan untuk mengisi daya ponsel karena telah digantikan oleh energi matahari tersebut.

Saat ditanya mengenai keunggulan karya tersebut, dia berpendapat bahwa karya mereka lebih mudah dipraktekkan atau diboat sendiri oleh masyarakat. "Terlebih, helm yang kami ciptakan sangat dibutuhkan oleh masyarakat menengah ke bawah yang dalam ke sehariannya menggunakan kendaraan sepeda motor," jelasnya.

Selain sebagai alat keamanan utama dalam berkendara, helm ini juga mampu digunakan sebagai pengisi daya baterai ponsel. Sangat bermanfaat sekali ketika menggunakannya di jalan pada kondisi macet di Jakarta. Karya tersebut aman dan tidak membahayakan kesehatan kepala, khususnya otak karena helm *charger* itu menggunakan tegangan *Direct Current* (DC) yang tidak ada frekuensinya jadi aman untuk otak.

Tidak salah jika karya mereka diapresiasi oleh Wakil Menteri ESDM (Susilo Siswoutomo), Direktur Jenderal Energi Baru Terbarukan dan Konservasi Energi (Rida Mulyana), dan Ketua Masyarakat Energi Baru Terbarukan (METI), Rahmat Gobel. Para petinggi tersebut berharap agar karya anak UM segera dipatenkan. Mereka berharap agar helm tersebut bermanfaat dan tidak hilang fungsi utamanya sebagai alat keamanan dalam berkendara sepeda motor jika benar-benar diproduksi secara masal. **Tanty**

Laporan Utama

menyandang keunggulan ergonomis karena memberi kenyamanan mengingat alat tersebut tidak perlu digendong seperti diesel yang membebani pengguna.

Liku-liku Pengerjaan Karya Spektakuler Mahasiswa Didanai Dikti 2013

1) Helm Bertenaga Surya "Helmcharg" sebagai Sumber Cadangan Listrik untuk Ponsel Saat Travelling (PKM-KC)

PKM yang beranggotakan dua orang dengan satu ketua itu menjadi salah satu PKM yang fenomenal. Ide pembuatan *Helmcharg* berawal dari informasi mengenai helm yang mempunyai fungsi ganda (selain pelindung kepala) seperti helm vibrator, talkie, dan glow. Syifaul Fuada, ketua penelitian menjelaskan alasan utama dalam pembuatan *helmcharg* adalah urgensi dari keberadaan ponsel. Banyak orang

merasa khawatir jika baterai ponselnya tidak mampu menyuplai daya lagi (lowbat), padahal mereka masih membutuhkan ponsel untuk urusan genting. Apalagi, jika pengguna ponsel berada di wilayah yang jauh dari jangkauan jaringan listrik. Maka dari itu, inovasi pembuatan *helm charger* untuk *supply* daya listrik DC ponsel itu lahir.

Pembuatannya memang sedikit rumit sebab melalui sembilan kali revisi dengan enam bulan pengerjaan. Alat dan bahan yang diperlukan dengan mudah didapatkan di toko-toko elektronik, seperti sel surya, *powerbank*, dan kabel USB. Langkah instalasi sel surya yang diseri-paralel. Hal itu dilakukan untuk mengetahui kenyataan di lapangan apakah sama dengan perhitungan. Jika sesuai dengan ekspektasi, maka langkah yang harus dilakukan adalah membuat boks sel surya agar nampak serasi. Ada boks berukuran kecil dengan ukuran tertentu untuk instalasi sistem yang di dalamnya terdapat saklar selektor, buck converter, dan USB.

Fendy Hananta selaku anggota menambahkan bahwa setelah boks diboat, sel surya tersebut dipasangkan di atas helm dengan cara diberi *double tip*. Langkah terakhir adalah menguji coba helm, uji coba itu memakan waktu beberapa hari untuk mengambil data sebarapa jauh keberhasilan rancangan tersebut.

Di dalam sel surya tersebut diberi pemtabil tegangan yang menggunakan buck konventer yang akan menstabilkan ke tegangan 5 volt jika tidak rata tegangannya, sehingga aman saat dimasukkan ke dalam *powerbank*. *Powerbank* berfungsi sebagai cadangan daya apabila helm tersebut digunakan di malam hari, maka helm dapat menghasilkan daya dari *powerbank* yang sudah di-*charge* pada siang harinya.

"Kelebihan dari *charger* panel surya ini adalah efisien, *friendly user*,dan kelebihan energi dapat disimpan," jelas Syifaul Fuada. Ia juga menambahkan, pasokan energi yang ada di *helmcharg* itu dapat diperoleh secara kontinu dan sederhana melalui konversi angin menjadi listrik selama pengguna melakukan perjalanan baik malam hari maupun siang hari, dan cahaya matahari menyinari permukaan helm secara merata di saat siang hari. Namun, kekurangannya adalah masih belum sempurna karya itu sebab perlu diboat desain sel surya yang lebih elastis, yakni sesuai dengan landasan helm, sehingga tidak nampak ukuran sel surya yang kotak.

2) Pemanfaatan Lumpia Rumput Laut Sebagai Alternatif Makanan Kesehatan Bagi Mahasiswa UM (PKM-K)

Ide awal dari pembuatan lumpia datang saat salah seorang anggota bernama Rizki Amalia mempunyai keinginan untuk memadukan rumput laut dengan jajanan gurih seperti lumpia karena selama ini rumput laut hanya dimanfaatkan sebagai bahan agar-agar.

Proses pembuatan lumpia rumput laut itu dibagi menjadi dua proses, yakni proses pembuatan kulit lumpia dan pembuatan lumpia itu sendiri. Bahan yang dibutuhkan untuk pembuatan kulit adalah tepung terigu, telur, air, garam, dan minyak goreng.

(a) **(b)**

Figure 6. **(a)** A report on a campus magazine 'Komunikasi', in *Info* column edition of year 35th No. 288 September-October edition, 2013: 27. **(b)** A report in 'Komunikasi' magazine, in the main report, year 36th No. 290 January-February edition, 2014: 6 to 9.

6. Business Development Model Approach

For the purpose of providing a bigger figure of the need to facilitate this form of technology for the need of future development, innovation stages of the *helmcharger* are mentioned in a ranking order. The following stages refer to the model of business development suggested by KEMENRISTEK BIC [17]. Thus, accurate mapping of the business development method can be obtained by employing these stages for reaching the marketing stage. According to the ranking order, the current stage for this solar power based helmet charger is “Field Test of Pre-Prototype”. See the following for more details.

1. Lab Scale

The concepts of function and characteristics of the solar power based helmet charger that was previously reported in paper was examined both analytically and experimentally in a lab scale. On the other hand, the market demand on the technology, particularity on this product, was merely observed thus reliable estimation of the profit could not be inferred, yet.

2. Field Test Simulation

The technology was now able to be tested in a simulation field test. At this stage, study of the market and lab research for fabrication process have been done.

3. Field Test of Pre-Prototype

The product could be technically tested for its engineering feasibility. The prototype has been examined with high laboratory accuracy or fidelity in an operational simulation scale (which was actually outside of the laboratory). Furthermore, the product is officially accepted by the division of manufacture/fabrication.

4. Field Test of Prototype

After being integrated into a prototype, the product is demonstrated and field tested. Now, the product is ready to step into the Low Rate Initial Production (LRIP).

5. Field Test of Pasca-Prototype

At this stage, the fabrication process is tested in a pilot line or LRIP thus it is supposed to yield an acceptable value and productivity rate.

6. Economic or Commerce Feasibility

The product will have been tested in its actual environment thus it will be appropriate for mass production. Yet, products of a kind from competitors may be known. The price of can now be estimated and compared to the products of a kind from competitors.

7. Mass Product

The product is marketable officially. Strategies of marketing may now be implemented in order to penetrate markets.

7. Summary

Various ornaments on helmets and advanced technologies have been emerging and developed massively in order to attract the bigger scale markets. Helmets added with various technologies (by still maintaining its primary function) are presumed to be the trend for Indonesian people, particularity the *helmcharger*. Due to the fact that solar power is one of renewable resources, this product is potential to be optimized in Indonesia as a country which is geographically located in equatorial line thus has fairly high intensity of sun light. There is not a country in the world but Indonesia on which the sun light is evenly distributed. Therefore, it is almost certain that the helmet with the solar panel, which is the sun light to electric converter, will be an ideal surface that faces straightly to the sun light. This helmet worn by motorcyclists which is covered by the device of solar panel is adequate for saving electrical power in the provided power bank thus functionality for charging cell phones.

Such innovation holds social impact for Indonesia, particularly Indonesian people, which is to help achieve the national program of energy 25/25 (renewable electrical power supply as much as 25% by the year of 2025). Nevertheless, to achieve the mass production there are plenty of steps necessary to take, such as preparing the document for international patent as a brand of invention, aside from the national patent. Several partners of industrial access that help accelerate the stage of ‘marketing invention’, are: (1) helmet producers, this is crucial since the author or innovator has not yet been able to produce helmet (focusing on electrical system), thus the helmet is produced joining the existing helmets. At this junction, the most plausible helmet producer for the author’s partner is local helmet producers. (2) Producer of solar cell, the

solar cell used for this product is imported from China thus requires high production cost. Additionally, the readiness of fabrication of technology and the human sources as well.

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