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THE ROLE OF INTELLECTUAL PROPERTY RIGHTS IN PROTECTING INNOVATION

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ABSTRACT
The introduction of novel concepts, ideas, technologies, management strategies, designs, and industrial designs into the production process are examples of innovative actions that fall under the intellectual property of certain individuals. Intellectual property, who's worth and maintenance are essential elements of innovation's success, will always be at the core of innovation. The main objective of the research is to evaluate how public administration processes for intellectual property protection contribute to economic development in the country. The essay argues that in order to study and understand the supply chain lifecycle, a novel method to research is necessary. Applications in the real world in the modern world, supply networks are essential to both everyday life and the global economy.
Keywords: intellectual, property, rights, protecting and innovation

INTRODUCTION
Intellectual property rights have a lengthy history and have developed along with advances in art, science, and technology. In ancient societies, when kings and governments awarded exclusive rights to those who improved society via their discoveries, works of art, and writings, the idea of intellectual property first emerged. The formalization and codification of intellectual property protection into legal frameworks grew throughout time. In order to encourage innovation and safeguard the rights of inventors, patent systems first appeared in Europe in the 15th century. The same is true for copyright laws, which provide inventors and writers authority over the reproduction and dissemination of their works. These laws were created to protect their rights.

Technology made enormous strides throughout the Industrial Revolution in the 18th and 19th centuries, which heightened the need of protecting intellectual property. Nations understood the need to provide incentives for entrepreneurs and innovators as well as the economic worth of innovation. As a result, comprehensive intellectual property laws were created, and copyright and patent systems were expanded to include a wider variety of technologies and creative works. With the creation of international agreements and organizations in the 20th century, intellectual property protection became even more important. Since its founding in 1967, the World Intellectual Property Organization (WIPO) has played a significant role in fostering global collaboration on intellectual property issues. A foundation for unifying intellectual property laws across participating nations was established by international accords like the Paris Convention for the Protection of Industrial Property (1883) and the Berne Convention for the Protection of Literary and Artistic Works (1886).

The late 20th and early 21st centuries' digital revolution brought with it new possibilities and difficulties for intellectual property rights. As digital technology advanced and the internet became more widely accessible, creative content and innovation exploded. However, it also led to problems like internet piracy, illicit distribution of copyrighted content, and intellectual property rights violations. To solve these issues, intellectual property rules and enforcement techniques have developed to take into account the digital environment. In the digital era, intellectual property is protected via digital rights management systems, copyright infringement detection techniques, and global initiatives to stop piracy.Analyzing intellectual property laws' function in defending innovation requires an understanding of their historical context. We may better understand the difficulties and possibilities involved in defending intellectual property rights in the contemporary day by looking at the historical evolution and legal frameworks around intellectual property.

LITERATURE REVIEW

Modic, Dolores et.al (2019). Purpose This paper's objective is to assess current improvements in intellectual property rights (IPR) databases, methods, and software tools, with a focus on some of these breakthroughs and their contribution to improving IPR management (IPRM) and broader societal benefits. Findings The study illustrates the landscape of patent databases, categorizing patent offices in accordance with the kind of data supplied, and illustrating the current condition of the IPR LOD. Examining the currently available IPR tools reveals that they are still under development and have limited use for IPRM. The study also offers a unique IPR-linked open data landscape and a new categorization of patent offices.

Stosic, Biljana et.al (2018).A variety of factors, including money, skills, markets, competition, and standards, a legal framework, and, of utmost significance, intellectual property rights (IPR), are crucial for innovation. One of the most important parts of the innovation process nowadays may be considered as the intellectual property system. Patents, trademarks, designs, and copyrights provide inventors the only right to utilize the information they have created while also facilitating the flow of knowledge and technology. Therefore, the purpose of this paper is to highlight the significance of providing companies with a thorough understanding of the conditions and prospects related to intellectual property (IPR); to identify the appropriate IPR for various stages of the innovation process; to highlight the significance and function of IP diagnosis and audit for businesses of various sizes; and to identify various maturity models with various patterns in the form of archetypes that are in line with the degree of IP practice.

Gaikwad, Arun. (2020). Intellectual property includes works of literature, art, and inventions as well as the names, symbols, and pictures used in business. Intellectual property rights are recognized in the same way that other property rights are. Owners of copyrighted works, patents, and trademarks may reap the financial benefits of their hard work and investment in these areas. Trademarks, copyrights, and patents are just a few examples of the many ways that ideas may be safeguarded. A patent is awarded for an invention that is both unique and useful to the general public, as well as being capable of being put to practical use in industry. In order to better recognize, plan, market, and protect innovative or creative works, IPR is essential. Each sector requires its own set of guidelines for intellectual property rights (IPR), management practices, and overall strategy.

Hagedoorn, John et.al (2015). Our survey and interviews with businesses offer the empirical groundwork for our exploratory research into the function of legal contracts and IPR in the setting of firm-to-firm OI. Our research shows that OI organizations are eager to have legal documentation for all of their OI agreements. Additionally, businesses still see IPR as being very vital to the preservation of their inventive skills notwithstanding OI's open nature. We find that the amount of firm transparency, the formal legal attitude, and the competitive dynamics of the product market environment are all connected with the desire of OI enterprises for IPR. The degree to which an organization's own R&D resources contribute to the favorable relationship between openness and demand for IPR is also significant.

Bainbridge, William. (2016). The protection of intellectual property in the form of patents, copyrights, trademarks, and the like is one of the most visible ways in which our society acknowledges and rewards inventors and creatives. despite the fact that a number of philosophers considered it to be inherent. On the other hand, monopolies may file blocking patents without intending to use them in order to prevent other firms from competing, while new information technologies make copying of many forms of communication so easy that they substantially undermine copyright rules.

TECHNICAL BACKING FOR QUANTIFYING THE WORTH OF PROPERTY RIGHTS TO INTELLECTUAL PRODUCTS

Several of its defining characteristics were uncovered via research into the process by which intellectual property is transformed into a marketable good. Terms from the field of economics, such as "price," "cost," "market value," "efficiency," "cost price," etc. [10 p. 56], have been used to characterize them. In light of this, we have conducted a comprehensive evaluation of the most prominent methods for estimating the value of IP. Figure1 depicts the three most common approaches to estimating the worth of an IP portfolio, including the cost method, the analogue method, and the income-based method. Each of these approaches has benefits and drawbacks of its own. Despite this, there is currently no one approach

that is widely accepted. An intellectual product's determined price may only be used as a starting point for figuring out its ultimate price. Despite the fact that they are often utilized for valuing real estate overseas, they are taken into consideration while creating local laws in India on real estate value. This being the case, each technique has to be carefully examined.

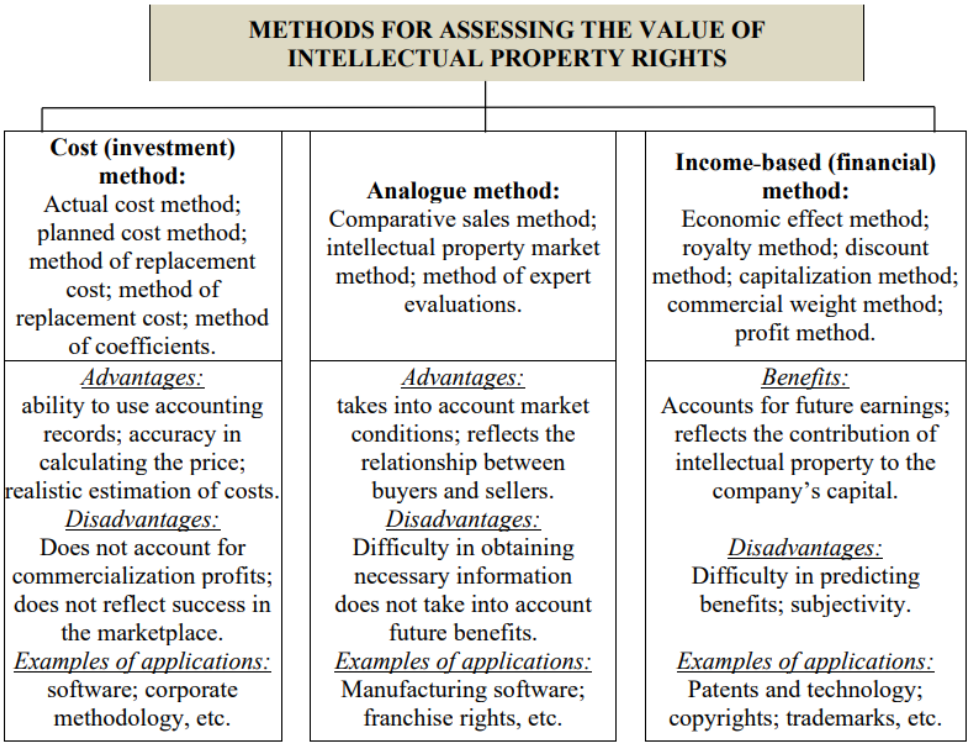

Figure 1. Valuation Techniques for Intellectual Property

The cost technique is predicated on the idea that a buyer with the required knowledge won't pay more for the pertinent items than the price of an equivalent item in intangible assets with a comparable usefulness. The cost technique is predicated on the idea that a buyer with the required knowledge won't pay more for the pertinent items than the price of an equivalent item in intangible assets with a comparable usefulness. To use this technique, you must first account for all real expenses related to the production, acquisition, or commissioning of intellectual property. The estimate is more accurate the more expenditures that are taken into account. The benefit of using accounting records is that it assures accuracy, impartiality, and regulatory and legal clarity in determining the value of intellectual property. The cost method's drawbacks include its inability to account for commercialization earnings and represent the company's performance in the market where the intellectual property is used. An investigation of comparable sales serves as the foundation for the analog technique of intellectual property rights valuation. Using this method presents challenges despite the analyses' simplicity. Given this, it is recommended to use this procedure using the following techniques. First, a database is created based on the sectoral systematization of data on license agreement conditions for the transfer of rights to these products in the local and international markets. It is used to establish the criteria by which commercially exploited intellectual property items are compared to their equivalents and, ultimately, valued. Second, this approach may be used to estimate the market value of products made with the use of intellectual property. The evaluation of the intellectual property's technical level and commercial circumstances versus its existing equivalents is the foundation for the comparison.

It is feasible to calculate economic indicators like market value and residual value by using the analog approach. To be sure, this strategy, like the one before it, has both benefits and drawbacks. In this instance, the object's current value is calculated for potential future reproduction periods. By using an income-based evaluation approach, it is feasible to calculate the proportion of each piece of intellectual

property to the business's overall profitability. Several techniques are used for this purpose, with discounting and capitalization strategies serving as the primary ones. The mathematical framework created by J. Friedman and N. Ordway serves as the foundation for the financial method's evaluation of intellectual property rights. However, its applicability has to be explained: The capital that may produce surplus value through the usage of an intellectual property asset is what determines the asset's worth. The inverse formulation enables a known incremental benefit to be used to calculate the monetary worth of intellectual property rights. Consider the discounting approach first to realize this, bearing in mind that the purchasing power of currency depreciates with time. The present value of an intangible asset is calculated by dividing the sum of its expected future cash flows by the discount rate. Investments in risky capital are subject to the lowest discount rate, while those tied to the inherent instability and contradictions of the production processes are subject to the highest discount rate.

Analysis of the Economic Benefits of Intellectual Property Protection in India Using Econometric Models

In the preceding paragraphs, we discussed some of the most common methods for valuing intellectual property on a local, or "micro," scale, such as the formalization of intellectual capital and the right to a particular new idea. It is obvious that the person or legal entity that owns the intellectual property has the most to gain from the process of financial appraisal. Additionally, the performance of the holder of intellectual property rights is examined using a financial evaluation of intellectual capital. The following actions are required if the goal is to evaluate how intellectual property protection affects macroeconomic growth: 1) locating publicly accessible information sources; 2) the research period's identification; 3) determining the factors that are independent and dependent; 4) Choosing the relationship's structure (econometric model) 5) testing for and removing multicollinearity between independent variables; 6) econometric modeling of the effect of indices of economic growth on intellectual property protection. 7) statistical estimate of the model's parameters' importance; 8) evaluation of the model's suitability and economic soundness. When looking for sources of open information, it is important to keep in mind that the State Enterprise "Ukrainian Intellectual Property Institute" (Ukrpatent), which is a department inside India's broader framework of legal protection for IP, keeps track of all data relating to IP law enforcement in the country.

Table 1. Information useful for simulating IP protection's effect on India's economic growth.

Years	Number of registered intellectual property protection documents				Gross domestic product, mln USD
	Patents for inventions	Utility model patents	Industrial design patent	Certificates of trademarks for goods and services	
2000	5,772	222	1,044	7,785	31,261.5
2001	2,307	422	1,186	8,675	37,972.3
2002	3,038	440	1,267	12,374	42,351.6
2003	3,113	672	1,474	12,809	50,084.2
2004	2,838	1,853	1,436	15,236	64,819.7
2005	3,433	7,467	1,569	11,645	86,057.9
2006	3,698	8,268	2,061	13,134	107,648.0
2007	4,058	9,215	2,213	15,375	142,580.0
2008	3,832	9,282	2,503	15,357	179,817.0
2009	4,002	8,391	1,754	15,137	117,113.0
2010	4,308	9,405	1,431	16,686	136,013.0
2011	4,132	10,291	1,337	16,677	163,160.0
2012	3,707	9,951	1,541	15,459	175,781.0
2013	3,699	10,137	2,010	14,981	183,310.0

2014	3,455	9,196	2,464	14,698	133,503.0
2015	3,014	8,153	2,521	12,388	91,031.0
2016	2,813	9,044	2,469	13,618	93,356.0
2017	2,590	9,442	2,390	15,248	112,190.0
2018	2,469	8,620	2,297	15,877	130,902.0
2019	2,255	8,412	2,599	17,322	153,781.0

Indicators of intellectual property protection in India, such as the number of patents for inventions, utility model patents, industrial design patents, and trademark certificates for goods and services, are summarized in Table 1 for the time period 2000-2019. These metrics serve as the foundation for modeling the effect of IP protection on economic development in India (as measured by GDP at the current USD exchange rate). The variables to consider are the yearly totals for patents for innovations, utility models, industrial designs, and trademark registrations. Any future multifactor econometric model should include GDP in current USD prices as the dependent variable. Because it presumes that the formalization of social ties, can be managed by linear rules, a basic sort of stochastic interaction is the least dependable in economic research and econometric modeling. The dynamics of national economic growth were simulated in relation to four aspects of intellectual property protection, power contact emerges as the most desirable and reliable kind of interaction. A multiple power regression model would generally take the following form:

$$\hat{Y}_X = \beta_0 \cdot X_1^{\beta_1} \cdot X_2^{\beta_2} \cdot \ldots \cdot X_n^{\beta_n},$$

where *Y^X*is the determined (theoretical) value of the dependent variable, and the model also includes the following independent variables: X1, 2,..., n;; β1, β2, …, βn is a fixed number; the independent variables in the regression equation; the elasticity coefficients, which express the percentage change in the dependent variable for a 1% change in the independent variable. The multiple power regression model appears as follows in logarithmic form: ln

$$\ln \hat{Y}_X = \ln \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \cdots + \beta_n \ln X_n.$$

In order to gain high confidence based on the multiple power regression model defined by formulas (1) and (2), it is important to emphasize that baseline growth rate indices are replaced for the absolute values of the variables in Table. To fill up Table 16, divide the current-year absolute values of the indicators by their respective baseline values from the year 2000. The proposed method serves three purposes: first, it standardizes the indicators' dynamics by providing a uniform formalization of these indicators' dynamics; second, Third, it develops algebraic presumptions for the logarithmization of indicator values, which may be included into an econometric model of the impact of IP protection on economic development, by standardizing the indicators to a single unit of measurement.

Table 2. GDP per capita and intellectual property protection growth rates in India as well as other countries

Years	Patents for inventions (*PI*)	Utility model patents (*UMP*)	Industrial design patent (*IDP*)	Certificates of trademarks for goods and services (*CTGS*)	*GDP*
2001	0.3997	1.9009	1.1360	1.1143	1.2147
2002	0.5263	1.9820	1.2136	1.5895	1.3548
2003	0.5393	3.0270	1.4119	1.6453	1.6021
2004	0.4917	8.3468	1.3755	1.9571	2.0735
2005	0.5948	33.6351	1.5029	1.4958	2.7528
2006	0.6407	37.2432	1.9741	1.6871	3.4435
2007	0.7030	41.5090	2.1197	1.9750	4.5609
2008	0.6639	41.8108	2.3975	1.9726	5.7520
2009	0.6933	37.7973	1.6801	1.9444	3.7462
2010	0.7464	42.3649	1.3707	2.1434	4.3508
2011	0.7159	46.3559	1.2807	2.1422	5.2192
2012	0.6422	44.8243	1.4761	1.9857	5.6229
2013	0.6409	45.6622	1.9253	1.9243	5.8638
2014	0.5986	41.4234	2.3602	1.8880	4.2705
2015	0.5222	36.7252	2.4148	1.5913	2.9119
2016	0.4874	40.7387	2.3649	1.7493	2.9863
2017	0.4487	42.5315	2.2893	1.9586	3.5888
2018	0.4278	38.8288	2.2002	2.0394	4.1873
2019	0.3907	37.8919	2.4895	2.2250	4.9192

According to Table data, between 2001 and 2019, Patent registrations for inventions dropped by 60%, while trademark registrations for goods and services rose by 220%, industrial design patent registrations rose by 250%, and utility model patent registrations rose by 380%. We develop a more precise equation for the multiple power regression model using formula (1) and the notations of the indicators in Table Monograph $P = \beta 0 \cdot PI\beta 1 \cdot UMP\beta 2 \cdot IDP\beta 3 \cdot CTGS\beta 4$.

Multicollinearity is present when there is a significant stochastic interaction between any of the predictor variables. In the absence of a method for removing multicollinearity between all candidate predictor variables, one of every given pair of predictors will need to be dropped from the model. Before testing for multicollinearity, the pairwise correlation coefficients of all possible combinations of predictor variable pairs are summed in a correlation matrix. We'll make use of Excel's features for this. Acquired pairwise correlation coefficients are put to the test. Calculating the crucial boundaries of the range of pairwise correlation coefficient values within which multicollinearity does not exist is the fundamental issue that this test solves. Use the F-test formula to resolve this issue [21, p. 634–635]:

$F = r\ 2\ 1 - r\ 2 \cdot n - m - 1$,

where m is the total number of predictors, n is the sample size, and r is the strength of the association between the two sets of data. The F-test p-value is interpreted in relation to the estimated critical value based on the degrees of freedom k1 = m and k2 = n-m-1 and the significance level set at 0.05. In this instance, k1 = 1 and k2 = 19 – 1 – 1 = 17. The critical value of the F-test is found using the Excel statistical function "F.INV": F.INV(0.95;1;17) = 4.451. Because all possible values of the paired correlation coefficient for which the observed F-test results would be less than 4.451 suggest a statistically insignificant link between them, we may conclude that there is no multicollinearity between the predictor variables. Determine the highest possible value of the paired correlation coefficients for which this condition holds using equations with a single unknown:

$$4.451 = \frac{r^2}{1-r^2} \cdot \frac{19-1-1}{1} = \frac{17r^2}{1-r^2};$$
$$17r^2 = 4.451(1-r^2);\ 17r^2 = 4.451 - 4.451r^2;$$
$$21.451r^2 = 4.451;\ r^2 = 0.2075;$$
$$r = \sqrt{0.2075} = \pm 0.456.$$

As a result, when the condition r ∈ [-0.456; 0.456] is implemented, multicollinearity between the predictor variable is not taken into account. The pairwise correlation coefficient should fall within a certain range of values, as shown in formula (5), in order to say that there isn't multicollinearity between a pair of independent variables.

Table 3. Growth rates of measures of intellectual property protection and their correlation to India's gross domestic product

	PI	*UMP*	*IDP*	*CTGS*	*GDP*
PI	1				
PUM	0.4010	1			
DP	-0.1486	0.6397*	1		
CTGS	0.3299	0.6595*	0.3721	1	
GDP	0.4666	0.9089	0.5348	0.7772	1

The grey cells in Table 3 represent those whose pairwise correlation coefficients' values were within the range specified in formula (6). As a result, There is strong evidence for multicollinearity due to the considerable stochastic interaction among the independent variables Utility Model Patents, Industrial Design Patents, and Certificates of Trademarks for Goods and Services. To get rid of multicollinearity, we construct Utility Model Patents from a set of independent factors.

Table 7The GDP growth rate of India and the rate of protection of intellectual property both as natural logarithms

Years	ln *PI*	ln *IDP*	ln *CTGS*	ln *GDP*
2001	-0.9171	0.1275	0.1082	0.1945
2002	-0.6418	0.1936	0.4634	0.3036
2003	-0.6174	0.3449	0.4979	0.4713
2004	-0.7099	0.3188	0.6715	0.7292
2005	-0.5196	0.4074	0.4027	1.0126
2006	-0.4452	0.6801	0.5230	1.2365
2007	-0.3523	0.7513	0.6805	1.5175
2008	-0.4096	0.8744	0.6794	1.7496
2009	-0.3662	0.5188	0.6649	1.3208
2010	-0.2925	0.3153	0.7624	1.4704
2011	-0.3343	0.2474	0.7618	1.6523
2012	-0.4428	0.3894	0.6860	1.7269
2013	-0.4450	0.6551	0.6546	1.7688
2014	-0.5132	0.8587	0.6355	1.4517
2015	-0.6498	0.8816	0.4645	1.0688
2016	-0.7188	0.8608	0.5592	1.0940
2017	-0.8014	0.8282	0.6722	1.2778
2018	-0.8492	0.7885	0.7127	1.4321
2019	-0.9399	0.9121	0.7998	1.5931

As a result, the creation of Table 4 marks the end of all preliminary tasks before the direct econometric modeling of how intellectual property protection affects India's economic growth. The "Regression" function of the add-on "Data Analysis" is then used to populate data arrays with independent and dependent variables from Table 4.

CONCLUSION

Thus, there may be a variety of conclusions that may be drawn from research into the impact of intellectual property protection on economic growth. the legal protections afforded by legally binding licenses, copyright agreements, or other contracts for the purchase of intellectual property; documents in the public domain relating to design, technology, design, economics, law, and other fields; the subjects of copyright and associated rights; licenses, copyright agreements, and other agreements for the acquisition of intellectual property, completed in accordance with relevant legislation; know-how rights proven by company documents. the cost (investment) method, which draws its conclusions on factoring in all expenses incurred in the creation, acquisition, and use of intellectual property; the income-based (financial) technique; the analog method, which analyzes the market worth of rights with efficiency comparable to intellectual property and takes into consideration relevant data on pricing for comparable goods; and Thirdly, it is shown that the GDP of India increases by 3% at actual USD prices for every 1% increase in the registration of design patents, invention patents, and certificates of trademarks for goods and services, highlighting the crucial role that intellectual property rights play in the economic development of the nation.

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