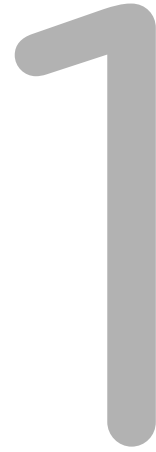




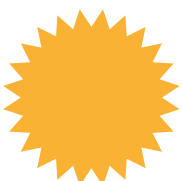
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Patent Quality: Does One Size Fit All?

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PATENT QUALITY: DOES ONE-SIZE-FIT ALL?

Summary

Concerns about questionable patent quality are on a rise in Europe. Sound policy considerations are urgently needed to optimize the existing European patent system. Nonetheless, any meaningful policy-oriented discussion about patent quality in Europe may only start by building a strong premise and clarity about the term 'patent quality'. However, the various meanings and perspectives attributed to patent quality show significant disharmony and patent quality is often described as 'quality in the eyes of the beholder' rather than based on a consensual definition. At the same time, while stakeholder-perceptions on patent quality may be more subjective, academic literature gives more promising insight based on objective theories and reasoning rather than personal perspectives.

In this article a broad range on literature is analyzed to answer the question; what the term "patent quality" may encompass and whether there could be one-size-fits-all definition? The paper seeks to facilitate identifying the factors that influence the quality of patents, especially from a sound policy perspective.

1 Introduction

The previous decades have witnessed rising concerns about patent ‘quality’ and various patent offices have taken steps to monitor and improve quality.¹ It is interesting to note that a substantial share of literature focusing on patent quality and related concerns comes from the U.S.A.,² maybe because critics in the U.S.A. gauged the problem earlier than elsewhere. Interestingly, most of the earlier comparative studies on patent quality conclude that EPO has been producing better quality patents (e.g. than the U.S.A.). However, recent trends at the EPO suggest that it too has been led into the same trap of questionable ‘patent quality’.³

However, any objective study on “quality” is an extremely difficult endeavour given the subjectivity of the term. This may mean that there is a risk that what is essentially a subjective study is seen as comprehensive and non-prejudicial. Similarly, this premise also applies to studies relating to ‘patent quality’ and the issues surrounding it, creating an inherent uncertainty in defining and measuring patent quality.⁴

At the same time, any policy discussion about the patent quality problem in Europe may only start meaningfully if there is clarity about the term ‘patent quality’.⁵ However, this task is not

¹ A Patent Quality Review Office (the U.S.A.) was created in 1974; in 2010 a Quality Metrics was introduced to gain more insight into measuring patent quality; 2015 USPTO Enhanced Patent Quality Initiative (EPQI) was taken. See, Tara Klamrowski, 'The USPTO'S EPQI and the Demand for Higher Patent Quality' (22 November 2016) <<http://knowledge.reedtech.com/intellectual-property-all-posts/the-uspto-s-epqi-and-the-demand-for-higher-patent-quality>> accessed 2 January 2018. The EPO states one of its aims as ‘quality management’ and is raising concerns about patent quality; In 2010, its report ‘Raising the bar’ focused on quality aspects of a patent followed by its first report on quality, published in 2016. See, EPO Quality Report, (2016) <[http://documents.epo.org/projects/babylon/eponet.nsf/0/D4D30CF45FD00F51C125814C003C4B0D/\\$File/epo_quality_report_2016_en.pdf](http://documents.epo.org/projects/babylon/eponet.nsf/0/D4D30CF45FD00F51C125814C003C4B0D/$File/epo_quality_report_2016_en.pdf)> accessed 20 January 2018.

² Dietmar Harhoff, 'Patent Quantity and Quality: Trends and Policy Implications' in Dominique Foray and Brian Kahin (eds), *Advancing Knowledge and The Knowledge Economy* (The MIT Press 2006) 332.

³ The EPO also holds ISO 9001 certificate for the entire process, which is an internationally recognized standard for quality management systems. Everything seemed to be working well at achieving the highest quality if we rely on the constant reports and posts from the EPO and its President. However, an extra ordinary letter signed by 924 EPO examiners, addressed to the members of the Board of the Administrative Council stated that the “quality of the EPO patents is endangered.” See, EPO Examiners, ‘Petition to the Administrative Council of the EPO’ (7 March 2018) <<https://regmedia.co.uk/2018/03/14/epo-examiners-letters.pdf>> accessed 3 June 2018. Over the years the EPO has centred its concerns on how to allocate work load and revenue, essentially overlooking their responsibility in upholding the main motive of the patent system. See, Dominique Guellec and Bruno van Pottelsberghe de la Potterie, *The Economics of the European Patent System: IP Policy for Innovation and Competition* (Oxford University Press 2007), 2.

⁴ Colleen Chien, 'Comparative Patent Quality' (2016) Santa Clara Law Digital Commons <<http://digitalcommons.law.scu.edu/facpubs/938/>> accessed 6 December 2017; Giuseppe Scellato and others, 'Study on the Quality of the Patent System in Europe, PATQUAL: Tender MARKT/2009/11/D', 19 <http://ec.europa.eu/internal_market/indprop/docs/patent/patqual02032011_en.pdf> accessed 6 December 2017.

⁵ The problem of patent quality in general terms is the risk that patent law may protect more than it should. See, Prof. Reto M. Hilty argues that this ‘over-protection’ is a problem when there is more negative impacted associated with the protection i.e. under-utilization of patent protected inventions/innovations. It is a problem when competitors cannot enter the market or have to go through litigation/licensing to do so as this ultimately

easy, as this exploration may never be unidirectional.⁶ Rather, the wide variety of meanings and perceptions that may be attributed to patent quality show that the disharmony is quite loud, therefore, patent quality is often described as 'quality in the eyes of the beholder' rather than based on a consensual definition.⁷

All the same, there is no deficiency of literature related to patent quality (in general) and related concerns. In this article, I undertake a literature review of the scholarly contributions on patent quality in order to derive meaningful conclusions about characteristics/definition of a 'good quality patent' or factors that affect the quality of patents. This review is undertaken bearing policy-oriented research in mind.

2 Patent Quality: Parable of the blind men and an elephant

Every patent system is a complex interaction of various stakeholders, resulting in the perception of patent quality being driven by the interest or perspectives of these stakeholders.⁸ (See diagram 2.1) For instance, patent attorney, a patent office or a patent court may consider a well-written patent that clearly fulfils the statutory patentability conditions to be a high-quality patent (legal validity).⁹ For the engineer or inventor, the high-quality patent might be perceived as the one protecting a major invention rather than an incremental one (technologically advanced). For the manufacturer, a high-quality patent is one that clearly describes the invention in a manner that can be successfully implemented. Economists may

hinders innovation. See, Reto M Hilty, 'The Role of Patent Quality in Europe' in Josef Drexler and others (eds), *Technology and Competition: Contributions in Honour of Hanns Ullrich* (Technology and Competition: Contributions in Honour of Hanns Ullrich, Editions Larcier 2009), at 2. However, Prof. Polk R. Wagner (2009) broadens the understanding by considering even inappropriate denials (not protecting/protecting less than it should) along with inappropriate grants as a part of the problem of sub-optimal patent quality. See, R. Polk Wagner, 'Understanding Patent-Quality Mechanisms' (2009) 157 *University of Pennsylvania Law Review* 2135, at 2141. The challenge for quality is concerned with the rigorous application of the patentability standards. See, Robin Cowan and others, *Policy Options for the Improvement of the European Patent System*, (2007), at 37.

⁶ Sara-Jayne Adams, 'Quality is the Key to a Bright Patent Future' (2008) *Intellect Asset Manage* 55, 55 <http://www.oceantomo.com/pdf/studies/IAM_April_May_2008_Barney.pdf> accessed 24 May 2018.

⁷ Gaétan de Rassenfosse, Adam B Jaffe and Elizabeth Webster, *Low-quality Patents in the Eye of the Beholder: Evidence from Multiple Examiners* (NBER Working Paper No 22244, 2016) <<http://www.nber.org/papers/w22244>> accessed 6 December 2017.

⁸ Christi J Guerrini, 'Defining Patent Quality' (2014) 82 *Fordham Law Review* 3091. For her, the four important stakeholders whose perception of patent quality is relevant in formulating a definition are 1. the patent office, 2. the courts, 3. the patentee and 4. the public. Also see, Adams, 'Quality is the Key to a Bright Patent Future' compilation of interviews where a number of stakeholders and IP experts are approached in the patent community on behalf of IAM Magazine to understand their opinion on patent quality is an interesting read in this regard.

⁹ Mariagrazia Squicciarini, Hélène Demis and Chiara Criscuolo, *Measuring Patent Quality: Indicators of Technology and Economic Value* (OECD Science, Technology and Industry Working Paper No 2013/03, 2013) 7 <http://www.oecd-ilibrary.org/science-and-technology/measuring-patent-quality_5k4522wkwl8-en> accessed 1 December 2017. Warren Woessner (Schwegman, Lundberg & Woessner) and Mike Lloy (Griffith Hack) opinions cited in Alexandra Sklan, 'Ask the Experts-Patent Quality' (2014) 3 *Pharmaceutical Patent Analyst* 17,18-19 <<https://www.future-science.com/doi/pdf/10.4155/ppa.13.74>> accessed 24 May 2018.

want to test the quality of a patent by analyzing if it fulfils its basic function of incentivizing innovation and the costs involved (economic value).¹⁰ For them, “*high-quality patent should cover only those inventions that would not have been made without the incentive provided by the protection of the intellectual property right.*”¹¹ A patent owner’s standpoint would depict patent quality necessarily as a function of value.¹² For him, the value would be linked to the likelihood of the successful enforceability of the patent in litigation and the amount of damages that could be obtained in case of his patent being infringed (and successfully keeping competitors at bay!).¹³ This list is, of course, not exhaustive.

The public would perceive quality as maintaining an appropriate balance between rights granted to the patentee over the invention and receiving the publication of the invention (with sufficient disclosure) through the patent system. Lastly, the public also desires the efficient working of the judicial system (including both, invalidating patents that never should have issued and upholding patents that merit protection).¹⁴ A quality patent can also be considered to be one that can ultimately be commercialized and that brings social, economic and/or environmental welfare.¹⁵

In this regard, some contend that the degree of patent quality is different for evaluators in different situations, for example, in patent trade (sold patents are of high quality), in patent litigation (validated patents are of higher quality), and in patent assignment (patents that have assignment processes are of high quality).¹⁶

¹⁰ Squicciarini, Dernis and Criscuolo, *Measuring Patent Quality: Indicators of Technology and Economic Value*; Bruno van Pottelsberghe de la Potterie (2011) argues that the economists’ routine consists in overly simplifying the examination practice under abstract concepts such as patent “breadth” or “scope,” which are nearly impossible for examiners to implement in practice. Therefore, he urges to achieve a fair balance between complexities and abstraction while studying the subject. See, Bruno van Pottelsberghe de la Potterie, 'The Quality Factor in Patent Systems' (2011) 20 *Industrial and Corporate Change*, 1756 <<https://academic.oup.com/icc/article/20/6/1755/888713> > accessed 10 April 2018.

¹¹ See, Scellato and others, 'Study on the Quality of the Patent System in Europe, PATQUAL: Tender MARKT/2009/11/D', 19.

¹² See, Guerrini, 'Defining Patent Quality'.

¹³ See, Jonathan Atkinson (Harrison Goddard Foote LLP) cited in Sklan, 'Ask the Experts-Patent Quality', 21.

¹⁴ Guerrini, 'Defining Patent Quality', 3126.

¹⁵ Though, attaching these considerations to determine ‘patent quality’ go beyond the scope of the patent system. Still, some authors rely on a broad definition of patent quality. See, for example, SONG Hefa and LI Zhenxing, 'Patent Quality and the Measuring Indicator System: Comparison among China Provinces and Key Countries', 4 <https://www.law.berkeley.edu/files/Song_Hefa_IPSC_paper_2014.pdf> accessed 25 November 2017.

¹⁶ Amy JC C Trappey and others, 'A Patent Quality Analysis for Innovative Technology and Product Development' (2012) 26 *Advanced Engineering Informatics* 27 <<https://www.sciencedirect.com/science/article/pii/S1474034611000486> > accessed 20 August 2018.

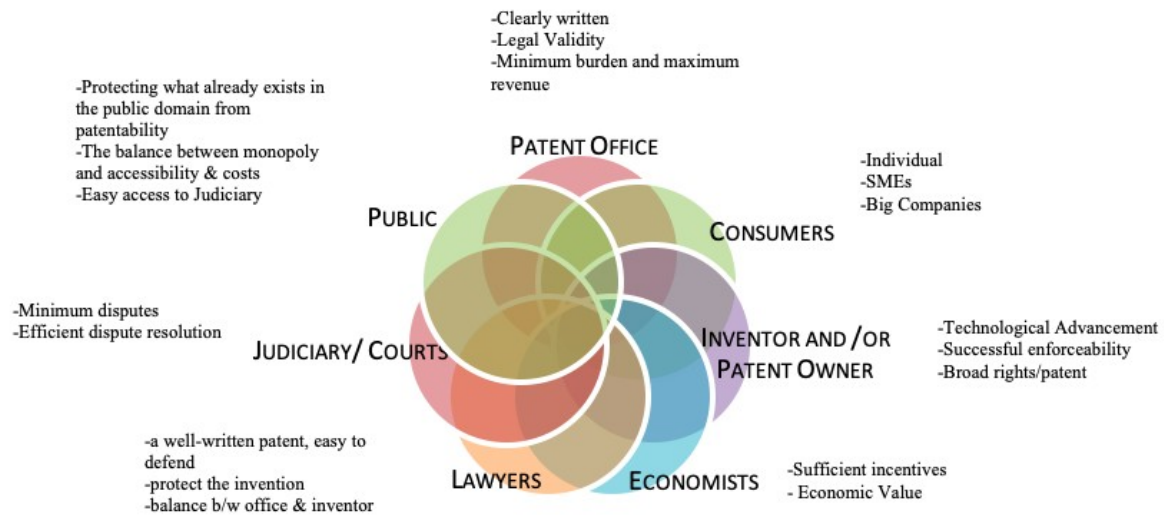


DIAGRAM 2.1: PATENT QUALITY: MIXED EXPECTATIONS

These varied notions of quality are subjective and have given rise to a wide array of definitions of patent quality as users have tried to formulate the indicators/definitions of patent quality most suited to them. Further, the complexity not only arises by virtue of the interaction of various actors but also because the patent systems are established at an interface of legal constraints, economic incentives, scientific and technological advances and business strategies.¹⁷

The parable of the blind men and an elephant (see diagram 2.2) fits nicely with the current perceptions about patent quality. A group of blind men come across an elephant for the first time and start touching the elephant to conceptualize it. Their description of the elephant is then based on the one part of the elephant that they were in contact with and is different from each other. Hence, the resultant description is their absolute truth but based on their limited and subjective experience. In the case of the patent system most of the stakeholders perceive 'patent quality' with some vested interest. Some are very much concerned about the private gains; others may possibly want to bring in the public-interest explanation for a patent system. However, ultimately everyone comes with some bias, blind (if only partial) to the other aspects of the system.

¹⁷ See, Potterie, 'The Quality Factor in Patent Systems'.

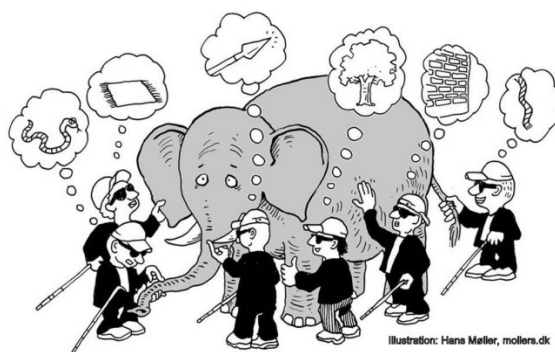


DIAGRAM 2.2: THE PARABLE OF THE BLIND MEN AND THE ELEPHANT¹⁸

To find out the whole truth, one must put parts together and should conceptualize the concept with open eyes!

3. Conceptualizing Patent Quality: A review of the Academic Literature

Academic literature has also made a significant contribution to the subject of patent quality and attempts have been made to define (wholly or partly) the notion of patent quality.¹⁹ This has included empirically measuring patent quality (or composing patent quality indicators),²⁰ assessing the factors affecting quality,²¹ comparing patent quality across various jurisdictions²² and so on. Academic literature gives a more promising insight of quality criteria, based on theories and reasoning, than perceptions based on stakeholder bias.

¹⁸ Image Source: Hans Møller, mollers.dk. The image was downloaded from the following link: <https://caroline-smith.com/2016/07/14/truth-is-an-elephant-2/> accessed on 18 November 2018. Due permission from the illustrator has been sought to use the picture.

¹⁹ For example, see, Guerrini, 'Defining Patent Quality'; Potterie, 'The Quality Factor in Patent Systems'; Hefa and Zhenxing, 'Patent Quality and the Measuring Indicator System: Comparison among China Provinces and Key Countries'; Ronald J Mann and Marian Underweiser, 'A New Look at Patent Quality: Relating Patent Prosecution to Validity' (2012) 9 Journal of Empirical Legal Studies 1 <<https://pdfs.semanticscholar.org/1df5/e28df889032b81ecec639bb659d48702f9b0.pdf>> accessed 28 November 2017.

²⁰ For example, see, Hefa and Zhenxing, 'Patent Quality and the Measuring Indicator System: Comparison among China Provinces and Key Countries'; Squicciarini, Dernis and Criscuolo, *Measuring Patent Quality: Indicators of Technology and Economic Value*; Jean O Lanjouw and Mark Schankerman, 'Patent Quality and Research Productivity: Measuring Innovation with Multiple Indicators' (2004) 114 The Economic Journal 441 <<http://onlinelibrary.wiley.com/doi/10.1111/j.1468-0297.2004.00216.x/epdf>> accessed 6 December 2017.

²¹ For example, see, R. Polk Wagner, 'Understanding Patent-Quality Mechanisms' (2009) 157 University of Pennsylvania Law Review 2135 <<https://www.law.upenn.edu/live/files/86-wagner157upalrev21352009pdf>> accessed 6 December 2017; Scellato and others, 'Study on the Quality of the Patent System in Europe, PATQUAL: Tender MARKT/2009/11/D'; Gaétan de Rassenfosse and Adam B Jaffe, 'Are Patent Fees Effective at Weeding Out Low-Quality Patents?' (2018) 27 Journal of Economics and Management Strategies 134 <<https://onlinelibrary.wiley.com/doi/epdf/10.1111/jems.12219>> accessed 27 March 2018.

²² For example, see, Potterie, 'The Quality Factor in Patent Systems'; Chien, 'Comparative Patent Quality'.

Any academic discussion about patent quality must commence with the analysis of the legal quality of the patent.²³ Legal quality may simply be associated with the statutory standards of patentability. Any invention can be granted a patent if it fulfils three basic conditions of (1) novelty; (2) inventive step and (3) capability of the industrial application.²⁴ Otherwise, it cannot be patented in the first place or runs the risk of being invalidated. Theoretically, these conditions of patentability may sound simple but their interpretation and implementation is a matter of subjective assessment. This may affect the (legal) quality of granted patent and mean that even granted patent does not ensure validity.²⁵

While operationalize ‘patent quality’ as legal validity, scholars like Prof. Ronal J. Mann and Dr. Marian Underweiser (2012) have not only limit their analysis to traditional concept of validity (i.e. features apparent on the face of the patent-novelty, inventive step, patentable subject matter etc.) rather they seek to build a robust insight into the features that might relate to validity, including, the textual features of the patent (including, claims and specifications) and information about prosecution history.²⁶ They analyze the validity of the patents as a

²³ See, John R Thomas, 'The Responsibility of the RuleMaker: Comparative Approaches to Patent Administration Reform' (2002) 17 Berkeley Technology Law Journal, 730-31 <<https://scholarship.law.georgetown.edu/cgi/viewcontent.cgi?article=1318&context=facpub>> 24 July 2018. In author's opinion, "...quality patents are, in short, valid patents. Such patents may be reliably enforced in court, consistently expected to surmount validity challenges, and dependably employed as a technology transfer tool. Quality patents fortify private rights by making their proprietary uses, and therefore their value, more predictable. They also clarify the extent to which others may approach the protected invention without infringing. These traits in tum strengthen the incentives of private actors to engage in value-maximizing activities such as innovation or commercial transactions..."

²⁴ A simple glance at how similar (but not identical) the USA and the Europe substantive requirements look can be tabulated as follows to notice that differences that may occur. Further, the definition, assessment criterion and interpretation of these substantive requirements may also vary.

TRIPS	USA	EUROPE
New	Novelty	Novelty
Inventive step	Non-obviousness	Inventive Step
Industrial application	Usefulness	Industrial Application
Any invention in all fields of technology [Exclusions: Art. 27 (2) and 27 (3), TRIPs]	machine, manufacture, composition of matter, or any improvement [judicial exceptions]	Any invention in all fields of technology [Exceptions: Art. 52 (2), EPC]
Sufficiently clear and complete disclosure	adequate disclosure	adequate disclosure

²⁵ This variation is not only across jurisdictions (for example, at EPO uses the problem-solution approach and the 'could-would' concept while evaluating Inventive step requirement. However, U.S.A.'s evaluation of non-obviousness is based on the tests of 'teaching-suggestion-motivation' and 'Graham Factor') but also within the same jurisdiction different assessment results of similar cases may be possible (For example, the expertise of the examiner, the time available for examination etc. may affect the decision, and hence quality). Also, see, 'High Quality of Patent in Europe', 4iP Council <https://www.4ipcouncil.com/download_file/view_inline/177> 28 January 2019. The study focuses on the invalidity rate of German Federal Patent Court.

²⁶ Mann and Underweiser, 'A New Look at Patent Quality: Relating Patent Prosecution to Validity', 2. Also see, Nefissa Chakroun, 'Improving Patent Information Quality: Development and the Disclosure Requirements' (2012) 15 The Journal of World Intellectual Property < <http://onlinelibrary.wiley.com/doi/10.1111/j.1747->

function of three distinct steps: (i) the invention, (ii) the effort of the applicant and (iii) the effort of the examiner.

This is similar to a report commissioned by the European Commission in 2009 that aimed to provide evidence of patent quality in Europe and which studied two complementary aspects: 1) quality of granted patent *per se* (compliance with fundamental requirements/substantive examination) and 2) quality of patent from a systematic perspective.²⁷ The authors did not only analyze the efficacy of the substantive examination process but also looked at other factors like costs for obtaining, managing and enforcing a patent.²⁸

For Prof. Colleen Chien (2016), the quality of patents is a result of a set of three important decisions in a patent process: By the applicant: i) submission of a certain quality of patent application, ii) to renew the patent. By patent office and by the patent office: iii) to grant the patent or not.²⁹

Dr. Gaetan de Rassenfosse et. al. (2016) interpret issuance of low-quality patents corresponding to two pathways based on the height of inventiveness: “(i) *the patent office may apply systematically a standard that is too lenient (low inventive step threshold); or (ii) the patent office may grant patents that are, in fact, below its own threshold (so-called ‘weak’ patents).*”³⁰ The existence of low standards that are applied consistently still generate valid patents.³¹ Prof. Bruno van Pottelsberghe de la Potterie (2011) definition follows this line and he defines (legal) quality as “*the extent to which a patent system complies with its legal standards in a transparent way.*”³² Prof. Song Hefa and LI Zhenxing (2014) added to this definition “*...the degree of its specification meeting requirements of sufficient disclosure...*” as another aspect of patent quality.³³

1796.2012.00438.x/pdf> 19 January 2018.

²⁷ Scellato and others, 'Study on the Quality of the Patent System in Europe, PATQUAL: Tender MARKT/2009/11/D', 7.

²⁸ Ibid, at 17.

²⁹ Chien, 'Comparative Patent Quality', 14.

³⁰ See, Rassenfosse, Jaffe and Webster, *Low-quality Patents in the Eye of the Beholder: Evidence from Multiple Examiners*.

³¹ Ibid, at 3.

³² See, Potterie, 'The Quality Factor in Patent Systems'.

³³ See, Hefa and Zhenxing, 'Patent Quality and the Measuring Indicator System: Comparison among China Provinces and Key Countries'.

Scholars have also clearly distinguished patent quality from its value.³⁴ However, scholars like Dr. Paul F. Burke and Prof. Markus Reitzig (2007), include the techno - (economic) quality created by the patent's underlying invention as an important aspect of patent quality along with the legal quality created by a patent's reliability as an enforceable property right.³⁵ They reframe the definition to link patent quality and patent assessment quality as follows: “*a patent office's consistent categorization of patents along a dimension of technological quality leading to sustainable property rights*”.³⁶

Prof. Dietmar Harhoff (2007) lists the characteristics of a high-quality patents as (i) having a high inventive step; (ii) clearly written with no intentional ‘smoke and mirror’; (iii) not a minor variation of some other patent; (iv) considering all prior art while search/examination; (v) clearly delineated and non-overlapping with other patents; (vi) extent of patent protection commensurate to the contribution to the state of the art and most importantly (vii) legally robust (meaning a small likelihood of revocation in courts or patent offices) with low uncertainty for investment.³⁷

Dr Squicciarini M, Dernis H and Criscuolo C (2013)³⁸ made a comprehensive attempt to measure patent quality to suggest an experimental composite quality indicator to capture the technological and economic value of a patented invention as indicators of quality. They defined and used thirteen indicators of patent quality, namely; (i) patent scope,³⁹ (ii) patent

³⁴ Wagner, 'Understanding Patent-Quality Mechanisms', 2138, A patent's value is dependent on factors like the size of the relevant market and the relationship between the patent's scope and a marketable good or service. He states that some of these factors may be related (directly or indirectly) to the quality, but these are factors much beyond the scope/concern of the patent law. See also, Rassenfosse and Jaffe, 'Are Patent Fees Effective at Weeding Out Low-Quality Patents?'.
³⁵ Paul F. Burke and Markus Reitzig, 'Measuring Patent Assessment Quality—Analyzing the Degree and Kind of (in)Consistency in Patent Offices' Decision Making' (2007) 36 Research Policy 1404 <<https://www.sciencedirect.com/science/article/pii/S0048733307001369>> ACCESSED 13 Aprile 2018.

³⁶ Ibid, at 1406.

³⁷ Dietmar Harhoff, 'Promoting Innovation – The Role of Patent Quality' (EUPACO-Towards a New European Patent System), 3 <<http://eupaco.wdfiles.com/local--files/eupaco2/Dietmar%20Harhoff.pdf>> accessed 11 October 2018.

³⁸ Squicciarini, Dernis and Criscuolo, *Measuring Patent Quality: Indicators of Technology and Economic Value*

³⁹ Patent Scope implies the breadth of the patent and is measured by counting the number of distinct 4-digit IPC classes the invention is allocated to.

family size,⁴⁰ (iii) grant lag,⁴¹ (iv) backward citations,⁴² (v) citations to non-patent literature (NPL),⁴³ (vi) claims,⁴⁴ (vii) forward citations,⁴⁵ (viii) breakthrough inventions,⁴⁶ (ix) generality index,⁴⁷ (x) originality index,⁴⁸ (xi) radicalness index,⁴⁹ (xii) patent renewal⁵⁰ and (xiii) patent quality: composite index.⁵¹ It may be observed that different aspects of quality may often overlap and may not be always categorized as mutually exclusive. Some indicators mainly denote technological (eg. Backward citation) or economic connotation (eg. Patent renewals), however, some identify with both (eg. forward citation).⁵² The choice of indicator(s) may also be based on the closeness of the meaning of quality to the purpose of use of such indicator. For example, private/individual relevance (for example, forward citation) or social/public relevance (for example, breakthrough inventions).

⁴⁰ The set of countries that are related by common priority dates constitute the patent family size (geographical scope).

⁴¹ Grant lag is defined as the time elapsed between the filing date of the application and the date of the grant.

⁴² Listing of sources of knowledge (such as prior patents and scientific works) as the basis of the invention in a patent application is generally referred to as prior art or backward citations.

⁴³ Majority of backward citation to non-patented literature (NPL) means citations to scientific articles. This has usually been associated with close linkage of a patented invention with the scientific research or “Technical closeness”.

⁴⁴ Use of number of claims as a quality indicator has often been associated with technological breadth as well as market value of a patent. Higher number of claims means higher the expected value of the patent. Also, more number of claims has been associated with more technological solutions that are monopolized.

⁴⁵ The number of citations a patent receives in the subsequent patents.

⁴⁶ This is an indicator built on the forward citation indicator. The high-impact innovations that lay the foundation for future technological developments are usually called breakthrough inventions. These are usually overly cited citation and Ahuja and Lampert (2001) define these as ‘the top 1% of cited patents’.

⁴⁷ Generality Index is assessed by measuring the range of technology fields – and consequently industries - that cite the patent.

⁴⁸ Patent originality refers to the breadth of the technology fields on which a patent relies.

⁴⁹ The radicalness of a patent is measured as a time invariant count of the number of IPC technology classes in which the patents cited by the given patent are, but in which the patent itself is not classified.

⁵⁰ This is a simple count of years during which a granted patent has been kept alive (the latest year in which it has been renewed or until it has lapsed or has been withdrawn).

⁵¹ “*The patent quality index is a composite indicator based on four to six dimensions of patents’ underlying quality: forward citations; patent family size; number of claims; generality index; plus, backward citations and grant lag*”

⁵² Squicciarini, Dernis and Criscuolo, *Measuring Patent Quality: Indicators of Technology and Economic Value*, 7.

They also cautioned that the patent-based indicators should only be considered as proxies since they do not contain information about market transactions or the real use of the (patented) technologies. Their choice of indicators is based on (and restricted to) information contained in the patent document, that means the measure can be compiled only ex-post, i.e. *“once the pieces of information they rely upon are included in the patent file”*.⁵³

The conclusion of academic opinions on patent quality demonstrates a versatility in approaches, although the academic literature still largely concentrates on legal aspect (narrow or broad) for defining patent quality, with only some authors trying to add the techno-economic aspect of quality to the definition. There is some logic in this approach; if a patent can be readily invalidated, all of the other quality measures are without merit. Therefore, a patent that fails to meet the basic legal requirements for patentability can never be a quality patent, regardless of any other merits (technological or commercial or any other) in determining quality.⁵⁴ It is agreed that patents with higher legal quality are usually more difficult to be challenged during examination or invalidation procedures.⁵⁵

For a policy-oriented research it is important to settle on *‘one of these many concepts/perception’* of patent quality, as this will definitely be the lead for any further research or discussion about the subject.

3 Analysis and Conclusion

Should patent quality be defined to take account the perspectives of all the stakeholders involved in the system?⁵⁶ The larger the number of legitimate stakeholders, the more perspectives and so the greater the difficulty in formulating a ‘one size fit all’ definition of patent quality or the more indicators need to be considered. The major risk is that these perspectives may not always be complementary or supplementary to each other. For example,

⁵³ Ibid, 8.

⁵⁴ Brian Elias, 'Patent Quality: It's Now or Never' LexisNexis White Paper, 2
<https://www.lexisnexis.nl/db_images/white-papers/Whitepaper-patent-quality-no-or-never.pdf> accessed 20 December 2017.

⁵⁵ See, Hefa and Zhenxing, 'Patent Quality and the Measuring Indicator System: Comparison among China Provinces and Key Countries'.

⁵⁶ *The OECD Innovation Strategy: Getting a Head Start on Tomorrow* (Organisation for Economic Co-Operation and Development (OECD) 2010) 148 <
<http://www.oecd-ilibrary.org/docserver/download/9210061e.pdf?expires=1516620458&id=id&accname=ocid177396&checksum=982312E56F59FCF1D3C854F68BC47F61>>
11 December 2018.

a stronger patent may mean a broader patent (so that not just the one invention but also close substitutes are also excluded) for an investor or industry; but may be of less interest to the society.

Nonetheless, conceptualizing ‘patent quality’ for the purpose of policy making must be well-grounded theory, bearing in mind the goal for which a patent system is created. This goal may appear be an economic one (i.e. promote innovation and encouraging investment), at the same time it is regulated by a legal instrument (patent law) and the law has a societal function/purpose to fulfil.⁵⁷ In conformity, academic literature summarized above seems well-reasoned than stakeholders-perception.

The issue of patent quality can be looked at in two different ways: i) analyzing the substantive legal standards (e.g. novelty, inventive-step including PHOSITA, patentable subject-matter etc.) or/and ii) studying the interpretation and application of these standards, both by the applicant and the examiner. Choosing one of these paths will essentially set the boundaries of one’s analysis.

The former i.e. revising the standards would require revisiting the theoretical justification for granting patents and observing if the present system needs re-alignment with the purpose for which it was created/ for which it exists. The economic welfare theory of patents suggests that granting of a patent involves a trade-off. Patent protection is provided in return for a clear and sufficient disclosure. A monopoly right should only be granted if it provides a true incentive for innovation. The law should then require a patentable invention to be really new/novel, non-obvious/inventive and capable of industrial application.⁵⁸ Further, social purpose of the system is the disclosure requirement that is also an important characteristic of a "high-quality patent"- *"that it enables those "skilled in the art" to comprehend the invention well enough to use the patent document for implementation of the described invention"*.⁵⁹ From a social welfare perspective, breadth of claim is also relevant. The utilitarian economic approach to justify the patent system sees patent system not as providing natural right that the inventor should have, but as a mere policy instrument adopted by the government to benefit the

⁵⁷ See, Dominique Guellec and Beuni van Pottelsberghe de la Potterie, *The Economics of the European Patent System: IP Policy for Innovation and Competition* (Oxford University Press 2007).

⁵⁸ Bronwyn H. Hall and others, *Prospects for Improving U.S Patent Quality via Post- Grant Opposition* (NBER Working Paper No 9731, 2003) 2 <<http://www.nber.org/papers/w9731>> accessed 2 December 2017.

⁵⁹ Another criterion for a “high-quality patent”. This dimension of patent quality, however, is less likely to be affected by post-grant opposition proceedings. See, *ibid*, at 3.

society.⁶⁰ In theory, patents supplement the market forces in achieving a socially desirable level of innovation, hence patent should be granted only if they are beneficial to society.⁶¹ Hence, this route of interpreting quality may be taken while revising the economic aim/expectation form a patent system. This is also relevant when comparing patent quality with the international standards or across various jurisdictions.

The other way is to accept the existing substantive law as it is and analyze how well a patent system complies with its own standards.⁶² This is a more practical route of interpreting/defining quality when we one seeks policy suggestions to internally improve the patent system.

The process of patent prosecution starts with the applicant taking the first step by submitting a patent application to the patent office. Therefore, the applicant assumes control over quality aspects of the patent (on the assumption that the filing rules are clear enough for the applicant to fulfill).⁶³ Once the application is submitted, the quality of the prosecution process will also determine the quality of the patent that is then finally granted.⁶⁴ This, of course, will include the quality of examination that also influences the quality of the patents.⁶⁵

Furthermore, any policy consideration would at least expect a system to produce a legally valid patent that complies with the statutory requirements of patentability.⁶⁶ Many scholars

⁶⁰ See, Guellec and Potterie, *The Economics of the European Patent System: IP Policy for Innovation and Competition*.

⁶¹ Dominique Guellec, 'Patent Design' in Dominique Guellec and Bruno van Pottelsberghe de la Potterie (eds), *The Economics of the European Patent System: IP Policy for Innovation and Competition* (The Economics of the European Patent System: IP Policy for Innovation and Competition, Oxford University Press 2007), 114.

⁶² See, Potterie, 'The Quality Factor in Patent Systems'.

⁶³ Gene Quinn (founder, IPatchdog) is of the opinion that the quality of the output depends on the quality of input. In the case of patent quality, the applicant has the foremost role to play in determining the quality and consistency of the input as he drafts and defends the patent application. See, Brian Cronin, *The Quest for Patent Quality: European Inventive Step and US Obviousness* (2016).

⁶⁴ The quality of a patent is affected by the quality of the overall system in which it operates. This implies that the peculiarities of the European patent system (environment) need to be studied to determine the patent quality it produces. See, Scellato and others, 'Study on the Quality of the Patent System in Europe, PATQUAL: Tender MARKT/2009/11/D'.

⁶⁵ See, Bruno van Pottelsberghe de la Potterie (2011), Scellato G. et. al. (2011), Bhaven N. Sampat et. al. (2005).

⁶⁶ See, Bruno van Pottelsberghe de la Potterie (2011), Gaétan de Rassenfosse and Adam B. Jaffe (2018), Scellato G. et. al. (2011), Gaetan de Rassenfosse et. al. (2016), Prof. R. Polk Wagner (2009), Prof. Colleen Chien (2016), Susan Walmsley Graf (2007), Paul F. Burke and Prof. Markus Reitzig (2007), Christi J. Guerrini (2014) and Song Hefa and LI Zhenxing (2014) have agreed to legal quality/validity as one of the dimensions (if not the only one) of overall patent quality.

have rightly extended their interpretation of the term patent quality beyond ‘traditional’ legal quality (compliance with statutory requirements of novelty, inventive step, capable of being industrially applied and patentable subject matter).⁶⁷ A robust insight of the features that may relate to validity (or at least influence the chances of patent being valid), include the textual features of the patent document (for example claims and specifications),⁶⁸ clear and sufficient disclosure,⁶⁹ time & costs structures⁷⁰ and the ease of management of granted rights or ease of enforceability.⁷¹ Legal certainty and reasonable costs are also considered important for business purposes.⁷² It is also clear that if patent quality matters, the stakeholders/actors involved in the patent system must change/improve their ways in order to fulfil the legal requirements and goals of system..⁷³ A careful look at the the academic literature reveals that many scholars⁷⁴ have also followed a logical sequence to study the patent quality by broadly

⁶⁷ See, Ronal J. Mann and Marian Underweiser (2012).

⁶⁸ See, Ronal J. Mann and Marian Underweiser (2012), Susan Walmsley Graf (2007), Christi J. Guerrini (2014), George Matta, *A Renewed Focus on Patent Quality – Implications for Patent Owners* (Globe Business Media Group 2017) 50.

⁶⁹ See, Prof. R. Polk Wagner (2009), Prof. Colleen Chien (2016), Susan Walmsley Graf (2007), Christi J. Guerrini (2014), Song Hefa and LI Zhenxing (2014).

⁷⁰ Brian J. Love (2016), Scellato G. and others (2011).

⁷¹ Scellato G. and others (2011).

⁷² B. Pottelsberghe, 'Lost property: The European Patent System and Why it doesn't Work' Bruegel Blueprint Series 9, 4 <http://bruegel.org/wp-content/uploads/imported/publications/patents_BP_050609.pdf> accessed 6 December 2017.

⁷³ Thomas, 'The Responsibility of the RuleMaker: Comparative Approaches to Patent Administration Reform', at 741. This is however, an vey ideal ambition.

⁷⁴ Mann and Underweiser, 'A New Look at Patent Quality: Relating Patent Prosecution to Validity'; Bhaven N Sampat, 'Determinants of Patent Quality: An Empirical Analysis' <<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.382.8290&rep=rep1&type=pdf>> accessed 18 November 2017; Kevin Mack, 'Reforming Inequitable Conduct to Improve Patent Quality: Cleansing Unclean Hands' (2006) 21 BERKELEY TECHNOLOGY LAW JOURNAL 147 <<https://scholarship.law.berkeley.edu/btlj/vol21/iss1/9/>> 5 April 2018; Susan Walmsley Graf, 'Improving Patent Quality Through Identification of Relevant Prior Art: Approaches to Increase Information Flow to the Patent Office ' (2007) 11 Lewis & Clark Law Review 495 <<http://law.lclark.edu/live/files/9569-lcb112grafpdf>> accessed 13 April 2018 ;Wagner, 'Understanding Patent-Quality Mechanisms'; Guerrini, 'Defining Patent Quality'.

studying two phases of the patent process, namely, i). the quality of application as submitted by the applicant,⁷⁵ and ii). the quality of operational design.⁷⁶

So, a thorough analysis of each of the aforementioned factors affecting patent quality will allow the policymakers to understand the root cause of any sub-optimal patent quality problem and find appropriate solutions.⁷⁷ This is only possible with a solid understanding as to what features of the patent system actually influence the granting of the sub-optimal patents. Lastly, patent quality is also affected by the so-called ‘non-traditional’ use of the patent system (for example, firms adopting a high-volume, low-quality patenting/portfolio strategy, ‘ever-greening’ etc.).⁷⁸ A policy-oriented research should delve deeper into all these concerns of patent quality to deliver meaningful suggestions.

⁷⁵ This includes the law/rules available for reference by the applicant to draft the patent application, the effort (in terms of time and money) that the applicant puts before filing a patent application and the various resources the applicant uses during this process. Rather some of the empirical results also found that the decisions and efforts of the applicant are of more relevance than any other factor. See, Chien, 'Comparative Patent Quality'.

⁷⁶ This may include examination quality, efforts by the examiner, interactions between examiner and applicant, third-party involvement, opposition proceedings etc.

⁷⁷ Michael D. Frakes and Melissa F Wasserman, *Decreasing the Patent Office's Incentives to Grant Invalid Patents* (The Hamilton Project, 2017) 5
<https://www.brookings.edu/wp-content/uploads/2017/12/es_121317_decreasing_patent_office_incentives_grant_invalid_patents.pdf> accessed 19 March 2018.

⁷⁸ Prof. R. Polk Wagner (2009), Susan Walmsley Graf (2007), Song Hefa & LI Zhenxing (2014). Under such circumstance, the applicant does not desire a patent because the grant of such patent will incentivize the invention, however, has other considerations (for example, creating a monopoly over broad rights, avoiding competition etc.). This may make them less concerned about the quality of their patent.