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# The Impact of Patent Portfolio on Competitive Landscape of Digital Signage Apparatus

**Tommy Hendrix[1*], Mahardhika Berliandaldo [2], Eki Karsani Apriliyadi[3], and Firman Tri Ajie [4]**

[1,3] Research Center for Science, Technology, and Innovation Policy and Management, Indonesian Institute of Sciences

[2] Bureau for General Affairs, Indonesian Institute of Sciences

[4] Research Center for Chemistry, Indonesian Institute of Sciences

**Abstract.** *The digital signage market has been flourishing every year, and this situation opens up new commercialization opportunities for stakeholders related to the acceleration function. The modern world has allowed technological innovation to satisfy market demands, primarily based on portfolio of patent information. The digital signage apparatus became an economical solution for the costly technology in the digital era. The purpose of this paper was to find the impact of the competitive landscape on the digital signage apparatus towards e-commerce development based on a patent portfolio from the WIPO database. The research was performed based on the patent information using Innograph software and information related to digital signage apparatus resulting in a total of 146 registered patents and 40 patents matching the research subjects. The results revealed that the patent portfolio on the digital signage apparatus has high perceived usefulness, but only few industries used this as a reference in benchmarking their technological competitiveness. This paper is beneficial to the industry that seeks for the impact of the latest technological implementation amidst the competitive commercialization of the digital signage apparatus.*

**Keywords:** *Competitive Landscape; Digital Signage Apparatus; Impact; Patent Portfolio.*

**Abstrak.** *Pasar signage digital telah tumbuh pesat setiap tahun, dan situasi ini menjadi kesempatan bagi para pemangku kepentingan terkait dengan percepatan fungsi komersialisasi. Di era modern menjadi masalah umum yang memungkinkan peningkatan teknologi untuk memasuki kebutuhan pasar, terutama dari portofolio melalui informasi paten. Peralatan signage digital menjadi solusi ekonomis dalam nilai mengenai di era digital sangat mahal. Tujuan dari makalah ini dilakukan untuk menemukan dampak lanskap kompetitif pada peralatan signage digital terhadap pengembangan e-commerce dengan portofolio paten dari database WIPO. Metode yang dilakukan melalui informasi paten menggunakan software Innograph dan informasi terkait penggunaan alat signage digital dengan hasil total 146 paten terdaftar dan cocok dengan subjek 40 paten. Hasil penelitian menunjukkan bahwa portofolio paten pada alat signage digital memiliki kegunaan yang dirasakan tinggi, tetapi lebih sedikit industri yang menggunakan ini sebagai referensi dalam tolok ukur daya saing teknologi. Makalah ini bermanfaat bagi industri yang ingin mengetahui dampak penerapan teknologi terkini dalam tingkat persaingan dalam komersialisasi peralatan signage digital.*

**Kata kunci:** *Dampak; Lanskap Kompetitif; Portofolio Paten; Peralatan Digital Signage.*

*Corresponding author. Email: tomm001@lipi.go.id
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## Introduction

The technological development will drive the wave of significant technological innovation in many fields to meet the customer's demands. These demands call for still technological innovation to enhance economic competitiveness, which requires new patterns of production and consumption. The technological innovation shall adapt from the existing products and processes to generate better productivity applicable to their local contexts in the innovation area. For example, in the process ability, local firms or enterprises should learn technological know-how to shape their ability in providing products and services to improve living standards and promote growth and competitiveness. Rapid technological development becomes an essential factor in increasing the 'economic growth on a macro level. Social development occurs if a society can develop technology and reflect them in their social and cultural lives.

The economy has been guiding the technology as the innovations introduced to the world by technological advances are closely correlated with the economy and follow the economic relationships. Technology is a handy tool for the economic ecosystem when entering the digital era to determine sustainable enhancement. This is a logical condition given the natural habit of technological implementation in the appropriate area. There is a more objective assumption about how digital transformation technology presents new revolutionary changes in business models" competitive landscape.

For example, technology on the digital signage apparatus can have an impact on the e-commerce development in the electronic markets connected to the internet into economic fields. Simultaneously, the creation of new market infrastructures based on the use of information technologies and the increasing replacement of traditional markets by electronic markets have naturally led to the rapid development of e-commerce (Rayport, 1994).

Digital advertising is a tool that closes the connection and stimulates the development of e-commerce at the retail level. Business-to-business (B2B) models have derivatives concerning dynamic growth and expenditure in the digital advertising ecosystem regarding effectiveness and better visibility.

Although the beginnings of retail e-commerce were rather modest, its growth rate has been high since its inception (Wielki, 2000). At the same time, with the improvement of elements perceived as barriers to its development, such as reliability and speed of network infrastructure, efficiency of logistics systems, or the development of secure payment systems, electronic commerce in the B2C sector has become an increasingly important element of modern economic reality (Wielki, 2018). While technology can be a solution, its implementation needs protection to ensure the authentic technological development in market orientation.

Emerging Intellectual property rights (IPR) nowadays have created many opinions in the context of economic development. There is an applicable term when national or international connections adopt the linkage of know-how and technology as a tool to support prosperities. On a global scale, the effect of IPR, especially in its scope, can influence FDI in trade, economic growth, technology transfer, licensing costs, R&D, employment, and others to stimulate development. Patents are representatives of the technological innovations of a country or an organization. They are indeed an agreement between the inventor of the patent and the government or any agency designated by the government (Ernst, 2003). In a business environment, the ownership of the critical pieces of intellectual property (IP) is an essential strategic battleground (Granstrand, 2000), and making sense of patent strategies is a pressing and exciting challenge for management research (Rivette & Kline, 2000). IPR and e-commerce are related and complementary. The product or the services offered in an electronic commerce platform involves IPR and its licensing (Rakoto, 2018).

A patent portfolio indeed needs a strategy, which varies from company to company. A larger company with significant financial resources often pursues a strategy of procuring and maintaining many patents. A patent portfolio with a development strategy at an initial stage can be a wise investment to help the company develop and build a robust foundational asset on which to grow. A comprehensive intellectual property portfolio can be of value. In contrast, a patent portfolio's function may be used for various business objectives, such as entering the market position, protecting research and development efforts, generating revenue, and encouraging favorable cross-licensing or settlement agreements. In the development of e-commerce, the patent portfolio can find the potential market and users that already apply for commercial interest and know the technology trends and current research progress (Hendrix, 2019).

This paper discusses how digital signage apparatuses on technology can be traced using a research and development patent portfolio. The hub between technologies becomes a considerable propriety to achieve market target and serves as a valuable asset to many industries. Benchmarks of patents provide useful insight for the competitive position of a company (Ernst, 1998). At the same time, patent portfolio assessment represents a promising way to compare companies' technological know-how objectively (Campisi et al., 1997; Ernst, 2003; Fabry et al., 2006). Moreover, as patents usually anticipate the real use of technologies in a commercial application, benchmarks may also function to give an outlook into the future competitive landscape (Ernst et al., 2010). Technology causes global competition, affecting the new competitive landscape and uncertainty in the business environment.

This paper aims to analyze the impact of a patent portfolio on the digital signage apparatus's competitive landscape, which is very important for the development of e-commerce.

The patent portfolio was analysed using Innography Software to know technological development orientation through licensing, patent portfolio, status, competition, innovation, and market monitoring derived from the World International Patent Organization (WIPO) database. This research recommendations are projected to provide gudelines for business sectors in choosing appropriate and market-oriented alternative technologies. The patent documents enables the understanding on the current technology trends, technology companies, and even competitors mastering specific technologies, especially in the digital signage apparatus.

## *Literature Review*

### *Patent Portfolio as Competitive Landscape on Digital Signage Apparatus in E-commerce*

The currently proliferating technological development has given us more time to evaluate the purpose and the specific reasons for the technological innovation and its consequences since more people become aware of their technological demand. Contrastively, to fulfill the technological demand as a way to fulfill people"s needs, a new perspective engaging patent database on products becomes the settlement of new technology sources that offers a technological solution for the users.

Along with tight technological competition between industries that leads to the shift in the global economic system, the current technological development is not something new to increase national competitiveness. Economic development will have an impact on the industrialized system when new technology is introduced in the market and provide advantages on the primary covered issues. Successful commercialization of innovation requires the use of the related know-how in conjunction with other capabilities or assets (Tushman & Anderson, 1997).

Along with the modern development, patent portfolio has become an increasingly essential reference in developing technology that has an added value, especially in the competitive landscape of commercial business. Patents are exclusive rights that can only be granted to inventions that are new and inventive. High-quality patents are assets that can help attract investment, secure licensing deals, and provide market exclusivity. Inventors pay annual fees to maintain commercial value to them; the rest lapse, leaving the technical information in them free for everyone to use (EPO, 2017).

Patent as an indicator of invention and innovation shows the different outcome of scientific, technology, and innovation (STI) that encourages specific activities and generate business impact. Patent as a part of the intellectual property right scheme commonly becomes a significant output on research and development activities. Patent data has been considered a few valuable sources of standardized information for technological knowledge (Sharma & Tripathi, 2013). Since the emergence of the knowledge-based economy, science and technology have been recognized as an essential engine for successfully innovating firms. "Open innovation" is one of the most frequently used keywords in the literature of technology management. The management of intellectual property forms an integral component in this strategy for technology-based firms (Chesbrough, 2006).

On the one hand, the use of patents, in particular, can trigger industrial development by disclosure of inventions, which enables other actors to continue developing the invention further (Shen & Su, 2016). On the other hand, the patent portfolio analysis with a close link with industrial aims to use some definitions, such as: monitoring the technological advances of their line of business; identifying the invention made by their competitors; and having an overview on legal cases of the use of patenting (Brockhof, 1992).

Figure 1 presents that the main factor plays the most important role in different technological regimes and convinces users that patents are becoming indicators to leverage industrial sectors. There are some reasons as to why patents are more exciting to discover by stakeholders (Hendrix, 2020), and thus, they need to understand the following points;

1. Exclusive rights are against the results of the discovery;
2. Patents give a stronger position because it is more lawful;
3. Patents reduce competition with other parties to utilize the results of discovery;
4. Patents offer higher Return on Investment (ROI);
5. Licensing are more significant because investors are more interested in gaining revenue;
6. Patents improve the bargaining position of products or technology;
7. Patents give a positive image for the company license holders.

A patent application is submitted to the patent office until the patent's exclusive right is granted to the inventors with a description of the invention andinformation about its origin. Patent exclusive rights generally contain the invention title, experiment results, and a technical description of the patent. Therefore, it is possible to analyze the process of recording information about the inventors or active organizations in technology (Madvar et al., 2016). The usefulness of patents in technological development provides a schematic method for the business concept and competitive strategy of technology. Patents are the most accessible and reliable sources of information to assess technology (Hsieh, 2013). They are considered one of the most valuable output indicators of the technological innovation process (Hidalgo et al., 2009), (Rodríguez & Tello, 2012). Patent portfolios hold a critical strategy for companies to give them a reasonably accurate idea of the activity's volume in specific research areas and reveal the underlying trends (Burhan & Jain, 2012).

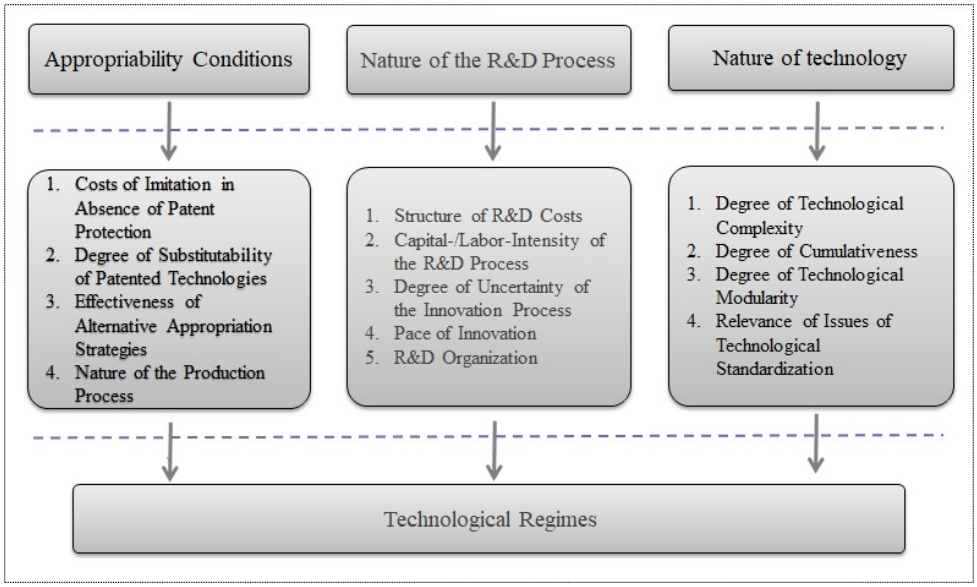


*Figure 1.*
The Main Factor Affecting the Role and Effectiveness of Patents in Technological Regimes (Pammolli & Rossi, 2005)

A patent portfolio contains all specific information related to outstanding, published and active patents of an entity. Patent portfolio data can be retrieved internally for their patents and externally through publicly available databases. The patent portfolio is an innovative step that seeks for new technological concepts by combining invention through the patent database and economic environment to support its strategic and valueable creation during the business process. All these matters shall reach the policymakers to asses their precision and accuracy on strategic business goals and economic compatibility.

The eventual target of these processes is an investment in patent knowledge for better leverage, and better responsibility to cut off and minimize inappropriate strategic measurements. Patent portfolios are beneficial since theycan enable users to determine the main areas of technology related to patenting decisions on product innovation. As a result, the modern innovative environment exhibits (and requires) a high-volume, portfolio-based approach to the patent database that is at odds with conventional scholarly assumptions. The litigation of patent portfolio can define the overall quality and the quality of the individual patent, which is conducted by comparing relative patent strength. A widely used method to identify patent criteria is international patent classification (IPC), investors, assignee, location, and other information related to the significant value of knowledge technology, thus emphasizing technological pattern, trend, opportunities, thread, litigation, and strength, as well asother additional useful information.

The universal growth of the internet connection in global trade demonstrates that the tendency to utilize is necessary to support a product's sale. Electronic commerce (E-commerce) communication is established by the connection of commercial systems through the Internet by globally offering products, services, and information. Doing transactions and communications without borders and delays have extensive effects on all branches. E-commerce realizes the electronic presentation of products and services, online acceptance of orders, automatic processing of customer inquiries, and online payment and transaction processing (Al-Anii, 2009). E-commerce is an old practice as an Electronic Data Interchange (EDI). The function of EDI in businesses is to perform billing, ordering, and inventory, and value-added networks.

Though EDI has regular use by strictly handling commerce between companies, the Internet and PC's intense penetration into the household and workplace has turned the electronic commerce between companies and the individual consumer into reality.

Although this type of commerce's current level is small compared to business commerce, it has experienced a rapid growth (Kodama, 2005) (Maitland et al., 2002). The derivative impact of e-commerce on business will significantly lead to e-Business applications that provide a means of carrying out traditional business functions faster, cheaper, and in principle, better through the use of information and communications technology (ICT). The application will bring much effort and usually needs expertise to allow a smooth operation of the business and to be used in every business line. Innovation and the development of e-commerce technology have given rise to new opportunities and economic benefits for businesses. These technologies include e-commerce applications that provide businesses with opportunities to carry out business functions that would otherwise not be possible if they perform in-house operation. There are tremendous growth and development due to improvements in technology. The innovations in technology have led to innovations in different fields. These improvements have a significant impact on the methods of marketing. Technological development can bring both positive and negative impacts, depending on how we measure the demands of changes. The digital age presents opportunities for retailers to increase operational efficiency and customer-centricity in their business models.

Early definitions of e-commerce (Schneider, 2002) made no mention of sustainability or technological impacts; however, more recent studies examine the progress of e-commerce and its future environmental challenges. The usage of tools in the digital signage apparatus demonstrated an increase in electronic goods procurement, whether computers, notebooks, or other equipment that is part of the business process and make it become a basic necessity.

Figure 2 indicated that the yearly sales of computing devices are related to fluctuating demands. For example, the prediction of 2020 illustrates a decreasing trend until 2022. Those technological devices are projected to frequently experience a fluctuating trend in shipment, because many varieties of the products can substitute each other.

The direct function and part of the digital signage apparatus in a modern era are mostly designed for pure purposes. Commonly, they are created to convince customers to promote the products as indicated by market orientation. For example, digital indoor advertising as a part of digital signage is beneficial in some areas as a way to achieve customer satisfaction at a national or international level.

The effectiveness will deliver the following message to the customer (LocalAdFace, 2014); (1) Building Brand Awareness. Brand awareness is the extent to which a brand is recognized by potential customers and is correctly associated with a particular product or service; (2) Reaching the Right Demographic because Indoor Digital Advertising displays can place virtually anywhere. Businesses can pick and choose specific locations that cater to their business's most important demographic area; (3) Reaching the Right Geographic Area to gain market share in a specific geographic area. Businesses must find creative ways to target the areas where there is an opportunity to expand; (4) Offering total flexibility. The use of Indoor Digital Advertising can run multiple messages on the same display and frequently change those messages to ensure that advertising is always relevant; (5) Reaching a captive audience. Indoor digital advertising screens are located in venues with an identifiable audience that can be measured; (6) Affordability. When identifying media products to invest advertising budget on, return on investment (ROI) deserves a significant consideration; (7) Innovative approach. Digital media offers an innovative approach to branding a business and gives advertisers a platform to display original ideas and creative concepts; (8) Engagement with viewers.

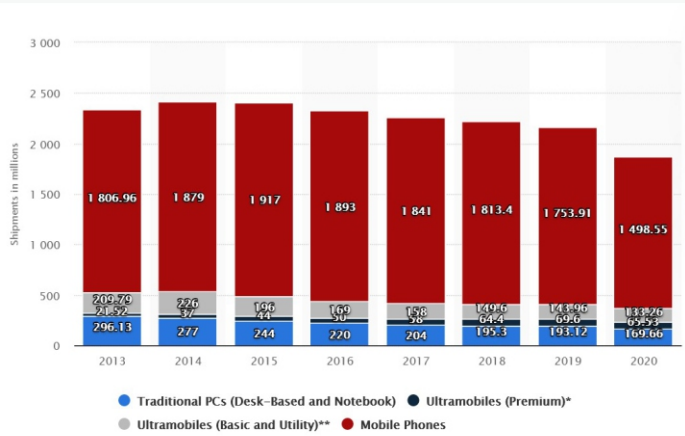


*Figure 2.*
Computing Device Shipments Forecast Worldwide from 2013 to 2022
*Source: Statista, 2020.*

Because of long dwell times and technological advantages of indoor digital advertising, consumer engagement with the product is high; (9) High viewership. Reaching many potential customers is essential in a campaign, but so is reaching the right consumers; (10) Customizability. Indoor digital advertising offers businesses the opportunity to customize their pricing and advertising locations without boxing them into a specific package.

Digital signage apparatus, as a part of digital signage, plays essential tools in the commercialization segment related to the point of sales or in public places. Those kinds of equipment are used as tools by the company to create, manage, distribute, and publish its content, by combining the advantages of digital advertising and more conventional external advertising. Direct contact and interaction with the consumer become an obligation to measure the attraction through media promoting. In this case, indoor advertising needs an innovative style with creative digital content to attract and influence sales points.

The following data in Figure 3 based on India, 2020 presents the useful communication types. An ideal advertising message commands and draws attention, holds the interest, arouses desire for possession of the product, and elicits an action (Gupta, 2012). Thus monitoring and evaluation need to be done to measure the impact of the target achievement. Effective digital signage mostly has a message that depends on no small extent on its visual contents. In addition, the advertisement boards must be placed in the strategic place by fulfilling some business requirements and projections. The advertising must respond to the advertiser's approach or interest and influence the products, services, or ideas. Alignment contribution on the patent portfolio in the competition landscape-level remains to have a huge impact on the planning, processing, and product output, especially in the digital signage apparatus. The patent strategy derived from the corporate strategy is intended to help generate business potentials and secure existing and realized potentials. It is, therefore, obvious to deduce appropriate standard patent strategies from the abovementioned technology portfolio structure. These strategies are aligned with the strategic importance of and internal resources available for corporate technology, product, and service competencies (Bader, 2007).

Benchmarking related to the development of e-commerce in the digital signage apparatus plays an important role in the advertising industry. Many industries have used it to gain competitiveness and to commercialize in market orientation (see in result and discussion). This emerging advertising model provides new opportunities for consumers and businesses due to its great array of possibilities. Along with the development in various digital signage types and their increased application options, there is a growing need for diversified business approaches (Bauer et al., 2016).

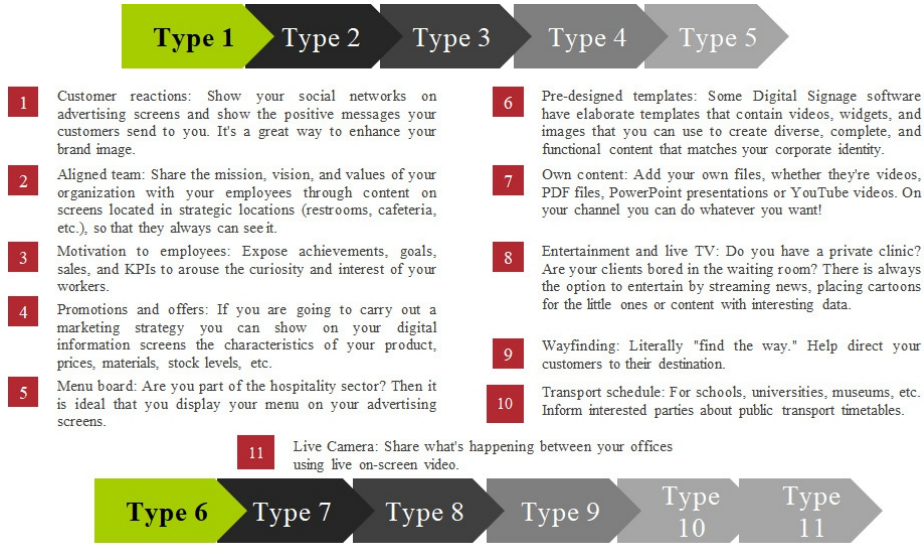


*Figure 3.*
Useful Communication Type in Digital Signage
*Source: India, 2020 (Processed)*

## Research Methodology

This paper used qualitative research methodologies by studying literature on the impact of the patent portfolio on the competitive landscape of digital signage apparatus towards the development of e-commerce. The systematic development of theory in social settings depends on inductive approaches, which is appropriate for the study mainly aiming at theoretical development (Glaser & Strauss, 1967). Qualitative research is used to explore the potential antecedents and factors, about which little has been known and explored (Strauss & Corbin, 1998). The research will only be based on the data on mining from the WIPO database as a reference. In this research, the authors used several stages to trace the patent data related to the research subjects. This patent data search used the Innograph software for viewing developments, measuring the patent portfolio of digital signage apparatus, and seeing its impact on theindustry's competitive landscape. This patent search was analyzed through mining to generate patent data registered at the WIPO office. Patent mining is a vital technique for searching for cutting-edge technology that would benefit the given production and development (Supraja et al., 2015).

Data mining is one method or process for extracting hidden patterns from a collection of particular data that emphasizes on data mining as the most important stages that transform data into patent information (Yanhong & Runhua, 2007). Patent analysis is beneficial for organizations in determining the novelty of their inventions, as well as identifying the Intellectual Property (IP) and technological competitiveness (strengths and weaknesses) of the competitors (Abraham & Moitra, 2001). The stages used in conducting data mining and database on this research are:

1. Literature Study, which was done by browsing information related to the topics and issues from various sources, such as books, journals, articles, or papers of other scholars;
2. Document search on the impact of patent portfolio of digital signage apparatus on e-commerce sustainability. Patent Portfolio analysis used innography software taken from the World Intellectual Property Organization (WIPO) field.

Figure 4 describes the stages of the patent portfolio that determine the impact of using digital signage apparatus by focusing on the development of e-commerce.

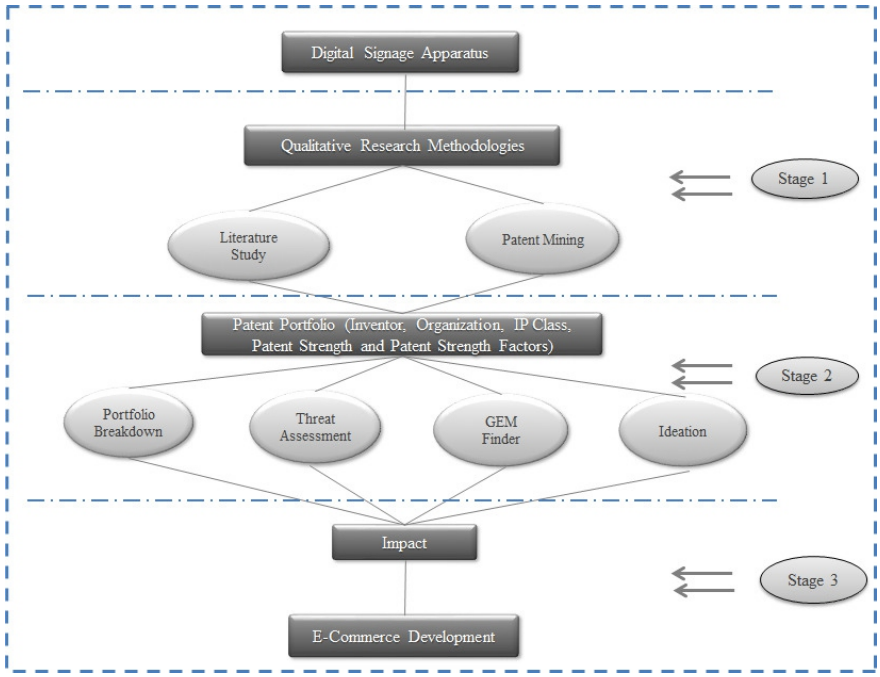


*Figure 4.*
Diagram of Research Stages (Own Interpretation)

The purpose of this paper is to find information on the impact of competitive landscape of patent portfolios on the digital signage apparatus in the field of e-commerce development. Some examples on data mining includes inventor, organization, IP class, patent strength, patent strength factors, portfolio breakdown, threat assessment, ideation, and GEM finder on the WIPO database. The relation of these examples on research and development also provides readers with the latest research on positioning in e-commerce sustainability.

The target is to find the potential development of derivative product of e-commerce and its implementation in the industry since users have applied their commercial interest and known the current technology trends and research progress. This paper is expected to provide the input for potential users of technology and useful information in the development of science and technology and the nature of modification process. Its implementation and reversed engineering of technological information are sourced from the patent portfolio.

## Results and Discussion

There have been many opportunities to generate from these activities that can elevate more specific uses on the impact of digital signage. Those impacts emerged from the broader use of technology as a source of information for consumers. This patent data search is expected to be used as a stepping stone in measuring technological portfolios' impact, since a patent portfolio can help clarify decision-making processes and define the best patent strategy in a company. Moreover, the patent portfolio analysis can improve the patent and patent portfolio management and make the intellectual property portfolio structure more precise to take on the competitive landscape. From the impact using applications of data mining, there have been patent and publications analyses that present the roadmap of technology database, especially for industrial uses.

There have been some papers published on a similar topic that directly refer to the management of foresight technology based on patent portfolios. These papers are concerned

on the ability impact of a technology that has to be performed and implemented in industrial sectors. Furthermore, all those papers are based on the patents registered in the WIPO database. However, there are some limitation regarding a policy taken by the industry in developing their goals in capturing marker requirement.

The mining result indicated that a large amount of data was exploited based on digital signage apparatus using Innography software. Based on the keyword of "digital signage apparatus," we found about 164 patents registered which were reselected based on keyword match of 40 patents in the WIPO database. Afterwards, we selected all patents that were in line with the subject of the digital signage apparatus. The subscription form all that patent was only resulted from the search by title subject, and it ranged from the period of 2000 to 2018. Based on an in-depth analysis and visualization from many components that were in line with the software, we selected the maximum number of patent documents, for example by searching the top 20 results on the title, as mentioned below;

*Derivative Patent Portfolio on Digital Signage Apparatus*

Data collected from the WIPO database have much information regarding patent portfolio that can allow users to know the way to spread the structure of Inventor, Organization (Current Assignee), IP Class, Patent Strength, and Strength Factor. A patent represents an invention in a particular field of technology, and previous studies portray that a considerable part of the information presented in patents is relatively new (Hunt et al., 2012). In general, analyzing patent management gives us many opportunities to gain information on benchmarking product development as the primary need of users from the industry. For example, the needs for information includes monitoring scientific activity, analyzing the patent trend, market trend, trend on technological development, dynamic of a competitor, road-mapping technology, and strategic development planning (Hendrix et al., 2018).

Figure 5 presents a listed inventor, a person who holds a certificate of a granted patent that concerns on the R & D, who made an inventive contribution to the invention as defined by the patent application claims in the top 20 positions in the field of digital signage apparatus.

From the search, we identified the following results: 40 Patents, and Top 20 Inventors of 50 Total Patents on WIPO database from a data list. The top 4 inventors mostly have great achievement in finding patents on digital signage apparatuses, and most of whom work at private corporations and universities. The name of these inventors are: 1. Yun Jung Mhun, who works in LG Electronics Inc. with 9 patents; 2. Yun Jung Kim, who works in LG Electronics Inc. with 7 patents; 3. Hyun Sun Lyu, who works in LG Electronics Inc. with 7 patents; and 4. Hyo Jung Lee, who works in LG Electronics Inc. with 7 patents. All inventors work in the same company (LG Electronics Inc.). This fact indicates that the sector of digital signage has substantial opportunities in the market place.

Figure 6 describes the details of the organizations of the 38 patents, and the top 20 organizations of 40 total patents on the WIPO database. The organization was the 1st user patent that receives the ownership of legal IP (current assignee). This fact pinpoints that the users have been using technology for business development through implementation in production or concept of development in industries until now and have been concerning in the commercialized area under management organization. All these facts spread in the top 20 positions in digital signage apparatus.

Figure 6 illustrates the patent assignee's distribution on the digital signage apparatus and almost the entire patents have been applied. The data demonstrated the following adoption of digital signage apparatus: top 4 organizations, such as LG Electronics Inc. with a total of 16 patents. This corporate is focused on developing new innovations and is committed to providing electronic products,

and thus earning revenue of $48,926,294,134.00 and litigation of 750 in US Patent; Electronics and Telecommunications Research Institute with a total of 10 patents. This corporate deals with development and commercialization of industrial source technology in the field of convergence and sophisticated technology related to information, communication, electronics, and broadcasting, and diffusion of achievements, and thus earning revenue of $0,00 and litigation of 10 in US Patent; Seoul National University of Science and Technology with a total of 7 patents. This corporate deals with research and development in electronics technology, and thus earning revenue of $0,00 and litigation of 0 in US Patent; Toshiba Corporation with a total of 4 patents.

This corporate deals with manufacturing of electronics devices, and thus earning revenue of $39,153,250,000.00, and litigation of 457 in US Patent. Figure 7 depicts the distribution related to International Patent Classification (IP Class) with 40 Patents, and Top 20 IPC Groups of 40 Total Patents on WIPO database. IP Class, established by the Strasbourg Agreement 1971, was defined as a "hierarchical system of independent language symbols for the classification of patents and utility models according to the different areas of technology to which they pertain." International Patent Classification (IPC) is a classification symbol for independent patent and utility models in technology areas. All of these facts spread in the top 20 positions in the field of digital signage apparatus.


*Figure 5.*
Top 20 Inventor in the Field of Digital Signage Apparatus
*Source: Innograph Software, 2020 (Processed)*

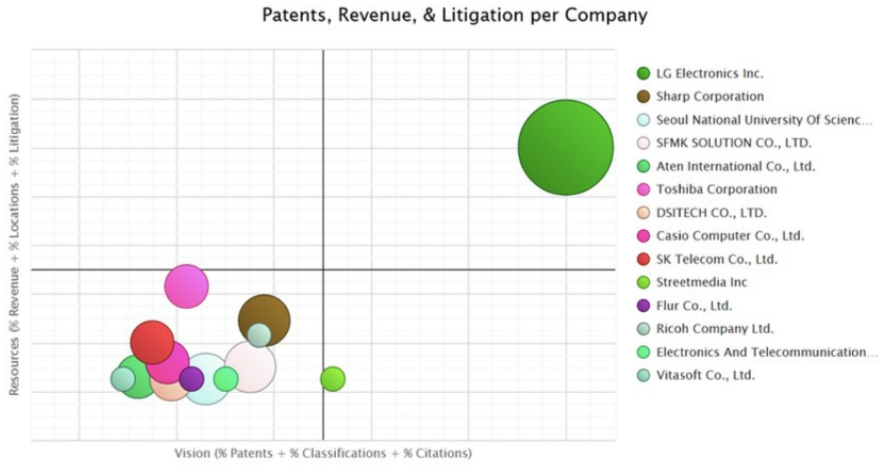


*Figure 6.*
Top 20 Organization in the field of Digital Signage Apparatus
*Source: Innograph Software, 2020 (Processed)*

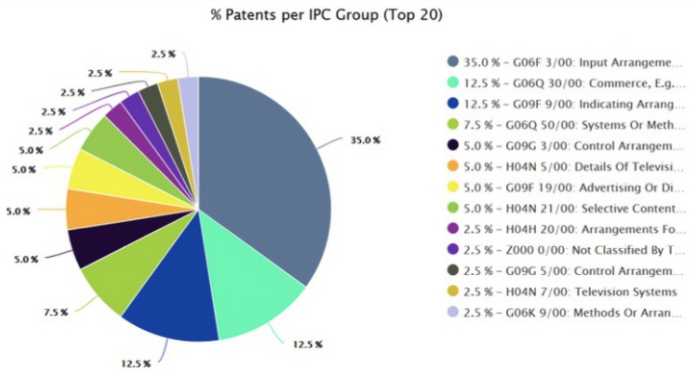


*Figure 7.*
Top 20 IP Class in the Field of Digital Signage Apparatus
*Source: Innograph Software, 2020 (Processed)*

Figure 7 shows IP Class distribution on digital signage apparatus and the fact that almost the entire patents have been applied. The followings are the top 4 lists on IP Class drawn into derivatives structures such as; G06F 3/00: Input arrangements for transferring data to be processed into a form capable of being handled by the computer with 14 patents; G06Q 30/00: Commerce, e.g., shopping or e-commerce with 5 patents; G06Q 50/00: Systems or methods specially adapted for a specific business sector, e.g., utilities or tourism with 3 patents; and G06K 9/00: Methods or arrangements for reading or recognizing printed or written characters or for recognizing patterns, e.g., fingerprints with 1 patent.

The secondary structure of patent analysis was conducted through Innograph Software to measure the strength of the patent and factors determining a patent application. Patent strength means a product average of quality and activity, especially for a company interested in representing the competitive technological positions of all competitors in the field. A company strategy is a part of the business by evaluating the activity that measures the successful technological innovation reflecting technology leaders in the market. Figure 8 shows results from 40 Patents, Top 10 Patent Strength Deciles.

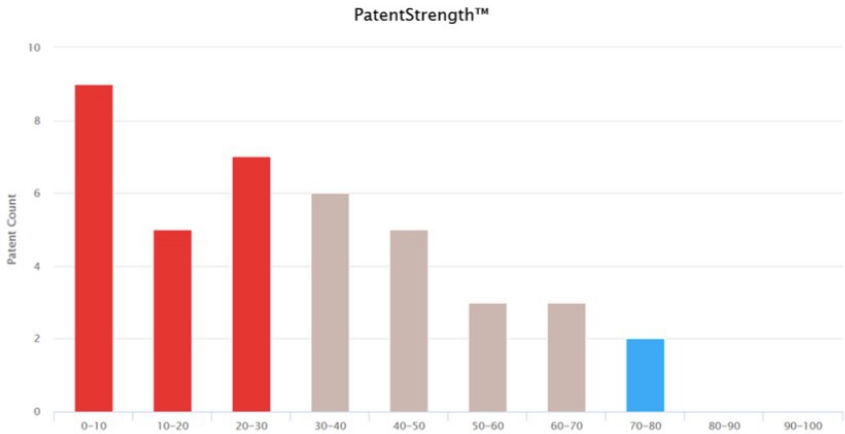


*Figure 8.*
Top 10 Patent Strength Deciles
*Source: Innograph Software, 2020 (Processed)*

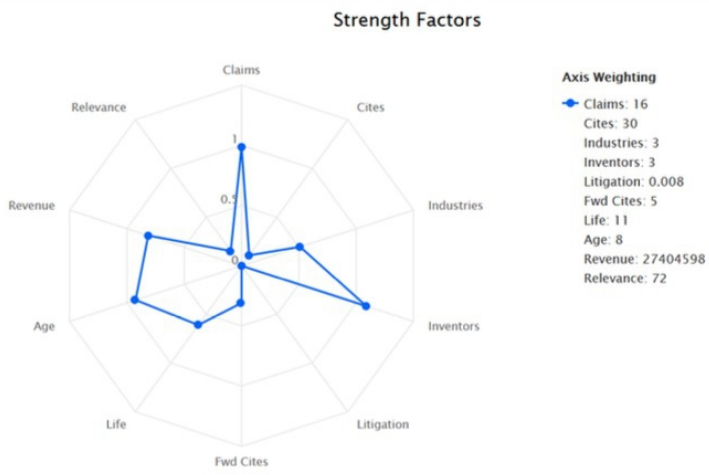


*Figure 9.*
Top 10 Patent Strength Factors (Radar) in the Field of Digital Signage Apparatus
*Source: Innograph Software, 2020 (Processed)*

Strength factors were described to enabler and encourage users to find related information with dimensions of interaction regarding survivability of intelligence when meeting court challenges., For example, litigation (0,008>0) means that patent litigation has a high impact on protecting patents from infringement or violation of the law; industries (3>0,510978) mean that patent industries have a low impact on industrial application; claim (16>0,986258) means that patent claims have low limits of precisely what the patent does, and does not cover; life (11>0, 609792) indicates that patent life have a low impact on the protection period on its fulfilment until granted; inventor (3>1,088827) means that patent inventors have a low position on productivity in patent production each year; cites (30>0,107836) mean that patent cites have a very low impact on citation each year and can possibly target the acquisition of active patents, which results in the enhancement of R & D output and, consequently, much improvement or new products; fwd cites (5>0,310722) mean that FWD cites have a low impact on anticipating claim invention or similar invention from revealing state of the art; revenue (27404598>0,814065) means that patents give a high impact on economic sector; relevance (72>0,152778) means that patent technology is still on the right track to support significant development in industries; and age (8>0,924419) means that patent progress is in protection and still has a low movement on expired period.

*Patent Result on Portfolio, Threat Assessment, Ideation and GEM Finder as Benchmarking in Field Digital Signage Apparatus*

This section emphasizes on data analysis related to digital signage apparatuses to ensure the product's advantages before being commercialized. The data emerged when we worked through monograph software, and the results can have a significant impact on industrial competitors. The current data were taken on 2020-06-03, and they were analyzed using digital signage apparatus (search), and resulting in 40 Analyzed Patents. The stages of leveraging patent portfolio of digital signage apparatuses towards e-commerce development can explain how strong the patent is, who the competitors are, which is the most valuable patent, and how to perform patent over time, and seek for protection. The subsequent information provides as the following points;

1. Portfolio Breakdown, based on the selections, 0 of which 0 was expired grants; 14 were active grants; 7 were active applications, and 19 were expired applications. This portfolio consists primarily of Computer and Office Equipment, Communications Equipment, Electronic Components and Accessories, Household Audio and Video Equipment patents. This portfolio indicates an above-average value in 2 of those categories.

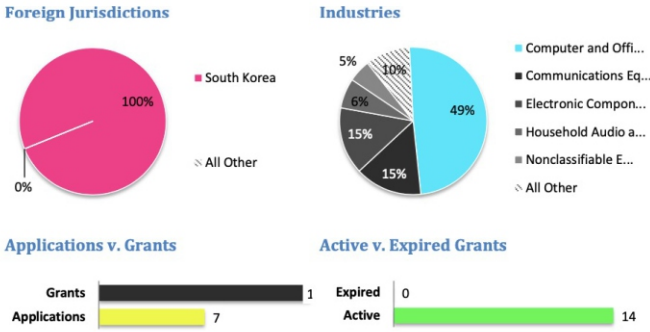


*Figure 10.*
Patent Portfolio Breakdown of Digital Signage Apparatus
*Source: Innograph Software, 2020 (Processed)*

As a whole, this portfolio indicates decreasing patent filings over time, especially in South Korea, the United States, based on WIPO. Within the most valuable sector of Household Audio and Video Equipment, most patents are related to Content Files (2), Display Panel (2). Proportionately, only few of these patents were expired; this condition increased the value of the portfolio. Those active patents had the average remaining life of 13 years. Based on the examination on those sectors, the average remaining effectiveness was lower than the cycle time of typical products. This portfolio was used when identifying filing trends by time, topic, and classification. In addition, it was also used to see the distribution of patents in the portfolio into constituent categories.
.

2. Threat assessment is generally done by companies which are heavily litigious in technological areas that are core to the organization, representing threats to an existing business or new developing products. Those activities are conducted to prevent attractive buyers that come when they know the advantages and positioning of each patent presented. Companies that are heavily litigious in technological areas core to the organization can represent threats to an existing business or develop new products. When selling patent portfolios, companies that often assert in the industry might represent attractive buyers. Hence, four companies were selected for inclusion and the historical details on their litigation were provided in Table 1

Table 1.
*Litigation of 10 Company in Threat Assessment*

| No. | Company | Revenue | Referenced Patent | Total Cases |
|---|---|---|---|---|
| 1 | West View Research, LLC | $0 | US9412367 - Computerized information and display apparatus | 3 |
| 2 | Ultravision Technologies, LLC | $0 | US9212803 - Led light assembly with three-part lens | 2 |
| 3 | R.D. Jones, Stop Experts, Inc. | $0 | US8081087 - Flashing beacon | 1 |
| 4 | PINN, INC. | $0 | US9013145 - Transport and/or storage container for rechargeable wireless earphones | 3 |

This data are based on companies involved in patent infringement litigation that match the query of digital signage apparatus, such as text document, associated patent of text document, or other metadata case. The results were then limited to defendants within all related industries.

3. Ideation was an idea that concerns on the description of recent inventions and inventors in a similar space. Those inventors are seeing emerging trends and opportunities around an idea that will help shape and capture the full potential of inventions. Collaboration with other inventors inside or outside the organization can also provide helpful feedback. As the emerging trends, inventions are similar to ideas that have fueled recent innovation.

The following key concepts describe the technological areas of the core concern of these innovations. It is necessary to consider expanding the idea to include similar areas. Inventions similar to ideas have recently started to expand into the above key concept areas. Furthermore, as described in the Emerging Trends section, the patents could represent the recently starting realization of valuable new uses. The following individuals, either inside or outside the organization, have filed inventions in a related area. Hence, it is important to consider having these people review or collaborate with an idea. Figure 11 shows 5 key concepts of how a patent can refer to multiple fields of display devices, mobile devices, user interface, digital signage, and wireless signal. In addition, it is also closely related to collaboration among the users.

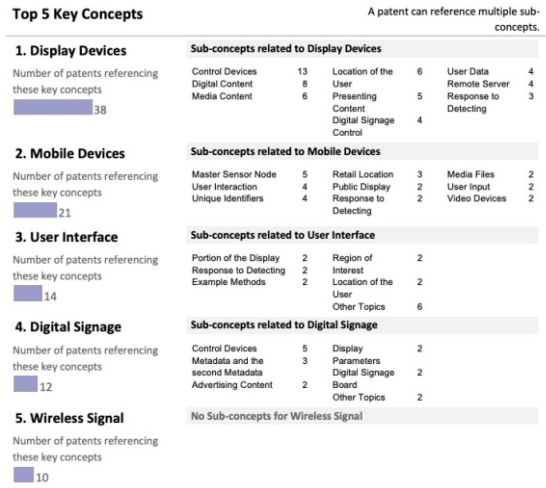


*Figure 11.*
Ideation on Digital Signage Apparatus
*Source: Innograph Software, 2020 (Processed)*

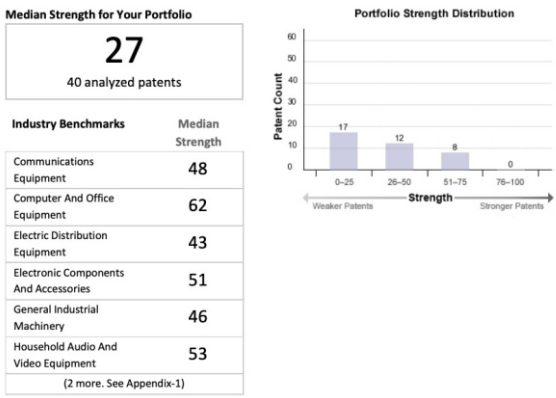


Figure 12.
GEM Finder related to Patent Strength of Digital Signage Apparatus
*Source: Innograph Software, 2020 (Processed)*

4. GEM Finder described overall portfolio quality and the quality of the individual patents by comparing relative Patent Strength. It can help quickly assess which portfolios and specific patents should be at the top of the list as potential IP opportunities or threats. The Total Portfolio of Patent Strength Distribution chart below describes how all 40 analyzed Patent Strength distributes patents from the search on "digital signage apparatus." Patent strength is a proprietary Innography algorithm that describes factors, the number of claims, forward and backward citation counts, time in the United States Patent and Trademark Office (PTO) prosecution, number of litigation cases, and other key performance indicators. Industries are at the top level of the Standard Industrial Classification (IPC) of the patents. Appropriate individual patents are then analyzed and consolidated into these industries.

## Conclusion

A patent portfolio's impact on the competitive landscape becomes more useful in industrial development, especially as a tool to leverage the main business in capturing market needs. The digital signage apparatus has significantly impacted the development of a positioning market and simplifying the users for gaining their needs through e-commerce.

Patent as a tool technology is often implemented to revised demand on the derivative product. It is regularly defined as the concept of "from idea to the invention" and "from invention to innovation," and generate a "new resolution of a technical problem," for commercial orientation. Exploiting the use of the patent that has registration and expiry duration as the freedom for operation currently becomes a strategic opportunity in the effort of developing derivative product diversification that is ready to market. A patent portfolio defines an activity in extracting technology from the patent database, which is mainly used for product development and can increase development productivity through the secondary cultivation data source. Contrastivey, a patent portfolio's impact draws the competitive landscape map and increases gross profit by protecting innovations through product development and sourcing. A product or service advertised through digital signage apparatus creates awareness in potential buyers' minds through various advertising mediums, such as newspapers, Magazines, Television, Radio, Posters, Hoardings, billboards. Moreover, in recent times, internet and web advertising and the field of digital signage apparatus, mostly used as a business activity, provide new opportunities for consumers and businesses due to its excellent array of possibilities.

The usefulness of patent information related to digital signage apparatus investigated the value of possible utilization and impact used as a benchmarking from industries or stakeholders that need to measure their product output level like a patent portfolio. Analytical aspect from patent impact represents information to be used as a strategy for the research and development of an organization.

Furthermore, it is expected that there will be the results of studies in digital signage apparatus and derivative products to enhance the development of business sectors that are innovative and highly competitive in e-commerce fields.

The data mining on the WIPO database found 40 patents registered in the digital signage apparatus. That finding has some derivative information as follows;

1. All top 4 inventors with great achievement in filing patents on digital signage apparatus work for LG Electronics Inc;
2. The distribution of all top 4 patent organization (assignees) is on digital signage apparatus and most of the patents have been applied;

3. Popular IP Class drew into derivatives structures on digital signage apparatus G06F 3/00: Input arrangements for transferring data to be processed into a form capable of being handled by the computer, with 14 patents applied;
4. Patent strength shows the increasing point, with decile 0 – 10 having 9 patents. It means that the patents rank is attributed to different factors, either positive or negative;
5. Strength factors were described to enabler and encouraged users to find related information with dimensions of interaction regarding survivability of intelligence when meeting court challenges;
6. Portfolio, contained in 40 patents was based on the following selections: 0 were expired grants; 14 were active grants; 7 were active applications, and 19 were expired applications;
7. Threat Assessments that are heavily litigious in technological areas that are core to the organization could represent threats to an existing business, or develop new products. West View Research, LLC was involved in patent infringement litigation and was still in progress with a total of 3 cases in court;
8. Ideation, the intent on seeing emerging trends and opportunities around an idea, will help shape and capture the full potential of invention in 5 key derivative concepts in multiple fields of display devices, mobile devices, user interface, digital signage, and wireless signal;
9. GEM Finder describes the individual patents' overall portfolio quality as determined by comparing relative Patent Strength, with a median of 27 from 40 analyzed patents.

It is also recommended to use patent tools to see the foresight of the existing technology in the industry as a way to evaluate the expansion of product development needed in the market.

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