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Pilot Study for Essentiality Assessment of Standard Essential Patents

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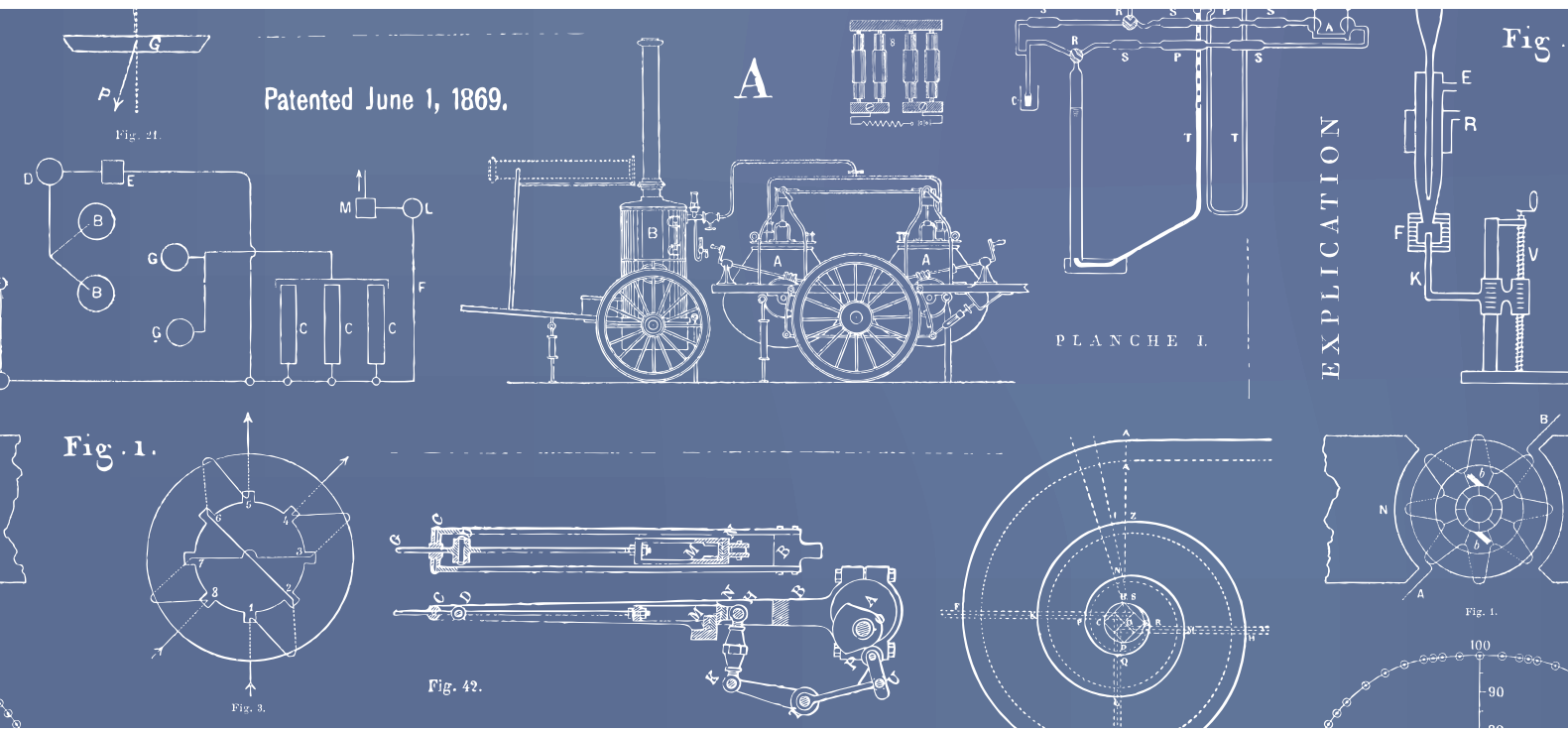

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PILOT STUDY FOR ESSENTIALITY ASSESSMENT OF STANDARD ESSENTIAL PATENTS

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Project team

This research was conducted by a consortium of researchers from Eindhoven University of Technology, Technical University of Munich, AOMB (patent attorney firm), TaylorWessing (international law firm), Dialogic innovation & interaction (private consultancy firm) and Sant'Anna University Pisa. A core team was responsible for the overall study and project management. Members of the specialist research team carried out specific work packages. The internal patent evaluation team performed (blind) essentiality assessments but, as such experimental design dictates, were not involved in the experiment design, analysis or reporting.

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Commissioning body

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ABSTRACT / FOREWORD / EXECUTIVE SUMMARY

Abstract

This study investigates the technical and institutional feasibility of a system that ensures better essentiality scrutiny for Standard Essential Patents (SEPs).

We first studied the state of the art on essentiality assessment in literature, court cases involving larger scale essentiality assessments, essentiality assessment in patent pools, and the Japanese Hantei for Essentiality advisory opinion. A patent landscape analysis of SDO declared patents was performed to assess their use as input to essentiality assessment mechanisms. Technical feasibility was assessed in a pilot experiment, in which a variety of assessors evaluated patents for their actual essentiality. Institutional feasibility was, among other means, assessed via a stakeholder workshop.

Given (1) the observed interest in transparent data on essentiality of patents for standards, from implementers, patent owners and courts alike, (2) the potential benefits of such data for these parties and for the system as a whole, and (3) our finding that a system for generating such data seems both technically and institutionally feasible, we recommend policy makers to pursue the development and implementation of a system for essentiality assessments.

Foreword

This report has been managed by the Digital Economy Unit of the European Commission Joint Research Centre (JRC). The report was developed under the framework of the 2017 Communication of the European Commission 'Setting out the EU approach to Standard Essential Patents' (COM(2017) 712 final). This research builds on the previous work and expertise of the European Commission gathered in the field of standardisation and intellectual property rights, namely the following reports:

- 2014 study for DG ENTR 'Patents and Standards – A modern framework for IPR-based standardization'.
- 2015 JRC Science for Policy Report 'Fair, Reasonable and Non-Discriminatory (FRAND) Licensing Terms; Research Analysis of a Controversial Concept' EUR 27333 EN.
- 2015 JRC Science for Policy Report 'Intellectual Property and Innovation in Information and Communication Technology (ICT)' EUR 27549 EN.
- 2016 study for DG GROW 'Transparency, Predictability, and Efficiency of SSO-based Standardization and SEP Licensing - A Report for the European Commission'.
- 2016 study for DG GROW 'Landscaping study of standard essential patents in Europe'.
- 2017 JRC Science for Policy 'Licensing Terms of Standard Essential Patents; A comprehensive Analysis of Cases' EUR 28302 EN.
- 2019 JRC Science for Policy 'Making the rules. The Governance of Standard Development Organizations and their Policies on Intellectual Property Rights' EUR 29655 EN.
- 2019 JRC Science for Policy 'The Relationship Between Open Source Software and Standard Setting'. EUR 29867 EN.

Executive summary

Policy context

In November 2017, the European Commission issued a Communication "Setting out the EU approach to Standard Essential Patents" [17]. The first topic, covered in this Communication is on "Increasing transparency on SEPs exposure". The Commission notes that information on the existence, scope, and relevance of SEPs is vital for fair licensing negotiations and for allowing potential users of a standard to identify the scale of their exposure to SEPs and necessary licensing partners. The Communication discusses essentiality assessments as a means of increasing transparency, announcing that the Commission will launch a pilot project for SEPs in selected technologies to facilitate the introduction of an appropriate scrutiny mechanism [17, p. 5]. In March 2018, the Council of the European Union issued 'Council conclusions on the enforcement of Intellectual Property Rights', in which they also address this topic [11, §15].

Benefits of essentiality assessments

Depending on its design and depending on which transparent data on essentiality is generated, such an assessment mechanism (or system, as we will call it in this report) can have important benefits (see also Table 15), including:

- Determining the actual SEP exposure for a given product (including knowledge on which patent owners actually hold actual SEPs for a given product);
- Facilitating smoother and faster SEP licensing negotiations, requiring fewer resources and reducing transaction costs in general;
- Reducing legal tension and 'unnecessary' court cases, and increasing legal certainty;
- Enabling better assessment of reasonableness of individual royalty rates;
- Providing data valuable in the context of infringement procedures, especially when dealing with unwilling licensees.

Such benefits are particularly relevant in a world where standards that require the use of patented technology are becoming more and more widespread, where developments like IoT, Industry 4.0, connected cars and much more are reshaping the technological landscape and ecosystems. Many more companies, especially SMEs, will be part of future license negotiations. Maintaining an opaque environment in an increasingly complex and diversified area of technological uptake appears to bear high risks.

Objective of this study

The objective of this study is to *"assess the feasibility of a system that ensures better essentiality scrutiny for SEPs. This includes both the technical feasibility, how better scrutiny possibly could be carried out, and institutional feasibility, which institutions could possibly set-up and implement a system of better scrutiny"* [16].

Methodological approach

A combination of approaches was applied to investigate whether it is technically and institutionally feasible to introduce a system for large-scale essentiality assessment. In short:

- **Case studies** enabled us to learn from existing activities where some form of essentiality assessment has already been carried out. We looked at case studies on (1) academic and commercial literature reporting on essentiality assessment activities, (2) court cases that included large-scale essentiality assessments, (3) patent pools, and (4) the Hantei opinion for Essentiality offered by the Japan patent office.

- A **specific investigation** was carried out to explore the **potential of automated systems** in the context of essentiality assessments, including Artificial Intelligence (AI).

- A **landscape study on potential SEPs disclosed at Standards Developing Organisations (SDOs)** was performed to investigate, among other things, how such disclosures could be used as an input for essentiality assessments.

- A **pilot experiment** was conducted, in order to investigate technical feasibility. Here, 28 different persons spent 176 working days, performing a total of 205 SEP assessments (considerably more than the 30 SEP assessment specified in the technical specifications for this project). This experiment was carried out in close collaboration with six European patent offices, who provided examiners available for the assessments, and also helped to refine the assessment protocol. Internal project teams also participated in this experiment as assessors. The close collaboration with companies provided invaluable information to conduct this experiment, such as claim charts (which are documents that match specific patent claims – and their features – to specific parts of a standard).

- The interactive process included a **stakeholder workshop** with 23 participants, covering all relevant stakeholder categories (including SMEs), in particular to learn about the many relevant aspects of institutional feasibility. We also had numerous other exchanges with other parties to validate and complement our findings.

Below, the key findings of our study are summarised. In Chapter 10, these key findings are discussed in more detail.

Key findings on the concept and meaning of essentiality

1. **Essentiality is a binary concept, but an essentiality assessment is a complex process.** Conceptually speaking, a patent is either essential for a standard, or it is not; there is no such thing as a 'degree' of essentiality.

2. **Essentiality can only be determined once the standards' document in question is final (often referred to as 'adopted' or 'frozen') and once the patent in question is granted.** Only at that point in time, the precise normative elements in the standard, and the exact scope of the exclusive rights conferred by the patent, are known.

3. **Patent essentiality differs from patent validity, patent enforceability, and patent value, and these concepts should be kept separate.** Nevertheless, these concepts are all important in the context of licensing negotiations concerning essential patents and deserve attention. They are also related to each other and in particular cases cannot be seen in isolation.

4. **Patent essentiality also differs from patent infringement, because infringement depends on the specific implementation of a standard in a device.** Whether a specific device actually infringes a specific actually essential patent often depends on the type of device: not every device category needs to incorporate all the normative elements of a standard. In addition, it may also depend on whether the patent in question is only essential to an optional normative feature (which may or may not have been implemented in the device). Finally, a device may implement (and thus infringe) a patented invention that is not essential.

5. **An essentiality assessment ideally starts from the definition of essentiality, but could also be designed in an alternative way, closer to procedures that patent examiners are familiar with.** Both the pilot experiment and extensive discussions with stakeholders indicate that the results are largely similar, even though there might be rare edge cases where differences emerge.

6. **Essentiality assessments should be based on the normative elements of the standard only. Standards should be drafted in such a way that it can be clearly determined which are the normative elements.** Standards contain both normative elements (which may be mandatory or optional) as well as non-normative elements (e.g. recommendations, possibilities, and informative statements). Most SDO have rules which define how specific words and/or how the document structure signals what is normative or not. It is important that such rules are well respected by those that draft standards.

7. **Essentiality assessments should be based on the claims of the patent.** Solely the claims determine the scope of the exclusive rights conferred by the patent. The description and drawings of the patent should be used to interpret the claims.

Key findings on existing essentiality assessment mechanisms (case studies)

There is a very wide range of essentiality assessments available. They differ considerably in design, efforts, and quality. The below findings on these existing mechanisms are on the basis of desk research.

8. **Claim charts play a key role in high-quality essentiality assessments.** In patent pools, actual assessments are outsourced to independent, specialist third parties, who receive claim charts as input. Individual companies prepare claim charts also for their own, standard-based licensing programs. The availability of claim charts is found to have a great positive impact on the quality of the outcomes and the efficiency of essentiality assessment. Here, efficiency refers to the resources required to achieve that quality.

9. **To date, patent pools have the most sophisticated systems in place for independent essentiality assessment, and there are many opportunities to learn from them.** Pools have well-developed appeal processes in place. Companies also create claim charts for the purpose of their individual licensing activities.

10. **Differences in national patent law do not pose substantial problems for large-scale essentiality assessments.** Such differences (e.g. the Doctrine of Equivalents or induced infringement) may however still technically impact the outcome of a small number of essentiality assessments.

11. **There are substantial differences in essentiality rates across firms and across technology generations.** This has been confirmed in a number of court cases. This confirms that there is merit in transparent information on essentiality: in licensing negotiations, one cannot simply assume that all companies, over all technologies, have similar essentiality rates.

12. **Courts use information from large-scale essentiality assessments to reach their verdict, even though they recognise the information they used, usually provided by experts, is not perfect.**

13. **For several reasons, market parties have not made use of the Japanese advisory opinion for essentiality, known as Hantei-E (as of 10 March 2020).** Our conversation with JPO staff indicated that likely reasons are: (1) there are several stringent admission criteria, (2) the test itself is narrowly defined, and (3) only one single patent is investigated, which means no insights are gained on essentiality at the portfolio level. The procedure was revised in June 2019, and the significant changes that were made might make the system more appealing to potential users.

14. **Commercial assessments studies vary considerably in methodology and quality.** Moreover, details about the methodology are often not made available, which makes the quality of the outcomes difficult to assess.

15. **None of the existing assessment mechanisms we looked at establishes a formal legal status of essentiality** (unless agreed between parties in a private contract, e.g. in patent pools). Parties disagreeing on the outcome of the essentiality assessment can challenge the assessment in court.

16. **In existing, large scale essentiality assessment schemes, the resources spent for commercial studies and for court cases are very diverse (many range from € 300 to € 1000, but there are outliers as high as € 9000 per patent). The resources spent in a patent pool to assess a single European patent range from € 5,000 to € 10,000.** Note that the procedures and depth of the work differ greatly between them. The assessors in the above-mentioned schemes are usually technical engineers (both senior and supervised junior), patent attorneys, and patent lawyers.

Key findings on AI-based and other automated approaches

In our study, we also looked at possibilities to use artificial intelligence (AI)-based and other automated approaches for essentiality assessments. Our findings here are based on extensive discussions with stakeholders.

17. **AI-based and other automated approaches for essentiality assessment** (e.g. based on semantic similarity) are promising as supportive tools. Such tools can facilitate human essentiality assessment, increase their quality and/or reduce the amount of resources required.

18. **For several reasons we believe automated approaches will not be able to replace human efforts for full essentiality assessments in the short or medium term.** These reasons include: (1) the precise meaning, interpretation and scope of words and terminology (both in patents and standards) cannot easily be 'understood' by an automated system, (2) semantic approaches can face difficulties dealing with changes in terminology over time, (3) patents are written in a different vocabulary (or even language) than standards, (4) a technology or solution required to implement the standard may not be explicitly mentioned in the standard's text (i.e. implied by the standard), (5) an essentiality assessment should consider possible alternatives to the patent under investigation that may also satisfy the standard, (6) an AI system would require a (not yet existing) reference training set, with a sufficiently large number of verified assessment outcomes, both positive and negative.

19. **The use of AI-based approaches for essentiality assessment may come with new challenges,** such as anticipation (by those that file patents or submit technical proposals for standards) and acceptance of such AI systems by stakeholders.

20. **The introduction of a (non-automated) assessment system creates the opportunity to build a large data set of verified assessment outcomes, both positive and negative. This reference data set could then be used to develop and validate future AI-based system.** On the short to medium term, this could lead to an AI system as supportive tool, and on the longer term, perhaps, to a fully automated system for essentiality assessments.

Key findings on technical feasibility

Our findings on technical feasibility are based on a pilot experiment with a total of 205 essentiality assessments.

21. **Our experiment confirmed that essentiality assessments on a larger scale, where each assessment takes on average approximately 7 hours, are technically feasible.** We compared the outcomes by assessors with various backgrounds with the assessment outcomes of the same patents done by patent pools, seen here as our reference point. The most consistent results are achieved by individuals who work in a patent office as patent examiners and are provided with a claim chart. They achieve a consistency rate of 84% (despite spending

considerably less time than the pool assessors). In our experiments, assessors who are senior engineers in academia score lower than that (75% consistency rate, without input claim charts). (Note that even in an experiment where assessments were – again – done by the pools themselves, it is not guaranteed that the outcomes this time would be 100% consistent to the earlier findings.)

22. **We expect the performance observed will improve in a future essentiality assessment system.** Firstly, performance was likely impacted negatively by several choices that were necessary to meet the scientific requirements for the experiment design. Among other things, we did not allow assessors to communicate with the patent owner to ask for clarification, to consult additional (public) information sources (such as the patent prosecution history) or to discuss cases with colleague assessors. In practice, such restrictions can be lifted, and performance is expected to increase. Secondly, in an actual implementation, there are (more) opportunities to seek specialisation, for instance by allocating patents to assessors according to their key technological competences, and by individual specialisation on specific standards or even parts of standards. Thirdly, there are strong reasons to expect significant learning effects both at the individual and group level, as a result of specialised training. Fourthly, the system could implement features that improve accuracy, such as allowing parties (patent owners and/or third parties) to challenge the outcome of the assessment. Altogether, we anticipate substantially higher consistency scores, even though these could not be quantified in our study.

Key findings on institutional feasibility

Our investigation on the institutional feasibility of essentiality assessment is based on a variety of sources, including a stakeholder workshop (see Section 9.1 for details).

23. **Setting up a system for essentiality assessment is institutionally feasible**. Doing so, a choice has to be made for a consistent set of design choices across many interrelated dimensions, which involve several challenges and trade-offs. There are several scenarios that offer such a consistent set of design choices.

24. **Many stakeholders express a clear interest in increased availability of transparent data on the essentiality of patents for standards.** The interest comes from different stakeholder categories, among which implementers, patent owners, and courts. In addition, SDOs have expressed interest in information on actual essentiality. While actors in these categories sometimes have different reasons for their interest, there are also commonalities, like the potential for smoother and faster licensing negotiations, reducing transaction costs in general, for parties that are in principle willing to enter into a license.

25. **The above-mentioned interest is mostly expressed in relation to mobile telecommunications and wireless networking standards, but the future may bring a similar interest in other standards.** The emergence of IoT, Industry 4.0, changes in vertical industries, as well as the anticipated role of standards in solutions helping to address Grand Societal Challenges (standards for smart grids, Intelligent Transport Systems, etc.) may lead to a need for transparent data on essentiality for other, more domain-specific standards. Because it is hard to predict for which precise standards will be of interest in the future, it is advisable to set up any mechanism for essentiality assessments in an open manner, so it can be used in relation to any standard.

26. **This study distinguishes five types of data relating to essentiality.** These are:
    i. '*Numerator data*' is information on the actual SEPs portfolio of a specific patent owner for a specific standard.
    ii. '*Denominator data*' is information on actual SEPs owned by *all* relevant patent owners for a specific standard. In combination with numerator data, it can indicate the size (extent) of the SEPs portfolio owned by a specific patent owner in relation to all SEPs for the standard in question. Being able to do so is crucial for one of the licensing principles expressed by the European Commission [17], which states that, in defining a FRAND value, an individual

SEP cannot be considered in isolation, and one needs to take into account a reasonable aggregate rate for the standard.

iii. *'Validated summary claim charts'* are one-page summaries that map claims in the actual essential patents to relevant parts of specific standards documents, also considering device categories and optional normative features. Such data helps to understand why and how a patent is essential, and also allows one to determine whether a patent is indeed used by a specific product (as a specific product usually does not implement all the normative elements of a standard. This data type both benefits patent owners and implementers in a number of ways but also benefits the patent owner specifically in an infringement context and helping it to meet one of the key requirements of the Huawei/ZTE legal framework.

iv. '*Detailed assessment outcomes'* provide extensive information on both patents assessed to be essential and those for which essentiality was not found. It is especially valuable for patent owners, for instance when they want to challenge the outcomes of an assessment, or when they need to prove possible infringement.

v. '*Current ownership data'* provides, as the name suggests, information on the current owner of the patent in question. Without this data, knowledge about essentiality of a given patent has considerably less relevance, and without it, it is hard to create the numerator data mentioned above.

27. **A system for essentiality assessments should make accessible the underlying data points.** With such detailed data, the user can create the information that is relevant for use in a specific context by applying relatively simple filters (which standards documents, which device categories, which optional features, etc.).

28. **The availability of claim charts (made available by the patent owner) as input for an assessment procedure is an important aspect of designing a system that combines high quality with high efficiency.** This is also confirmed by our experiment as well as by patent pools. Equally, it is important to acknowledge these claim charts are usually made and provided by the patent owner with an interest in a positive outcome. Therefore, in any mechanism, assessors should be well-instructed and gain experience in critically reading such claim charts, and assessments using such charts as input should remain rigorous and thorough. Essentiality assessments are however also possible without access to claim charts. In that case the claims for consideration must be selected by the assessor (and patents often have many claims). This makes the assessment more demanding (but completely independent from patent owner involvement). As a result, the amount of required resources will likely be higher, or the level of accuracy will likely be lower.

29. **This study identifies nine scenarios** (see Table 1 below) **for a large-scale essentiality assessment mechanism. These scenarios differ in the degree they create the various data types relevant for essentiality, and in their feasibility.** A scenario is a set of consistent design choices over the dimensions identified in this study (see Table 14). Below, Table 1 shows the degree by which these scenarios generate transparent data on essentiality, and the degree to which their implementation is feasible.

	SCENARIOS								
	0: Status quo	A: Self-assessment	B: All SDO disclosed patents	C: Sampled SDO disclosed patents	D: Voluntarily requested by patent owner	E: As D plus third-party requests	F: As D plus sampled disclosed SDO patent	G: AI-based system	H: As D plus assistive AI system
Degree to which transparent data on essentiality is generated [Main limitation]	**Low** *[No data at all]*	**Low** *[No impartial data, diversity of definitions and tests]*	**Medium** *[No type III or type IV or ownership data]*	**Low to medium** *[Limited numerator data, type III or type IV or ownership data]*	**Medium** *[No denominator data. For non-participating firms, no numerator data and no ownership data]*		**Medium to high** *[For non-participating firms, less detailed numerator data and no ownership data]*	**Low to medium** *[Depends on public acceptance; no type III or type IV or ownership data]*	**High** *[For non-participating firms, no ownership data]*
Feasibility of implementation [Main challenge]	**High**	**Low** *[willingness]*	**Low** *[financing, capacity]*	**Medium** *[financing]*	**Medium to high** [participation]		**Medium to high** *[participation, financing]*	**Not yet**; possible in the (distant) future?	**Not yet**; possible in the (nearer) future? [participation]

TABLE 1: OVERALL SCORES OF THE SCENARIOS ON (A) THE GENERATION OF TRANSPARENT DATA ON ESSENTIALITY AND (B) IMPLEMENTATION FEASIBILITY. Type III data is 'validated summary claim charts' data; type IV data is 'detailed assessment outcomes' data. Dark orange indicates a low degree or a low feasibility, yellow medium, and green high.

30. **We identify the three scenarios that are the most promising.** These scenarios, described below, score at least 'medium' in terms of the degree to which transparent data on essentiality is generated.

- *In Scenario B, all patents disclosed to SDOs as potentially essential for a given standard are systematically assessed.* The advantage of this scenario is that it satisfies many (but not all) expressed interests for transparent data on essentiality, and its implementation is independent of parties' willingness to participate or provide input: data is created for the full landscape. A main downside is that it requires very significant resources (in person-years). A lack of clear opportunities for a financing mechanism might make it difficult to self-finance this system. Finally, in this scenario the system does not generate information on patent ownership, which is also important for many uses of essentiality data.

- *In Scenario D, assessments are initiated at the request of the patent owner, who then also provides claim charts as input to the process*. The advantage is that this scenario can generate rich data on essentiality, including ownership data and detailed data that may help to make patent licensing negotiations smoother and faster. The involvement of patent owners also allows for higher quality and more cost-efficient assessments and is likely to increase acceptance in the market. Furthermore, it requires considerably fewer resources than the above scenarios and allows for a self-financing model in which all those that benefit contribute their share. Because patent owners perform a self-selection of potentially essential patents and the procedure is more cost-efficient, the overall needed resources are considerably lower than in Scenario B. A major downside is that it relies on voluntary participation by patent owners, and no data is generated for those parties who do not participate (and therefore no comprehensive overview of the total essentiality landscape is created).

- *Scenario F combines the key elements of the two scenarios above, and assessments initiated at the request of the patent owner are complemented with an assessment of patents disclosed to SDOs.* For the latter, however, a representative sample of granted patents is taken instead of a systematic review of each and every patent. This scenario combines the key advantages of the two above scenarios. Required resources are estimated to be slightly higher than in Scenario D. Compared to Scenario B, an amount of overhead would need to be added to the on-demand assessment, and/or (pre)financing for the sampling part would be required.

Two other scenarios (G+H) use some form of automated assessment, like Artificial Intelligence (AI). While promising, we think these two scenarios are not yet feasible in the short term but may become feasible in the future.

31. **Many stakeholders indicated they would support a system for essentiality assessment. However, only once final decisions on system designs are made (and published) and the system is operating, will we see the actual support for a specific design.** To gain more support, it would be advisable to involve stakeholders throughout the different stages of setting up (e.g. setting requirements, defining specifications, and designing) any system for essentiality assessment. As standardisation is global and involves patents at national and international levels, it would be beneficial to open it to skilled assessors specialised in these different legislations, for gaining credibility and trust from all stakeholders.

32. **Many stakeholders embraced the principle of 'all benefiters should pay'.** While determining the allocation of costs and finding a way to collect financial contributions may be difficult, the voluntary participation scenarios we discussed (D, E, F and H) offer good opportunities to collect contributions that are then shared among the benefiters, in a market-based mechanism. Such a system will obviously require significant resources. However, stakeholders point out that such investments are still minor in light of the high potential value these essential patents represent, the considerable costs associated with acquiring and exploiting these legal rights, and the potential benefits if SEP transaction costs, tension and legal battles were reduced.

33. **While a transparency system has a public benefit, it would also be beneficial if the system were self-financing** (by all benefiting stakeholders in the entire ecosystem). This would reflect the utility and value that the stakeholders see in the system.

Recommendations

Transparent data on essentiality brings important benefits for all stakeholders. Based on our analysis we present recommendations addressed to policy makers in general and to the European Commission in particular (as commissioning body of this study), patent owners, implementers of standards, patent offices and patent organisations, patent pools, Standards Developing Organisations (SDOs), and, finally, to all stakeholders.

a) **We recommend policy makers to pursue the development and implementation of a system for essentiality assessments.** We recommend them to further formulate the precise requirements for such a system, identify the demand for a specific design, and assess its impact when creating a new legal framework, while taking into account the issues and risks relating to any particular approach. Because both the product markets and patent licenses in standards-related markets have a predominantly global character, we also recommend policy makers to collaborate with similar institutions from other regions/countries to work towards an open and harmonised approach.

b) **We recommend that policy makers engage with all stakeholders in the above process, as acceptance by stakeholders is a key success factor.** Among other things, this requires the system to be designed and operated in such a way that it earns trust. To achieve this, it is important to ensure high levels for reliability, thoroughness, and impartiality. It is also beneficial to keep information up to date as appropriate.

c) **When designing a system for essentiality assessments, we recommend to specifically consider the three most promising scenarios we identify.** These are:

- *A scenario where all patents disclosed to SDOs as potentially essential are systematically assessed (Scenario B in this report).* The advantage of this scenario is that it satisfies many (but not all) expressed interests for transparent data on essentiality, and its implementation is independent of the willingness of parties to participate or provide input: data is created for the full landscape. A major downside is that it requires very significant resources, which might be hard to raise in a self-financing manner. It also does not generate information on patent ownership, which is important for many users of such data. Moreover, it requires that the SDO in question publishes all the disclosed patents' identities, and this is not the case for SDOs that allow blanket disclosures.

- *A scenario in which assessments are initiated at the request of the patent owner, who then also provides valuable input claim charts as input to the process (Scenario D).* The advantage of this scenario is that it generates rich data on essentiality, including ownership data and detailed data that can help to make patent licensing negotiations smoother and faster, which already provides a benefit for patent owners to participate. The involvement of the current patent owners also allows for higher quality and more cost-efficient assessments and is likely to increase acceptance in the market. Furthermore, it requires considerably fewer resources than Scenario B, and allows for a self-financing model in which all those who benefit are contributing their share. A major downside is that it relies on voluntary participation by patent owners, and for those parties that choose not participate, no data is generated (and, in case participation is low, no comprehensive overview of the total essentiality landscape is created).

- *A scenario that combines elements of Scenarios B and D, and assessments initiated at the request of the patent owner are complemented with an assessment of patents disclosed to SDOs.* For the latter part, however, a representative sample is taken of disclosed granted patents instead of a systematic review of each and all patents. This scenario combines the key advantages of the two above scenarios.

d) **We recommend that, in designing a system, to take into account the various business and licensing models of SEP owners.**

e) **We recommend to recognise the specific situation of SMEs.** For SMEs that implement standards, it is important that transparent information on essentiality is available at the product category and optional feature level, enabling them to determine the relevant SEPs for their specific products (for instance an IoT device that uses a the 3GPP NB-IoT protocol, which only implements a very specific part of the total 5G standard). It has to be taken into account that some SMEs might not be able to mobilise as much knowledge or skills to interpret/process that information in a business context. For SMEs that are potential owners of SEPs, the assessment system should be designed in such a way that it does not create unnecessary obstacles to participate, and that the anticipated benefits clearly outweigh the costs.

f) **We recommend to strive for a self-financing system for essentiality assessments,** in which all benefitting stakeholders in the ecosystem contribute. This would reflect the utility and value that the stakeholders see in the system.

g) **We recommend the European Commission to arrange for a small, supervising body to design and define the procedures, to oversee the system, to harmonise internationally with the different regions/countries concerned, and to have overall responsibility for quality and performance.** Actual assessment tasks can then be outsourced to existing organisations, especially those that already have experience with similar tasks, such as patent offices and patent organisations, as well as law firms and patent attorney firms that already perform essentiality assessments. A certification scheme is a good way to ensure that these organisations perform the assessment in a harmonised manner and meet the requirements for reliability, impartiality, quality and performance.

h) **We recommend to consider the detailed assessment procedure developed in our pilot experiment as input when specifying and designing a system.** This procedure is described in Chapter 8. Our procedure was developed in close collaboration with patent offices and with input from experts. We furthermore recommend embracing the specific, future improvements we identified in our pilot experiment (see Section 8.3). Among other things, such improvements include technical specialisation, collaboration between assessors and between assessors and patent owners, and training and learning in individual as well as group settings.

i) **We recommend to explore Artificial Intelligence (AI) based approaches to support essentiality assessments in the future. We recommend starting by arranging essentiality assessment records to be collected so they can be used for developing (including training and validating) AI systems for this specific task.** One option is to have a future competition, where external parties get access to a dataset for training and testing purposes in order to develop AI-

based systems. The performance of these contenders is then validated (using a different part of the data set), and the best design can be selected to play a complementary role (e.g. pre-screening) in the essentiality assessment system.

j) **We recommend that patent owners consider how a system for essentiality assessment can benefit them.** In specific, we recommend them to consider how 'validated summary claim charts' (this is a one-page summary mentioning claim numbers and sections in standards documents; see Section 9.2.1) can help them to conclude smoother and faster licensing negotiations with willing prospective licensees and enable them to act better when facing unwilling prospective licensees.

k) **We recommend that implementers consider how a system for essentiality assessments can benefit them and how they can contribute to support or facilitate such a system.** A potential benefit for implementers is that such a system can help them check if license offers by patent owners are fair and reasonable. A possible form of support could be an indication of their willingness to cooperate proactively and constructively when transparent, impartial information is available on actual essentiality resulting from the application of a defined and published methodology.

l) **We recommend that the European Patent Office (EPO), national patent offices and/or patent organisations consider playing an active role in carrying out assessments in a system for essentiality assessments to be introduced.** This study identified that these organisations are very well positioned in terms of knowledge and skills to perform this task, and widely trusted to be impartial and objective.

m) **We recommend that patent pools and their members investigate whether the assessments they perform (and have performed) can serve as an input to a new system for essentiality assessment** and engage in discussion with the European Commission with the aim of evaluating whether a fast track procedure can be implemented.

n) **We recommend that patent pools and their members investigate how essentiality assessments under the new assessment system can play a role in their own patent inclusions procedures.** Patent pools could benefit from the efficiencies and effectiveness of assessments done under the new assessment system, if these meet their requirements for those assessments, possibly in the form of input to additional own assessments.

o) **We recommend that Standards Developing Organisations (SDOs) implement improvements in their disclosure rules/procedures and (access to) disclosure data**, while ensuring that such steps do not compromise the current roles these processes and databases have in their own processes and policies. Such steps would not only facilitate (external) essentiality assessments but also provide added value for their members and stakeholders otherwise. We recommend that SDOs specifically consider improvements in:
   a. *data specificness* (e.g. data on the individual patent identity and on the specific standard, document, document version or specific sections or parts within such documents),
   b. *data quality* (e.g. updating unharmonised records and orphans, and complement incomplete disclosures), and
   c. *keeping data up to date* (e.g. by updates of disclosures).

p) **We recommend that all stakeholders mentioned above adopt a constructive and collaborative stance towards the potential creation of a system for essentiality assessments.** While there are certainly differences between parties, the availability of transparent data on actual essentiality in the long term will benefit all benevolent parties in the market, will reduce transaction costs and friction. In the current practice, information is usually shared under NDAs, and it often takes months if not years to agree on them. It takes courage to move to a new practice, in which documents such as *validated summary claim charts* (see above) are shared without NDAs, or perhaps even made public. Yet, such a change is likely to eventually offer great benefits to both patent owners and (willing) licensees. Maintaining an opaque environment in an increasingly complex and diversified area of technological uptake appears to bear high risks. Forward-looking steps will require parties to think in terms of possibilities, not objections.

1 INTRODUCTION

1 Introduction

1.1 | Context of the study

Both, the standardisation system and the intellectual property system are of key importance for our increasingly technological society. Both systems aim to promote innovation and contribute to general welfare. They bring about technological solutions that are important in our daily lives, and there is a strong expectation that new technological solutions can help us to address grand societal challenges in the fields of energy, transport and mobility, environment and sustainability, health and wellbeing, and a secure society.[1]

At the same time, there is tension between the standardisation system and the intellectual property system. While they serve common goals, the standardisation system is based on inclusiveness (so that any party, without undue barrier, can implement technical standards), whereas the intellectual property system is one that provides parties with rights to exclude others from using specific innovations.

Many standards setting organisations addressed potential problems that can result from this tension by adopting Intellectual Property Rights (IPR) policies. A very common policy found in the major Standards Developing Organisations (SDOs) is one in which members (or other participating in the standard-setting process) are (1) obliged to notify ('disclose' or 'declare'[2]) the SDO of their belief that they own patents[3] that may be or may become necessary to implement standards developed by that SDO (i.e. an obligation to 'disclose' patents are potentially 'essential'[4]) and (2) requested to undertake a commitment to license such patents under Fair, Reasonable and Non-discriminatory (FRAND) terms and conditions should these patents actually become essential.[5] If a patent owner decides not to enter into such a commitment, the SDO will ensure that the standard they develop does not require the patented invention in question. By having such policies, SDOs reduce the risk that investment in the preparation, adoption and application of standards could be wasted as a result of an essential patent for that standard being unavailable.

The above declarations are usually made public by the SDO, and their numbers have been growing over time. At the time of writing, the European Telecommunications Standards Institute (ETSI) alone published 297,557 disclosed patents, belonging to approximately 25,000 patent families. It is important, however, that these are patents that were believed to 'may be or may become' essential for a standard, and do not tell us about whether they are actually essential. A party may, for instance, have submitted a technical proposal and (properly) disclosed patents related to this proposal at that time, but the eventual standard may not include the technology in the proposal. Or a party may have made a declaration on the basis of a patent application (as most SDO policies indeed require), but the eventual granted patent does not include the claim any more that would be required to implement the standard. Such cases are not rare, and it is believed that many disclosed patents, if not the majority, is actually not essential. [6]

That patents that once were disclosed are not actually essential does not hamper the working of the SDO IPR policies in any way. Their goal of preventing to develop

[1] These challenges are among the main focus of the EU's Horizon 2020 research and innovation program, which reflects the policy priorities of the Europe 2020 strategy and addresses major concerns shared by citizens in Europe and elsewhere (European Commission, 2020).

[2] SDOs differ in the terminology they use here, and some SDOs use both terms (sometimes with slightly different meanings; for instance, a 'declaration' may be a document where a party 'discloses' one or more patents and also enters into a licensing commitment). For reasons of consistency, we will only use the term 'disclosure' in this report.

[3] While such policies often cover any form of IPR, in the scope of this report we will specifically focus on patents.

[4] Further on in this report, we discuss more specific definitions of essentiality.

[5] In this report, when we talk about essential patents, we in principle refer to patents that actually essential (sometimes referred to by others as 'factually essential'), unless we specifically mention 'potentially essential', 'alleged essential', etc.

[6] See also Chapter 3, that discusses court cases. While the data from such court cases night not be perfect, they do provide us with an order of magnitude.

standards for which essential patent are unavailable, is still met. Yet, it does mean that this list of disclosed patents cannot be regarded as a total overview of actually essential patents. This makes this database not well fit to be used, for instance, for licensing purposes (there are other reasons for this as well; for instance, a declarations database does not inform us about the *current* owner of a patent).

In November 2017, the European Commission issued a Communication "Setting out the EU approach to Standard Essential Patents', often referred to by its number, COM(2017)712 Final [17]. This communication covers four main topics, of which the first is titled 'Increasing transparency on SEPs exposure'.[7] The Commission notes that information on the existence, scope and relevance of Standard Essential Patents (SEP) is vital for fair licensing negotiations and for allowing potential users of a standard to identify the scale of their exposure to SEPs and necessary licensing partners. The Communication discusses essentiality assessments as one way to increase transparency, and introduced this as follows:

> *"Evidence points to the risk of broad over-declarations and makes a strong case for more reliability with respect to SEP essentiality. Stakeholders report that recorded declarations create a de facto presumption of essentiality in negotiations with licensees. This scenario places a high burden on any willing licensee, especially SMEs and start-ups, to check the essentiality of a large number of SEPs in licensing negotiations. There is therefore a need for a higher degree of scrutiny on essentiality claims. This would require scrutiny being performed by an independent party with technical capabilities and market recognition, at the right point in time. Having said this, introducing such a scrutiny requirement to SEPs must be balanced against the cost. However, an incremental approach, whereby scrutiny takes place at the request of either rightsholders or prospective users, calibrating the depth of scrutiny and limiting checks to one patent within a family and to samples, could ensure the right cost-benefit balance of this measure."* [17, p. 5] (footnotes omitted).

In the Communication, the Commission furthermore *"considers that declared SEPs should be subject to reliable scrutiny of their essentiality for a standard, and will launch a pilot project for SEPs in selected technologies with a view to facilitating the introduction of an appropriate scrutiny mechanism"* [17, p. 5].

In March 2018, the Council of the European Union issued 'Council conclusions on the enforcement of Intellectual Property Rights', in which they also address this topic [11, §15]. Here, the Council *"emphasises the importance of more transparency related to the essentiality of patents and invites the Commission, together with relevant stakeholders – including, where applicable, Intellectual Property Offices – to develop a system that ensures better scrutiny."*

1.2 | Objective of this study

The objective of this study is to ***"assess the feasibility of a system that ensures better essentiality scrutiny for SEPs. This includes both the technical feasibility, how better scrutiny possibly could be carried out and institutional feasibility, which institutions could possibly set-up and implement a system of better scrutiny"*** [16]. Among other things, the call for tenders specified that a sample of at least 30 SEPs had to be assessed (we eventually carried out 205 assessments), a SEP landscaping analysis had to be carried out, and case studies to be executed on court cases, the Japanese Hantei-E model, and at least 3 patent pools.

While the above aim is short, it is a challenging one. In order to answer it, we deployed and combined a number of different research approaches (see below), both considering existing knowledge and experiences as well as carrying out experiments to create insights that do not yet exist.

[7] The other three topics are "General principles for FRAND licensing terms for SEPs", "a predictable enforcement environment for SEPs" and "open source and standards", respectively.

It is also important to note that in-depth mechanisms that would generate data on patent validity, on other aspects of patent enforceability (such as non-expiration, renewal fees paid, formal requirements being met, etc.), or on the technical merit or economic value of patents, are outside the scope of this study. Yet, we do discuss such aspects when they relate to specific aspects of essentiality assessments.

1.3 | Methodology

In this study, various methods were employed to answer the research questions. Figure 1 provides a schematic overview of how the full study was set up. The arrows represent the (dominant) knowledge flows and dependencies between tasks.

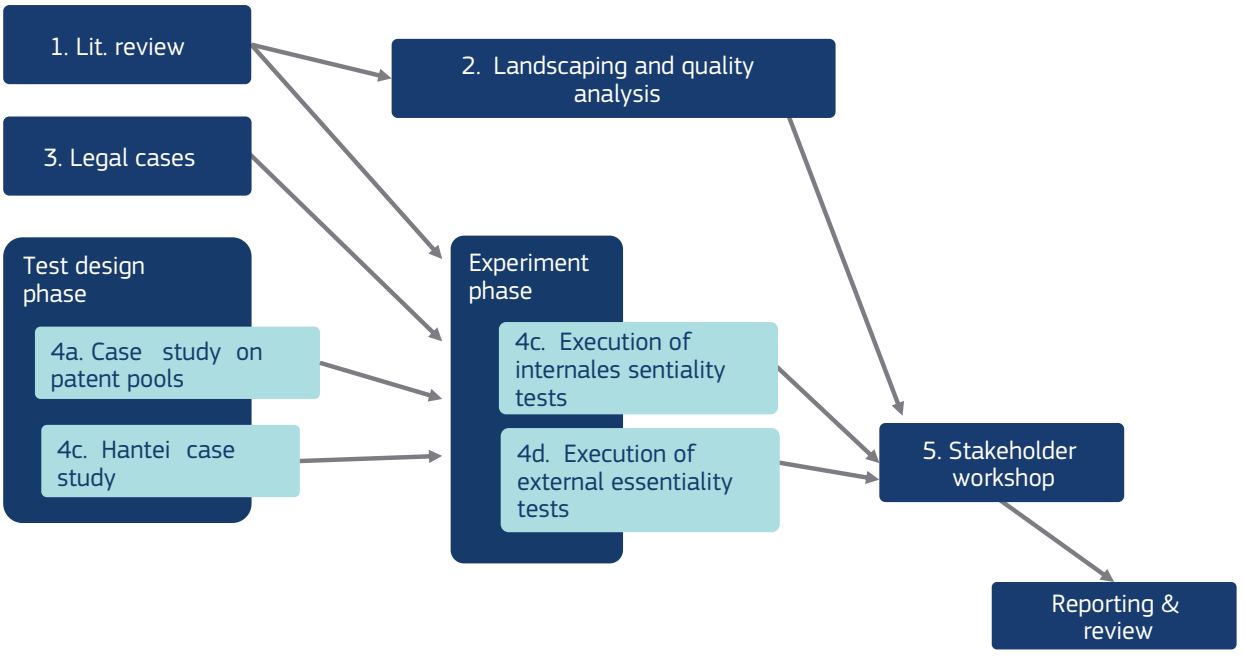

FIGURE 1: SCHEMATIC OVERVIEW OF THE STUDY.

In the initial, exploratory phase of the study, the *literature review* provided an overview of the academic, commercial and institutional reports on essentiality assessment mechanisms. A *landscaping analysis and* a *quality analysis* were performed simultaneously to gain insight into the relevance of essentiality assessment mechanisms.

We then investigated current implementations of essentiality assessment through three case studies:

- A *legal case study* analysing various court cases in which essentiality evaluation was carried out.
- In an analysis of *patent pools*, we describe and compare the mechanisms put in place by patent pools to determine the essentiality of patents before entering the patent pool.
- An analysis and evaluation of the Japanese *Hantei advisory system*.

From the knowledge gathered thus far, an *experiment* was performed in order to test the *technical* feasibility of essentiality assessment as well as the necessary parameters: what experience and training levels are required, are there learning effects for evaluators, etc. The experiment was carried out by a team consisting of researchers (with participants from various backgrounds, ranging from patent attorneys to senior engineers), as well as teams of patent examiners at European patent offices.

For both the landscape analysis and the experiment, we focused on ETSI standards. One reason for that is that the declarations database of ETSI is the best database of its kind. The fact that we focussed on ETSI standards in the landscape analysis and the experiment does not imply, however, that the overall scope of transparency and feasibility of a mechanism for essentiality assessment is limited to ETSI.

The final step was to discuss the range of technically feasible methods and *institutional feasibility* through a workshop.

The outcomes of all the steps are presented in this report, which contains policy recommendations regarding essentiality assessment mechanisms in Europe.

1.4 | Structure of this report

The remainder of this study is organised as follows: Chapters 2 to 5 present the insights from the case studies, starting with a literature review (Chapter 2), then an overview of relevant legal cases (Chapter 3), an investigation of patent pools (Chapter 4) and an explanation of the Japanese Hantei for Essentiality Advisory Opinion (Chapter 5). In Chapter 6, we summarise our landscaping exercise. Chapter 7 describes in detail the technical feasibility of essentiality assessment, based on our pilot experiment. Chapter 8 presents the organisational feasibility of such an assessment mechanism, derived from the views collected during the stakeholder workshop. In Chapter 9 we integrate all the outcomes, resulting in a number of key findings and recommendations. The Annexes contain an overview of the material we consulted in our literature study (Annex 1), the instructions and feedback form used in our pilot experiment (Annex 2) and the list of stakeholder workshop participants (Annex 3).

2

LITERATURE REVIEW OF ESSENTIALITY ASSESSMENT

2 Literature review of essentiality assessment

2.1 | Introduction and selected literature

To develop a method for essentiality assessment of SEPs, we built on and learned from earlier approaches to such assessments. We conducted a literature review in order to collate and analyse existing publications reporting on essentiality assessments performed by various parties. We focussed on studies that analyse what share of declared SEPs determine which patents declared as standard essential are in fact essential for the respective standard.

By reviewing existing publications, we found out about essentiality assessment methods employed in practice. More precisely, we collated and analysed information on a) the overall approach to essentiality assessment applied in each case, b) the patents (or patent documents) that are subject to essentiality assessment, and c) the entities or persons tasked with essentiality assessment. We also learned about the context and how the use of these methods is embedded as part of our aim to assess the quality and cost of essentiality assessments.

Annex 1 contains an overview of all the sources we used for this review.

2.2 | Main topics in the selected literature

Essentiality assessments of patents and in particular declared SEPs are commissioned by different parties, for various purposes, and with varying approaches. Even though many literature contributions rely on manual assessments of essentiality, process design choices and operationalisations can differ substantially. We grouped the main findings into six topics.

Main topic 1: Results and accuracy of essentiality assessments

The rate of actually essential patents across the various studies differs substantially, from 20% in Goodman & Myers [24], 35% in PA Consulting Group [37] and approximately 56% in two Cyber Creative Institute studies [13]. The differences can be partly attributed to the fact that these studies look at different standards, at different periods in time, and use different samples. It is therefore not easy to determine the accuracy of any of these studies (see Main Topic 6, below).

Main topic 2: Assessors' qualifications

The assessors' qualifications can vary. Many studies provide limited information on qualifications. Fairfield [20], [21], [22] report that "telecom engineers" and, in later studies, "experienced wireless engineers" did the assessments; Jefferies [33] mention "physics PhDs, wireless engineers, patent law specialists" and "former patent office employees". In the case of the 3G3P patent pool, the lead evaluator is usually a patent lawyer or a knowledgeable agent from the firms in the International Patent Evaluation Consortium (IPEC) consortium.

Main topic 3: Time spent and number of patents rated per person

The studies also seem to differ considerably concerning the time an assessor spends on each patent, although precise information on this parameter is not usually provided. Only Fairfield [22, p. 17] report "an average of one hour of analysis per patent". 3G3P is at the upper end of the scale, claiming to devote an average total of three working days to assessing one application to the pool (two days by the lead evaluator, half a day each by two additional evaluators). No report provided detailed information on the number of patents assessed per person. This variable should be relevant since we would expect learning effects, resulting in increased speed and/or accuracy.

Main topic 4: Parts of the patents considered

Some studies mention which parts of the patents were considered in the assessment. Others do not provide this information. In the case of 3G3P, patent owners provide extensive information on the patents prior to essentiality assessments, including claim charts, with an explanation of why they consider the input claims essential for the respective parts of the standard.

Main topic 5: Cost

Few studies provide precise cost estimates, and the estimates that are given vary. PA Consulting's discussion document [36] prepared for the ETSI IPR Meeting in 2015, indicates that their assessment costs € 300 to € 500 per patent. At the same time, they claim that developing claim charts and running thorough validity checks would cost € 5,000 to € 10,000 per patent. Similarly, Charles River Associates [10] estimate that for one declared patent, a "medium" assessment would cost around € 4,500 and a full assessment € 9,000. In the case of the 3G3P patent pool, we estimate higher costs. The lead evaluator devotes on average two working days to assessing one application.

Main topic 6: Reliability

Most of the studies we analysed do not compare their assessment results with any external, high-quality benchmark (such as the patent pools' assessment), not even a subsample of the patents they studied. Thus, we have no information on the accuracy of their essentiality assessments. The one exception is the academic study by Brachtendorf et al. [8], which we discuss in more detail in Chapter 6. As far as we are aware, most studies also do not measure inter-coder reliability (where the same patent is assessed by two or more assessors, and the level of agreement is measured). This is only mentioned in the case of 3G3P, where three evaluators assess one patent (although information on the level of agreement is not provided). If two studies refer to the same standard and the same set of patents, then reliability could be checked at least on an aggregate level. However, the standards and/or patent sets that were analysed differ across studies, which makes it difficult to compare the results. Even the definition of a "patent family" is not consistent across all studies.

2.3 | Conclusions

In recent years, a number of commercial assessment studies and services related to essentiality have been published and introduced. Even though the approaches of these studies may look relatively similar at first glance, they can differ substantially when it comes to details. The definition of essentiality varies, and several studies actually measure something different entirely (such as 'seminal patents'). Although detailed information on their

methodology and actual execution is often incomplete or not publicly available, we observe there is a great diversity in design, operational choices, and resource investment.

In spite of the differences between the various studies, we were able to identify some design features and learnings to be considered for this study:

- Most studies start from lists of patents disclosed as potentially essential, for instance patents disclosed to ETSI. Patents are considered until either a certain cut-off disclosure date, or according to which standard or technical specification they refer to.

- Relevant patents are usually grouped into patent families (definitions vary or are often not provided), and then a representative patent is identified and assessed for essentiality. The exact approaches to this grouping exercise differ between studies. Some studies not only consider granted patents but also investigate 'essentiality' of patent applications (one can dispute whether such a thing is possible in the first place).

- It is not always clear from the various reports which part of the standards documents' text was actually used in order to assess essentiality (i.e. only specific claims or the entire patent text). In some cases, patent owners could provide additional information (e.g. claim charts), thereby indicating which claims to look at.

- In terms of the actual essentiality assessment process, the commercial and institutional studies we reviewed all utilise manual assessments of essentiality. The (few) academic contributions we identified on this topic all used an automated approach (being semantic similarity between patent and standard documents).

- Most studies seem to be commissioned or carried out by consultancies specialising, to some degree, on intellectual property. They either get external evaluators involved or ask internal expert staff to carry out the assessments. Nonetheless, most studies did not provide details on the assessors carrying out the assessments, such as qualification and experience.

It is hard to assess the quality of the outcomes of these efforts, as there is no accountability, no appeal procedure, and no evaluation of the outcomes. Most of the studies do not present indicators of data validity, such as inter-rater reliability or a comparison of the results to a benchmark of known accuracy. Such indicators would be useful for the interpretation and evaluation of the results.

3

CASE STUDY ON COURT CASES INVOLVING LARGER SCALE ESSENTIALITY ASSESSMENT

3 Case study on court cases involving larger scale essentiality assessment

3.1 | Introduction and studied court cases

The overall aim of this case study is to learn from relevant legal cases about the design and implementation of essentiality analyses. In order to do so, we identified – within a large pool of case law - almost twenty court cases and competition agency rulings that involved (directly or indirectly) determining patent essentiality in the context of technical standards. In consultation with the European Commission and its JRC, we subsequently focused on three court cases that included *large-scale* essentiality analyses and therefore had the most potential for the overall aims of our study. These three cases are: Unwired Planet v Huawei (judgement issued in 2017) [44], TCL v Ericsson (judgement issued in 2017) [40] and Innovatio (judgement issued in 2013) [26].

Before further introducing these three cases below, we would like to note that:

- This case study focuses specifically on essentiality assessments as conducted in the context of these court cases. We do not consider the numerous other interesting aspects of these cases, nor their outcomes (unless directly related to essentiality assessments).

- While we committed our best efforts to correctly summarising these court cases on the relevant aspects, the cases and the actual procedures for the essentiality analyses described, have a level of detail that is impossible to fully discuss within the scope of this case study. For more details, we therefore refer readers to the actual rulings.

3.1.1 Unwired Planet v Huawei (2017)

Unwired Planet International is a non-practicing entity that acquired a telecommunications patent portfolio from Ericsson, with the aim of concluding license agreements with implementers of relevant standards. Several implementers who refused to conclude a license were faced with infringement proceedings before the courts, and one of those implementers was Huawei. Unwired Planet brought infringement proceedings against Huawei before the High Court of Justice of England and Wales, Chancery Division, Patents Court. The judgement [44] was handed down in April 2017 by Judge J. Birss.

The proceedings related to the UK parts of six European patents from Unwired Planet's portfolio which the company used to sue Huawei, Samsung and Google for patent infringement in March 2014. Five of these patents were claimed to be an SEP by Unwired Planet and one was not. Unwired Planet's aim was to conclude a license for an entire portfolio rather than the six patents in dispute. Alongside technical trials discussing the technical merits of the disputed patents as well as the essentiality of those individual patents, the Court also scheduled a non-technical FRAND trial. This was to deal with *inter alia* essentiality, but on a much larger scale, to determine the total number of patents essential to each of the relevant standards. By April 2016, three technical trials had taken place involving four of the six patents. Two of Unwired Planet's patents were held valid as well as essential to the standard by the Court, and two were held invalid. At this point Unwired Planet and Huawei agreed to postpone the technical trials indefinitely.

Huawei lodged an appeal, for which the judgement [43] was handed down by the Court of Appeal on 23 October

2018. The content of the appeal judgement is not considered in this case study, because the appeal did not concern the essentiality assessment as performed by the parties in the first instance, nor the High Court's evaluation of those assessments.

3.1.2 TCL v Ericsson (2017)

Ericsson owns a large portfolio of patents relating to telecommunications. TCL is a large handset manufacturer and was the seventh largest seller of handsets globally in the last quarter of 2016 [45]. The two parties had concluded a license agreement with a term of seven years for Ericsson's 2G/GSM patent portfolio in March 2007, and over the course of the years, started negotiations on 3G/UMTS and 4G/LTE licenses as well. Between October 2012 and late 2014, while negotiations were still ongoing, Ericsson launched a number of patent infringement lawsuits in six non-U.S. jurisdictions: France, the UK, Brazil, Russia, Argentina and Germany. Negotiations between the parties, however, continued.

In March 2014, TCL filed an action with the Central District Court of California asking for a declaration that Ericsson had failed to offer FRAND rates and requesting the court to determine the FRAND rates to which TCL was entitled. In response, Ericsson filed a mirror image action in Texas, which was eventually transferred to the Central District Court of California and consolidated with TCL's initial action. The case did not involve a discussion on possible infringement of individual patents but focused on the calculation of the FRAND license for Ericsson's portfolio. The judgement [40] was handed down in December 2017 by Judge J.V. Selna.

In December 2019, this judgement was overruled on procedural grounds by a ruling [41] of the Court of Appeals for the Federal Circuit because Ericsson was denied a jury trial by the District Court. Therefore, the Court of Appeals did not have to deal with the other grounds for appeal, including the criticism of the portfolio calculation. This means that the judgement relating to this substance was "vacated", but not explicitly rejected. Thus, our report will only look at the calculations presented in the District Court's judgement.[8]

3.1.3 Innovatio (2013)

Innovatio IP Ventures LLC owned a portfolio of patents relating to wireless networks which originally belonged to Broadcom. Innovatio had sued a large variety of users who applied the IEEE 802.11 standard (popularly known as 'Wi-Fi') in their day-to-day businesses, like restaurants, coffee shops, hotels, and grocery stores, for violating 23 of its patents. A number of device manufacturers, including Cisco, Motorola, Netgear, and Hewlett-Packard, sought a declaration that their products – and the networks or systems that those products were a part of – did not infringe Innovatio's patents, and that these patents were invalid. In turn, Innovatio accused the manufacturers of infringing those 23 patents as well. All cases were referred to the Northern District Court of Illinois for so-called multidistrict litigation. The judgement [26] was handed down in September 2013 by Judge F. Holderman.

3.2 | Main findings from selected court cases

In each of the above cases, one or more large-scale essentiality assessments were performed by the parties involved. These were usually done in the context of the 'top-down approach', in which, for a given standard, the essential patents portfolio of a specific company is compared to all existing essential patents.

Below, we discuss important aspects of these essentiality assessments.

[8] See [41, p. 19, Footnote 8]: "As Ericsson confirmed during oral argument, we need not reach any of its arguments challenging the district court's FRAND analysis if we conclude that the district court violated Ericsson's right to a jury trial."

3.2.1 Selection of patents to be assessed

In the reviewed court cases, we observed several sets of starting points in terms of patents to be assessed on essentiality. In the **Unwired Planet v Huawei** case, both parties had instructed experts to perform essentiality assessments: one is referred to in the case as HPA and the other as MNPA. In short:

- The HPA calculations took ETSI disclosed patents as starting point. This involved various steps, including ETSI database extraction and de-duplication, then finding patent family members. Eventually, a set of 18,938 potentially essential patent families was identified. Of these, 11,384 families were selected that included at least one issued and non-expired patent and an English or Chinese language member. In the next step, families were allocated to one of more of the following 'classes': GSM (n=1,525), UMTS (n=5,158) and LTE (n=7,077).[9]

- The MNPA calculations also took ETSI disclosed patents as starting point, focussing only on the LTE standard. This also involved a number of selection steps (seven in total), many of which were similar to HPA: identifying the patent families declared as essential to ETSI for the relevant standard, removing duplicates and expired patent families. Several steps were criticised during the proceedings, which led to a revised MNPA. The revised MNPA identified 5296 'live LTE families', 1781 fewer than the comparable 7,077 families identified by HPA. In later steps, that set of families was divided into 3,377 'core' and 1,919 'non-core' patent families.[10] Within 'core', it then identified 2,128 families as potentially relevant for handsets, and in 'non-core' 1,209 patent families potentially relevant for handsets.[11]

In the **TCL v Ericsson** case, only TCL had instructed experts to perform an essentiality analysis for both (1) the total number of patents essential to the standard (the 'denominator'), as well as (2) Ericsson's share relative to that number (the 'numerator'). For (1), the starting point was disclosed patents at ETSI, and their identified patent family members. The following steps selected active families (at least one patent is non-expired), patents published in English, and patents with claims potentially essential for user equipment. The 7,106 patent families remaining after the selection process were then divided into 2G, 3G, and 4G, and then sorted by patent owner for the 15 largest patent owners. For (2), the TCL experts started with a set of 235 patent families that Ericsson contended to be essential to the 2G, 3G, and 4G standards. For 192 of these, Ericsson had provided claim charts, and these were the ones selected for essentiality assessment by the TCL experts [40, pp. 32-33].[12]

In the **Innovatio** case, the starting point was a set of 444 patents claims asserted by Innovatio to be infringed. Note here, that the Northern District Court of Illinois kept to the language of the IEEE Bylaws, which explicitly refers to Patent Claims instead of Patents.[13] The defendants contended that all these 444 patent claims were in fact essential to the IEEE 802.11 standard, and therefore covered by a FRAND obligation. Innovatio claimed that only 276 patent claims were essential, and that it was not bound to a FRAND obligation for the other claims (allowing the company to demand a higher royalty-fee, for instance).

In summary, we see that several analyses presented at court cases take the ETSI database of disclosed patents as their starting point. These analyses are similar in terms of the selection and filtering steps considered relevant (e.g. family reconstruction, filtering for the relevant standard, de-duplication, selection of granted and non-expired patents, relevance for the relevant device category). The actual operational choices across these analyses, however, vary considerably (see below) and have a significant effect on the ultimate selections. Furthermore, some analyses applied additional filters, for the time period or 'importance' of the patent. In the context of this report, these observations are important:

[9] For more details, see [44, §286-289]. For the numbers mentioned, see especially the figure in §288.

[10] For this analysis, 'core' denotes importance, not the common technical use of that word (the common distinction between 'RAN' and 'Core network'). In the MNPA, whether a patent was a 'core' patent or not was determined by a cut-off date: any patent with a priority date after 31st December 2008 was non-core, see [44, §274].

[11] For more details, see [44, §274-281]. For the numbers mentioned, see especially the figure in §278.

[12] Note that it was contended that certain patents were essential to multiple standards, which resulted in 219 pairs of patent families and standards with corresponding claim charts.

[13] For more details, see [27, pp. 13-14].

different selections only lead to different patents being assessed. They will also likely lead to different 'essentiality rates', even if the results of each individual assessment were identical. For the purpose of this case study, we define 'essentiality rate' as the total number of patents found to be essential, divided by the total number of patents investigated for essentiality. Such a rate could be calculated for all companies that own patents relevant to a given standard, or for one patent owner in particular. Often, the denominator in this division (i.e. 'total number of patents investigated') is the total number of patents disclosed at an SDO as potentially essential for a given standard, but the denominator can also be another set of patents, such as a set preselected by a patent owner.

Finally, the Innovatio case raises an interesting aspect for this study: a patent owner can also have an interest in asserting that their patents are *not* essential to a standard.

3.2.2 The use of sampling

In two of the analyses, sampling was used to reduce the number of patents that would have to be assessed for essentiality.

In order to determine rates of essentiality in the Unwired Planet v Huawei case, the experts who conducted the revised MNPA analysis (see above), made their selection of potentially essential families as discussed, then drew random samples of the patents owned by two selected, large patent owners. The extent of these samples, 38 and 30 patents respectively, was argued to be *'of a size that would allow [..] to draw conclusions with at least 90% confidence about the pool from which the sample was drawn."*[14] The court in this case did not criticise the fact that sampling was used. The results that the experts derived from this exercise were later used in their calculations as average essentiality rate for the whole industry.

In the TCL v Ericsson case, the experts who performed an essentiality analysis drew a random sample of one-third of the patents from each of the 15 largest patent owners, for each standard (GSM, UMTS and LTE). The resulting sample included 2,600 patent families [40, p. 28]. This sampling procedure was not criticised by the court or disputed by the opposing party.

3.2.3 Essentiality assessment procedures

Below, we discuss which procedures were used for essentiality assessment in the court cases under review, what criticisms were raised, and the courts' responses to these criticisms. Note again that these court cases are sophisticated; sometimes courts dismiss certain criticisms, at other times courts acknowledge them, but adopt adjustments or corrections and still use the results. It is beyond the scope of our analysis to discuss our cases in that level of detail, and so for further details, see the actual rulings.

In the **Unwired Planet v Huawei** case, again we need to distinguish between the efforts of the experts on both sides. The experts doing the 'HPA' analysis reviewed *"the essentiality of a patent in [the 11,384 families mention in the previous section]. The review took about 30 minutes per family. The patent and relevant standard were selected in accordance with given rules. The claims of the patent were compared to the relevant standard specification to determine if the standard required all the elements of the claims. If the Evaluator determines that the specification does not provide a clear reason to rule out the patent as being essential, then the family is deemed essential. If the family provides a clear reason to rule out the patent being essential, the family is deemed not essential. [...]"* [44, §286] On the opposing side, the expert conducting the 'revised MNPA' analysis, was asked to review the 38 respectively 30 patent families of the two selected, large patent owners (see above), and this took him 5-6 hours per patent family. He concluded that the essentiality rate of one of these patent owners (excluding optional features) was at most 16.6%, then revised that further to 15.9%. He concluded that the essentiality rate (excluding optional features) for the other patent owner was at most 9.4%.

[14] For more details, see [44, §333].

Various objections were voiced against both approaches. Concerning the HPA analysis, one critique related to what could be summarised as its "in case of doubt, consider the patent to be essential" approach, which results in an overestimation. The judge commented: *"I find that it is accurate to describe the evaluation step in the HPA as a step which errs on the side of including a patent in the deemed essential pool."* [44, §355]. For the revised MNPA, however, the court noted that *"The corresponding number in the Revised MNPA is 355 but that number is much too low if it is too represent all Relevant SEPs."* [44, §377]. Eventually, for its own calculations, the court picked a number about halfway between the results of these two analyses. [44, §377].

In the **TCL v Ericsson** case, as explained above, one party had a sample of 2,600 patents assessed by a team of assessors for essentiality, and of those, a subset (17%) was checked by an expert for accuracy.[15] The procedure of essentiality assessment received several criticisms from the opposing party, one being that the team of assessors "must have spent on average about 20 minutes per patent, and charged $100", pointing out the difference between the fees charged in patent pools. To this criticism, the court replied: *"While charging on average only $100 per patent family may be cheap, this process is only intended to provide a workable size of the relevant universe and has no need to be as precise as a licensing pool must be. The Court does not think that the internal procedures used by either patent pools or Ericsson to determine the essentiality of their own patents are fair benchmarks for assessing quality of the analysis done by [the assessment team for TCL]. While they are similar tasks, they require very different levels of certainty because the results are being used in very different ways."* The court did, however, agree with the criticism that the experts who performed the essentiality assessments had failed to read the entire patent specification. It was therefore probable that they had included too many patent families. Here, the court writes: *"This means that they may not have noticed if a patent contained a means plus functions claim, likely would not have noticed if a patent used its own lexicography, and would not have read any specification disclaimer or the file history."* [40, p. 31].[16]

In the **Innovatio** case, both sides had involved experts to discuss the essentiality of the patent claims. As already explained, in this case it was not the patent owner but the defendants who contended that certain patent claims were in fact essential to the relevant IEEE 802.11 standard (so the FRAND commitment would apply). Therefore, the court ruled that the burden of proof should rest with the defendants, and thus their analyses were subject to the most scrutiny [27, p. 13]. The court itself also performed in a sense an essentiality analysis since it had to rule on each and every individual patent claim whether it was essential or not.[17]

3.2.4 Findings on essentiality rate

As mentioned in Section 3.2.1, we see 'essentiality rate' as the total number of patents found to be essential, divided by the total number of patents investigated for essentiality. Such a rate could be calculated for all companies that own patents relevant for a given standard, or for one specific patent owner. Often, the denominator in this division (i.e. 'total number of patents investigated') is the total number of patents disclosed at an SDO as potentially essential for a given standard, but the denominator can also be another set of patents, such as a set preselected by a patent owner.

In the court cases under review, we find – or can calculate – various results for these essentiality rates, as produced by experts but also by courts themselves (often based on adjusted input from experts). Such numbers should be looked at with utmost care. They cannot be compared with each other, unless the process used to generate them is identical or, at least, comparable. We showed in Section 3.2.1 that the analyses in the court cases under review differ considerably in operational choices, as well as in essentiality assessment procedures. Indeed, looking at exercises where the starting point was SDO disclosed

[15] For more details, see [40, p. 28].

[16] The court also rejected several steps in the TCL expert analyses concerning the importance and contribution of the patents in question, adjustments to arrive at royalty rates, and a confirmation step on the basis of forward citations; however, these steps are beyond the scope of this study focusing on essentiality assessments.

[17] [27, pp. 23-48] contains said analysis per technological category.

patents, we see essentiality rates for the entire industry ranging from 16.6% (for the 4G/LTE standard) [44, §333] all the way up to 47.9%.[18] Looking at exercises where the starting point was a specific set of asserted patents, we see essentiality rates between 70.7% for a given company's 2G portfolio[19] and 100% for another specific company's asserted patent claims.[20] [27, p. 49].

Having expressed our concerns about reporting absolute essentiality rates, and about comparing rates derived from exercises using different operational choices, we think it is useful to examine the differences between rates generated by one and the same exercise. This shows significant differences over technology generations. To illustrate, in the HPA analysis for the Unwired Planet v Huawei case, we found that the essentiality rate of disclosed GSM patents was 28% higher than disclosed UMTS patents, and 14% higher than disclosed LTE patents.[21] While the court in question acknowledged that specific procedural choices affected the results of this analysis (see above), such choices probably affected the results for the various technology generations (GSM, UMTS and LTE) in the same way.

Across various patent owners, we see even larger differences. For instance, the revised MNPA analysis in the Unwired Planet v Huawei case assessed the essentiality rates of two selected, large patent owners. The rate found for one company was 69% higher than the other.[22] Even though we acknowledge the possible limitations to this specific analysis, it suggests there are significant differences in essentiality rates across companies.

Case	Analysis or data by	Standards in question	Total standard or portfolio of a specific party?	Essentiality rate	Numerator
Unwired Planet	Experts for Huawei ('HPA')[23]	2G/GSM	Total standard	41.2% for all 20.5% for RAN 23.7% for UE	ETSI disclosures plus filter ("Identified disclosed families with at least one issued and non-expired patent and an English or Chinese language member"
		3G/UMTS	Total standard	31.8% for all 18.2% for RAN 22.4% for UE	
		4G/LTE	Total standard	35.8% for all 22.4% for RAN 26.3% for UE	
	Experts for Unwired Planet ('MNPA')[24]	4G/LTE	Total standard	13.9%	ETSI disclosures plus filter
		4G/LTE	Portfolio of major patent owner A	9.4% 'at most'	
		4G/LTE	Portfolio of major patent owner B	15.9% 'at most'	
	Judge Birss[25]	4G/LTE	Total Standard	26.2%	n/a (*)
TCL	Experts for TCL[26]	2G/3G/4G	Total of all three standards	47.9%	ETSI disclosures plus filter
		2G/3G/4G	Total U.S. patents of all three standards	44.5%	
	Judge Selna[27]	2G/3G/4G	Total U.S. patents of all three standards	39.4%	n/a (*)

TABLE 2: ESSENTIALITY RATES DERIVED FROM TWO COURT CASES (DISCLAIMER: THESE RATES HAVE BEEN OBTAINED USING DIFFERENT DATA SETS, ASSUMPTION AND PROCEDURES AND CANNOT BE COMPARED).
RAN: Radio Access Network, a specific part of mobile standards. UE: User Equipment, referring to a handset.
*: Rate chosen after considering input of both parties.

[18] Percentage derived from [40, p. 29]: 446 (2G) + 1,166 (3G) + 1796 (4G) patent families / 7,106 total patent families = 47.9%.
[19] Percentage derived from [40, p. 34]: 29/41 = 70.7%.
[20] Here the court concludes asserted patents were found to be essential by court.
[21] Calculations based on the numbers as reported in [44, §288].
[22] Calculations based on the numbers as reported in [44, §333].
[23] See [44, p. 64] The "for all" rates can be calculated by dividing the three numbers mentioned in Step 5 by the corresponding numbers mentioned in Step 4 of the HPA table. The RAN and UE numerators can be found in the same table and column below Step 5.
[24] See [44, §333]. The rate of 13.9% is the average of the two rates of patent owner A and patent owner B.
[25] See [44, §377]. The rate of 26.2% is the average determined by the Court of the two LTE numbers contended by the experts from both sides.
[26] See [40, pp. 28-29]. Rates are calculated as follows: the total number of SEPs identified as essential (446 + 1,166 + 1,796) divided by the total number of patent families of 7,106.
[27] See [40, p. 32]. Rates are calculated as follows: the total of (365 + 953 + 1,481) divided by the total of patent families of 7,106.

Table 2 summarises the essentiality rates that can be derived[23] from the Unwired Planet v Huawei judgement and the TCL v Ericsson judgement.[24] These numbers must be treated with care and are provided to demonstrate once more that using different data sets, assumption and procedures, can lead to essentiality rates can varying greatly (which makes comparisons difficult).

3.2.5 Use of essentiality findings on final judgement

In all the cases reviewed, the courts noted imperfections and sometimes flaws in the submitted essentiality assessment analyses. At the same time, these courts expressed their view that some uncertainty is inherent to such tasks, and that a certain degree of uncertainty can be acceptable. They explain that imperfections and flaws do not necessarily mean that there is no merit in the findings of such analyses. Without being exhaustive, the above is reflected by the following court statements:

> *"First, as with the HPA, one needs to take care with the results because the error bars are wide. However the results of the MNPA are not meaningless and do not systematically favour Unwired Planet, as long as one does not think the results are the true essentiality rates."* [44, §367].

> *"The task the HPA performs is an inherently difficult one. The answers can only ever be approximate. In the HPA the essentiality evaluation step is and was intended to be a coarse filter to screen out non-essential patents and to err on the side of including a patent in the deemed essential pool. This does not mean the method is flawed or unreliable. I am satisfied that the HPA has applied a consistent yardstick and produces meaningful results. It is a reasonable attempt to deal with over-declaration and derive information about how many essential patents there really are."* [44, §361].

> *"Having now been through all the points in detail, I will stand back and consider the MNPA as a whole. Broadly the HPA and MNPA are aimed at the same difficult task. The MNPA has flaws but, apart from one aspect of the Original MNPA, overall in my judgment the Original MNPA was and the Revised MNPA is a reasonable attempt to derive information which allows one to assess the strength of a portfolio of patents declared essential to LTE as against the industry as a whole, from the point of view of what licensees would be interested in."* [44, §366].

> *"Ultimately the Court finds that the flaws are not enough to justify rejecting TCL's experts' calculation of the total number of SEPs entirely. However, the Court does find it appropriate to make certain adjustments to TCL's calculation of the overall number of SEPs [...]."* [40, p. 32].

In all the cases we reviewed, the essentiality analysis results were eventually considered for reaching a verdict – and in fact played a significant role in each case.

3.3 | Conclusions

Having reviewed three court cases in which one or more large-scale essentiality analyses were performed, we now present several conclusions specifically selected for their relevance to our overall study.

- The common assumption by many is that a patent owner has an interest in having confirmed that its patents are actually essential, and an implementer an interest to see confirmed these patents are not actually essential. But from the cases we studied, we also see the opposite situation, in which a patent owner has an interest in having confirmed that its patents are NOT actually essential, and an implementer an interest to see confirmed these patents ARE actually essential. (This oppo-

[28] Some of these percentages are not mentioned in the judgement but can be derived by means of a simple division of the applicable numbers.

[29] We do not discuss the Innovatio case here, as it did not generate such data. Furthermore, the table does not contain data points of calculations where the start was a specific preselection of patents believed to be essential (as outcomes reflect the choices in that preselection, and outcomes are totally incomparable with the data in this table.

site situation seems especially relevant when patents are indeed implemented in products, and if they are not actually essential, then the owner is not bound by any FRAND commitment it may have made.)

- Those analyses that took SDO disclosed patents as a starting point, show a strong similarity in terms of the selections and filters found to be relevant. However, the actual operational choices in these analyses varied considerably and had a significant effect on the final set of patents to be assessed for essentiality. This is likely to result in different outcomes for the overall exercise, even though the results of each individual patent assessment would have been identical.

- In two court cases, sampling is used to reduce the number of patents that would have to be assessed for essentiality. In one case, experts used a 33% randomly drawn sample on a per-company, per-standard basis, and this approach was not criticised or disputed in the case. In the other case, experts used sampling to select 68 patents from two selected, large patent owners, and this sample size was argued to be large enough to achieve a 90% confidence level that the sample was representative for the pool from which the sample was drawn. Also here, this approach was not criticised or disputed.

- The actual assessment procedures varied considerably in design and parameters used. In some analyses, senior experts spent 5-6 hours per patent. In others, a team of assessors spent 20-30 minutes per patent, sometimes supervised by a senior expert, who validated a sample of the results.

- Because specific operational choices and differences in assessment procedures have a large impact on the outcomes, **the resulting essentiality rates of the various analyses we see in the court cases under review cannot be compared.**

- When looking at a single analysis, however, it is informative to note possible differences in essentiality rates across standards (e.g. technology generations) and across patent owners. For both, we observed large differences. In one analysis, the overall essentiality rate found for disclosed GSM patents was 28% higher than disclosed UMTS patents. In another analysis, the essentiality rate of one selected, large patent owner was 69% higher than the rate of the other selected, large patent owner for this analysis. **Such differences suggest there is merit in transparent information on essentiality: we cannot simply assume that all companies, over all technologies, have similar essentiality rates.**

- Although in all three cases some aspects of the patent selection procedures and the actual assessment procedures were criticised by the opposing party, and also the courts acknowledged that the outcomes of such assessments are not perfect and are subject to some flaws, the courts still took the position that such assessments do have merit. In fact, in all three court cases, the results of the essentiality assessments were finally used to reach a verdict (sometimes after the court made adjustments).

4

CASE STUDY ON ESSENTIALITY ASSESSMENTS IN PATENT POOLS

4 Case study on essentiality assessments in patent pools

4.1 | Introduction and selection of patent pools

Patent pools aggregate IPR for the purpose of joint licensing [42]. Pool membership is voluntary, and most patent pools focus on technology standards. Competition and antitrust laws require that the patents in pools are complementary and not substitutes. To meet this requirement, standards-based pools undertake efforts to ensure they include patents that are in fact standard-essential patents (after all, standard essential patents are by definition complementary).[30] When pool members submit patents to the pool, these patents must pass an essentiality assessment. These assessments are typically outsourced to specialist organisations, located across the globe.

Arguably, of all the organisations carrying out essentiality assessments and publicly share results, patent pools are arguably the most experienced: they are one of the few types of organisations in which essentiality assessment is currently implemented structurally. The aim of the patent pool case study is to learn as much as possible about essentiality assessment experiences in such pools.

This case study involved carrying out extensive interviews with five selected patent pool administrators, or recognised experts involved in the pool effort, as well as desk research on relevant documentation. The interviews lasted two to four hours each, mostly with several representatives of the patent pool (up to six). Four interviews were performed face-to-face, and one was via teleconference. All the interviewees were given a transcript of the interview as well as the opportunity to correct or augment this transcript afterwards. Two interviewees made use of this opportunity, and their additional feedback was processed. We also considered any document or reference provided by the organisations and interviewees where relevant.[31]

We selected the five following pools/pool administrators:

- **3G3P**, also known as the "WCDMA pool", or the "3G Patent Platform" is an initiative that emerged from the UMTS IPR Working Group, established in the late 1990s. Over the years the pool has selected different licensing administrators. For the first 5 years it was 3G Licensing, then for 5 years SIPRO, and since 2017 Via Licensing.

- **Avanci** is a relatively new patent pool focused on licensing technology for telecommunications in IoT markets (primarily connected cars, smart meters and connected homes).[32] The Avanci pool offers patents relating to 3GPP 2G (GSM, GPRS, EDGE), 3G (WCDMA, HSPA) and 4G (LTE, LTE-A) cellular standards. As per February 2020, the Avanci pool covers patents from 37 patent owners and counts Audi, BMW Group, Porsche, Skoda, Volkswagen and Volvo among its licensees.[33]

- **One-Blue** administers a patent pool holding patents related to Blu-Ray Disc (BD). One-Blue considers itself a 'one-stop-shop' for licensing UHD, BD, DVD and CD essential patents. Licensing programmes are split by product category (e.g. software, player/recorder, drive, PC, ROM discs, Recordable/Rewritable discs). One-Blue was established in 2009 by Panasonic, Philips, Sony, Hitachi, Samsung, and Cyberlink.

- **SISVEL** is an administrator of various patent pools related to wireless communication, audio/video coding, broadband technology and digital video and display technology, among others. SISVEL emerged from the patent and trademark department of Italian consumer electronics vendor Indesit in 1982.

[30] Carrying out essentiality assessments also helps to create a fair basis for royalty distribution among pool members.
[31] A particularly useful source for the 3G3P pool is [23].
[32] At the time of writing, licenses for connected cars and smart meters were already available, and licenses for connected homes were coming 'soon'.
[33] Source: [www.avanci.com], consulted 17 February 2020.

- **Via Licensing** is an organisation administering various licensing programmes, related to the AAC (an audio coding standard), LTE ("4G"), WCDMA ("3G"), 802.11a-j ("Wi-Fi") and several MPEG standards, among others. Via Licensing was formed in 2002 and is an independently managed subsidiary of Dolby Laboratories.

Most licensing administrators manage multiple pools. Usually, each pool has its own Pool Agreement that is reached by the patent owners involved in the pool's setting-up phase. Consequently, differences can arise between the precise rules and arrangements in pools within the same licensing administrators. We asked pool administrators to elaborate on such differences if any.

The interviews were semi-structured and focused on four main topics:

1. Patent submission procedure.
2. Technical aspects of the essentiality assessment procedure.
3. The evaluators performing the essentiality assessment.
4. Appeals and publication of results.

The findings presented here relate to the pools we interviewed; other pools may of course be organised differently. The interviews were held in March 2019 and other information has been updated up to 22 August 2019.

4.2 | Main findings from selected patent pools

4.2.1 Main topic 1: Patent submission procedure

Patent pools require prospective members to submit one or more patents for assessment. The **pools** also all **require a claim chart**, which they **consider** crucial **for being able to properly assess essentiality with an appropriate level of confidence.** Thus, we can characterise the assessment procedure as 'validating submitted claim charts', rather than performing 'greenfield' assessments.

The claim charts need to be detailed. For each patent claim deemed essential, the claim chart must identify for which standard document(s) and specific version(s) that is the case. Additionally, for each claim deemed essential, the chart must show how all the individual claim features match the specific text (sentences) in the standard, for instance using colour coding. Most pools expect patent owners to prepare the claim chart themselves; some pools offer claim chart construction as a service (for a fee). If the scope of a pool is limited to specific device categories (like terminals, also called User Equipment – UE), the patent owner must limit their claim charts to those devices.

If companies submit patents that belong to what they consider the same patent family, they inform the pool. Some pools will fully examine each family member independently,[34] whereas others only do so with defined 'key countries' and offer a lighter procedure for other countries.[35]

Fees

All the pools we analysed outsource essentiality assessments to specialised parties. When a patent owner submits a patent for assessment to a pool, the pool charges a fee, which the patent pools indicate reflects the actual, average costs of an outsourced essentiality assessment. In most cases, pools charge fixed fees, while others charge fees based on the actual (per-hour) costs, with an upper limit. The fees differ across as well as within pools.

The most significant variation within pools is due to differences in labour costs between various regions of the world (typically, pools source assessors from all major patenting countries in the world and assign assessors depending on the country where the patent is granted). In one pool, the assessment of a US patent costs twice as much as an assessment of a European patent, and ten

[34] Usually this is done by different evaluators, see below.
[35] For instance, by applying a 'vouching' procedure, where the patent owner makes a formal statement that a certain patent contains the same deemed essential claim(s) as another patent undergoing a full assessment and provides a certified translation as well.

times as much as the assessment of a Chinese patent. Some pools charge additional costs if the submitted patent is claimed to have more than two essential claims. Some pools charge costs per claimed product category. Most pools charge fees for re-assessment (see the section on 'appeals', below). There is often a discounted assessment fee for family members. The typical fee charged by pools for a European patent is between € 5,000 and € 10,000.

Patent selection

Only granted patents can be submitted for assessment. A prospective pool member must own and submit at least one patent they believe to be essential. It is up to the prospective member whether to submit *all* the granted patents they believe to be essential for the given pool, or to (initially) submit only a subset. In the first case, a higher royalty income from the pool may be expected, as the royalty allocation in virtually all pools is based on the number of patents positively identified as being essential.[36] In the second case, however, there are initially lower expenses on assessment fees, and the fees may be spread over time. During the interviews, pool administrators indicated that most companies choose to submit all the patents they believe to be essential already at an early phase.

None of the pools we analysed uses sampling methods. Several interviewees expressed their belief that competition law requires all patents in a pool to be assessed for essentiality, and thus sampling is not allowed. Some pools impose limits on the number of patents that can be submitted by a single patent owner for assessment ('caps'). Presumably, they do so because of the huge time and financial resources that would be required to assess all the potentially essential patents held by their members.

4.2.2 Main topic 2: Technical aspects of the essentiality assessment procedure

Most pools adopt a definition of essentiality that is equal or very similar to the one used by the SDO producing the standard. Some pools limit essentiality (by definition) to specific product categories. Most, but not all pools include patents for optional normative features in their definition.

Typically, pools exclude patents required to include features generally requested by buyers of products, but not covered by the standard as such (sometimes called 'implementation patents').

Pools expect the evaluators they contract to consider the full national law when they assess a patent for particular jurisdiction. **Theoretically speaking, the outcome of the assessment could depend on whether particular jurisdiction recognises the Doctrine of Equivalents,**[37] **or induced infringement,** or other specific national aspects. **Yet, interviewees indicated that in practice, such differences hardly ever matter for essentiality assessments.**

Standard version considered

In most pools, the submitting patent owner selects the version of the standard to evaluate against (usually the latest one available at that time). In some cases, the pool prescribes the version. Some pools explained to us that they also check whether a patent submitted for assessment covers an invention that was already present in an earlier version of the standard, predating the priority date of the patent – in that case, the patent is likely to be invalid in the first place.[38]

Usually, new versions of standards exclusively add features and almost never remove existing features. Additionally, licenses granted by pools typically cover current, previous and future versions of a standard. Hence, pools do not investigate whether a patent 'loses' essentiality in a later revision the standard version. (Almost invariably, a new revision of a standard is comprising all elements of the previous – one reason being the necessity to maintain

[36] The actual royalty allocation models may be complex, however, and involve more parameters.

[37] The Doctrine of Equivalents is a legal rule in many (but not all) of the world's patent systems that allows a court to hold a party liable for patent infringement even though the infringing device or process does not fall within the literal scope of a patent claim, but nevertheless is equivalent to the claimed invention.

[38] Note that pools do not check patent validity and follow the general rule that a granted patent is assumed to be valid until a competent authority decides otherwise.

backwards compatibility to products that implement an older version of the same standard. As a result, it is very uncommon that a patent 'loses' essentiality. Note, however, that while a 'new standard' or 'new standard generation' (e.g. 5G versus 4G) may inherit technology from the previous standard, but on that step, there will also be technology that is not 'inherited'.)

Rejection rates

When asked for rejection rates, pools report figures from 'almost zero' up to 10%. All pools stressed that this number is the result of strong selection effects: before submission, patent owners prepare a claim chart, and will only submit the patent to the pool if they themselves believe – based on the prepared claim chart – that the patent is actually essential. As a result, patents likely to be non-essential are not submitted to the pool in the first instance. Hence, the essentiality rate of patents offered to a pool should never be compared to the essentiality rate of patents disclosed to SDOs as 'potentially essential'. In addition, several pools 'pre-screen' patents, which further reduces the rejection rates in the assessment process. Lastly, there are also learning effects on the side of the patent owner in terms of preparing claim charts.

4.2.3 Main topic 3: The assessors performing the essentiality assessment

Most pools outsource essentiality assessment to external contractors, usually specialised law firms. Some pools outsource the task to the International Patent Evaluation Consortium (IPEC),[39] a network of 26 patent law firms in 23 countries performing essentiality assessment services. Outsourcing creates a strict division between essentiality assessment and the patent pools' other activities. Usually, a patent in a given jurisdiction is assessed by a contractor under that same jurisdiction. Within contracting firms, individual evaluators are selected on their experience in specific technology fields, and many individuals have performed work for different pools throughout their career.

In some pools, an experienced 'master' law firm develops the procedure and trains law firms involved in other jurisdictions to ensure consistency in procedures.

An essentiality assessment in the context of a patent pool on average requires between 2 to 3 days per patent, although there is considerable variation. In the (unusual) case of the patent owner not providing a claim chart, the assessment requires considerably more resources. As noted above, the fees charged for the assessment reflect the average costs.

To prevent bias or conflict of interest, pools respect the principle that an assessment is never performed by a law firm working for or against the owner of a patent to be evaluated. Pools usually also rely on the general principle that a law firm should not accept a task that might involve a conflict of interest. Often, pools have more than one evaluator in a given jurisdiction and can thus avoid such conflicts.

4.2.4 Main topic 4: Publication of results

Most pools make all positive assessment outcomes public by publishing a list of pooled patents.[40] For some pools, this list also differentiates product categories.[41] However, pools that limit the number of patents that can be submitted by a single patent owner for assessment ('caps') may not publish a list of pooled patents. Because they only look at a portion of the total portfolio of their members, these pools believe such a list is not meaningful.

The (detailed) outcome of the assessment is described in a report that usually remains confidential between the evaluator, the submitter,[42] and the pool. Neither do other

[39] See [www.ipside.com] and [ipec-patent-evaluation.com].

[40] Such lists can be found on the pools' websites. Several pools, however, indicate these lists are *samples,* and it is hard to say whether they are complete or not.

[41] An example here is the list published by Sipro Lab Telecom for the WCDMA pool [38].

[42] Sometimes, the submitter is only informed whether the outcome is positive or negative, and so if they want the report, they have to request it.

pool members nor third parties typically have access to this assessment report. The report typically states (1) whether the patent is essential or not, (2) the claim(s) found to be essential, and (3) considerations by the evaluator if the outcome is negative. For pools with different licensing plans for different device categories, the assessment report may also indicate for which device categories the patent was found to be essential. In some but not all cases, the report includes an annotated claim chart provided by the submitter, where the annotations from the evaluator relate to their interpretation of the claims.

While the above, full detail report is usually confidential, pools can also create complementary documents, with a somewhat lower level of detail, that may be made public or available to a wider audience. As an illustration of a specific case, we will now provide details on the documents issued by 3G Licensing and its successor, Sipro Lab Telecom, in their respective role of WCDMA patent pool administrator. These are:[43]

1. A "Certificate of Essentiality" establishes the current ownership of an identified patent associated with a Certified Essential Patent: it may be used widely to indicate that the Patent Owner has a Certified SEP and intends to actively license them;

2. A "Declaration of Essentiality" is usually one-page summary mapping claims in the identified patent to relevant product categories and relevant parts in one or more standards, each identified by a reference and version number (and often also reference to specific figures, table or other elements in the text of the standard). It allows any third party to quickly verify the essentiality of the patent. It may also support a patent owner in disclosing a patent to an SDO (and providing detailed information on the relevant standards sections and the 'illustrative part of the standard' if applicable);

3. The full output results of the assessment. This contains a full (validated) claim chart[44] where each claim submitted to essentiality assessment is broken down into a set of claim elements, each of them individually indicated to read onto a listed referenced and extracted relevant standard portion. These full output results are made available to the applicant only (and to the patent owner if it is not the applicant initiating the evaluation process). This document may be used to prove essentiality or may lead to prove possible infringement. Its use is decided by the patent owner.

Generally, the underlying documents used for assessment (including submitted claim charts) are considered commercially very sensitive information and are therefore covered by non-disclosure agreements (NDAs). The same is true for the potentially negative outcomes of assessments, which are not made public either. Interviewees indicated that one of their concerns is the legal risk, especially where an opponent could use such documents to their advantage.

4.2.5 Main topic 5: Appeal procedures

Most (but not all) pools have formal appeal procedures.[45] If this is the case, the owner of a rejected patent can request the assessment report or a motivation report (insofar this has not already been automatically provided) upon a negative outcome. If the patent owner appeals, some pools will request a different contractor to perform a new assessment (and neither the 'old' nor the 'new' contractor is informed this is a re-assessment). Other pools will ask the same contractor for a re-assessment, and the patent owner may provide clarifications, improved claim charts, or additional documents. In some cases, the patent owner can choose between a new contractor or the same contractor. Appeals usually come with a charge, albeit usually lower than a regular assessment.

Some pools also allow *licensees* to appeal a positive essentiality assessment. We have no data on how often this happens. Furthermore, some pools allow *other* pool members to appeal a positive essentiality assessment. They may do so by providing a 'fast procedure' where

[43] Sources: [2], [1] and [39].

[44] Note that this is not the *submitted* claim chart of the applicant.

[45] Note that pools evaluate whether a submitted patent goes against an agreed version of the standard (see above). The standard may further evolve, and a patent not found essential now, may indeed become essential for a future version. If a firm believes so, it can submit the same patent later on to be evaluated against a newer version. But we do not consider such cases to be an appeal.

the appellant ('challenger') provides all its arguments against the positive result, the patent owner rebuts, and the appellant is allowed to react to the rebuttal. After that, the evaluator makes a binding decision. This procedure, however, is hardly ever used, as most pool members do not want to provoke a *challenge war.*

4.3 | Conclusions

Patent pools have extensive experience of carrying out essentiality assessments. Although the context in which they do so (e.g., collective licensing, respecting antitrust/competition law) differs from that of the general essentiality assessments this study is investigating, pools do demonstrate a process which could in many ways serve as a *blueprint* for such general assessments. While their processes are discussed in detail above, patent pools typically have the following features and strengths:

1. A voluntary process to participate (in the case of pools: a focus on generating licensing revenue).

2. A key role for claim charts, submitted by patent owners, to ensure high effectivity and efficiency (where effectivity refers to the quality of the outcomes and efficiency refers to the resources required to achieve that quality).

3. Actual assessments are outsourced to experienced, specialist third parties, and thus separated from other activities in the pooling process.

4. Well-developed appeal processes, which are not called upon often but provide safeguards deemed necessary by stakeholders.

5. A specific choice in terms of transparency: positive results generally become public, and some pools also make a more detailed, one-page summary available to interested third parties that maps claims in the identified patent to relevant product categories and relevant parts in one or more standards, each identified by reference and version. In all pools, however, negatives outcomes and underlying documents (including submitted claim charts) are recognised as commercially sensitive and are not published.

5

CASE STUDY ON THE JAPANESE HANTEI FOR ESSENTIALITY ADVISORY OPINION

5 Case study on the Japanese Hantei for Essentiality advisory opinion

5.1 | Introduction to Hantei-E

This case study investigates the Japan Patent Office (JPO) advisory opinion (Hantei) system of essentiality assessment (Hantei-E). The availability of such an assessment mechanism for standard-essential patents aroused the interests of not only the European Commission but also other governments [29]. The JPO has employed an advisory opinion (Hantei) system (hereafter referred to as 'conventional' advisory opinion system) since 1959. On April 1st, 2018, JPO introduced a variant on this conventional system specifically designed to assess the essentiality of patents asserted to be essential by their owner. To date, this system is the only mechanism in existence in the public sector that assesses the essentiality of standard essential patents.

We discuss how JPO's essentiality assessment mechanism is designed, how it contributes to resolving disputes involving standard-essential patents, and which issues have emerged since its introduction. Ultimately, we describe the key lessons to be learned from this system with a view to potentially implementing an essentiality assessment scheme in Europe.

This case study is primarily based on the documents and other materials made public by the JPO, in particular, the *"Manual of 'Hantei' Advisory Opinion for Essentiality Checking"* [31] as well as Japanese government documents explaining the background and establishment of Hantei-E. In addition, we interviewed JPO officials on March 1, 2019 in Tokyo. JPO was given the opportunity to review the transcript of that interview and provide feedback and corrections.

Not long after our interview, changes were made to Hantei-E, and in June 2019, the JPO published a revised version of its document describing the system. In Section 5.3, we discuss the major changes.

Here we adhere to the language used by the JPO in its (translated) documents as closely as possible. For instance, the documents consistently use the terms 'demandant' (party requesting an opinion), 'demandee' (party that is requested to reply)', and 'trial'.

5.2 | Main findings on Hantei-E

The main findings describe the scope, operation, usage, and limitations of Hantei-E. We first describe the 'conventional' Hantei advisory opinion on which Hantei-E is based.

5.2.1 Original model: the conventional advisory opinion system

The JPO introduced the conventional Hantei advisory opinion system in 1959. The system was devised to determine whether a particular product or service infringes the scope of a granted patent. When a request for an advisory opinion is filed, the JPO (or more specifically: a panel of three administrative judges) determines whether the object, product (or process) specified by the demandant falls within the technical scope of the indicated patented invention.

The JPO's advisory opinion does not have any legally binding force. Nevertheless, it is considered to be an authoritative determination, well-respected by Japanese society [30]. While this chapter focuses on patents, the

advisory opinion system is also applied for utility models, designs, and trademarks.

Every year, the JPO receives between 50 and 100 requests for a conventional Hantei advisory opinion, and typically dozens of these requests are for patents [30]. A fee of JPY 40,000 (approximately € 300) is charged for each request. The average trial period for a request differs across various types of intellectual property rights. In the case of a patent, the average trial period is between four and five months [30].

JPO's advisory opinions are published, including all documents submitted by the parties involved. An exception can be made if such documents contain trade secrets.

5.2.2 Scope of the Hantei-E advisory opinion system

On April 1st, 2018, JPO introduced a variant on the conventional advisory opinion system, specifically designed to assess the essentiality of patents asserted to be essential by their owner. We refer to this new system as Hantei-E.

Any request for Hantei-E must adhere to the following three scoping criteria:

1. There is a dispute over the essentiality of the patented invention between the parties concerned (the demandant and the demandee[46]). Such a dispute must be about the essentiality of a specified patented invention. If two parties are in a licensing negotiation, but one of the parties informs the JPO there is no dispute, then the request is not admissible.

2. It must be possible to specify a *virtual object* based only on indispensable features required in a specified standard document issued by an SDO. This standard document must also be submitted to JPO as evidence.

3. The requester must be willing to allege that the specified virtual object falls within the technical scope of the patented invention. In other words, the procedure can only be initiated by a party arguing that a patent is essential and cannot be initiated by a party that believes a patent is *not* essential.

5.2.3 Operating the Hantei-E advisory opinion system

The Hantei-E procedure consists of three steps:

1. A demandant (party requesting an opinion) submits a request for an advisory opinion on essentiality. This must include the reasons for the request and the identity of the demandee (party requested to reply).

2. The demandee submits counterarguments. If the demandee does not submit any counterargument, the JPO will make a determination based solely on the allegations and evidence provided by the demandant. If the demandee believes that there is no actual *dispute* over the essentiality, they may alternatively provide specific reasons why they believe this.

3. Having considered all the documents submitted by the demandant and the demandee, the JPO starts the proceedings. The JPO assembles a panel consisting of three administrative judges who have a good understanding of the technologies relevant to the patent and the standard in question. The three administrative judges are designated by the JPO's Commissioner. The panel determines whether the virtual object product specified by the demandant falls within the technical scope of the patented invention. In cases where more information is needed to make an appropriate determination of essentiality, the JPO will request further documents from the demandant and/or the demandee.

The trial period for essentiality assessments is not known, as the advisory opinion on essentiality has not been requested since its introduction. The judges are expected to spend a total time of several days working on this essentiality assessment.

[46] In this chapter, we will continue to use the language as used by the JPO for Hantei-E.

A fee of JPY 40,000 (approximately € 300) is charged, equal to the fee in the conventional advisory opinion system. This fee obviously does not reflect the total (labour) costs.

5.2.4 Usage of the advisory opinion system for essentiality assessment

As of March 2019, the JPO has not received any requests for Hantei-E. This is in stark contrast with the regular Hantei advisory opinion, for which dozens of requests are received every year.

We were informed that in cases concerning products that comply with standards, parties are advised by the JPO to request a conventional Hantei assessment instead of Hantei-E (insofar the product already actually exists).

5.2.5 Limitations of the advisory opinion system

Hantei-E has various limitations, which may correspond with the reasons why the system has not yet been utilised.

1. Implementers are not likely to meet the scoping criteria for requesting an opinion. As indicated above, the demandant must assert that a given patent is essential. In most cases, however, an implementer will not want to make such an assertion (it is much more likely that an implementer wants to assert that a patent is *not* essential). However, we note that there might be (exceptional) cases where this is different.[47]

2. The negotiating parties may be reluctant to engage in Hantei-E as all the information they provide will become public and especially because this will usually include details about the negotiations between the parties.

3. By requesting Hantei-E, a party may breach the confidentiality agreements it entered into when starting negotiations with the other party.

4. In Hantei-E, only a single patent is considered. It does not provide information about the essentiality rates of larger portfolios of patents.

5. It is not possible to request Hantei-E for optional [normative] features of a standard.

6. Hantei-E requires that the demandant selects a specific part of the standard to be considered. The procedure will not consider that the patent may be essential for *another* part of the standard. Consequently, Hantei-E can only confirm that a patent is essential for the entire standard but cannot confirm a patent is *not* essential for the entire standard (as the patent may be essential for another part which is not being investigated).

7. The requirements to file a request for Hantei-E are demanding (perhaps even more so for implementers). After all, it is the demandant who must define the virtual object and compare it with the patented invention and the virtual object.

8. The advisory opinion of essentiality is not legally binding. If an advisory opinion is not favourable for either party – the demandant or the demandee – the party in question can still take this to court (neither an appeal to the JPO nor a second advisory opinion are possible).

[47] In cases where a patent owner argues that an implementer is infringing a patent but that the patent is not essential, and the patent owner argues they are not bound to any FRAND commitment, the implementer might want to attest that the patent is essential.

5.3 | Revision of Hantei-E in June 2019

In June 2019, the JPO published a revised version of its document describing Hantei-E [32], revealing several significant changes to this system, including:

1. In addition to licensing negotiations, Hantei-E can now also be used for negotiations to buy and sell SEPs.

2. You can now also request the JPO to provide an opinion that a Virtual Object does *not* fall within the technical scope of the patented invention.

3. Patents that are essential for optional [normative] features are now within the scope of Hantei-E.

4. Documents concerning Hantei-E can be kept confidential, subject to the JPO Commissioner's approval, for instance in case of trade secrets.

5. The Hantei-E system also covers practically essential technologies which are not specified in the standards documents but necessary when implementing standards (referred to as "self-evidently technically essential").

6. Multiple standard documents from various SDOs can be considered simultaneously for one single Hantei-E request (as far as relevant statements can be specified).

5.4 | Conclusions

Until now, market parties have not made use of Hantei-E[48]. Our conversation with staff of the JPO indicated that the likely causes are that:

- There are several stringent admission criteria. Among other things, the requesting party must be willing to attest the patent is essential (so the procedure cannot be initiated by a party that believes a patent is non-essential); both parties must declare that there is a dispute (if one party denies the dispute, the case is not admissible), and must agree to their roles in the procedure.

- Relevant information (also about the negotiations) will become public. Parties may be reluctant to have such information becoming public, and parties may also have entered into an NDA which does not allow them to disclose such information.

- The test itself is narrowly defined. The requesting party must define a virtual object based on the standard; this object may not include optional features, and must indicate a specific part of the standard (hence, the procedure will not consider that the patent may be essential for another part of the standard, and therefore can never result in a conclusion that a patent is non-essential – it can only result in a statement that it is essential for that specific part of the standard.

- Only one single patent is investigated, so no insights are generated on essentiality at the portfolio level.

The Hantei-E revision incorporated several significant changes. By broadening the admission criteria, allowing for negative advice (i.e. that the virtual object submitted is not infringing upon the patent), including optional features in the standard, and allowing confidentiality and more, the Hantei-E system might be more appealing to potential users.

[48] In personal communications with a representative of the Japan Patent office, we were informed that as of 10 March 2020, there have not been requests for Hantei-E.

6

AUTOMATED APPROACHES TO ESSENTIALITY ASSESSMENT

6 Automated approaches to essentiality assessment

6.1 | Introduction to semantic similarity and AI approaches

In recent years, automated text comparison based on semantic similarity measures and more recently on Artificial Intelligence (AI) tools has been on the rise. Given the nature of the task of essentiality assessment and the growing popularity of AI, many people are wondering whether AI systems would be suitable for such a task. If so, the benefits would be significant: they require relatively few human resources and have an almost infinite overall system capacity. Their analysis could be – in principle – impartial and free of human error or judgement. We will start by discussing the first academic paper applying semantic similarity to assess essentiality of patents (Section 6.2). We then reflect on the potential and limitations of AI-based essentiality assessments (Section 6.3).

6.2 | The Brachtendorf, Gaessler, and Harhoff study

Of particular interest is the first published study exploring the use of a semantic similarity approach to determine essentiality, by Lorenz Brachtendorf, Fabian Gaessler, and Dietmar Harhoff, associated with the Max Planck Institute for Innovation and Competition, Munich, Ludwig Maximilian University of Munich, and the Technical University of Munich [8]. Their study investigates the semantic similarity between patents and standards documents in order to assess the essentiality of patents disclosed as potentially essential to a technical standard.

The paper considers standards documents, identified on the basis of patent declarations at ETSI (resulting in 4,796 standards documents). The authors compare these with 37 million patent documents, considering patent claims as well as technological descriptions (see below).

The study uses an algorithm developed in the 2016 dissertation by Michael Natterer [35], who later founded a company to further develop that algorithm. In essence, the algorithm measures similarity using a vector space model, calculating, among other things, the cosine distance between texts. It uses two metrics: similarity score (the absolute similarity value calculated by the algorithm, expressed as an integer between 0 and 1,000) and similarity rank (a focal patent's rank relative to other patents, in order of similarity score).

The algorithm is validated by comparing the findings with the results of the manual essentiality assessments for the TCL v Ericsson court case (see Chapter 3). At the individual patent level, consistency is limited. From the set of 166 patents assessed to be essential by manual evaluators, the automated system predicted only 40 (24%) were essential. From the set of 236 patents assessed not to be essential by manual evaluators, the automated system predicted 216 (92%) were not essential. If we assume the reference point is perfect (which it may not be), then the automated system has many false negatives, and fewer false positives. Yet, the authors find strong and highly significant correlations between the experts' decisions on standard essentiality and their own measurement of semantic similarity, and good accuracy in predicting the share of actual SEPs in a larger portfolio.

While emphasising that the "method can hardly replace a thorough manual assessment", they describe their findings as a "meaningful approximation of standard essentiality" [8, p. 18] on an aggregate level, and name several use cases [8, pp. 21-22] to "estimate shares of true SEPs in firm patent portfolios"; to "*facilitate the assessment of SEPs as well as the search for relevant, but (so far) undeclared patents*"; and to "*help singling out patents relevant for specific parts of the standard.*" The authors point out that "*a substantial advantage of [the] approach lies in its*

scalability, and thus, time- as well as cost-efficiency"; it is also "*arguably more objective and accessible than most of the proprietary datasets on SEP assessments.*"

The authors furthermore note that "[...] *we find that the semantic similarity between patents and standards is more strongly determined by the technological description than by the specific wording of the patent claims.*" [8, p. 8]. However, in a robustness test, the authors show that the relationship holds when using the claims as sole input. The stronger determination of the patent description is interesting, but also worrying: it is only the claims that determine the scope of exclusive rights conferred by the patent, and therefore only the claims determine the essentiality.[49] The technological description in the patent may be important to further understand the appropriate interpretation of the words used in the claim, but this description in itself cannot be considered a basis for essentiality. Further critique, also raised by the authors, is that the patent wording can be chosen strategically to resemble the standard document.

In sum, the method will hardly be able to replace a manual approach when it comes to assessing essentiality at individual patent level, but could prove very useful for efficient pre-screening. For that purpose, the approach can perhaps be further calibrated to have very few false negatives, at the expense of generating more false positives. After all, if used for pre-screening, the selected patents will still undergo a manual test.

6.3 | Conclusions

While carrying out this study, we had many discussions on the use of automated systems, based on semantic similarity or on AI, for essentiality assessment. These discussions highlighted the advantages and potential, but also a number of – often inherent – limitations of such systems for determining essentiality.

Based on our discussions, we concluded that while automated approaches to essentiality assessment are promising, it is unlikely they will be able to replace human efforts in the short or medium term for a number of reasons:

1. The meaning, interpretation, and precise scope of words and terminology (both in patents and standards) are dependent on context, making it hard to automatize.[50]

2. Semantic approaches can face difficulties dealing with changes in terminology over time. This may be particularly relevant for fundamental or foundational patents for technologies used in standards, because at the time these technologies were invented, the vocabulary might have been different from when the text for the standard was drafted.

3. The patent to be evaluated, or parts of it, may be written in a different (natural) language than the respective part of the standard. Furthermore, even with the same natural language, the vocabulary in patents (drafted by patent attorneys) often differs from that in standards (drafted by engineers).

4. A technology or solution required to implement the standard may not be explicitly mentioned in the standard's text, but still be required in order to satisfy the standard (i.e. implied by the standard).

5. An essentiality analysis should consider possible alternatives to the patent under investigation that may also satisfy the standard. This means that an automated approach should not only look at the patent under investigation, but also all other patented and non-patented inventions.[51]

[49] See Article 69, Clause 1 of the European Patent Convention [19] "The extent of the protection conferred by a European patent or a European patent application shall be determined by the claims. Nevertheless, the description and drawings shall be used to interpret the claims."

[50] As a simplified example, consider the use of the word 'diode', an electronic device that allows current to flow easily in one direction while presenting high resistance in the reverse direction. Before the broad introduction of the semiconductor diode, references to 'diode' implied a vacuum tube electronic device functioning as a diode. The semiconductor diode and the vacuum tube are very different devices, but depending on the context and time frame, the same word was used for both.

[51] The definition of essentiality at ETSI is explicit on this aspect: if alternatives exist that are not patented, the patent in question is not essential; if only alternatives exist that are also patented, then the focal patent is essential (as well as the patented alternatives). Rules at other SDOs differ or are not explicit [6, pp. 66-67].

6. An AI system would require a reference training set, with a sufficiently large number of assessments, both positive and negative, of a very high confidence level. Such a perfect training set does not (yet) exist.

7. Any such system is prone to gaming, whereby patent owners, anticipating the workings of such a system, will adapt the wording in their patent applications (which might end up in the granted patent claims) and in their technological contributions to SDOs (and might find their way into the text of the standard).

Furthermore, we stress that any automated approach should base its conclusions for essentiality solely on the normative portions[52] of a standard. Also, it should base its conclusions on essentiality solely on the text in the patent claims.[53]

We do however acknowledge that automated approaches may be valuable as assisting tools and potentially improve the efficiency of human essentiality assessment. A primary role here could be reducing a large number of potentially essential patents (e.g. SDO disclosed patents) to a smaller set that might be essential (removing those which are 'easy' to determine as not essential at all, for instance because the standard is based on an entirely different technology than the one in the patent). For such a task, it is acceptable that the mechanism still selects some degree of false positives, but it should have an absolute minimum of false negatives (otherwise, patents would be deleted from the set even though they are in fact essential).[54] To ascertain whether any system satisfies the latter requirement, you need a large set of actually essential patents to verify that (a reference set).

As indicated above, one of the challenges for creating such an AI system is the availability of a reference set, in order to validate the system's performance, and, if relevant, train the system (sets must be different and non-overlapping). A set must be large enough to serve its purpose and include both actually essential and actually non-essential patents. The difficulty is obtaining such a set; those currently most likely to have such information (the owners themselves) are, for understandable reasons, not keen to make such information public, especially if it concerns non-essential patents (one of the reasons why the patents for our pilot were subject to NDAs). Yet, if the European Commission set up a system for essentiality assessment, the outcomes, generated over a certain period of time, could serve as input for developing, testing and validating an AI-based approach which could then be introduced to assist. This development could be outsourced to external parties, if the necessary confidentiality was ensured.

Another possible future role for a semantic-similarity or AI-based approach is to identify potentially essential patents owned by companies that made blanket declarations at SDOs which allow this (e.g. IEEE, ITU, ISO, and IEC). For this purpose, the availability of a reference set is less of a challenge.

Finally, there is also an important non-technical aspect to consider: whether stakeholders that need essentiality data (implementers, patent owners, and courts) will accept the outcomes of essentiality assessments based on semantic or AI approaches. The general attitude in society towards such systems is still an open question, as well as the specific views of stakeholders for whom the stakes can be high.

[52] The normative portion is that part of the text that must be implemented in order to comply with the standard. Standards documents also have many non-normative parts, which can be used to explain, clarify, give examples, and so on. According to the ETSI essentiality definition, both the mandatory and optional features in the standard are normative portions (other SDOs may have other definitions).

[53] After all, only the claims determine the scope of exclusive rights conferred by the patent, and therefore determine the essentiality. The description and drawings are to be taken into account for interpreting the claims. Note that for a considerable number of European patents, the claims are available in the English language (among others), but the description is only in German or French.

[54] Note that the study presented in Section 6.2 currently has the opposite characteristics: many false negatives and few false positives.

7

LANDSCAPE ANALYSIS OF POTENTIALLY ESSENTIAL PATENTS DISCLOSED TO SDOs

7 Landscape analysis of potentially essential patents disclosed to SDOs

7.1 | Introduction and selected database

Part of the Terms of Reference of this study was the execution of a 'landscape' study of patents disclosed at ETSI, one of the three European Standards Organisations (ESOs).

This landscape analysis fulfils three main goals in this study: (a) to understand how patents disclosed at ETSI are best retrieved and processed in order to investigate them, (b) to understand the features of patents disclosed at ETSI, and the implications of these features using them as input for an essentiality assessment mechanism, and (c) to analyse whether SDO disclosed patents differ in quality (both technical merit and economic value) from other comparable patents.

This chapter presents a summary of the landscape study, which is separately available as:

> R. Bekkers, E. Raiteri, A. Martinelli & E. M. Tur (2020). "Landscape study of potentially essential patents disclosed to ETSI". JRC Digital Economy Working Paper 2020-06, JRC120137. Available at https://ec.europa.eu/jrc.

7.2 | Data, methodology and approach

Investigating patents disclosed at SDOs brings along a number of challenges.

The first challenge is finding a reliable source of declarations data. This source has to enable us to clearly identify the universe of disclosed patents for a specific standard and all the members of the patent family of the disclosed patents. These are the requirements for reducing concerns about confounding effects in the analysis. Using a data source that is incomplete or does not enable us to reconstruct the full patent family of a disclosed patent would risk including patents in the analysis that have been disclosed as SEPs or members of a family disclosed as SEP. To ensure our analysis met the above requirements, we focussed on patents disclosed to a single SDO: the European Telecommunications Standards Institute (ETSI), as was also specified in the Terms of Reference for this study). ETSI maintains a public and complete database of patents disclosed by patent owners as potentially essential to an ETSI standard. The language ETSI uses in its declaration form is "[patents and patent applications] **that may or may become essential** […]" [15, ANNEX 6, Appendix A]. A key element in the ETSI database is the '**basis patent**': the specific patent provided by the disclosing party. Although the disclosing party can state the identity of the basis patent's family members, ETSI IPR policy determines that the FRAND licensing commitment entered into includes ALL the base patent's family members,[55] where the family definition is provided by ETSI (see below).

The information in the ETSI database also enabled us to reconstruct the patent family of disclosed patents and match the disclosed patents to other data sources in order to recover additional bibliographic information.

The second challenge is that, although the ETSI database is public, the data collection and processing require considerable

[55] Technically speaking, the disclosing party may also inform ETSI that it wishes to exclude a specific family member from its FRAND commitment.

attention and careful decision making. We aimed to create a list of all the unique patents and patent applications disclosed to ETSI and identify all the family members of the disclosed patents. To this end, we applied the ETSI definition of patent family: an ego family of the basis patent which includes all the documents that have at least one priority in common with the basis document, as well as the priority document(s). In addition, we considered both granted patents and patent applications in our data gathering and identification process. For this reason, unless clearly indicated otherwise, whenever we mention 'patents' here, we mean both patent and patent applications (similar to ETSI IPR policy).

Third, we need to gather additional and up-to-date information about the ETSI disclosed patents. To do so, we matched the list of disclosed patents that we recovered from ETSI with the PATSTAT database (Autumn 2018 version). Of particular importance is the identification and construction of the patent quality measurements used for the main analysis.

Finally, the quality comparison between disclosed patents and 'comparable' patents not disclosed as SEP demanded the creation of an appropriate control set. To facilitate this task, we considered exclusively patents granted by the United States Patent and Trademark Office (USPTO) or the EPO, both for the disclosed and the control patents. Then we applied exact matching techniques to increase the degree of similarity between the two groups, and, given the general abundance of potential control patents for each disclosed SEP, we randomly selected up to five control patents for each treated unit.

Table 3 summarises our approach and main outcomes.

Phase	Data	Method	Outcome
Data collection: – Identification of disclosed patents – Identification of the ETSI patent family	ETSI online declarations database EPO-PATSTAT Database (Autumn, 2018)	Database matching based on application/ publication number or family identifier	Identification of 25,072 disclosed (basis) patents and their related ETSI family
Landscape of disclosed patents: – Construction of relevant patent variables (patent level) – Descriptive statistics	25,072 disclosed (basis) patents as identified in Chapter 2	Gather patent level information on the sample of 25,072 disclosed (basis) patents	Patent-level information dataset Description of the disclosed (basis) patents' characteristics, regarding timing, technology, ownership, patent family size, claims, backwards and forward citations.
Quality assessment: – Identification of the disclosed patents – Construction of the control set – Quality assessment	Set 1: 4,607 granted disclosed European patents and 19,477 matched control patents Set 2: 12,832 granted disclosed USPTO patents and 56,100 matched control patents EPO-PATSTAT Database (Autumn, 2018) OECD Quality Database (Version 2019)	Starting point is the 25,072 patent families as identified in Chapter 2. Focal patents are granted to EPO (USPTO) patent family members Construction of the control group: exact matching of patent-level characteristics	Quality comparison between disclosed patents and patents not disclosed Regression analysis to account for quality differences between disclosed and control patents

TABLE 3: OVERVIEW OF THE PHASES, DATA, METHODOLOGY AND OUTCOMES OF OUR APPROACH

7.3 | Main findings from landscape analysis of SDO disclosures

Our main conclusions are as follows:

1. While the ETSI IPR database of disclosed potentially standard-essential patents is by far the most sophisticated one, it is a non-trivial task to identify patent numbers from that database and clean/harmonise/select/de-duplicate/transform that data into information that can be used for a given purpose, such as input for an essentiality assessment process.[56] It is also important to have a good understanding of ETSI IPR policy, the related procedures, database aspects and in particular, the meaning of 'patent family' in the ETSI context. For good reasons, ETSI uses a tailor-made definition, and this has a significant impact on understanding and interpreting the data for specific purposes. Unlike usual definitions of patent families such as DOCDB and INPADOC, ETSI patent families are ego-families and not mutually exclusive. As a simplified example, Figure 2 shows how a given set of eight patents and their priority relations translate into two DOCDB patent families, one INPADOC family, and eight ETSI patent families (which partly overlap).

While the ETSI database also contains a large number of 'non-harmonised records' (i.e. records that ETSI itself has not yet managed to match with the European patent database), we found that these records are not likely to have a large impact on the use of the data.

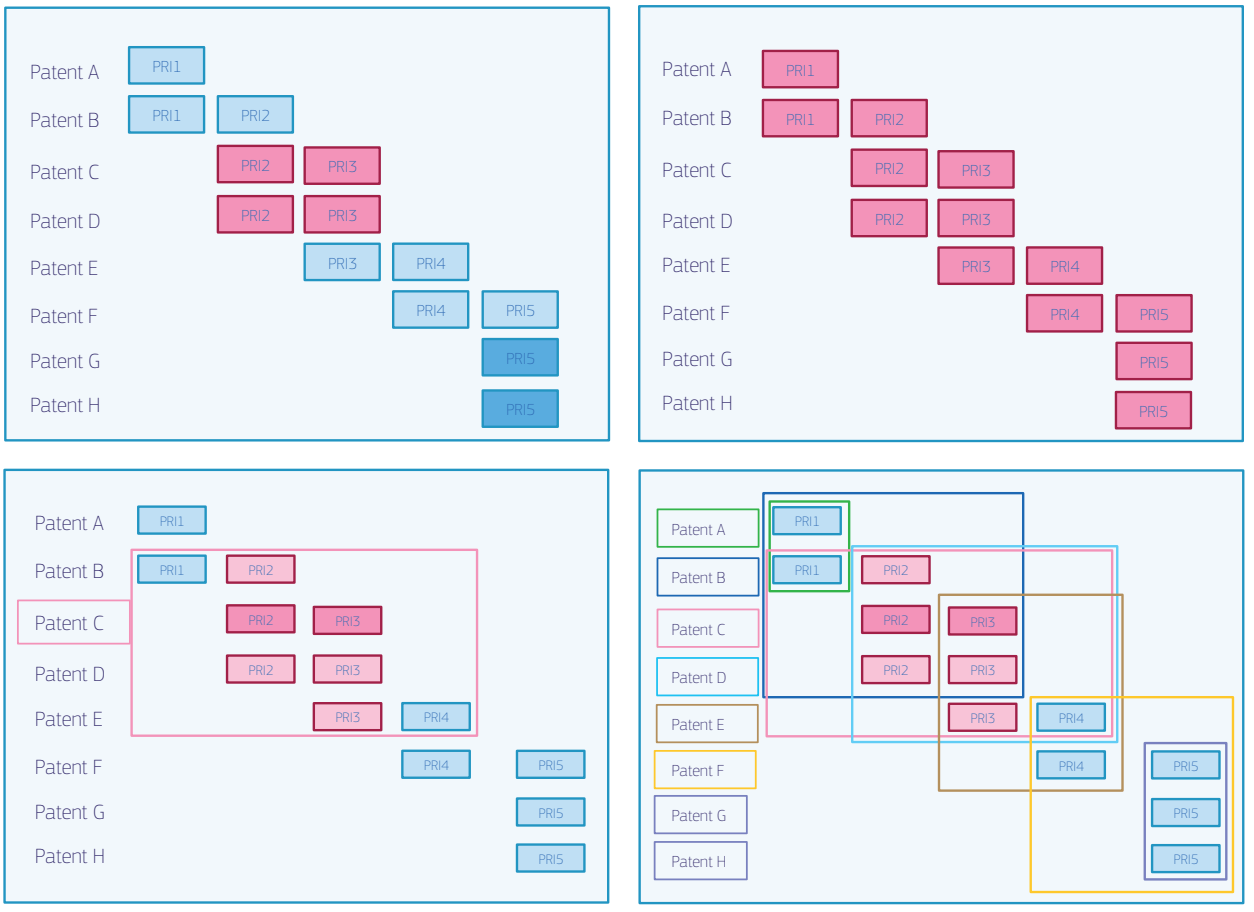

FIGURE 2: THE DIFFERENCES BETWEEN THE DOCDB PATENT FAMILY (TOP LEFT), THE INPADOC PATENT FAMILY (TOP RIGHT), AND THE ETSI PATENT FAMILY (BOTTOM LEFT AND RIGHT), FOR A GIVEN SET OF PATENTS AND THEIR ASSOCIATED PRIORITIES.

[56] In order to obtain correct counts of ETSI IPR declarations and patent disclosures for a given set of standards, we used, as recommended to us by ETSI, the on-line ETSI 'Dynamic Reporting' tool, not the 'Declaration' tool (which is reserved for declarants and does not eliminate any multiple declaration, as intended). ETSI also publishes a Special Report (SR 000 314) from time to time (usually twice a year) which lists all the declarations and disclosures received so far. At the end of 2019 (after we finalised the data analysis for this report), ETSI started to make the Special Report also available as an Excel file which contains the main tables from the ETSI IPR Database and allows for advanced filtering in Excel without the need to know SQL query language.

2. Data on disclosed patents provides valuable insights into which patents are potentially essential to a standard. This data clearly serves an important function within the operation of the SDO itself, which is to ensure that a standard only requires known patents for which a FRAND commitment has been issued. It is important, however, to be well aware of the intrinsic limitations of such data if used for other purposes. Among other things, patents disclosed as being potentially essential: (1) may not be owned (anymore) by the disclosing firm, (2) may not be actually essential, (3) may not be granted, (4) may not be enforceable (valid, non-expired, renewal fees paid, etc.), (5) may greatly differ in technical merit, (6) may relate to functionalities not relevant for a certain product category (e.g. a mobile phone or an infrastructure product), and (7) may relate to optional normative features that might not be used in a given device conforming to the standard. Moreover, the patent families of these patents may differ substantially in terms of geographical coverage.

3. ETSI-disclosed patents can be used as a starting point for an essentiality assessment procedure (see the scenarios Section 9.3). Overall, the dataset includes 25,070 disclosed patent families, of which 16,089 contain a European patent (Table 4, left column, also shown in Figure 3). Focusing on disclosed patent families whose basis patent was granted as of February 2019 yields a much lower total of 12,760 families, among them 9,818 with an EPO family member (Table 4, middle column). If one limits the assessment procedure to SEP exposure in Europe (i.e. only looks at patent families that comprise a granted European patent), then the relevant dataset includes 8,320 European patents that would need to be investigated: 1,449 families that have a granted European patent as a basis patent, and for 6,871 families there is a granted European patent in the family of the disclosed basis (Table 4, right column). It is worth noting that those 2,942 patent families whose basis patent is granted but that do not contain a European patent are mostly filed at the Chinese patent office and at the WIPO. Numbers could go down a bit if one excludes expired patents from the analysis, as well as patents that cannot be enforced because renewal fees have not been paid. But doing so requires careful consideration whether there are family members of that patent that are still alive, which would result in enforceability (and thus SEP exposure) in other geographies. Further note that these were the numbers as of February 2019[57] and, almost on a daily basis, new patents are disclosed, and patents that were disclosed earlier in time, are granted.

Patent families	Total number	With granted basis patent	With granted European patent
Total number of disclosed families (patent families following the ETSI family definition)	25,072 (100%)	12,760 (100%)	8,320 (100%)
which have an EPO basis patent	2,151 (8.6%)	1,449 (11.4%)	1,449 (17.4%)
which do not have an EPO basis patent but include an EPO family member	13,938 (55.6%)	8,369 (65.6%)	6,871 (82.6%)
which do not have an EPO basis patent and do not have an EPO family member	8,983 (35.8%)	2,942 (23.1%)	n/a

TABLE 4: NUMBER OF DISCLOSED PATENT FAMILIES (FOLLOWING THE ETSI FAMILY DEFINITION): TOTAL, WITH GRANTED BASIS PATENT AND WITH GRANTED EUROPEAN PATENT.

[57] These numbers are based on the ETSI database as of late February 2019 (when we retrieved the data), and patent grant information is from the PATSTAT 2018 Autumn Edition.

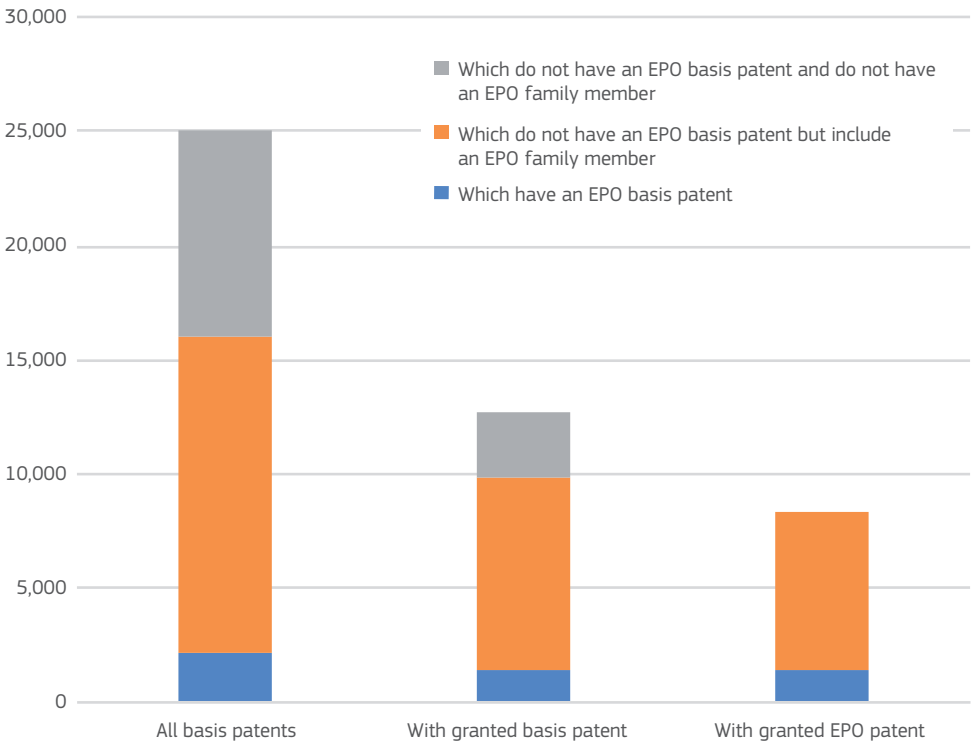

FIGURE 3: TOTAL NUMBER OF DISCLOSED PATENT FAMILIES (APPLYING THE ETSI DEFINITION OF FAMILY) AND WITH EUROPEAN BASIS PATENTS. ON THE BASIS OF ETSI DECLARATIONS DATA RETRIEVED AS PER FEBRUARY 2019

4. For the 6,871 families where there is a granted European patent in the family of the (non-EPO) disclosed basis patent, it is key that the ETSI patent family definition is used to identify that European patent. If the DOCDB family definition were used instead, changes are significant that no European patent is identified at all while there may very well exist an actually essential EPO family member of the disclosed patent. If the INPADOC family definition were used, changes are significant that a European patent is selected which is actually non-essential, while another EPO family member exists that is actually essential (but not selected).

5. There is considerable variety over time in the number of new patent families being disclosed. In general, there is an upward trend. In the years 2017 and 2018 alone, 9,311 new patent families were disclosed to ETSI – that is 37% of the total of all 25,072 families (the year 2019 falls outside our data set). This is a clear peak compared to other years, probably because of intense 5G standardisation activity during that period.

6. There is considerable fragmentation in the distribution of companies – or organisations – that disclosed these patents, as shown in Figure 4. Furthermore, the distribution is skewed, with a long tail: out of the 148 disclosing firms, 14 disclosed more than 500 patent families, 21 companies disclosed between 50 and 500 families, and 113 disclosed less than 50 families. Again, we emphasise that the current owners of these patents may be different from the disclosing firms. These distributional characteristics are relevant in case any essentiality scheme chooses to use sampling: given the skewed nature of the distribution, a sample of disclosed patents might need to be stratified in order to be representative of individual firms. Assessing larger samples or even full portfolios for such companies is a potential solution.

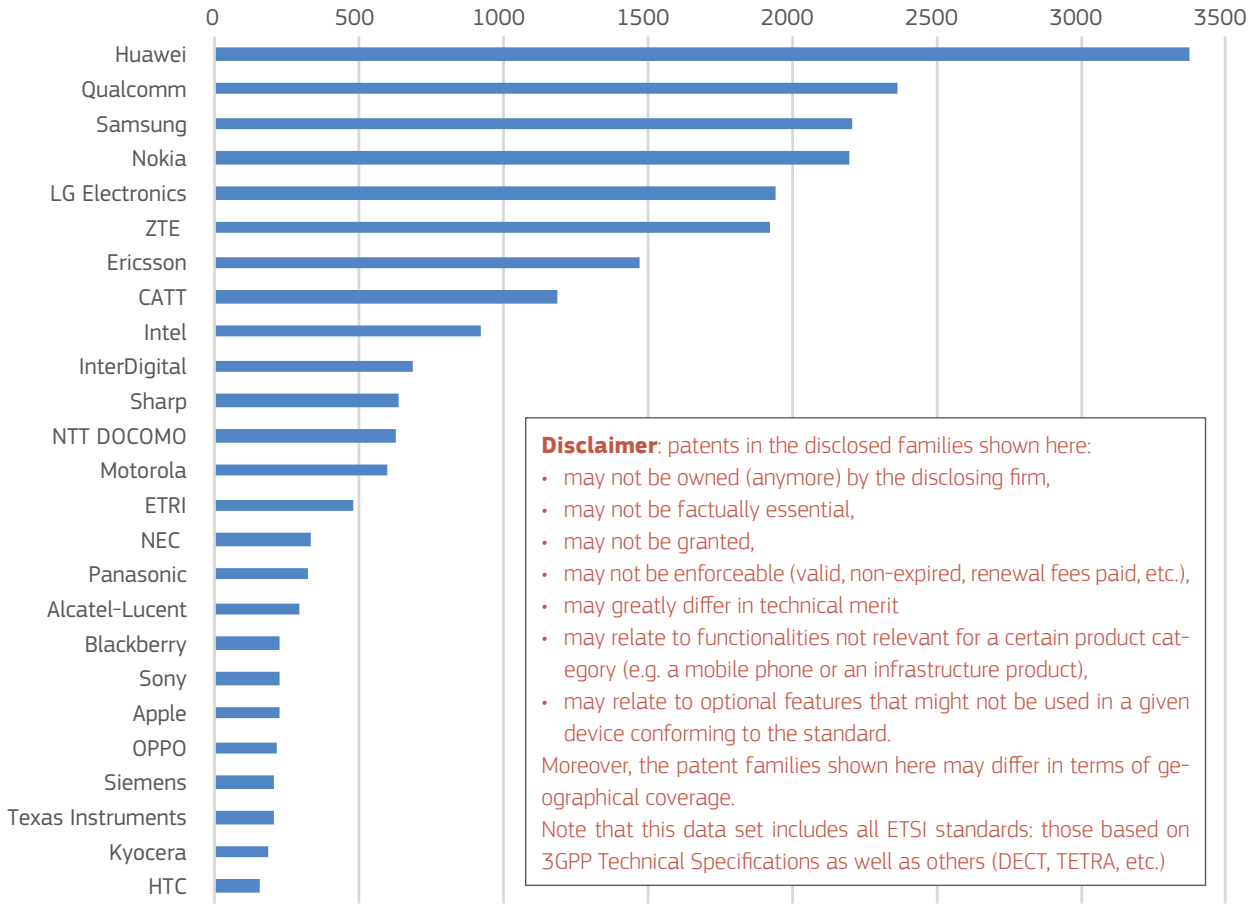

FIGURE 4: NUMBER OF DISCLOSED PATENT FAMILIES (USING THE ETSI DEFINITION OF FAMILY) BY EARLIEST DISCLOSING COMPANY; 35 LARGEST COMPANIES; FULL TIME PERIOD (1990–2019). (DATA SET: THE 25,072 DISCLOSED BASIS PATENTS FROM DIFFERENT JURISDICTIONS). BASED ON ETSI DECLARATIONS DATA RETRIEVED AS PER FEBRUARY 2019.

7. We observe big shifts over time in terms of the home country of firms disclosing patents (see Figure 4). Especially remarkable is the recent increase in shares of disclosed patent families from Chinese firms and, to a lesser degree, from South Korean firms, at the expense of European and US firms. Again, we stress that such numbers as such do not yet say anything about whether these patents will eventually be granted (and in which countries), and what their technical merit is, etc. But the growth in numbers is notable. This is also reflected in an increasing share of disclosed basis patents from the Chinese patent office.

8. It would be desirable to break ETSI declarations related to cellular standards up into, for instance, technology generations (2G, 3G, 4G and 5G). Yet, despite the high sophistication of the ETSI declarations database, for the bulk of the ETSI declarations, such a distinction cannot be made in a reliable way without examining the content of each individual disclosed patent. This is related, among other things, to the way 3GPP technical specifications series are structured.

9. This study also investigated whether SDO disclosed patents differ in quality from other comparable patents. We looked at two dimensions of quality: technical merit (i.e. the technological contribution to the field) and economic value (i.e. the economic returns a patent generates). We use observable characteristics of patents and patent families, such as forward citations, family size, and patent renewal, to proxy both dimensions (for details, see the separate landscape study report). While such proxies are known to be far from perfect, they do provide us with valuable insights. Our analyses showed that disclosed SEPs score higher in all the main proxies for patent quality commonly used in the patent literature. This is true for variables usually associated with technical merit and for those usually associated with economic value. All in all, these results confirm the expectation that patents disclosed to ETSI are of greater technological importance and have more market potential than suitable controls. Our interpretation of these findings is as follows:

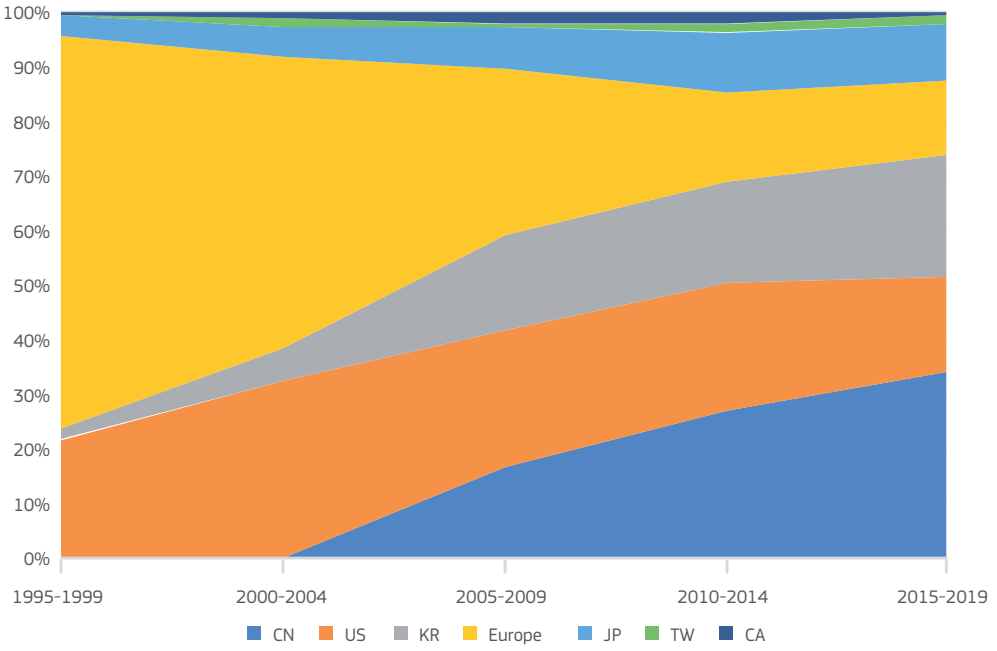

FIGURE 5: SHARE OF DISCLOSED PATENT FAMILIES (USING THE ETSI DEFINITION OF FAMILY) BY DISCLOSING FIRM'S HOME COUNTRY/REGION, OVER TIME (DATA SET: THE 25,072 DISCLOSED BASIS PATENTS FROM DIFFERENT JURISDICTIONS). NOTE THAT THE 1990–1995 TIME FRAME IS OMITTED, DUE TO FEW OBSERVATIONS IN THOSE YEARS. BASED ON ETSI DECLARATIONS DATA RETRIEVED AS PER FEBRUARY 2019.

- That disclosed patents have a higher economic value than comparable, non-disclosed patents is not surprising. After all, a subset of these patents will become actually essential patents, then will need to be licensed by all parties in the world implementing that standard,[58] and thus have the potential to generate significant licensing revenues (or other benefits such as cross-licensing opportunities). Hence, it is rational for the applicants of such patents to seek protection in many countries and renew their patent, precisely the variables associated with a patent's higher economic value.

- If disclosed patents have a higher technical merit, this may indicate that SDOs are able to attract promising technologies (to know whether they are able to select attractive technologies for the standard, we would need to know which of these are actually essential). Yet, the higher technical merit may also be on account of the act of declaration as such, because: Firstly, disclosed patents are more 'visible'. Secondly, for any party investing in R&D in a technical field where standards are important, it is rational to build such R&D on knowledge already embedded in these standards, instead of on a 'dead track'. This also increases the likelihood that essential patents (and also the wider set of disclosed, potentially essential patents) receive more citations from future patents.

[58] To be precise: insofar the patent is actually required for the normative portions of the standard that is implemented in a specific product.

7.4 | Conclusions

The main results of our landscape study of disclosure of potentially essential patents made to ETSI are the following.

- **Caveats:** Using data from the ETSI IPR database of disclosed potentially standard-essential patents is a non-trivial task that requires a good understanding of ETSI IPR policy and the related procedures. In particular, one needs to bear in mind that such SDO databases were not created to be used in the context of licensing. Moreover, the fact that a patent has been disclosed as being potentially essential does not imply that it is actually essential, granted, enforceable, of high technical merit, or necessarily infringed[59] by all products that conform to the standard.

- **Trends and patterns of disclosure:** We find a considerable variety over time in the number of new patent families being disclosed. In general, there is a strong upward trend, with a particularly high number of disclosures in 2017 and 2018. As to the home country of companies (or organisations) disclosing patents we observe an increase in recent years in the shares of disclosed patent families from China and, to a lesser degree, from South Korea. Looking at the companies (or organisations) that disclose patents we find a fragmented and highly skewed distribution, with the top 6 out of a total of 148 accounting for more than half of all disclosed patent families. Finally, our analyses show that disclosed SEPs score higher in all the main proxies for patent quality commonly used in the patent literature.

- **Use of ETSI disclosures for assessments:** ETSI-disclosed patents can be used as a starting point for an essentiality assessment procedure for mobile communication standards. If one focusses on SEP exposure in Europe, then (as of February 2019) our dataset includes 8,320 European patents that would need to be investigated: 1,449 families according ETSI's family definition that have a granted European patent as the disclosed ('basis') patent, and a further 6,871 families that comprise a granted European patent.

- **Use of other SDOs disclosures for assessments:** Going beyond ETSI, one needs to be aware that there is a large variation between SDO patent disclosure databases. In particular, SDOs that allow blanket disclosures (which do not explicitly name patents deemed essential) pose a very significant challenge.

- **Importance of the appropriate patent family definition:** If disclosed patents are indeed used as a starting point, one will often need to consider the family members of these patents. Here, it is important to take good note of the ego-family definition that ETSI adopted. This definition allows for identification of all those patents that in fact share one or more priorities with the disclosed patent. Other patent family definitions (such as the widely used DOCDB and INPADOC) do not work in this way,[60] and we advise against using these other definitions when considering family members in the context of assessing essentiality.

[59] Wherever we use the word infringement, note that if a patent is actually licensed, it is not infringing.

[60] DOCDB (somehow simplified) only identifies families that have exactly the same *combination* of priorities. Using this definition in the context of identifying family members for essentiality assessment, one would overlook members that might indeed include the essential claim. INPADOC identifies all families that share priorities, directly or indirectly. Using this definition in the context of identifying family members for essentiality assessment, one would risks including a lot of family members that do not include the essential claim of the disclosed patent at all (and even patents that are filed long before the invention of the essential claim!).

8

TECHNICAL FEASIBILITY: PILOT EXPERIMENT ON ESSENTIALITY ASSESSMENT

8 Technical feasibility: pilot experiment on essentiality assessment

8.1 | Pilot experiment on essentiality assessment

One of the key elements of the overall study is a pilot experiment, in which a variety of assessors evaluated patents for their actual essentiality. We start by describing the experiment set-up, our reference point and then how, the we collected our data and constructed our cases.

8.1.1 Experiment set-up

The pilot experiment we conducted consists of two parts. The first part, also called the 'internal experiment', focused on differences across assessor profiles in terms of skills and background. The assessors in this part were members of the research consortium and had the following profiles: (1) patent examiners, (2) patent attorneys, (3) senior-level engineers and (4) junior-level engineers (supervised). The second part, also called the 'external experiment', focused on the effects of the availability of claim charts and on regular assessment vs. novelty-based assessment. Here, the assessments were carried out by examiners working for patent offices across Europe. Our main goal was to ensure that all the assessors are both neutral and professional. In total, over both experiments, 28 different persons (assessors) performed a total of 205 assessments. A single assessor carried out up to 9 assessments (7.3 on average). The assessors reported they spent an average of 6.9 hours on each case, which means that all the assessors together spent a total of 1,414 hours (176 working days) on assessments.

We wish to express our gratitude to the patent offices and their individual examiners participating in this experiment. Our various meetings and extensive dialogues with these offices enabled us to improve our pilot experiment, and the very significant resources these offices made available permitted us to make a large number of observations, and thus achieve more robust conclusions.

Numerous 'cases' were prepared for the experiment, whereby each case included: (a) a patent, (b) one or more specific standard documents for which essentiality needs to be assessed (e.g. TS 25.211 V2.5.0), and, in selected cases, (c) a claim chart document. We aimed to include a broad sample of patents and standard documents, to ensure our findings would not be the result of some specificities of individual patents or standards. In total, the experiment involved 45 unique patents and 48 unique standards documents. Cases were randomly allocated to assessors, while ensuring that a single assessor never received more than one case on the same patent or on the same standard document (to prevent unobserved learning effects).

The assessments were set up as a blind experiment. The patents to be assessed were anonymous: applicant, inventor names and patent numbers were removed, and assessors received strict guidelines not to consult any other information about the patents they were looking at than the one provided. A Chinese wall was created between the people carrying out the assessments and the people who designed the experiment. Among other things, the assessors did not know that their results would be compared to a reference point.

To ensure the assessors did not have to look at patents outside the scope of their own knowledge area, the experiment focused on one single technological area, and

individual assessors were chosen on the basis of their knowledge of that area. In consultation with the European Commission, we decided to focus the experiment on the ETSI/3GPP 3G and 4G standards.

One important element of the experiment was to inform the assessors about what definition of essentiality they should apply for conducting their task. Our starting point here was to stay as close as possible to the definition of essentiality adopted by ETSI,[61] the standards body that created the 3G and 4G standards central to our experiment. (Moreover, the patent pools from which we derived our reference points – see below – use an identical or very similar definition to ETSI.) While staying as close as possible to ETSI's definition, we explained essentiality in a way that would be more informative for our assessors.[62] We furthermore emphasised to our assessors that their exercise should disregard the patent's presumed validity, enforceability (e.g. whether the patent has expired, has been declared invalid by a court, etc.), its economic value, and whether the patent would be infringed by a specific product or product category based on the standard.[63]

During our meetings with the patent offices, the argument was raised that the above definition of essentiality includes the concept of 'infringement'. Some offices felt that due to the nature of their regular activities, they would be ill-equipped to answer questions relating to infringement, whereas other offices indicated they would not have any problems using such a concept. (The latter category included offices that already offer freedom-to-operate services on the market, and such services also use the concept of infringement.) During the discussions with patent offices on alternative approaches that would not require the concept of infringement, an assessment was proposed which we will call the **novelty-based assessment**. In this assessment, the assessor carries out the following thought experiment: *In the hypothetical case that the standard document had already been published before the patent's priority date, would that document have been novelty-destroying?* Note that this is a hypothetical case: a valid patent can only be standard-essential if its priority date precedes the publication of the standards document for which it is essential; if the order would have been the other way around, then the patent would by definition not meet the novelty requirement and thus be invalid. The outcomes of this novelty-based assessment may indeed be very similar to those of a regular essentiality assessment (we test that in our pilot experiment). During extensive discussions with the patent offices and other parties, we tried to identify situations where the outcomes of the two assessments would be different, but we did not find any. In fact, most parties commented that even though the criteria to be assessed are different, the actual work the assessor carries out seems very similar. Based on the above, we gave patent offices the freedom to perform the experiment using the alternative novelty-based assessment. Ultimately, one office decided to do so, and the examiners at that office were given an adapted version of the instruction set, in which the regular definition of essentiality was replaced by one based on novelty.

The experiment took place between May and September 2019. To ensure the essentiality assessments would be as reproducible and objective as possible, the assessors were given a 15-page instruction set, developed in collaboration with the participating patent offices. This document included the precise task and procedure to be followed, definitions of essentiality and other relevant concepts, organisational elements, an explanation of what other documents they could or could not consult, example evaluations, and the feedback we sought (both the determination of essentiality and other qualitative feedback). Communication with assessors took place via a personalised web system, whereby each assessor received

[61] ETSI's definition of essentiality is: *"'ESSENTIAL" as applied to IPR means that it is not possible on technical (but not commercial) grounds, taking into account normal technical practice and the state of the art generally available at the time of standardization, to make, sell, lease, otherwise dispose of, repair, use or operate EQUIPMENT or METHODS which comply with a STANDARD without infringing that IPR. For the avoidance of doubt in exceptional cases where a STANDARD can only be implemented by technical solutions, all of which are infringements of IPRs, all such IPRs shall be considered ESSENTIAL.'* See Clause 15 (Definitions) of ANNEX 6 (ETSI Intellectual Property Rights Policy) in [15].

[62] The explanation we gave our assessors was: *"A patent is essential with respect to a particular standard if it is not possible to comply with the standard without infringing that patent. More specifically: (1) Essentiality should take into account normal technical practice and the state of the art generally available at the time of standardization, (2) A patent is essential even if it would only be infringed when implementing optional features of the standard, and (3) The costs of alternative (non-infringing) implementations should not be taken into account when deciding essentiality (i.e. 'commercial essentiality' is not considered here). There may be a very specific situation where the following applies: If an un-patented alternative is available that complies with the standard, then the patent cannot be essential. If alternatives exist, but are all patented, then they are all considered essential."*

[63] Ideally, our experiment would have used precisely the same definition of product categories as the pool reference points. However, as our experiment included four different pools, each with their own product category definition, this was not possible.

precisely the right information and set of documents and could provide results and feedback per case and general feedback. This web system also ensured that cases were performed (and submitted) one by one.[64]

8.1.2 Reference point: patent pool inclusion

Ideally, a pilot experiment like this would be able to compare the assessment outcome with the absolute truth, and thus be able to measure the accuracy of assessments, as well as the shares of false positives (patents assessed to be essential but actually not) and false negatives (patents assessed as not essential but actually are). But such a perfect world does not exist. Ultimately, the verdict of essentiality (and infringement) lies with an authorised court, and there are very, very few cases where this verdict is drawn (far too few to be able to serve as reference point for a study like this). Moreover, verdicts of court cases may be reversed in appeal, or based on specific assumptions (e.g. essentiality with respect to a specific product category) or conditions (e.g. patent law in a specific country). Furthermore, the selection of patents in court cases is not random. Thus, perfect reference points do not exist in the real world.

Yet, despite not being 'perfect', one data item does exist that can serve as sensible reference point: the essentiality assessments carried out by patent pools. As already concluded in our case study on pools (see Chapter 4), pools have well-developed and sophisticated assessment procedures, carried out by external parties. They have many years of experience in this, spend significant resources on such assessments and have appeal procedures if stakeholders believe an assessment is not accurate. Yet, arguably, in case of uncertainty about the actual essentiality of a patent submitted by a member, patent pools may be subject to incentives to include that patent, which would lead to over-inclusion. Also, communication between a submitting member and the evaluator as well as appeal opportunities may lead to over-inclusion. At the same time, such effects may be offset by pressure from other members not to do so, as these other members would see their own share in the allocation of royalties drop, and thus demand neutral judgements. After carrying out our experiment, we investigated our data, but found no indications that suggest our pool reference point suffers from over-inclusion.[65]

Given the fact we work with patent pools as reference points, our study will not report results in terms of *accuracy*, *false positives* and *false negatives*, but instead speak of *consistency* (with the pool results), *inconsistent positives* (patents by a patent pool member that are assessed as essential, but are not included in the pool) and *inconsistent negatives* (patents assessed as non-essential but included in the patent pool).

Table 5 presents an overview of concepts in the 'perfect world' and in our pilot experiment.

In the below sections, present our findings on the consistency rates with pools. When we do so, please keep in mind that even when new assessments would be done with exactly the same procedure as used by these pools (and even by the pool assessors themselves), the 'consistency' outcome is not by definition 100%. After all, individual assessors might still come to different outcomes (we further discuss that below at Section 10.1).

The 'perfect world'	This pilot experiment
Accuracy: degree to which assessments are similar to absolute truth	*Consistency*: degree to which assessments in the experiment are similar to the outcomes of patent pool assessments
False positives: patents assessed to be essential but are actually not	*Inconsistent positives:* a patent pool member's patents that are assessed as essential in the pilot, but not included in the pool
False negatives: patents assessed not to be essential but actually are	*Inconsistent negatives*: patents assessed as non-essential in the pilot, but included in the patent pool

TABLE 5: CONCEPTS IN THE 'PERFECT WORLD' AND IN OUR PILOT EXPERIMENT.

[64] This was done to prevent assessors, after completing their last case, from changing their assessment of earlier cases (for instance assuming 50% of the cases should have been essential). It was also pivotal in order to measure learning effects.

[65] If over-inclusion was indeed significantly present in our cases, we would see more inconsistent negatives than inconsistent positives in our experiment. However, looking at the actual data, we see this is not the case. Thus, while we cannot rule out over-inclusion by pools with a high confidence level, we have no indications of it.

8.1.3 Data collection and case construction

Given the two values of the reference point (included or not in the pool), and our aim to be able to compare assessments with and without the claim charts made available to the assessors,[66] we created a data set with the cases that fall into four different categories, as shown in Table 6.

	Patent included in pool ('supposed essential')	Pool member patents not included in pool ('supposed non-essential')
Claim chart made available to assessor	**Category I** • Data source: pool acceptance information supplied by patent owner; claim charts supplied by patent owner • Data quality: very high • Assessment difficulty: average	**Category II** • Data source: pool rejection information supplied by patent owner; claim charts supplied by patent owner • Data quality: very high • Assessment difficulty: high (see text)
No claim chart made available to assessor	**Category III** • Data source: pool inclusion information from pool publication • Data quality: very high • Assessment difficulty: average	**Category IV** • Data source: pool non-inclusion data reconstructed (see text) • Data quality: medium (see text) • Assessment difficulty: average

TABLE 6: THE FOUR CATEGORIES OF CASES IN OUR PILOT.

To construct our cases, we consulted several complementary data sources. While most patent pools publish data on individual patents that are included in the pool (and hence have successfully passed the pool assessment), pools invariably do *not* publish information on patents rejected because they did not pass the essentiality assessment. Furthermore, for neither accepted nor rejected patents do pools publish the claim charts submitted by the patent owners. Since we wanted to have accepted as well as rejected patents in our experiment, and also access to the original claim charts, we sought collaboration with companies to give us this private data. We formally approached ten SEP owners[67] who had submitted patents to the WCDMA patent pool, the Sisvel LTE/LTE-A patent pool, the Via Licennsing LTE patent pool, or the Avanci patent pool – all pools that focus on the same technological area as our pilot experiment. Following the initial responses from these patent owners, we entered into extensive discussions with three SEP owners, covering the patent information as well as the non-disclosure agreements (NDA) they would require in order to agree to share such data with us and with the assessors in our experiment. Eventually, agreements were reached, and NDAs were signed with all involved parties, allowing us to create cases for both categories I and II in Table 6.

We wish to express our gratitude to the SEP owners and persons involved in this project, by discussing and/or providing the information required to execute this experiment. We appreciate that each SEP owner has invested a significant amount of time and resources in their cooperation, for which we are extremely grateful.

It is important to note that cases in category II are expected to be, on average, of a relatively higher difficulty level. After all, a patent owner will only submit a patent to a pool if they perceive there is a good chance it will be found essential. Patents that are clearly not essential (e.g. because the final standard uses a different technology than the one covered by the patent, or where the claim in the patent application giving rise to essentiality is no longer present in the granted patent) will likely not be selected by the patent owner for pool submission.

[66] The claim charts made accessible to the assessors are the same ones these patent owners used for their earlier pool submission. While the format of these charts is not pre-defined by pools in detail, they do all look similar: they identify the patent and the standards document(s) in question, and provide a table of alleged essentiality links between specific patent claims and paragraphs in the standards document(s), followed by an extensive discussion on each of these alleged essentiality links, where each feature in the patent claim relates to the full text in the standard (often color-coded by feature).

[67] For an explanation on these entities, see Chapter 4.

The data collected via the above procedure is of very high quality (we can be certain of pool acceptance or rejection, and each individual data point was extensively discussed with the patent owner). Given the self-selection of patents submitted to patent pools as described above, however, there are considerably fewer rejections at patent pools than acceptances. As a result, we only had a limited number of observations generated this way, which we used for categories I and II. Ideally, we would use data from the same procedure also for categories III and IV (although no claims charts would be needed for these, we would benefit from the high data quality), but given the scarcity of data points, we had to resort to another approach for categories III and IV, which we describe below.

For category III, we relied on the patent list from the so-called WCDMA patent pool (a pool which we discussed in the assessment procedures in Chapter 4)[68] that was published by pool administrator SIPRO [38].[69] The data from this source is also of a very high quality: we can be certain of pool acceptance. The most challenging category, however, is category IV. As pool rejection cannot be directly observed here, we had to reconstruct this category, by creating a set of patents very similar to the one in the actual pool. To do so, we selected patents using a set of defined criteria.[70] Where possible, we performed additional steps to check the selected patents were indeed not essential.

While we believe that this is the best possible approach to find patents for this category, it cannot be ruled out that some of the patents we found were – for whatever reason – never offered to the pool for assessment. As a result, the uncertainty for data in this category is inherently higher than for the other three categories (and hence we characterised data quality as 'medium' in Table 6). Furthermore, we carefully checked the outcome of the experiment for any indications that an individual data point might be problematic, and for this reason discarded a limited number of cases from our final analysis.[71] Before this step, we already removed some other cases when we learned that not all our assessors had followed our instructions in terms of which standard documents (or versions thereof) had to be considered, thereby rendering their assessment result incomparable to that of the pool assessment.[72]

Thinking about a future mechanism for essentiality assessment, the cases in quadrant I, II, and III are more representative of a mechanism where (selected) patents are submitted by patent owners for evaluation. Cases in IV, in contrast, are more representative of a mechanism where the starting point is all patents disclosed to an SDO.

8.2 | Main findings from our pilot experiment

In this section, we discuss our main findings, focusing on the following questions:

1. How consistent are the assessment results with the pool outcomes?
2. How frequently are assessments inconsistent positives or inconsistent negatives?
3. How does the availability of claim charts affect the results?

[68] Over time, different names and organisations have been associated with this pooling activity. First, the activities moved from UMTS IPR Working Group to the UMTS IP Association (UIPA), and then to the 3G Patent Platform Partnership (3G3P). An organisation called PlatformWCDMA Ltd was exclusively established for the WCDMA pool. Initially, a newly established firm 3G Licensing Ltd was given the task of performing licensing operations; that task was later assigned to Sipro Labs Telecom, and currently Via Licensing acts as a licensing administrator for this pool.

[69] This list was downloaded from [www.sipro.com] but the website is no longer available (and the pool currently has a different licensing administrator).

[70] These criteria are as follows: (1) the patent owner is a member of the WCDMA pool, (2) the patent was declared to ETSI as potentially essential for the relevant standards, (3) the ETSI declaration included information on the specific standards documents for which the standard was potentially essential, (4) the ETSI declaration was within a time window in which the declaring firm declared most of its patents that eventually became WCDMA pool patents, (5) the patent itself is not part of WCDMA pool patents nor of an INPADOC family containing other patents that are among WCDMA pool patents, and (6) the patent was applied for at the EPO and granted.

[71] Eventually, we noted that 5 patents in our data set (of a total of 45 unique patents) were each assessed by at least two different assessors in our experiment, and for 75% or more of the observations, our assessors disagreed with the pool. These patents all belonged to Category IV. Looking at the qualitative feedback, we noted that for all five cases, our assessors reported specific issues after conducting their assessment. The 22 observations associated with these 5 patents were discarded from our analysis.

[72] On the basis of this, we discarded already 32 cases. After these removals, there are 205-32-22=151 observations in the final data set. Of these, 42 are in the internal experiment and 109 in the external experiment. Note that in Table 7 and Table 12, on the internal experiment, we do not include the 5 cases that have claim charts, so we show 42-5=37 cases there.

4. Is there a difference between regular essentiality assessment and 'novelty-based' assessment?
5. Is there a learning curve in terms of consistency with pool assessments?

8.2.1 How consistent are the assessment results with the pool outcomes?

Table 7 presents the **internal** assessments (37 in total).[73] Overall, 70% of the outcomes are consistent with the patent pool determination.

	Consistent with pool	Inconsistent with pool	Total
Patent included in pool ('supposed essential')	15 (75%) (Consistent with pool)	5 (25%) (Inconsistent negatives)	20 (100%)
Patent of pool member not included in pool ('supposed non-essential')	11 (64%) (Consistent with pool)	6 (36%) (Inconsistent positives)	17 (100%)
Total	26 (70%)	11 (30%)	37 (100%)

TABLE 7: DISCRIMINATION BETWEEN ESSENTIAL AND NON-ESSENTIAL PATENTS (INTERNAL EXPERIMENT).
Note: Cells show number of observations and percentage of row total.

We tested our results for statistical significance. The appropriate statistical test here has the null hypothesis that the assessment does not discriminate. This can be tested with a chi-square test of proportions to check whether the table is homogeneous. The p-value for this test[74] is 0.015 and using a 10% confidence level,[75] we can thus reject the null hypothesis. In other words, from a statistical perspective, assessments (in the internal experiments) work better than a random labelling as "essential" or "non-essential", with probability proportional to the number of cases included or not in the pool.

Table 8 shows **external** assessments (109 in total). In 74% of all the observations, the outcomes of the external experiment are consistent with the patent pool determination. Note, however, that because the cases in the external experiment include observations both with and without claim charts, we should not directly compare these results with those of the internal experiment in Table 7, which excludes observations with claim charts.

	Consistent with pool	Inconsistent with pool	Total
Patent included in pool ('supposed essential')	53 (83%) (Consistent with pool)	11 (17%) (Inconsistent negatives)	64 (100%)
Patent of pool member not included in pool ('supposed non-essential')	28 (62%) (Consistent with pool)	17 (38%) (Inconsistent positives)	45 (100%)
Total	81 (74%)	28 (26%)	109 (100%)

TABLE 8: DISCRIMINATION BETWEEN ESSENTIAL AND NON-ESSENTIAL PATENTS (EXTERNAL EXPERIMENT)[76]
Note: Cells show number of observations and percentage of row total.

We tested our results for statistical significance. Again, the appropriate statistical text has the null hypothesis that the assessment does not discriminate, so we used a chi-square test of proportions to check whether the table is homogeneous. The resulting p-value for this test is 0.00000137 and using a 10% confidence level, we can thus reject the null hypothesis. In other words, assessments (for the external experiments) work better than a random classification. Yet, for the internal experiment, the share of assessments inconsistent with those of the respective pool is considerable.

[73] Note that we have not included the (few) internal assessments where claim charts were provided.
[74] For our analysis, we considered applying Yates correction for continuity in the 2x2 contingency tables, but finally decided not to use it as this tends to overcorrect. However, in all the cases where it could be applied, it did not actually make a difference to our results.
[75] Given the number of observations in our pilot experiment, we worked with a 90% confidence level throughout the study.
[76] Cases with claim charts were included.

As indicated, 70% (internal experiment) and 74% (external experiment) of all the assessments in our experiment are consistent with those in the respective pool. We should, however, emphasise that: (1) we selected and stratified our cases in such a way that we were able to answer our defined research questions (such as the effect of the availability of claim charts), and (2) we believe pools are a good but not necessarily perfect reference point. Consequently, these percentages should not be taken as our expected accuracy outcome if a future assessment mechanism was introduced.

8.2.2 How frequently are assessments inconsistent positives or inconsistent negatives?

For the internal experiment, we consider the results shown in Table 7 above. We see that inconsistent positives occur more often than inconsistent negatives (36% vs. 25%), suggesting a bias toward a positive assessment. We tested these results for statistical significance. Our null hypothesis here is that there are no differences in the occurrence of inconsistent positives and inconsistent negatives. Performing chi-square test of proportions, we find a p-value of 0.49. Thus, we cannot reject the null hypothesis that there are no differences between inconsistent positives and negatives. This non-significance is probably due to the small sample size.

For the external experiment, we consider the results shown in Table 8. Again, we see that inconsistent positives occur more often than inconsistent negatives, in fact now about twice as often (17% vs. 38%). We tested this difference for statistical significance. Our null hypothesis here is that there are no differences in the likelihood of inconsistent positives and inconsistent negatives. Performing chi-square test of proportions, we find a p-value of 0.015. Thus, we can reject the null hypothesis that there are no differences between inconsistent positives and inconsistent negatives. Assessors appear to be biased toward a positive assessment; and having more observations and a larger difference allowed us to establish significance.

8.2.3 How does the availability of claim charts affect the results?

We answer this research question by looking at the external experiment, as that was specifically set up to determine the effect of claim charts. As shown in Table 9, the share of consistent assessments for patents with claim charts is 83% (compared to 67% for patents without claim charts), suggesting that accuracy greatly improves if claim charts are available. We should emphasise that the cases with claim charts were more 'difficult' than those without.[77] Thus, for cases of comparable difficulty, the difference might be even greater than the 67% to 83% increase suggests.

	Consistent with pool	Inconsistent with pool	Total
No claim chart	38 (67%)	19 (33%)	57 (100%)
Claim chart	43 (83%)	9 (17%)	52 (100%)
Total	81 (74%)	28 (26%)	109 (100%)

TABLE 9: DIFFERENCES AS A RESULT OF THE AVAILABILITY OF CLAIM CHARTS (EXTERNAL EXPERIMENT)
Note: Cells show number of observations and percentage of row total.

[77] See Section 8.1.3.

We tested our results for statistical significance. Our null hypothesis is that there are no differences in consistency levels between experiments with and without claim charts available. (In other words, the 28 inconsistent assessments in Table 9 should be distributed over the rows "No claim chart" and "Claim chart" in proportion to the total number of cases in each row, yielding expected values of 14.6 and 13.4 respectively.) Performing chi-square test of proportions, we find a p-value of 0.056. Thus, we can reject the null hypothesis that there are no differences between the availability or non-availability of claim charts.

8.2.4 Is there a difference between regular essentiality assessments and 'novelty-based' assessments?

Since it was decided at a later stage that one patent office would do a 'novelty-based' assessment instead of the regular essentiality assessment, we now examine to what extent this assessment yields different results in terms of accuracy. We see that the outcomes of novelty-based assessments are slightly more often (79%) consistent with the pool outcome than the regular essentiality assessments (73%).

	Consistent with pool	Inconsistent with pool	Total
Regular essentiality assessments	59 (73%)	22 (27%)	81 (100%)
Novelty-based assessments	22 (79%)	6 (21%)	28 (100%)
Total	81 (74%)	28 (26%)	109 (100%)

TABLE 10: NOVELTY-BASED VS. REGULAR ESSENTIALITY ASSESSMENTS (EXTERNAL EXPERIMENT).
Note: Cells show number of observations and percentage of row total.

We tested our results for statistical significance. Our null hypothesis here is that there are no differences in consistency levels between experiments using the novelty-based assessment and those using the regular definition of essentiality. Performing a chi-square test of proportions, we find a p-value of 0.55. Thus, we cannot reject the null hypothesis that there are no differences between the regular essentiality assessments and the novelty-based assessments.

Combining claim chart availability and novelty-based assessments

Above we looked at chart availability and novelty-based assessments separately, but since these effects may be interrelated, we now look at the combination of both.

Claim chart provided	Type of assessment	Consistent with pool	Inconsistent with pool	Total	Time spent
No	Regular	27 (63%)	16 (37%)	43 (100%)	7.26 hrs.
No	Novelty-based	11 (79%)	3 (21%)	14 (100%)	12.63 hrs.
Yes	Regular	32 (84%)	6 (16%)	38 (100%)	5.89 hrs.
Yes	Novelty-based	11 (79%)	3 (21%)	14 (100%)	10.44 hrs.
All		81 (74%)	28 (26%)	109 (100%)	7.93 hrs.

TABLE 11: CLAIM CHART AVAILABILITY AND NOVELTY-BASED ASSESSMENTS (EXTERNAL EXPERIMENT).
Note: Cells show number of observations and percentage of row total.

The results shown in Table 11 also indicate the average time spent per case (self-reported). Interestingly, the consistency of novelty-based assessments seems to increase if no claim charts are provided, but to decrease if claim charts are made available.

Our null hypothesis here is that there are no differences in consistency with the pool result if the assessments are novelty-based or based on the regular definition of essentiality, taking into account the differences in consistency whether claim charts are provided or not. Performing chi-square test of proportions, we find a p-value of 0.247. Thus, we cannot reject the null hypothesis that there are no differences between the regular essentiality assessments and the novelty-based assessments.

8.2.5 Is there a learning curve in terms of consistency with pool assessments?

To assess the effect of a possible learning curve, we consider how the consistency of assessments develops as a function of the number of assessments already performed. For the internal experiment, Table 12 shows accuracy levels by assessment sequence number (if that number is 3, for instance, the assessor has already performed two previous assessments). Surprisingly, we see that the accuracy of the first assessment is relatively high, then the accuracy drops in assessments 2 to 6. (Because we randomised cases, we can rule out that this has anything to do with the nature of the first assessment as such.) Observations 7 and 8 are again more accurate. Note, however, that not all assessors did as many as 8 assessments and consequently, the final observations are based on relatively few data points. We can only speculate about what caused this pattern, but one possible explanation is that the assessors took their first case very seriously, felt it was not that difficult, and were perhaps less focused for the next few cases.

Assessment sequence no.	Consistent with pool	Inconsistent with pool	Total
1	7 (88%)	1 (12%)	8 (100%)
2	4 (57%)	3 (43%)	7 (100%)
3	3 (60%)	2 (40%)	5 (100%)
4	5 (71%)	2 (29%)	7 (100%)
5	1 (33%)	2 (67%)	3 (100%)
6	1 (50%)	1 (50%)	2 (100%)
7	3 (100%)	0 (0%)	3 (100%)
8	2 (100%)	0 0(%)	2 (100%)
Total	26 (70%)	11 (30%)	37 (100%)

TABLE 12: LEARNING CURVE (INTERNAL EXPERIMENT)[78]

We tested these results for statistical significance. Our null hypothesis here is that there are no differences in accuracy as a function of the number of cases already assessed.[79] Performing chi-square test of proportions, with null hypothesis that the table is homogeneous, we find a p-value of 0.490. Similarly, regressing the share of consistent assessments on the sequence number using the row totals as weights yields an insignificant slope of 0.008, p=0.59. Thus, we cannot reject the null hypothesis that there are no differences between the stages in the ex-ante probability of a correct assessment.

In the external experiment, each assessor assessed 8 patents, and so we have considerably more (109) valid observations than in the internal experiment. As can be seen in Table 13, results vary somewhat less than for the internal experiment, even though there is a bit of a drop for the sixth case. We can only speculate, but perhaps this is the result of reduced focus when carrying out repetitive tasks.

Our null hypothesis is, again, that there are no differences in accuracy as a function of the number of cases already

[78] Cases with a claim chart were excluded. Cells show number of observations and percentage of row total between brackets.

[79] In other words, the 11 inconsistent assessments in our table should be distributed over all the sequence numbers in proportion to all the assessments with the corresponding number, and the same for all the consistent assessments. For example, 5 of 37 cases are "sequence number 3" assessments, and so under the null hypothesis, the expected value of inconsistent "sequence number 3" assessments equals 11 × 5 / 37 = 1.486. Under the null hypothesis, the deviations we observe would be purely random variations.

assessed. Performing chi-square test of proportions, we find a p-value of 0.909. Thus, we cannot reject the null hypothesis that there are no differences. In contrast, regressing the share of consistent assessments on the sequence number using the row totals as weights, yields a significant negative slope of –0.016 (i.e., a decrease in the share by 1.6% per round), p<0.001.

Assessment sequence no.	Consistent with pool	Inconsistent with pool	Total
1	10 (83%)	2 (17%)	12 (100%)
2	10 (71%)	4 (29%)	14 (100%)
3	11 (85%)	2 (15%)	13 (100%)
4	11 (73%)	4 (27%)	15 (100%)
5	11 (79%)	3 (21%)	14 (100%)
6	8 (62%)	5 (38%)	13 (100%)
7	9 (69%)	4 (31%)	13 (100%)
8	11 (73%)	4 (27%)	15 (100%)
Total	81 (74%)	28 (26%)	109 (100%)

TABLE 13: LEARNING CURVE, EXTERNAL EXPERIMENT (NUMBER OF OBSERVATIONS)[80]

8.3 | Opportunities for improvement

Based on the assessment scheme in our pilot experiment, there are several ways that the results of any future implementation of essentiality assessments could improve.[81] In their open feedback, the assessors recommended the following improvements:

1. Allow assessors to communicate with the patent owner in order to ask for clarification, further information, etc. Such communication does take place (and is not unusual) in patent pools, and also in patent examinations at patent offices, the patent prosecution phase allows for such communication (which often takes place).
2. Allow assessors to consult additional (public) information sources, such as the patent file history (including information during the prosecution phase).
3. Allow assessors to discuss cases with colleague assessors, including calls for assistance.
4. Allocate patents to assessors according to their key technological competences.
5. Have assessors look at multiple cases involving the same standard (so they build up knowledge and experience in that specific standard), and possibly even seek specialisation across assessors.
6. Provide extensive, dedicated training for assessors, also on claim chart breakdown.
7. Allow parties (patent owners and/or third parties) to challenge the results of the assessment. However, challenging procedures need to be designed carefully in order to avoid the potential for the misuse.

Furthermore, in a future implementation, we would expect to see learning effects: (a) learning on an individual basis (progressing experience and knowledge), and (b) learning in a group setting (where individuals learn from each other). Assessors highlighted that 8 cases are not enough to enable learning effects.

Finally, we note that, in the pilot experiment, half of the assessed patents were selected to be actually essential and half were selected to be actually non-essential. In a real-world assessment system, these shares will likely differ, in particular if SDO disclosures are used as the starting point. Indications are that in portfolios of disclosed SEPs, often more than 50 percent are in fact non-essential. If this is the case, and if assessors are equally likely to produce false negatives (finding an essential patent non-essential) and false positives (finding a non-essential patent essential), then the number of essential patents in a sample will be overestimated, the more so the smaller the share of actually essential patents is. For illustration,

[80] Cells show number of observations and percentage of row total.
[81] During our pilot, we made several decisions to ensure the experiment was run properly, that unexplained variance would be reduced and that the results would be comparable with the pool assessment outcomes. In a future, real-life implementation, some of these restraints could be lifted.

assume that 30 percent of a sample of declared SEPs are actually essential and the likelihood of an incorrect assessment is 10 percent. Then the assessment yields, on average, a 34 percent essentiality rate, hence a relative overestimation by 13 percent. Such bias can be addressed in a future implementation by suitable statistical corrections.

8.4 | Conclusions

While a perfect, absolute reference point of actual essentiality does not exist, we believe we can answer our key questions by taking patent pool results as reference point. In other words, we test the consistency score with patent pools.

The best results (i.e. most consistent with patent pool outcomes) are achieved by individuals working at a patent office as patent examiners, who are provided with a claim chart, and perform a regular essentiality assessment (as opposed to a novelty-based assessment). **They achieve a consistency rate of 84% with the pool outcomes**, and report spending 5.9 hours on average per assessment. Note that this level of resources is considerably lower than what pools use to perform their assessments (see Chapter 4). The number of observations on which we base the above result is sufficient to be considered informative (38 cases with claim charts and regular assessments, out of a total of 109). (Note again that even in an experiment where assessments were (again) done by the pools themselves, it is not guaranteed that the outcomes this time would be 100% consistent to the earlier findings.)

In comparison, individuals working as senior engineers in academia (Associate Professor or Full Professor), who are not provided with a claim chart, achieve a **75% consistency rate** with the pool outcomes. They report spending on average 4.75 hours per assessment. Junior engineers in academia (Postdoc level or similar) achieve a similar score. Yet, the number of observations on which we base our results for engineers is more limited and the results are therefore less certain.

As with any experimental set-up, ours also has its limitations. Some of the pool assessments that serve as our reference point, may not be correct.[82] Furthermore, some of them may have been based on stricter or less strict criteria for essentiality than communicated to our assessors.[83] This means that the actual accuracy of the assessments in our pilot may be lower or higher than 84% and 75%.

Finally, we believe any future implementation of essentiality assessment could be improved in several ways, as suggested by assessors: (1) allow assessors to communicate with patent owners, (2) allow assessors to consult additional information sources, including the patent file history, (3) allow assessors to discuss cases with colleague assessors, (4) assign patents to examiners according to their key technological competences, (5) have assessors look at multiple cases involving the same standard and possibly seek specialisation across assessors, (6) provide extensive, dedicated training for assessors and (7) allow parties to challenge the results of the assessment. Furthermore, in future implementation, we would expect to see learning effects, both on an individual basis and in a group setting.

[82] Based on our observations, we do not see any indications that pools systematically over-include, but there might still be errors in the reference points.

[83] For instance, the pool may only have looked at essentiality for specific device categories covered by the pool license. (Footnote 62 explains why we could not use the same approach here as the pools.)

9

INSTITUTIONAL FEASIBILITY: STAKEHOLDER VIEWS ON ESSENTIALITY ASSESSMENT

9 Institutional feasibility: stakeholder views on essentiality assessment

9.1 | Introduction and methodology

A potential system for essentiality assessment should not only be technically feasible. It is part of a complex environment which requires that the system generates data that fits with the interests of parties for such data, has a suitable procedural design and organisational structure, and raises the funds needed to finance the required resources. Moreover, all previous design elements should be implemented in a mutually consistent manner and supported by stakeholders. Together, this determines what we call the institutional feasibility of the system.

This chapter discusses the above aspects, using 19 distinct dimensions, which we introduce in Section 9.2 and discuss individually in the subsections below.

In Section 9.3, we introduce a total of nine scenarios, each consisting of a set of consistent design choices for the dimensions we identified.

Our investigation on the institutional feasibility of essentiality assessment presented in this chapter is based on a variety of sources, including:

- a stakeholder workshop we organised in October 2019 in Brussels, with 23 participants selected from all different stakeholder categories, including SMEs;
- discussions and feedback at a number of events, including the Joint ITU-NGMN conference 'Licensing practices in 5G industry segments' (Geneva, January 2019), ETSI IPR Special Committee meetings #31 (Sofia Antipolis, March 2019) and #32 (Sofia Antipolis, February 2020), the TILEC conference 'Patent Pools 2.0' (Brussels, April 2019), the EC Expert Group on Industrial Property Policy (GIPP) (Brussels, July 2019 and October 2019), the EC Group of Experts on Licensing and Valuation of Standard Essential Patents (Brussels, December 2019);
- visits to the EPO in (Munich, April 2019) and the JPO (Tokyo, March 2019);
- sessions with the members of the Advisory Board (Sevilla, November 2019 and Brussels, February 2020) as well as during intensive online discussions;
- a number of visits to companies willing to discuss possible collaboration providing data for the experiment (see Chapter 8);
- numerous other exchanges with other parties;
- all the other work packages performed in the context of this study (literature survey, patent pools, Hantei-E, court cases, and landscape analysis).

9.2 | Dimensions that determine institutional feasibility

To facilitate a systemic discussion of the elements to bear in mind when designing a future system for essentiality assessment, we distinguish a total of 19 distinct dimensions. We group these into four categories: interest in transparent data on essentiality, procedures, organisation, and financing. The dimensions and their categories are shown in Table 14. The subsections in the remainder of this section discuss each of these dimensions.

Category	Dimension
A. Interest in transparent data on essentiality	A1. Interest in transparent data on essentiality from different stakeholder categories A2. Data types and desired confidence level A3. Interest for data on specific standards and industry sectors A4. Desired level of detail (product categories, optional normative features) A5. Data interest and the standards' life cycle A6 Legal status of assessment outcomes A7. Public availability of assessment outcomes
B. Procedures for essentiality assessment	B1. Patent selection (within given standard) B2. Use of sampling B3. Required and available input B4. Patent owner interaction B5. Availability of a procedure to challenge outcomes B6. Required capacity B7. Fast track for existing patents in a patent pool
C. Organisational structure for essentiality assessment	C1. Executing entity, capabilities and expertise C2. Impartiality C3. International dimension
D. Financing of essentiality assessments	D1. Principles for financing D2. Financial contribution collection

TABLE 14: THE 19 DISCRETE DIMENSIONS RELATED TO INSTITUTIONAL FEASIBILITY.

9.2.1 Interest in transparent data on essentiality

A1. Interest in transparent data on essentiality from different stakeholder categories

At the stakeholder workshop as well as during one-to-one discussions with stakeholders, we observed that stakeholders expressed a clear interest in transparent data on actual essentiality: many (but certainly not all) of the stakeholders we talked to found it useful to know which patents are essential to specific standards, and why.

Interest for transparent data on essentiality was expressed by standards' implementers, by SEP owners and by courts, which all have different underlying reasons for their interest. Table 15 summarises the main benefits as perceived by these stakeholder groups. In addition, SDOs have expressed interest in transparent information on actual essentiality.

The interests we observed are divergent. Even though these divergent needs were never really conflicting, they may call for different design parameters and can result in trade-offs. We will discuss that in more detail below.

Standards' implementers could benefit from data on actual essentiality in the following ways. First, it can empower them in deciding with whom they should engage in licensing discussions. Even if a patent owner discloses potentially essential patents to an SDO, that does not mean they own patents which are actually essential, and are also actually essential for the specific products an implementer wishes to make (version of standard, product category, and inclusion of optional normative features). Furthermore, it can help them to be better informed during the licensing discussion about the actual SEP exposure of a given product (insofar the transparent data includes information on relevant product categories and optional normative features). Moreover, implementers may better determine what fraction a licensor's essential patent portfolio forms out of the total stack of essential patents for a given standard, product category or product, which may help them in assessing the reasonableness of a demanded royalty for that SEP portfolio.[84, 85] Finally, implementers may benefit from smoother and faster licensing negotiations, requiring fewer resources. Depending on the context, the data need of an implementer could range from knowledge of the SEP landscape at large (without necessarily identifying specific

[84] Note that the number of owned SEPs as such may not only be the only parameter to be taken into account when it comes to the determination of a FRAND royalty rate, but those owned SEPs do form the starting point for such a determination.

[85] As we will further discuss below, such a comparison is only possible if numerator and denominator are assessed with the same level of accuracy and lack of bias.

claims or patents) to the actual essentiality of a patent (claim) for an implementation of a specific product. (Below, we discuss one specific type of data, being 'validated summary claim charts', that allows such use.)

SEP owners could benefit from data on actual essentiality as it provides them with better knowledge of the extent of their own portfolio in relation to that of others,[86] helping them to determine FRAND compliant licensing fees. We also refer to the fourth licensing principle put forward by the European Commission in COM(2017) 712 final [17], which states that, in defining a FRAND value, an individual SEP cannot be considered in isolation, and a reasonable aggregate rate has to be taken into account for the standard.

SEP owners could yet benefit more from such assessments if they would generate "validated summary claim charts" (see below for more details), established by an independent, impartial assessor.[87] If such documents are made public, they create several advantages for the patent owner:

- Firstly, SEP owners may benefit from smoother and timelier license negotiations, especially with parties in principle willing to license but who are held back by lack of credible information at the implementers' side on what to license.[88] This can save valuable resources and pull licensing revenues forward in time.

- Secondly, SEP owners can derive value from such data in the context of infringement procedures (e.g. reporting by the infringer, damages, seeking injunctions, etc.), where it can create valuable, independent evidence.

- Thirdly, this data is especially relevant in the context of the legal framework created in the Huawei/ZTE legal framework case. In the court case that initiated this framework, The Court of Justice of the European Union (CJEU) ruled that the holder of a SEP who has committed to license that patent on FRAND terms, may be found in breach of the competition rules (Article 102 TFEU) by seeking an injunction against a potential licensee in certain circumstances [12]. The CJEU's judgment also explains that if the SEP owner meets a number of key requirements, then it would NOT be in breach of the competition rules and can indeed seek injunctive relief. One of these key requirements is "*specifying the way in which [the SEP] has been infringed*". "Validated summary claim charts",[89] generated by an independent, impartial assessor, may be well used to specify the 'way of infringement' as meant in the Huawei/ZTE court case, and helping the patent owner to seek injunctive relief if the implementer does not meet its own requirements under that framework.

We note that implementers, if they are given such 'validated summary claim charts' in the course of a licensing negotiation, also benefit from that data as it makes them better able to take a position towards which patents are actually essential and why so.

We furthermore note that many SEP owners are also standards' implementers, and thus may enjoy the benefits listed above for implementers.

Courts may benefit from information on actual essentiality when they face the task of determining or assessing FRAND compliant fees. The judges we spoke to informed us that although they feel well equipped to deal with issues concerning validity or infringement of the attested patents in SEP cases (typically a handful), they often lack good input to determine or assess FRAND compliant fees.[90] To do so, they require good and impartial data on actual essentiality for the SEP owner in question and – if possible – for other SEP owners using the same standard. This is especially relevant with cases that employ the so-called top-down approach (see Chapter 3).

Depending on its design, a system for transparency assessment can also provide information on the current ownership of SEPs – for instance, a system based on submissions by patent owners would reveal current ownership. Such information would be valuable for all stakeholder categories.

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[86] See previous footnote.

[87] It does not provide insights on whether an implemented device infringes non-SEPs, but that it outside the scope of our study.

[88] Even if the patent owner itself attests that a given set of patents is essential, an implementer may find such information not to be determined in an impartial way, and may not be willing to rely on it.

[89] For this, it is crucial that these documents also provide information on product categories and optional normative elements, as this is necessary to make the 'translation' from 'essential' to 'whether a specific product necessarily infringes the patent'.

[90] Currently, courts mostly rely on input provided by experts – either provided by the parties or appointed by the court. Their input, of course, does not have any binding value. The decision is taken by the judge(s) upon their own consideration of the (expert) input.

Stakeholder category	Main benefits derived from transparent data on essentiality
Implementer	• Identification of which patent owners have legitimate claims concerning SEPs. • Better information on actual SEP exposure for a given product. • Enables better assessment of reasonableness of individual royalty rates (by comparing the extent of the actually essential portfolio of a specific patent owner with that of the actually essential portfolios of all relevant patent owners).[91] • Smoother and faster licensing negotiations. • Reduced need for resources in licensing negotiations. • [Information on current ownership of SEP].
Patent owner	• Enables better assessment of reasonableness of individual royalty rates (by comparing the extent of the actually essential portfolio of a specific patent owner with that of the actually essential portfolios of all relevant patent owners).[92] • Smoother, faster licensing negotiations, especially with willing licensees. • Reduced need for resources in licensing negotiations. • Pulls licensing revenues forward in time. • Helps in in terms of infringement procedures (e.g. reporting by the infringer, damages, seeking injunctions, etc.), and in specific to meet a key requirement as set out in Huawei/ZTE framework ('way of infringement'). • [Information on current ownership of SEP by other firms].
Courts	• Supports courts being able to determine or assess FRAND compliant fees. • [Information on current ownership of SEP].

TABLE 15: MAIN POTENTIAL BENEFITS FOR THE VARIOUS STAKEHOLDERS.

The above types of interest in data have different implications for the transparent data needed to satisfy that interest, in terms of the type of data, and the confidence level of that data. This will be discussed in more detail in the next sections. The data interests may also be divergent. Trade-offs exist between these data types, as well as between the desired data and the design of a feasible mechanism to generate such data (see for instance Dimension A7 at Section 9.2.1, where we discuss the trade-off between having a high level of transparency, and conditions under which parties may be willing to participate in such a mechanism).

Finally, note that there are also reasons why stakeholders may *not* wish to have more transparent data available. We will discuss these in Section 9.4.

A2. Data types and desired confidence level

Ideally, each individual essentiality assessment delivers a perfect result and every potential patent is assessed for essentiality. In practice, this is not possible. Not only are there inherent limitations to accuracy, there is also a trade-off between invested resources and the accuracy of the outcome.

We suggest looking at confidence from the usage perspective (e.g. the interest in data from implementers, patent owners, and courts), then consider whether a certain approach can satisfy such confidence levels. While we underline the importance of a rigorous process, both for usefulness and credibility, the required confidence level

[91] Transparent data on essentiality can provide information on the extend of SEP portfolios. This is *necessary* information to assess the reasonableness of licensing offers, but not *sufficient* information: other factors also will need to be taken into account to judge a FRAND offer.

[92] See previous footnote.

should be assessed in the context of the way that data is used.

Here, we focus on confidence in the actual dataset – used for a specific purpose – not the confidence ('accuracy') level of individual assessments. To determine the dataset confidence levels required from the usage perspective, we start with the purposes for which stakeholders may want to use essentiality information (as summarised in Table 15), and then consider the types of data that would support such use. These different types of data could be characterised as:

- 'numerator': data on actual SEPs from a specific patent owner for a specific standard.

- 'denominator': data on actual SEPs from all relevant patent owners for a specific standard. Some refer to this data as the 'size of the total pie'.

- 'validated summary claim charts': a one-page summary that maps patent claims in the actual SEPs to relevant parts in one or more standards, each identified by reference and version (and where possible with references to specific figures, table or other elements in the text of the standard). It also indicates whether the patent is relevant for some device categories only, or relevant for an optional normative element in the standard only.[93, 94] The validated summary claim chart is specific enough map the patent to specific products, but not so detailed that it raises concerns over being distributed publicly.

- 'detailed assessment outcomes': data with full details on the outcome of the assessment procedure, for both actual SEPs and for assessed patents for which no essentiality was concluded (and for the latter, also the considerations by the evaluator to come to this conclusion). It contains a full (validated) full claim chart[95] where each claim submitted to essentiality assessment is broken down into a set of claim elements, each of them individually indicated to read onto listed referenced and extracted relevant standard portion.

- 'current ownership data', indicating the current owner of the patent in question.[96]

Here, the terms numerator and denominator are borrowed from court cases that use the top-down approach (see Chapter 3) and the following division to determine a given patent owner's numerical proportional share:

$$\textit{Numerical proportional SEP share of patent owner A} = \frac{\textit{Number of SEPs owner by A}}{\textit{Number of SEPs by all patent owners}}$$

The desired confidence level (i.e. the confidence level required to use the data for a certain purpose) has at least two dimensions: (1) the accuracy of the assessments (and, relatedly, if lower accuracy is subject to a systematic bias in some direction), and (2) the number of patents that needs to be assessed (e.g. full population or a sample).

The required confidence level differs for the five data types we distinguished:

i. The required dataset confidence level for numerator data is usually high, regardless of whether it is used by an implementer, a patent owner, or by court. Ideally, each separate patent would be individually assessed, at a high level of accuracy, and a sample would not suffice.

ii. The required dataset confidence level for nominator data is usually lower, as it is the aggregated data of all the relevant patent owners. Here, a properly

[93] Without specific information on device categories or optional normative element, the other information in this document can (in many cases) also help the reader to derive such conclusions (looking at the mapped claims and relevant part of standards, and where needed, consulting the text of the patent (claim) and that of the standard too. But this is a time-consuming exercise and requires knowledge and skills. If, instead, such data is readily provided in the document, it can be much easier be used in a large-scale exercise.

[94] This document can be regarded similar to such summary documents created by pools, such as the "Declaration of Essentiality" document issued by 3G Licensing and its successor, Sipro Lab Telecom, in their respective role of WCDMA patent pool administrator; see Section 4.2.4 for details. There is one element in which the 'validated summary claim charts' as meant in this study go a little step further: they also provide information on whether a patent is relevant for an optional normative element in the standard only.

[95] Note that this is not the *submitted* claim chart of the applicant.

[96] Such data may be directly obtained from the patent owners in some setting. While it may also be obtained from patent registers, this approach has limitations; see Dimension B3 in Section 9.2.2 for a more detailed discussion.

taken sample of all patents could suffice, where it is important that all relevant statistical considerations are taken into account to ensure the sample results in a representative data set (one would, for instance, take into account distributional aspects such as possible large differences in rates between patent owners). Moreover, we suggest the assessment of the chosen sample is of precisely the same methodology and carried out in the same rigor as that for numerator data to prevent systematic biases.

iii. The required dataset confidence level for 'validated summary claim charts' data is high. You really want accurate data for each individual patent.

The required dataset confidence level for 'detailed assessment outcomes' data is high. You really want accurate data for each individual patent.

iv. The 'current ownership data' indicates, as the name suggests, the current owner of the patent in question. The required confidence level is relatively high. This is typically relevant regarding the numerator, and not relevant for the denominator (which is about the 'size of the pie', regardless of who owns it).

Table 16 is an overview of the major elements in the above section.

Data type	Description	Data (specifically) important for	Required level of detail of the data	Required confidence level
I. Numerator	Data on actual SEPs from a specific patent owner for a specific standard	Implementers, patent owners, courts	A positive decision for a given patent regarding a specified standards document	Relatively high (high accuracy for individual assessments; sampling not preferred)
II. Denominator	Data on actual SEPs from all relevant patent owner for a specific standard	Implementers, patent owners, courts	A positive decision for a given patent with regarding a specified standards document	Moderate (high accuracy for individual assessments; sampling allowed (if well executed)
III. 'validated summary claim charts'	A one-page summary that maps claims in the actual SEPs to relevant product categories and relevant parts in one or more standards, each identified by reference and version (and where possible with references to specific figures, table or other elements in the text of the standard	Implementers, patent owners, courts	Information on the standards' specific claim(s) and the related specific requirement(s) as presented in the standard, for which the assessor has determined essentiality, and the relevant product categories. Preferable, this also provides information on whether patents are only essential for optional normative parts of the standard (see Dimension A4, below)	high (high accuracy for individual assessments; sampling not allowed)
IV. 'detailed assessment outcomes'	Data with full details on the outcome of the assessment procedure, for both actual SEPs and for assessed patents for which no essentiality was concluded (including considerations by the evaluator to come to this conclusion).	Patent owner[97]	Full (validated) full claim chart where each claim submitted to essentiality assessment is broken down into a set of claim elements, each of them individually indicated to read onto listed referenced and extracted relevant standard portion	high (high accuracy for individual assessments; sampling not allowed)
V. Current ownership data	Data revealing the current owner of the patent	Implementer, courts	Name of current owner, in relation to numerator data type	Relatively high (high accuracy for individual assessments; sampling not allowed)

TABLE 16: DATA TYPES.

[97] Especially in an infringement context, or when it wants to challenge the outcomes of a (negative) assessment.

Based on above insights, we can now map (a selection) of the main benefits, the stakeholders for whom these benefits are important, and the data types necessary to realise these benefits.

Finally, we'd like to stress that a system for essentiality assessments should not strive for generating a single set of aggregated, static numbers (like essentiality rate percentages). Such numbers would not cater for specific situations, and don't reflect that the data changes over time. Instead, a system for essentiality assessments should make accessible the underlying data points, where the user of the data, using relatively simple filters (which standards and documents, flags for device categories and for optional features, etc.), can create the information that is relevant for that used in the business context.

Main benefits derived from transparent data on essentiality	**Benefiting Stakeholders**			**Necessary data types**				
	Implementer	Patent owner	Courts	I. Numerator	II. Denominator	III. 'validated summary claim charts'	IV. 'detailed assessment outcomes'	V. Current ownership data
Identification of which patent owners have legitimate claims concerning SEPs	Yes	Yes	Yes	Needed				Needed
Identification of which patent owners have legitimate claims concerning SEPs for a specific product	Yes	Yes	Yes	Needed		Needed		Needed
Enables assessment of reasonableness of individual royalty rates for a specific product	Yes	Yes	Yes	Needed	Needed	Needed		Needed
Smoother, faster licensing negotiations	Yes	Yes		Needed	Needed	Needed		Needed
Helps in in terms of infringement procedures		Yes				Helpful	Helpful	
Helps to meet a key requirement as set out in Huawei/ZTE framework		Yes				Helpful		
Supports courts being able to determine or assess FRAND compliant fees			Yes	Needed	Needed	Needed		Needed

TABLE 17: MAIN BENEFITS (SELECTION), BENEFITING STAKEHOLDER, AND DATA TYPES NECESSARY TO REALISE THESE BENEFITS.

A3. Interest for data on specific standards and industry sectors

Most tension and conflict concerning SEPs have involved standards for mobile communications (i.e. the 3GPP Technical Specifications for 3G, 4G, 5G communications), for wireless networking ("Wi-Fi"[98]) and video encoding (MPEG-2/Video[99], AVC[100] and HEVC[101]). During this study, these were the standards most referred to by stakeholders in terms of benefitting from essentiality assessment. It is hard to say for which standards such needs will emerge in the future, but it is likely that standards relevant for IoT (in itself a very broad category, including radio standards as well as many more application-specific standards) will be part of that, as well as more sector-specific standards such as those for mobility – think of the Cooperative-Intelligent Transport Systems (C-ITS), where currently a battle is taking place between different standards.[102]

We also found that it is particularly important that any essentiality assessment is very clear about the specific version/release of the standard for which essentiality was assessed. After all, a patent that was found not to be essential for one specific version, might well become essential for future versions.[103] For instance, when in the past, key technologies such as High Speed Packet Access (HSPA) and Multiple-Input Multiple-Output (MIMO) were added to new releases of 3GPP Technical Specifications, patents became essential that were not essential to previous versions of these standards.

A4. Desired level of detail (product categories, optional normative features, standards version)

Especially implementers stressed how important it is that transparent data on essentiality must include information that allows them to determine whether a SEP is essential for a *specific* product, instead of merely stating it is essential to the standard as a whole.[104] Three types of distinctions are important here:

- The product *categories* to which the SEP applies. After all, the product category determines which parts of a standard are actually implemented in a device (and therefore exposed to certain SEPs). Taking a mobile communications standard as example: no single device is a mobile terminal, SIM card, base station and core network at the same time. Any one device only implements a subset of the standard, relevant for its product category. One challenge here is that relevant product categories may change over time. Like in 2014, for its WCDMA patent pool, licencing administrator SIPRO distinguished the following categories: Terminal, Base Station, Radio Network Controller and Core Network.[105] [38] Yet, for devices nowadays, it may be important to distinguish a terminal with voice vs. a data-only terminal. For future devices, it would be important to distinguish, for instance, between the various categories of narrowband communications devices for the Internet of Things (IoT), such as those based

[98] What is popularly known as "Wi-Fi" is formally known as the IEEE 802.11 suite of wireless LAN standards.
[99] MPEG-2/Video is formally known as ISO/IEC 13818-2 as well as ITU-T Rec. H.262.
[100] MPEG-4 Advanced Video Coding (AVC) is formally known as ITU-T Rec. H.264.
[101] High Efficiency Video Coding (HEVC) is formally known as ITU-T Rec. H. 265 as well as MPEG-H Part 2.
[102] Main contenders are the WLAN-based ITS-G5 standard (based on IEEE 802.11p and in Europe formally standardised as ETSI EN 302 663), and the cellular-based C-V2X standard (part of the 3GPP suite of standards).
[103] Technically, a patent may also lose essentiality for a newer version of a standard, although this is unlikely in practice.
[104] Technically speaking, there are at least three issues that needs to be determined in such an analysis: (i) is the patent claim under analysis directed to a particular product (UE, base-station, voice encoding device...), (ii) are the requirements in the relevant portion of the standard specification directed to a particular product? (e.g. "the UE shall"; "the base-station shall", or implicitly, the base-stations sends, therefore the UE must receive) and (iii) are there subcategories of products where only parts of the standard is used/required – such as a smartphone as opposed to an IoT device using eMTC, or base-station.
[105] This list was downloaded from sipro.com, but the website is no longer available (and the pool currently has a different licensing administrator).

on the NB-IoT or LTE-M technologies, which are now both part of 3GPP releases.[106] This is important, because such devices only implement a (small) subset of the complete set of 3GPP Technical Specifications, and thus will only be exposed to a (small) subset of all essential patents for the complete set of 3GPP Technical Specifications.[107]

- Whether the SEP applies to a *mandatory* portion of the standard, or an optional normative portion (which the implementer may decide whether or not to offer in a product). Note that while many SDOs (including ETSI and IEEE) include optional normative portions in their definition of essentiality, some do not define this, and other SDOs exclude optional normative portions in their definition (such as ITU).[108] In light of a transparency tool for SEP exposure and in the context of an essentiality assessment mechanism, it seems advisable to include optional normative portions in the overall definition of essentiality, and to provide more detailed information on whether a patent is essential only when a specific optional normative feature is implemented.

- The version (often called 'release') of the standard for which (document) the patent is essential. Almost invariably, a new revision of a standard is comprising all elements of the previous– one reason being the necessity maintain backwards compatibility to products that implement an older version of the same standard. So, for practical purposes, we assume that if a patent is found essential for a certain version, then it is also essential for future versions of that same standard Note, however, that while a 'new standard' or 'new standard generation' (e.g. 5G versus 4G) may inherit technology from the previous standard, but on that step, there will also be technology that is not 'inherited'.)[109]

Note that the first two items (information on product categories and optional normative portion) are important because they are the key link in the 'translation' from 'a patent being essential to a standard' to 'whether a specific product using the standard necessarily infringes the patent'.

Obviously, a desire to have a higher degree of detail such as outlined above will result in need for more resources for the assessment. It is out of the scope of this study to assess the precise differences, but without the level of detail outlined above, the instrument might be of limited value.

In the context of the precise text of the standard, we furthermore observe that the proper drafting of the text in a standard is critical in order to distinguish between requirements (normative), options (allowing for choices, which when selected become normative), recommendations (desired but not required), possibilities (examples of capabilities but not prescriptive), and informative statements which on their own do not permit establishing technical essentiality. Most SDOs have rules which define which wording is appropriate to be used in their specification under these circumstances: terms as 'shall', 'may', 'should', 'can', and respectively 'is/has' all have specific meaning in this context. Likewise, at many SDOs, standards follow a given structure (template): some parts are normative (such as clauses and sub-clauses, tables, figures, normative references) and others are informative. Annexes may be labelled normative or informative as deemed appropriate. A good example of such a structure is defined in [25].

An alternative approach for mapping parts of standards (and hence SEPs) to product would be that certain bodies develop "profiles" that describe certain sets of normative elements of standards. On the basis of these profiles, implementers could issue a "protocol implementation conformance statement" and patent owners could consider whether their SEPs are essential when implementing a specific profile.

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106 eMTC: enhanced Machine-Type Communication, included in 3GPP Release 13; NB-IoT: narrowband Internet of Things, included in 3GPP Release 14.

107 Alternatively, public (certified) claim charts could help implementers to decide whether a certain patent is relevant for the products they make or not. This approach may be better able to deal with product category changes over time. But this requires a significant amount of knowledge at the implementer's side and possibly a significant burden. Moreover, the decision to make certified) claim charts may have consequences for the degree to which patent owners are willing to make available (their own, non-certified) claim charts in the first place.

108 For more information, see [6, p. 58].

109 Note also that in mobile telecommunications, it is quite common that a device implements multiple generations (e.g. 2G, 2G, and 4G). In that case, the maker of the device must consider the actually essential patents for each of these generations

A5. Data interest and the standards' life cycle

An ultimate determination of essentiality is only possible once the standard is finalised, and after the patent has been granted and that decision has become final (e.g. because opposition is no longer possible, or no appeal had been filed. Only then, is it certain what is contained in the standard and what is covered by the patent's claims. Although there was general agreement during the workshop on this, some participants noted that licensing negotiations are not necessarily just about granted patents. These could include existing patent applications that may still be granted during the term of the contract, or even patents that will be applied for in the future and become SEPs, often in a defined capture period.[110, 111] While a patent owner is not allowed to require an implementer to license a patent that cannot (yet) be enforced, an implementer may nevertheless still decide to do so, and thus be certain of owning a license if the patent does become enforceable.

Note, however, that for any patent that it is not found to be essential for a given standard document version at a certain point in time, it may be reassessed at a later point in time, for a newer document version or other standards documents, and perhaps be assessed to be essential.

As a result, any strict determination of essentiality (by a court, ultimately) will not generate all the information implementers and SEP owners may wish to have access to when negotiating a license. This is a necessary limitation of essentiality assessment that everyone needs to accept.

While we propose that an assessment of essentiality is only done (1) once the standard is finalised, and (2) after the patent has been granted and that decision has become final, there is still an important decision to be taken about when (e.g. the exact point in time) the essentiality assessment is or should be done after these two conditions are met. This decision will depend on the final model (for instance: on-demand vs systematic assessment of all patents), on the behaviour of parties (especially in an on-demand scheme) and on available resources, both in money and qualified assessors.

A6. Legal status of assessment outcomes

It is obviously desirable that the outcomes of an essentiality assessment mechanism are valued, found useful and deemed respectable by all or the majority of stakeholders. This would be the case if during license negotiations, both parties agree these assessments form a solid basis for further negotiations about the value of the patents assessed to be essential (and essentiality would not need to be discussed further unless the parties engage in a court case). A high-quality mechanism, as well as procedures to challenge outcomes, can help to achieve this aim. At the same time, as expressed by many participants, courts have the sole authority to resolve IPR disputes, including infringement issues. While a European mechanism for essentiality assessment could provide the courts with valuable information, it should not challenge the courts' authority.[112] (This highlights again the need for a high level of rigour in any analysis that is made; ff any party feels that their treatment is incorrect in the analysis, they may go to court – which could result in an increase in litigation, rather than negotiating with this information as a basis.)

It is therefore advisable to not strive for such results that are legally binding. The outcome should rather earn the status of being of an industry standard level of quality that is generally accepted. We propose three terms may be chosen in this specific context:

- **'Opinion of essentiality'.** This is the term used by the Japan Patent Office for the outcomes of its Han-tei-E system.
- **'Certificate of essentiality'.**[113] This is the term used by various patent pools to describe the outcome of their essentiality assessments.
- **'Determination of essentiality'.**

[110] It is noted that when existing patent applications and future patent applications filed during the capture term are included, these may be only included to the extent these become essential to the standards within the scope of the license agreement or extensions/modifications of these standards generated during the term.

[111] Of course, some parties may also decide to agree on a license that includes both SEPs and non-SEPs. But such agreements are out of the scope of this study, which focusses on the essentiality of patents.

[112] This is also recognised by ETSI: "However, it should be noted that once an IPR (patent) has been granted, in the absence of an agreement between the parties involved, the national courts of law have the sole authority to resolve IPR disputes." See Clause 4.3 in [14].

[113] Not to be confused with 'certification' of parties that can carry out essentiality assessments. (See Dimension C1 in 9.2.3).

Note that specific words may give rise to (planned or unplanned) associations and interpretations. This should be carefully considered before deciding on a final terminology.

A7. Public availability of assessment outcomes

When we think of transparency, what springs to mind is providing full public availability of all relevant data. Concerning essentiality assessments, this would be the list of patents assessed, the outcome (positive as well as negative), as well as the all underlying evidence (input claim charts[114] and other documents used to reach a conclusion). At the same time, a scheme making all these documents publicly available could seriously threaten the support and engagement of patent owners. They fear that information on negative decisions and the public availability of input claim charts might be (mis)used by others in legal procedures. In patent pools, similar considerations have led almost all pools to decide to publish positive outcomes, but no negative outcomes or underlying data.

Looking at the five data types introduced in Dimension A2 in Section 9.2.1, we suggest the following (insofar the chosen system indeed generates such data):

- Numerator data should be made publicly available.
- Denominator data should be made publicly available.
- 'validated summary claim charts' should preferably also be made publicly available. This way, in licensing negotiations, such data can be exchanged and considered by all parties without first entering into lengthy and time-consuming negotiations on NDAs, and in this way this data could lead to significant advantages to all. While not all patent owners are currently willing to share such data, we believe it is advisable for them to consider doing so, as it does not contain real confidential data, and making it available can lead to considerable common benefits of patent owners and implements. The 3G3P pool (see Chapter 4) is a good example where patent owners actually agree to make such data available to interested third parties.
- 'detailed assessment outcomes' (as well as any input claim charts by parties) to be made available to patent owners only. For them, this data is especially valuable when they want to challenge the outcomes of an assessment, or when they need to prove possible infringement. At their own discretion, they may decide to share it with others. This category may include sensitive and confidential data. Disclosure of this type of data does not necessarily help the ecosystem as a whole. Also, if it would be made available, it is likely that patent owners are (much) less include to cooperate in any way in a system of essentiality assessments
- '*current ownership data*' should be made publicly available.

We also note that for a system that would be an official public procedure, sponsored by the EU and/or its member states, there may be other considerations of what should be made publicly available or not.

[114] To distinguish claims charts that are submitted by parties from 'validated summary claim charts' (which are one of the *outputs* of an essentiality assessment), we use in this chapter the term 'input claim chart'.

9.2.2 Procedures for essentiality assessment

B1. Patent selection (within given standard)

In the context of this study, patent selection refers to the mechanism applied to select patents for assessment. In principle, there are two different lines of approach: the 'SDO disclosure-based approach' and 'On-demand approach' which we discuss below.

I: SDO disclosure-based approach

In the first line of approach, candidate patents are identified from SDO databases containing patents disclosed as potentially essential to a standard.[115] Most SDOs have disclosure rules for concerning potentially essential patents, and thus in principle, this approach has the advantage that all potentially essential patents belonging to all relevant patent owners can be identified. In practice however, there are some limitations. Firstly, several important SDOs, including ITU, ISO, IEC and IEEE, allow parties to submit a 'blanket claim' indicating that they believe they own potentially essential patents, but do not provide the identities of these patents.[116] This option is often used: for instance, as per 8 January 2020, the IEEE IPR database for the "IEEE 802.11 and amendments" (the suite of standards known as Wi-Fi) contained 439 declarations (called "Related-Patent Letters of Assurance, LOA), of which 302 (68.7%) did not provide any identification of patents at all. But also SDO IPR databases that do not allow blanket declarations may not necessarily contain all potentially essential IPR, for at least two reasons: (1) not every potential SEP owner is a member of every SDO and thus may not be subject to a declaration requirement, and (2) many SDO IPR policies have declaration requirements with a limited scope, using wording as 'reasonable endeavors' (ETSI), 'personally aware' (IEEE), or 'known to the party participating' (ITU/ISO/IEC), and almost no SDO obliges its members to perform a patent search.[117]

It is important to realise that SDOs have declaration rules in order to know which patents are potentially essential, and in order to seek information on whether a FRAND license commitment is provided for those patents. Should such a commitment not be provided for a potentially essential patent, then the SDO can avoid adopting a standard that would require the use of that patent. For serving its purpose, it does not matter to the SDO at all whether there are (way) to many patents in the database; it is only important that as few as possible potential essential patents are missing. Indeed, SDO IPR databases are known to contain (many) more patents than those that are actually essential, for at least two reasons: (1) because such declarations are supposed to be submitted before the standard is finalised, and (2) they are often submitted before the patent is granted. Consequently, they suffer from a substantial 'overshoot' in the context of serving as starting point for essentiality assessments. The ETSI IPR database alone currently includes over 8,300 patent families that have a European patent family member (see Chapter 6 for more details), of which a substantial share (possibly more than 50%) would currently no longer be considered as potentially essential by their owner.

Further challenges are that SDO IPR databases do not always provide information on the relevant technical standard in the way we might want for essentiality assessments. For instance, the ETSI IPR database does not easily allow you to determine whether a patent is believed to be essential for the 2G, 3G or 4G standards. Moreover, SDO databases usually do not offer details of the precise standards document (version and date) for which the patent is believed to be essential. (Note that many SDOs request or require members to disclose potentially essential patents at a 'timely' moment,[118] and the precise standards document may not be known at that time.)

II: On-demand approach with patent owner requests

In the second line of approach, patent owners are the ones that take the initiative to request a certain patent (or patents) to be assessed for essentiality. The initiative could come from the patent owner themselves, who can file a request for a single patent, a set of patents, or their

[115] SDO IPR policies use wording such as 'May be or may become essential' (ETSI), 'Potentially essential' (IEEE) and 'Cover or may cover' ('IETF). For more details, see [6, p. 80].
[116] For more details, see [6, p. 89].
[117] For more details, see [6, p. 81].
[118] See [6, pp. 85-88].

full portfolio of potentially essential patents for a given standard. Having the patent owner make such a request has several advantages: (1) the owner will only file requests for patents they really believe to be essential, given the final standard and given the actual claims in the granted patent, (2) the owner may be asked specific information on the standard and on the precise standards document for which the patent is believed to be essential, (3) the owner may be asked to submit additional documents, such as a claim chart, and (4) information is also obtained about the current ownership of the patent (as part of the submission, patent owners may be asked to confirm that they believe they are the current owner of the patent in question). Also, by submitting a request, the owner is expressing support for the mechanism.

Note that while a patent owner in some specific cases might also be interested in a confirmation that a certain patent is not actually essential, we don't further discuss that situation further in this report.[119] One of the main reasons for this decision is that proving non-essentiality is very difficult. Suppose essentiality for a specific patent is not found when looking against a specific standards document for a specific document version, actual essentiality may actually exist for other standards documents (and for a complex standard, there may (many) dozens or of such documents). Moreover, essentiality for a specific patent is not found when looking against a specific standards document for a specific document version, actual essentiality may actually exist for future versions of that same standards document. We believe these reasons are indeed among the main considerations why JPO, in their Hantei-E, cannot offer confirmation that a patent is non-essential, only confirmation that it is essential.

III: On-demand approach with third-party requests

In a variant on the second approach, it could be other parties (such as implementers) are also able than the patent owner who be to file requests. As discussed in Section 3.3, there are situations in which another party than the patent owner may wish to see essentiality of a patent confirmed.[120]

In the case of a demand by another party, however, the four advantages listed above do not necessarily apply. More specifically: third parties may want to and/or asked to specific information on the standard and precise standards document for which the patent is believed to be essential, but perhaps are not in a good position to do so. The same goes for input claim charts. Third parties, lastly, are not likely to be able provide ultimate information on patent ownership. While one could, in case of a third-party request, ask the patent owner whether to provide additional information, but one cannot expect the patent owner to fulfil that request. All in all, information availability is more complicated in this variant.

An important element in this variant is whether third parties will file requests for individual patents or for entire portfolios. In the first case, third parties might pick patents they are particularly concerned about (e.g. patent assessed to be essential by their owner but not believed to be essential by the third party). Independent assessment of these patents can lead to interesting insights but will not generate a representative picture for the patent owner in question. In the second case, a representative picture would emerge, but if that owner has a large portfolio of potentially essential patents, the resulting work (and financial resources required) would be (very) large. Depending on who is carrying the burden if the cost, this could be substantial to the size of that party (especially if an SME).

Table 18 summarises the three approaches discussed above. Of course, approach II and III could also be combined (we discuss a similar combination further on in this chapter).

[119] Note that 'not found to be essential' does *not* equal 'found not to be essential'.

[120] It may also be that another party than the patent owner may wish to see non-essentiality of a patent confirmed, but we will not discuss that further, for the same reasons as explain just above at the patent owner.

Patent selection approach	Approach I: SDO disclosure-based approach	Approach II: On-demand approach with patent owner requests	Approach III: On-demand approach with third-party requests
What potential SEPs are identified?	All patents, unless part of a blanket declaration, owned by non-members, or fall outside the scope of the declaration obligation	Only those submitted by patent owner in question	Only those submitted by third party
Number of identified patents (cumulative for all potential SEP owners)	Very high	Low to medium (only patents of submitting patent owners, and only those patents the owner still believes might be essential). May depend on fees charged.	Low to medium (depends on third party's submission behaviour. May also depend on fees charged.
Can provide access to input claim charts?	No	Yes	No
Can provide detailed information on standard and standards document (version, date)?	No	Yes	No
Provides current ownership information?	No	Yes	No

TABLE 18: THE MAIN CHARACTERISTICS OF VARIOUS PATENT SELECTION APPROACHES.

B2. Use of sampling

In this report, sampling refers to a mechanism in which a subset of patents is selected for further essentiality assessment. Sampling could be done based of all the disclosed potentially essential patents, from a given disclosing party's set of all disclosed potentially essential patents, or from a given owner's set of all disclosed potentially essential patents. Sampling can bring down the overall costs for a given set of assessments, in cases where sampling still satisfies the desired level of confidence.[121]

Statistics dictate that the larger the sample, the more representative the outcome for the full population (and the higher the resulting confidence level), as long as samples are drawn from this exact population and in a completely random way. Section 9.2.1 already discussed that with some data, the requirements concerning confidence level are less strict than others.

As shown in the landscape study (see Chapter 6), the distribution of disclosing firms is very skewed. While actual current ownership does not necessarily lie with the original disclosing firm, the distribution of current ownership is probably also very skewed. As long as a dataset is sought that does not require information on the disclosing firm's ownership or identity, like the data used for the denominator, then a single, random sample will suffice. However, if data is sought that distinguishes the disclosing firm's ownership or identity (e.g. for the numerator), a stratified sample approach is needed, where sampling size is determined on a per-firm basis, to ensure that sample is representative of that firm within a required confidence level.[122]

For reasons of achieving credibility mat may be important to be transparent about the procedure of sampling, and perhaps even the sample itself.

In Dimension B6 in Section 9.2.2 below, some capacity calculations will include approaches with sampling. As it is beyond the scope of this report to calculate the required sample size for a specific context, we adopt a working assumption of a 10% sampling size for the purpose of indicative calculations. Whether that 10% is a proper number will require more investigation.

[121] Cost can also be brought down (resulting in more moderate degrees of confidence) by more superficial assessments, we are not in favor of this. First, more superficial assessments can lead to (unobserved) systematic biases. Second, efficiency gains are higher with sampling (100 times 4 hours instead of 8 hours is still more than 10 times 8 hours.

[122] Let us assume that 10% is representative of an entire pool of 8,000 patents. If one company in that pool owns 80 patents, probably around 8 of these are selected in the sample. Consequently, the confidence level for that firm will already be lower, and perhaps 20% of that individual firm's patents would satisfy the sought confidence level. If a firm owns 10 patents, probably only 1, 2 or perhaps even none of that firm's patents will be selected in the large sample. Obviously, the confidence level will be very low. For a better confidence level, more patents for that specific company would need to be selected, and perhaps even the full set of patents for that company (in that case, it is no longer a sample: if each and every patent is selected, the result is totally representative).

B3. Required and available input

The minimum input required for any essentiality analysis is: (1) the patent in question[123], (2) the precise standards document(s) – including version/date, such as 'ETSI TS 125 215') – for which essentiality is to be assessed. Also, the standards document must cover the focal parts of the standard that the essentiality exercise aims to address.[124]

Depending on how the assessment process is designed, additional information may be required or helpful to make the process more reliable and/or cost-effective. In our study we identified the following forms of additional information:

- **Information on the specific section(s) of the standardisation document(s) for which the patent is potentially essential** (such as 'ETSI TS 125 215, Section 6.1.1.2'). If Approach II ('On-demand approach with patent owner requests) was followed for the patent selection (see above), then patent owners can be asked or even expected to provide input claim charts as part of their request.[125] Since they are the ones taking the initiative to file a request, they are also likely to be willing to supply such information. If Approaches I or III are applied, it might be much harder to access such information, although you can always try asking the (current) patent owner. Alternatively, with an ETSI standard, you might look at ETSI IPR declarations databases. These include a field called *"Illustrative Specific part of the standard (e.g. Section)"*. Yet, this is not a mandatory field when declarations are filed, and in recent years, this percentage has dropped. As per November 2019, only 23% of all declarations contained such information. Also, if this information is indeed present, it may be insufficient as input for essentiality assessment: it may not be of the right granularity level, and because it is 'illustrative', it may be not complete
- **Input claim charts**, that detail precisely which patent's claim(s) are believed to be essential to what precise element in the standards document(s) (section, paragraph, preferably also specific text phrases), as well as information on device categories that require the relevant element in the standards document(s), and information on whether the patent is believed to be only essential for optional normative portions of the standard. In the case Approach II ('On-demand approach with patent owner requests) was followed for the patent selection (see above), then patent owners can be asked or even obliged to provide such input claim charts. Again, since they are the ones taking the initiative to file a request, they will probably be willing to supply such information. With approaches I or III, it might be much harder to access input claim charts, but you can always try asking the (current) patent owner.
- **Information on current ownership**. While not technically required to perform an essentiality assessment, this is very valuable information for the potential user of assessment outcomes, and important if you want to ask the patent owner for additional information, such as discussed above. Alternatively, ownership data could be derived from patent office data, where registered (re)assignment can be found. Disadvantages here are that such data is not necessarily complete (patent offices often do not require transfers to be registered, or only under specific conditions), and this data is complex to interpret. Among other things, many registered transfers are in-company transfers (sometimes for tax box reasons or reorganisations) or transfers as a security in the context of loans or financing. Interpreting such data at a larger scale is challenging and requires extensive skills and resources.

Finally, data on earlier patent pool assessments can also be a form of input. We discuss this separately in Dimension B7 in Section 9.2.2.

[123] Since the actual scope of protection is in the claims of a patent, we could also write here "at least those claim(s) of the patent believed to be essential"

[124] Whichever way you choose to define that focal standard: "GSM" "3G UMTS/WCDMA", or perhaps "3GPP Release 16".

[125] As no single 'standard' on claim chart format, structure and quality exists, this will probably be developed. A slightly different (related) approach would be to leave the format open, but work under the principle that 'a claim is not essential until the chart is convincingly proving essentiality.' The one who submits the chart would have decide on the claim interpretation and why the claim is required by someone implementing the standard, and provide sufficient evidence.

B4. Patent owner interaction

Interaction withgo patent owners during the phase of the assessment can potentially increase the quality and cost-effectiveness of assessment. Here we can take inspiration from the processes used at patent offices, as well as those of patent pools. Virtually all patent offices in the world allow for interaction between a patent applicant and the patent office. This is known as patent prosecution, and the rules and laws governing patent prosecution are usually set out in manuals released by the Patent Offices. For instance, an examiner may produce written objections describing why a patent would not meet the patentability criteria, and the applicant might respond by arguing in support of the application. Most patent pools allow for similar interaction between patent owner and the party conducting essentiality assessments for the pool. The patent owner could for example be asked to clarify their input claim chart.

Additionally, patent owner interaction can take place with an essentiality assessment mechanism and. may improve the accuracy and efficiency of the assessment. At the same time, interaction carries the risk of biased outcomes favouring the patent owner (thus reducing accuracy). Involvement of implementors (e.g. as third party) could be considered to mitigate this risk. The general feeling at our stakeholder workshop was that the advantages of patent owner involvement outweigh its disadvantages. It is important, though, that the rules for such interaction are laid down clearly and followed up appropriately.

B5. Availably of a procedure to challenge outcomes

Offering a possibility for parties to challenge[126] the outcome of an assessment if they believe it is incorrect offers further potentially increases of the quality and cost-effectiveness of assessment. Here we can again take inspiration from the processes used at patent offices, as well as those of patent pools. In addition, the availability of such procedures can significantly increase confidence and acceptance among stakeholders – who feel that if the assessment came to a wrong outcome, that there are opportunities to correct that

Patent offices have procedures by which a decision can be appealed, both decisions before the grant of a patent (pre-grant appeals) and after such a grant (post-grant appeals).[127] Some patent offices have opposition procedures, designed to allow third parties to present objections to the grant of a patent.[128] Also patent pools offer appeal procedures (see Section 2.2).

In the context of assessment of essentiality, we will here call this a 'procedure to challenge outcomes' (instead of calling it an 'appeal'), to highlight that the outcome of an assessment is not binding.

But also here is the risk of biasing outcomes in favour of the patent owner, especially if the procedure to challenge outcomes would be available only to the patent owner, or when procedure to challenge outcomes would be possible for third parties who would have less incentive, fewer resources or other reasons not to challenge. workshop participants generally feel that the advantages of procedure to challenge outcomes outweigh the disadvantages and that it is desirable that both the patent owner and third parties can challenge outcomes. It is important that a procedure to challenge outcomes need to be designed carefully to avoid the possibility of delaying tactics or using procedural options in bad faith.

B6. Required capacity

With capacity, we refer to the total workforce required to carry out assessment activities (internal and/or outsourced). That means that this does not include efforts by patent owners themselves (e.g. efforts for the original SDO declaration, for possible self-selection of patents for assessment, creating input claim charts, etc). We also do not consider organisational or overhead costs.

In Chapter 8 we explained how much time the assessors in our experiments spent assessing individual patents and discussed our findings on how time spent is related to outcomes. One may assume that, on general, the more time

[126] In the context of institution feasibility, this report uses the word 'challenge' instead of the word 'appeal', as the latter is in a strict sense often understood to be a 'request made to a court of law or to someone in authority to change a previous decision' (source: Cambridge Dictionary), and the essentiality assessment as referred to in this report are probably best not characterised as 'decisions'.

[127] For more details on such appeals, see [46, §4.77-4.11].

[128] For more details on such appeals, see [46, §2.35-2.37].

is spent, the higher the accuracy of the outcome will be.[129] Furthermore, the availability of input claim charts is found to have great positive impact on the quality of the outcomes and efficiency of essentiality assessments (Chapter 4). Considering the above, we will use the following working assumptions for our below estimates on required capacity: an assessment with input claim charts takes a fixed 8 hours, and an assessment without these takes a fixed 12 hours. With these assumptions, we aim at a comparable accuracy level for both cases (which is important for comparability between, for instance, numerator and denominator observations). Note, however, that the above 8 and 12 hours are working assumptions for the calculations in this chapter, not conclusions as such: It is up the initiators of a final scheme to choose the time spend for the assessments.

The capacity required obviously depends on the number of assessments to be carried out, and that number, in turn, depends on the patent selection (see Dimension B1 in Section 9.2.2, above). Our capacity calculations are for illustrative purposes; we have to rely on many assumptions (which may turn out differently in practice), and we do not include all type of costs (like management and organisational overhead). For our calculations, we use the ETSI/3GPP cellular standards 2G (GSM), 3G (UMTS/WCDMA), 4G (LTE) and 5G as focal standards. There are currently approximately 25,000 patent families potentially essential for these standards in the ETSI IPR database. If we are looking at 'European SEP exposure', the analysis should focus on the 16,000 or so families that have a European member. Of these, around 8,000 families have a granted European member. If we focus on 'Global SEP exposure', another 3000 families need to be investigated that have a granted patent outside the EPO.

If Approach I ('SDO disclosure-based approach') is used for patent selection, 8,000 European patents would need to be assessed for European SEP exposure. At 12 hours per patent (as there is no input claim chart), the total number of working hours involved would be 96,000, equalling 52.6 person-years.[130] For global SEP exposure, 11,000 patents would have to investigated, equalling 72 person-years (assuming the same effort is required for non-European patents). Note that with this illustration we are not suggesting that a transparency system should be focusing at these standards only or specifically.

If Approach II ('On-demand approach with patent owner') is used, the number of patents to be assessed depends on the degree to which patent owners decide to file requests. Importantly, you would expect firms to only file requests for patents which they currently believe to be essential (and which are granted in Europe), a number which is probably significantly lower than the number of patents disclosed to an SDO as potentially essential. For our calculations below, we make an *educated guess* that firms would file requests for 40% of the European granted patents they own. The total workload depends on the extent to which firms actually submit patent requests:

- Suppose all the firms that actually submit patent requests represent 25% of all SDO disclosed SEPs, the capacity required for European SEP exposure would be 8,000 * 40% * 25% = 800 patents. At 8 hours per patent (as there is an input claim chart), a total of 6,400 working hours would be involved, equalling 3.5 person-years. For global SEP exposure, this is 11,000 * 40% * 25% = 1,100 patents, a total of 8,800 working hours, equalling 4.8 person-years.

- If all the firms that actually submit patent requests represent 50% of all SDO disclosed SEPs, the total working time would be 7.0 person-years for European SEP exposure and 9.6 person-years for global SEP exposure.

- If all the firms that actually submit patent requests represent 75% of all SDO disclosed SEPs, the total working time would be 10.5 person-years for European SEP exposure and 14.4 person-years for global SEP exposure.

Note that the above applies to the ETSI/3GPP cellular standards. Other standards such as IEEE 802.11 ('Wi-Fi') would require additional efforts. (Since IEEE allows for blanket declarations, it is hard to estimate how large such additional efforts should be). Also note that every year, additional previously disclosed patents are granted, and new patents are disclosed as potentially essential, so the above is a moving target.

In Section 9.3 below, we return to the matter of workforce required in the various scenarios.

[129] Note that this does not necessarily have to be true for a set of observations such as the ones we have in our pilot experiment: in 'difficult' cases, assessors may have spent more time, but still come to a less reliable outcome. If one were able to correct for difficulty, one would expect to find a positive relation between time spent and accuracy. (Unfortunately, independent data on difficulty did not exist for the patent in our pilot experiment, so we could not correct for that.)

[130] This calculation uses the following data and assumptions: 52 weeks a year, a 5-day work week, an 8-hour workday and 32 days annual leave.

B7. Fast track for existing patents in the patent pool

Depending on the standard(s) for which an essentiality assessment mechanism is set up, companies may have patents that have already undergone an essentiality assessment in a patent pool. In order to reduce workload and costs, the outcomes of such pool assessments could be used instead of conducting a new assessment. In doing so, however, it is crucial that the previous assessment meets all the quality criteria defined in the new assessment system. A pragmatic approach is to set up a certification system whereby each individual pool can apply for a certificate,[131] and the assessments in that pool are examined to see if they meet the defined quality criteria (or whether additional steps are needed in order to comply). This in fact creates a fast track procedure for existing patents in a patent pool.

The potential savings with such a fast track procedure depend on the share of overall patents brought into a pool. For 3GPP cellular technologies, this share is relatively modest. Yet from the perspective of the individual companies that bring 3GPP patents into the pool, the fast track savings would be substantial.

The key aspect here is that, however, the resulting procedure should meet the requirements of general public acceptance.

In some cases, patent owners may have let outside law firms done essentiality assessments for their own individual licensing programs (while not choosing to license them in a pool). In that case a fast track procedure, where the individual patent owner or performing law firm can apply for a certificate and get its SEPs accepted without another essentiality assessment, could also bring substantial savings to individual companies. It is crucial, however, that in such a case, impartiality can be assured.

Also here, the key aspects here is that, however realised, the resulting procedure should meet the requirements of general public acceptance.

9.2.3 Organisational structure for essentiality assessment

C1. Executing entity, capabilities and expertise

While the task of running an essentiality assessment system could in principle be given to a single, newly-to-be established organisation, the challenges are considerable – setting it up, deciding what capacity is required, employing qualified staff to carry out the assessments, etc. For these reasons, many stakeholders expressed a preference for using existing organisations. Such an approach makes good use of exiting expertise, allows a quick set-up time, and would enable multiple organisations to perform the actual assessment, which would encourage specialisation (e.g. patents in a certain language or jurisdiction) and prevent conflict of interest (see below).

A small, administrative/management organisation could be established to design and define procedures, oversee the system, and have overall responsibility for quality.[132] This organisation could then outsource the actual assessment tasks for individual patents to (multiple) external parties. In fact, this organisational design very much reflects that of the patent pools. To ensure quality and impartiality, it is vital that external parties meet a defined set of criteria (which could be in the form of a certificate, see Dimension C2 below). An important design choice here is under which auspices or legal regime this organisation would be set up.

Various types of existing external parties could qualify for carrying out the actual assessments:

1. **Public institutions, including:**

    - The European Patent Office (EPO). While very well qualified, the EPO itself highlighted the importance of any activities being compatible with its mandate, and not affecting the granting process.

[131] Alternatively, a patent owner in a pool could file a request for a certain pool to be certified.

[132] Here, the ultimate responsibility for the essentiality assessments would remain with this organisation, while the organisation could call the external party (that is tasked to conduct the actual assessment) to account if its performance does not comply with the contract.

- National patent offices. Several national patent offices in EU countries in fact already offer commercial services to the market, like infringement analyses and freedom-to-operate studies. This might make it easier for them to decide to offer essentiality assessment services as well.

- The World Intellectual Property Organization (WIPO), which has gained specific expertise on standards essential patents in arbitration centres, has expressed interest in involvement in an essentiality assessment scheme.

2. **Commercial service providers, including:**

- Law firms and patent attorney firms. Several have already conducted essentiality assessments for patent pools, some of them for decades and gained extensive experience in this task. Interesting in this context is IPEC, the consortium of patent law firms and patent attorneys that currently provides assessment services for a range of patent pools. Compared to these firms' current activities, the assessments in the new system could offer opportunities for economies of scale and scope, and such firms may be able to offer lower rates than the current patent pool.

- Commercial firms offering assessment services, other than law firms and patent attorney firms. A number already performs essentiality assessment (for some of their publications, see Annex 1). We note that the workshop participants expressed concern about whether impartiality could be sufficiently ensured for such firms – see Dimension C2 below.

C2. Impartiality

During the workshop, the stakeholders overwhelmingly agreed that a European essentiality assessment system should ensure total impartiality. For the institutional parties mentioned above, impartiality is usually already warranted via their laws, rules and procedures.

Law firms and patent attorney firms are usually also subject to sectoral regulation and norms (e.g. a bar) that ensure impartiality. During the workshop, this was clearly acknowledged by representatives of the courts. It is also in their commercial interest not to cross the line: breaches of impartiality could have grave consequences for them in terms of winning new client contacts. Large organisations in this field also have experience dealing with complex issues, including the use of Chinese walls. Again we see an interesting example of how to avoid conflict of interest in essentiality assessment in patent pools – an assessor may only accept a task if the owner of the patent to be assessed is not a client of their firm, nor has an adverse interest in that firm in a legal dispute. By having a choice of multiple assessment firms (per country/jurisdiction), pools can simply turn to another firm should a conflict of interest arise.

The workshop participants did, however, express significant concerns about whether commercial firms other than law and patent attorney firms could meet the impartiality requirements.

C3. International dimension

As this study follows on from the European Commission in COM(2017) 712 final [17], it makes sense to first focus on whether a European system could be set up for essentiality assessment. If the scope was to be SEP exposure in Europe, technically speaking, EPO and national patents in the EU (possibly extended to the European Economic Area, EEA or the European Free Trade Association, EFTA) would be sufficient. In practice, however, firms often engage in global negotiations when it comes to essential patents, and just having information on SEP exposure in Europe might be insufficient to satisfy the transparency needs of the parties in question.

The most pragmatic approach might be to start with patent families, then focus on one patent in that family, selected in the following order:[133]

1. European patents

2. National patents in EU/EEA/EFTA countries

3. A patent from an IP5 office[134] other than EPO (order still to be decided)

[133] The applicability of this scheme depends on when the essentiality assessment is done and whether at that point in time patents have been already granted.

[134] The IP5 Offices are the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the China National Intellectual Property Administration (CNIPA) and the United States Patent and Trademark Office (USPTO).

In this way, one single patent per family would be assessed. Although it is in principle possible that within a family, a member in one country is essential, while a member in another is not, assessing each individual member would be extremely costly.[135] And in a system aimed at providing information on SEP exposure, and where licenses are typically global, it may not be that important to know about differences between family members after all.

The above also implies that the mechanism should be able to rely on assessors who can assess USPTO or JPO patents. The approach outlined in 9.2.3.C1 caters for that, as 'local' parties, located around the world, could be added to the set of certified outsourcing organisations.

In a later phase, after a successful introduction, discussions could be initiated on whether regulators in other world regions would be willing to set up their own essentiality assessment mechanisms. If so, good coordination is desirable, and could lead to fairer sharing of the overall burden, prevent duplication of work, and avoid unnecessary costs for stakeholders.

9.2.4 Financing of essentiality assessments

D1. Principles for financing

Many workshop participants underlined the principle that all parties benefitting from the system should play a part in financing it. Some put forward the view 'the polluter pays', but agreeing on who these polluters are, proved challenging.

Greater availability of transparent data on essentiality could also arguably serve a public need, and might convince people that it would be appropriate to use public funds for setting up such a system. Yet, as stakeholders are clearly the ones gaining many of the benefits, the abovementioned principle (that all benefitting parties should play a part in financing the system) seems appropriate.

That said, 'all benefitting parties' is a complex concept for translating into actual financial contributions, and raises questions like 'who benefits how much', 'benefits in the future vs. benefits now', and so on. The next section presents pragmatic approaches that might avoid such discussions.

D2. Financial contribution collection

An ex-ante model that determines how much stakeholder categories should contribute, and how much individual stakeholders should contribute, is not only hard to determine, but also the way to collect these contributions would be challenging.

The 'on-demand' approach, as discussed at B1 above, offers an interesting approach. Patent owners who voluntarily request that their patents are assessed, could be asked to cover the costs of such assessments (just like in patent pools) and thus pay up front. When licensing the patents that have been found essential, the patent owner can then pass on part of these costs to the licensing fee, just like already happens for other costs associated with patenting, such as fees to the patent office. Since actual SEPs have significant licensing opportunities, SEP owners face relatively low risks of these patents remaining unlicensed and not being able to pass on (part of) the costs of essentiality assessment.[136, 137] Moreover, the costs of essentiality assessments are likely to be relatively small compared with the potential licensing revenue of the related SEPs.

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[135] Patent pools make a different choice: they check essentiality for each family member. This choice is prompted by legal requirements and the pools' royalty allocation mechanisms.

[136] Of course, in markets with uncertainty, such as in the IoT space, it may be hard to predict in advance how many implementers will take a license. Also, there are questions in how to allocate the costs precisely over different types of implementers (small or large, different industries). Having this said, such challenges are also equally present for 'regular' licensing fees (that do not incorporate some of the costs of essentiality assessment).

[137] Such risks do exist if a significant portion of implementers is unwilling to license. Elsewhere in this report we explain how a transparency scheme, depending on the way it is designed, offers opportunities to react stronger against non-willing licensees (via de 'way to infringe' data).

In this way, the other beneficiaries, implementers, also bear part of the burden. The advantages of this mechanism are that it is market-based (the regulator does not need to design an ex-ante finance allocation scheme), and it only allocates costs to those actually benefitting from the specifically associated patents and standards (opposed to tax-like systems where those not benefitting also bear the burden).

Obviously, an essentiality assessment system, processing a significant portion of all potentially essential patents, does require significant funding. As discussed in Dimension B6 in Section 9.2.2 and in the scenarios, the resources required vary from approximately 5 to 72 person-years for the current ETSI/3GPP cellular standards. At the same time, workshop participants pointed out that such investments are minor in light of the enormous value these essential patents represent, the vast costs associated with acquiring and exploiting legal rights, and the benefits that would be gained if SEP transaction costs were lower and legal conflicts declined.

In the case of an approach in which a third party requests an essentiality assessment (Approach III above), one can consider having this party to have to bear the cost of this assessment. We note, however, that in this case, an SME requesting the patents to be assessed of a very large SEP holders, might be facing costs it could not bear. There is no simple solution to this, but if third party requests are combined with other schemes (that are cost-covering and allow for some overhead) then this might be less of an issue.

9.3 | Scenarios for essentiality assessment

Based on all the dimensions discussed, we created nine different scenarios – plus a baseline, status quo scenario – that are internally consistent (in terms of patent selection, data generated, data interests satisfied, financing). These scenarios, which might differ in feasibility, are:[138]

- **Scenario 0: Status quo.** Here, no action is taken, and no transparent data on essentiality is generated. The interest in such data is not satisfied at all.

- **Scenario A Self-assessment.** Here, patent owners themselves perform a self-assessment of the essentiality of their patents, after the final standard is issued and the patents in question are granted. This could be a voluntary or a compulsory scheme (e.g. if SDOs manage to make that obligatory in their IPR policies). Examples of the latter are CEN and CENELEC, two European SDOs who recently included such an update requirement in their IPR commitment forms. Note however, that the number of SDO commitments at these SDOs is much lower than that at, say, ETSI.[139] And given differences in governance structure across SDOs, these organisations will also differ in the degree they would be able to actually adopt such a change to their IPR policies.

- **Scenario B: Systematic assessment of all disclosed SDO patents.** Here, all patents that are disclosed to SDOs (for a given standard) are systematically assessed for essentiality. An additional mechanism would be needed for SDOs where disclosed patents may not be identified ('blanket declarations').

- **Scenario C: Assessment of sampled disclosed SDO patents.** Like Scenario B, but a random sample is drawn from those patents (either from the total set of patents, or one sample per patent owner).

- **Scenario D: Assessment of patents voluntarily requested by patent owner.** In this scenario, patent owners can choose to put their patents forward for evaluation.

- **Scenario E: As scenario D, complemented by third party requests**. Patent owners can put their patents forward for evaluation, but also third parties are allowed to file requests (depending on the implementation of individual patents and/or a patent owner's entire portfolio).

[138] Other scenarios can be created, but for the sake of space and clarity, we do not discuss each possible combination of approaches. For many combinations, the characteristics can be determined based on the information provided below.

[139] See [9, pp. 14-15], which states: *"The patent or other IPR holder believes that it holds granted and/or pending applications for intellectual property rights such as Patents, utility models or semiconductor topographies, the use of which would be essential to implement the above document and hereby declares [...] The Patent or other IPR holder undertakes to inform CEN and/or CENELEC for any update or change of the above information. [...]"*

- **Scenario F: As scenario D, complemented by assessment of sampled disclosed SDO patents.** Patent owners can put their patents forward for evaluation, and the patents of firms that choose not to do so, are subject to a sample approach similar to that in Scenario C.

- **Scenario G: An automated system.** Here, essentiality assessments would be performed fully based on an automated system, e.g. using AI.

- **Scenario H: As D, complemented with assistive semantic/AI system.** Patent owners can choose to put their patents forward for evaluation, and the patents of those firms that choose not to do so, are subject to a system whereby an AI system assists assessors by selecting patents most likely to be essential, followed by a human assessment.

We now consider the type of data interests (see Dimension A1 in Section 9.2.1), then which stakeholder(s) have that data interest (see Dimension A1 in Section 9.2.1), and the confidence level associated with that data (see Dimension A2 in Section 9.2.1) which we summarise in the first two columns of Table 19. Then, having considered the various scenarios, we determine to what degree they meet those data interest as shown in Table 19. For Scenarios D, E and F, in which parties can voluntarily request essentiality assessments, we will assume that some but not all parties will do so.

Concerning **numerator data**, we argued earlier that the required dataset confidence level is relatively high. Sampling is not preferred but can be used to generate insights. Hence, only Scenarios B and G can fully satisfy this demand (but, as we will later see, at great cost and low feasibility). They are followed by Scenario F (combining

	Stakeholder with data interests (see A1 and A2)	SCENARIOS								
		0: Status quo	A: Self-assessment	B: All SDO disclosed patents	C: Sampled SDO disclosed patents	D: Voluntarily requested by patent owner	E: As D plus third-party requests	F: As D plus sampled disclosed SDO patent	G: AI-based system	H: As D plus assistive AI system
I. Numerator (information on specific SEP owner)	Implementer, patent owner, courts	No	No (a)	Yes	Partly	Yes, for submitting patent owners	Yes, for submitting patent owners plus for SEPs selected in TPR (b)	Yes, for submitting patent owners, partly for others	Depends on public acceptance (c)	Yes
II. Denominator (information on all SEP owners)	Implementer, patent owner, courts	No	No (d)	Yes	Yes	No	No	Yes	Depends on public acceptance (c)	Yes
III. 'validated summary claim charts' data'	Implementer, patent owner, courts	No	Maybe (d)	Depends	No	Yes (f)	Yes (g)	Yes (g)	No	Yes (f)
IV 'detailed assessment outcomes'	Patent owner[140]	No	Maybe (d)	Depends	No	Yes (f)	Yes (g)	Yes (g)	No	Yes (f)
V. Current ownership data	Implementer, courts	No	No	No	No	Yes, for submitting patent owners	Yes, for submitting patent owners	Yes, for submitting patent owners	No	Yes, for submitting patent owners

TABLE 19: SCENARIOS AND HOW THEY MEET STAKEHOLDERS' INTERESTS FOR DATA (A1 AND A2).
Note: (a) Unless the patent owner in question has performed such self-assessments, and the reliability of the assessments it carried out is believed to be satisfactory; (b) TPR = Third Party Requests; (c) assuming the AI system is reliable and its outcomes are accepted by stakeholders; (d) Unless all patent owners have performed such self-assessments, and the reliability of the assessments they carried out is believed to be satisfactory; (d) depends on whether the quality of the self-assessment is deemed sufficient by a court to satisfy the relevant Huawei/ZTE requirement; (f) Yes, and this information is available (only) to the patent owners themselves, who are the stakeholder that has interest in such data (see text).)
Dark orange indicates that data interests are not met, yellow that they are partly or conditionally met, and green that they are met. Blue means that it depends on public acceptance.

[140] Especially in an infringement context, or when it wants to challenge the outcomes of a (negative) assessment.

requested patents with samples for the rest), then by Scenario E and Scenario D.

Concerning **denominator data**, we argue that the required dataset confidence level is moderate and can be satisfied with a sampling approach (as noted before, also when sampling is used, the actual resulting assessments must be using same methodology and same rigor for both numerator and denominator data, otherwise they are incomparable). Of course, the required dataset confidence level can also be achieved by systematically assessing all patents. Hence, Scenarios B, E, F and G all satisfy this demand. The other scenarios do not.

Concerning **'validated summary claim charts' data** (which helps in in terms of mapping a product to actually essential standards, helps implementers to know who owns SEPs for a specific products, helps to determine what is the

	SCENARIOS								
	0: Status quo	A: Self-assessment	B: All SDO disclosed patents	C: Sampled SDO disclosed patents	D: Voluntarily requested by patent owner	E: As D plus third-party requests	F: As D plus sampled disclosed SDO patent	G: AI-based system	H: As D plus assistive AI system
A3. Interest for data on specific standards and industry sectors	n/a	Can (will?) be chosen freely	Can be chosen freely, but challenges if SDO for associated standard allows blanket declarations					Can be chosen freely (a)	As B-F
A4. Desired level of detail	Preferably specific indication of relevant product categories and optional normative features								
A5. Data interest and the standards' life cycle	After the standard is finalised, and the patent has been granted, and opposition from the patent office is no longer possible								
A6 Legal status of assessment outcomes	Not legally binding, best characterised as an 'opinion', 'certificate', or 'determination'								
A7. Public availability of assessment outcomes	Public: fact that positive opinion is reached on specific patent and specific standard document(s) Not public: Negative opinions and underlying data								
B1. Patent selection (within given standard) B2. Sampling	n/a	Depends on SDO choices	All SDO disclosed	Sample of SDO disclosures	By voluntary requests	By voluntary requests	By voluntary requests complemented with SDO sample	All SDO disclosed	By voluntary requests complemented with all SDO disclosures
B3. Required and available input (b)			[some SSECT from SDOs] (c)	[some SSECT from SDOs] (c)	SSECT, ICC, OWN	SSECT, ICC, OWN	SSECT, ICC, OWN		SSECT, ICC, OWN
B4. Patent owner interaction	n/a	No (i)	No (d)	No (d)	Yes, for submitting patent owners; helps to increase accuracy and acceptance			No (d)	As D
B5. Availability of procedure to challenge outcomes	n/a	n/a	No (e)	TBD (e)	Yes, for submitting patent owners; helps to increase accuracy and acceptance			No (e)	As D
B6. Required capacity, in person-years, for 2G thru 5G for European SEP exposure (f)	0	Not estimated	52.6	5.3	3.5 / 7.0 / 10.5 (g)	4.8 / 9.6 / 14.5 (g)	7.5 / 9.6 / 11.8 (g)	Unknown	Unknown
Same, but for Global SEP exposure (f)	0	Not estimated	72.0	7.2	4.8 / 9.6 / 14.4 (g)	6.6 / 13.2 / 19.8 (g)	12.2 / 13.2 / 16.2 (g)	Unknown	Unknown
B7. Fast track for existing patent pool patents	n/a	n/a	No	No	Yes, for submitting patent owners; reduces costs and increases benefits			No	As D
C1. Executing entity, capabilities and expertise	n/a	n/a	Small central body and outsourcing of assessments to certified parties (e.g. patent offices, patent organisations, law firms, patent attorney firms)						
C2. Impartiality	n/a	n/a	Is ensured in patent offices and also via existing mechanisms in law firms, patent attorney firms						
C3. International dimension	n/a	n/a	System can also assess families without EPO family members, yet at additional costs. Future alignment with other regional initiatives						
D1. Principles for financing	n/a	Internal	Principle of 'all benefiters should pay'						
D2. Financial contribution collection	n/a	Internal	Not clear	Not clear	Linked to submission process, partial pass through via licenses			Not clear	As D plus extra financing
Feasibility [main challenge]	High	Low [willingness]	Low [fee collecting, finance]	Medium [fee collecting, finance]	High	High	Medium/ high [finance]	Not yet feasible, possible in the (far) future?	Not yet feasible, possible in the (nearer) future?

TABLE 20: SCENARIOS AND HOW THEY RELATE TO DESIGN DIMENSIONS (A3-D2).
Note: (a) may depend on standard of context for which AI system has been trained; (b) SECT: Information on the specific section(s) of the standardisation document(s) for which the patent is potentially essential; ICC: Input Claim charts, OWN: Information on current ownership; (c) Only sparsely from the SDOs, e.g. some ETSI declarations have "Illustrative Specific part of the standard (e.g. Section)"; (d) in non-participative scenarios, interaction with the patent owner is not logical; (e) to be decided, but less logical in such non-collaborative scenarios. In combination with Scenario B, workload would become unmanageable. (f) assumptions include firm self-selection of 40% for patent submission, 8 hours assessment time per patent; and 10% sample size; and third-party requests 10% on top of patent owner requests; see further at Dimension B2 (Section 9.2.2) and Dimension B6 (Section 9.2.2) for further details; (g) values for 25%/50%/75% participation levels. Colours indicate how well the dimension in question is satisfied by the scenario: dark orange indicates is low, yellow medium, and green high.

reasonableness of a proposed royalty rate, and helps implementers in infringement procedures and in meeting a key requirement as laid out in Huawei/ZTE framework), we argued above that the required dataset confidence level is very high. Furthermore, for at least that patent owner, full coverage is required, and sampling is not allowed. In terms of this criterium, Scenario B may satisfy, depending on its design.[141] Scenarios D, E and F satisfy *insofar that patent owner decided to voluntary submit its patents*. Scenario G would not satisfy this data type in the first place, as an AI-based assessment does not generate the relevant information. Thus, only Scenarios D, E and F meet all the criteria for this data category.

For the next step, we consider all the design dimensions discussed in the previous sections and how they are related to the various scenarios. The result is shown in Table 20.

As a final step, we combine the degree to which stakeholder interest in transparent data on essentiality is satisfied (derived from Table 19, and considering all five data types) and our overall estimate of feasibility of that scenario (derived from Table 20). Table 21 shows the overall scores of these scenarios on the degree they generate transparent data on essentiality for which interest was expressed, and their implementation feasibility.

	SCENARIOS								
	0: Status quo	A: Self-assessment	B: All SDO disclosed patents	C: Sampled SDO disclosed patents	D: Voluntarily requested by patent owner	E: As D plus third-party requests	F: As D plus sampled disclosed SDO patent	G: AI-based system	H: As D plus assistive AI system
Degree to which transparent data on essentiality is generated [Main limitation]	**Low** *[No data at all]*	**Low** *[No impartial data, diversity of definitions and tests]*	**Medium** *[No type III or type IV or ownership data]*	**Low to medium** *[Limited numerator data, type III or type IV or ownership data]*	**Medium** *[No denominator data. For non-participating firms, no numerator data and no ownership data]*		**Medium to high** *[For non-participating firms, less detailed numerator data and no ownership data]*	**Low to medium** *[Depends on public acceptance; no type III or type IV or ownership data]*	**High** *[For non-participating firms, no ownership data]*
Feasibility of implementation [Main challenge]	**High**	**Low** *[willingness]*	**Low** *[financing, capacity]*	**Medium** *[financing]*	**Medium to high** [participation]		**Medium to high** *[participation, financing]*	**Not yet**; possible in the (distant) future?	**Not yet**; possible in the (nearer) future? [participation]

TABLE 21: SCENARIOS AND THEIR OVERALL ASSESSMENT CONCERNING (A) THE GENERATION OF TRANSPARENT DATA ON ESSENTIALITY AND (B) IMPLEMENTATION FEASIBILITY.
Type III data is 'validated summary claim charts' data; type IV data is 'detailed assessment outcomes' data. Dark orange indicates a low degree or a low feasibility, yellow medium, and green high.

As the content follows from the above sections, we will highlight selected scenarios for specific features or merits.

Scenario B ('Systematic assessment of all disclosed SDO patents') scores medium in terms of the degree to which it generates transparent data on essentiality. It provides both information on specific firms (numerator) and all firms (denominator), but does not result in ownership information, or 'validated summary claim charts' data. We determined its feasibility to be low, because it would be hard to have this scheme financed by the stakeholders, and the required capacity of the essentiality assessment mechanism would have to be very large. Implementing elements like prosecution or procedures to challenge outcomes are not possible in this setting. That said, this scheme is entirely independent of stakeholder involvement, and if the European Commission wants to go ahead without having to rely on the choices of others, and is willing to bear the costs (for illustration: this is estimated at 72 person-years[142] for global SEP exposure information on the current state on 2G/GSM, 3G/UMTS/WCDMA, 4G/LTE and 5G, and more if other standards are added such as "Wi-Fi", etc.), this scenario that would allow that.

[141] Scenario B systematically assesses all patents, but the question is in how far this process without having input claim charts will allow for the creation of reliable 'validated summary claim charts'. In specific, not starting from claim charts, the assessor may overlook a specific mapping (and therefor the relevance to a specific device category).

[142] For the assumptions on which this number was derived, see Dimension B6 in Section 9.2.2 as well as Table 20 and its notes.

Scenario D ('Assessment of patents voluntarily requested by patent owner'), also scores medium in terms of the degree to which it generates transparent data on essentiality. For participating firms, it generates specific information on that firm (numerator), ownership information, as well as 'validated summary claim charts' data. But it does not generate information all firms (denominator). It scores 'medium to high' on overall feasibility, where the actual degree to which companies would indeed voluntarily engage is the critical issue. The voluntary involvement design has several interesting features:

- Voluntarily submitting patents is beneficial to companies, as they obtain 'validated summary claim charts' data. This type of data benefits both patent owners and implementers in a number of ways (see Table 17). The data benefits the patent owner specifically in an infringement context, helping it to meet one of the key requirements of the Huawei/ZTE legal framework. When negotiating with willing licensees, this data helps to make negotiations smoother and faster. With non-willing licensees, this data helps these companies to seek injunctive relief, when appropriate.[143]

- The voluntary request also opens up the possibility to request input claim charts and ownership information.

- Such a voluntary involvement also increases support and acceptance of the mechanism. Companies will have more confidence in the output if they can provide the right input (input claim charts), can clarify where necessary (prosecution) and can challenge the outcomes when they feel this is necessary.

- This voluntary involvement also creates a possibility for designing a financing mechanism, in which patent owners pay the up-front costs, and can (partly) pass them on into their patent license fees.

Scenario F combines the strengths of the voluntarily requested scenario (D) with that of an SDO declaration, sample-based approach (Scenario C). As a result, it creates both detailed data on participating firms as well as nominator data for the entire industry, and therefore scores 'medium to high' for the degree to which it generates transparent data on essentiality. Having all the features of Scenario D, it scores 'medium to high' on overall feasibility.

Scenario H brings an AI component to participative scenario D. In terms of generating transparent data on essentiality, it scores the best of all scenarios ('high'). But we believe this scenario is currently not feasible. Yet, if the system starts with one of the other participative scenarios (D, E or F), generates a sufficiently large reference data set that can be used to develop and validate the desired AI system, and such a system is found satisfactory, a relatively easy migration to Scenario I is possible (from Scenario F to I, you would just replace the sample-based component with the AI system).

9.4 | Key success factors, challenges, and potential risks

In this section, we summarise key success factors for the adoption as well as potential risks associated with any undertaking to assess essentiality at a large scale, specifically to inform the Commission on what to watch for and avoid, if such scheme would be implemented.

Key success factors

- **Broad acceptance by stakeholders.** To achieve that, it is important to **engage with all stakeholders in the above process**. Acceptance by stakeholders also requires that the system is designed and operated in such a way that it earns trust. To achieve this, it is important to ensure high levels of reliability, thoroughness, and impartiality.

- **Consider essentiality assessment as a continuous process, not a one-time snapshot.** This requires that data is kept up to date (e.g. when new standard releases are issues or new patents are granted, new assessments may need to take place to keep both numerator and denominator up to date). Furthermore, one should continue to evaluate for which standards assessments are desired and whether new types

[143] To do so, the company will also need to satisfy the other necessary conditions for the availability of injunctive relief in this framework.

of device categories (e.g. for specific usages) emerge that would require transparent essentiality data to be available.

- **Some of the most promising scenarios (partly) build on patent owners willing to submit requests for assessment, including input claim charts.** It is important to maintain benefits for these firms to do so. Furthermore, it is key that firms that supply information in this process can be confident their information is kept confidential where appropriate.

Key challenges

- The first challenge is to decide on the appropriate level of accuracy (degree of thoroughness) of assessments and the associated design parameters (including those for sampling). The confidence level required for the different types of usages of that data (see Dimension A2 in Section 9.2.1) and the resources (money) required to reach these levels are the primary important factors for these choices. Additionally, one should consider the views of stakeholders on what level of accuracy is found to be appropriate (and matching these likely increases overall acceptance of the system). Several stakeholders expressed to us that any system would need to ensure high levels of reliability, thoroughness, and impartiality. They stressed that if a solution is not rigorous, it may actually upset the current working principles of SEP licensing rather than enhancing SEP licensing in the future.

- A second challenge is that essentiality assessments are not checking validity or value. This could potentially result in a future situation where essentiality statistics are gamed. One example would be the filing of relatively narrow IPR, or filing many families on similar subject matter, and then claiming related solutions, all of which might be essential, but where each family with essential claim(s) add limited independent value over the other to the standardised feature.

- The third challenge is related to timing. If not updated regularly, the aggregated information drawn from such assessments becomes outdated, particularly during the early phases of a new standard's development. Essentiality analyses are best performed long after the stabilisation and adoption of the standard, and when the majority of all related IPR has been granted. Only at this time it is also known what portions of the standard have achieved a strong market adoption (and which portions remain as dead letters). However, it seems the stakeholders would benefit most from having the information much *earlier* in the process - which is not easily achievable.

9.5 | Conclusions

This chapter investigates the institutional feasibility of a system for large-scale essentiality assessment. We consider a system institutionally feasible if it meets an interest for transparent essentiality data, has a suitable procedural design, has an appropriate organisational structure, and can raise the necessary funds to finance the resources required.

As the above aspects are interwoven, we developed a total of nine scenarios, each consisting of a set of mutually consistent design choices over the 19 distinct dimensions we identified that cover all the above aspects.

We briefly discuss the scenarios that score at least 'medium' in terms of the degree to which they meet the stakeholders' expressed interest for transparent data on essentiality.

Scenario B ('Systematic assessment of all disclosed SDO patents') requires many resources and is the costliest scenario. That said, this scheme is entirely independent of stakeholder involvement, and if the European Commission wants to go ahead without having to rely on the choices of others, and is willing to bear the costs (for illustration: this is estimated at 72 person-years[144] for global SEP exposure information on the current state on 2G/GSM, 3G/UMTS/WCDMA, 4G/LTE and 5G, and more if other standards are added such as "Wi-Fi", etc.), this is a scenario that would allow that.

[144] For the assumptions on which this number was derived, see Dimension B6 in Section 9.2.2 as well as Table 20 and its notes.

Scenario D ('Assessment of patents voluntarily requested by patent owner') seeks to actively involve stakeholders and maintain the underlying benefits of the assessments, for them to participate. Because patent owners perform a self-selection of potentially essential patents and the procedure is more cost-efficient, overall needed resource is considerably lower (estimated at 9.6 person-years instead of the 72 person-years in the above scenario[145]) This involvement also opens up the possibility for additional data, that can help licensing negotiations between patent owners and willing licensees to be smoother and faster. It also helps patent owners to be able to seek injunctive relief and deal with non-willing licensees. The voluntary involvement is likely to increase overall support for the mechanism, create possibilities for a self-supporting financing structure, and achieve better overall accuracy and cost-efficiency. Yet, this scenario does not collect data on non-participating firms.

Scenario F combines the strengths of above scenario (D) with a system to collect data on non-participating firms, and therefore scores again higher in terms of creating transparent data on essentiality. The additional data for non-participating firms is based on assessments of a random sample of patents that they disclosed as 'may be or may become essential' at SDOs. Required resources are at 13.2 person-years when using the same assumptions as for the above calculations. In terms of overall feasibility (including financing), it scores as high as Scenario D, making it perhaps the most attractive of our scenarios. (Where we do note that costs for the sampling part would need to be covered by overhead on on-demand part, and that at start-up, pre-financing may be required.) Compared Scenario B, an overhead would need to be added to the on-demand assessment, and/or (pre)financing for the sampling part would be required, for instance from a public institution.

Two other scenarios use some form of automated assessment, like Artificial Intelligence (AI). While promising, we think these two scenarios are not yet feasible in the short term but may become feasible in the future.

[145] Ibid.

10

KEY FINDINGS AND RECOMMENDATIONS

10 Key findings and recommendations

We combine the insights and findings from all the previous chapters to present the overall conclusions on the feasibility of introducing a European large-scale system for essentiality assessments, followed by recommendations for the European Commission and various stakeholders.

10.1 | Key findings on the concept and meaning of essentiality

1. **Essentiality is a binary concept, but assessments are not a simple 0/1 exercise. Conceptually speaking, a patent is either essential, or it is not; there is no such thing as a 'degree' of essentiality. Yet, the actual assessment is a complex process, which may include some grey areas.** The outcome depends on the precise definition of essentiality, which differs across SDOs,[146] and further depends on which precise version of a standard (standards document) essentiality is investigated. It also depends on the concept of patent infringement, and there are differences across jurisdiction on the precise meaning of that concept.[147] The outcome may depend on the interpretation and meaning of technical vocabulary,[148] and also the assessor's knowledge of other technical solutions than the one in the patent that would also satisfy the standard. There have been court cases where senior experts, having spent a very considerable amount of time on the same, single patent and sometimes even serving as experts for the same party, came to different essentiality conclusions. In one such case, the judge commented: *"Based on my assessment of both experts, I am sure the disagreement represents cases in which reasonable people can differ."* [44, p. 74] In another case, the judge commented "… '*disagreements' is probably a more accurate label than 'error'."* [40, p. 28, Footnote 16].

   Furthermore, even though there are many different definitions of essentiality, there is a broad understanding on how 'essentiality' should be understood in the context of a large-scale assessment mechanism. The verbatim definition of essentiality differs considerably between (the policy documents of) SDOs, although in effect their meaning is often quite close. Policies also differ in whether (and how) they mention specific situations (examples are whether the definition encompasses of commercially essential patents, optional normative portions, normative references to other standards, enabling technologies, or patents for which alternatives exist which are all patented themselves).[149] Yet, in our exchanges with stakeholders during the preparation of our pilot experiment, it became clear that everyone was happy to work with the same working definition (see Section 8.1.1 for details).

   In this context, we also note that an assessment outcome *'not found to be essential'* does *not* equal *'found not to be essential'*. The reason for this is as follows: once an assessor has found essentiality, he or she can stop. But when essentiality is not (yet) found in a given amount of time, the question is how long an assessor is supposed to go on (a patent can have dozens of claims, and the number pages in all the potentially relevant standards documents can be immense). As a

[146] These differences relate to the types of IPR covered, the inclusion of commercially essential patents, optional normative portions, normative references, enabling technologies and the situation when all existing alternatives are patented.

[147] These differences relate to, inter alia, the concept of indirect infringement and the Doctrine of Equivalents.

[148] For illustration, we here shortly discuss a case which was referred to us by experts as 'Invalid-as-Applied'. Suppose a patent owner asserts a patent is essential and backs that claim by offering a relatively broad (but not unreasonable) interpretation of the scope of a claim in its granted patent. Also assume that when reading the description of the patent and the patent prosecution file, it becomes clear that the patent examiner used a narrower definition of that claim during its examination; and with the broader interpretation as offered by the owner, the patent would not have met the novelty criterium and would therefore not have been granted. What should the assessor conclude? That the patent is essential, but perhaps invalid (even though the assessor is not asked or positioned to determine validity)? Or that the patent is not essential? This is only one example that illustrates that such things can become complex.

[149] These differences relate to the types of IPR covered, the inclusion of commercially essential patents, optional normative portions, normative references, enabling technologies and the situation when all existing alternatives are patented.

result, a search cannot be always exhaustive, and the assessment is unbounded.

Although for a large-scale system of essentiality assessment several choices can be made relating to interpretation and implementation,[150] we conclude this would not significantly impact the outcomes on a large scale nor determine a widely supported and objective definition.

2. The **concept of essentiality also has consequences for the moment that essentiality can be determined.** By mere definition, actual essentiality can only be determined once the standards' document in question is final (often referred to as 'adopted' or 'frozen') and once the patent in question is granted. Only at that point in time, are the precise normative elements in the standard known, and the exact scope of the exclusive rights conferred by the patent.[151, 152] Some experts suggest that essentiality should not be assessed before the window for patent opposition (such as available at EPO) is closed. In commercial license negotiations, parties might also be interested in future outlooks: patents that still need to be granted, standards that are not finalised, and perhaps also new patents still to be applied for (called 'capture period' in licensing negotiations). But any exercise looking at such categories is about expectations or potential, not about actual essentiality. We advise keeping such exercises separate from actual essentiality analyses.

3. **Patent essentiality differs from patent validity,[153] patent enforceability,[154] or patent value.** These concepts are all important in the context of a licensing negotiation concerning essential patents. They are also related to each other and sometimes cannot be seen in isolation. Yet, we believe that it is best to keep these concepts separate for assessment (and that you can also strive for more transparency on these and other concepts).

4. **Patent essentiality also differs from patent infringement**[155]. Whether a specific device in fact infringes specific actually essential patents, often depends on the **device category**: not every device category needs all the normative elements of a standard. For instance, a communication module that implements the 3GPP 5G NB-IoT standard will only need to implement a very small subset of all the normative parts of the 3GPP 5G standard and would therefore only infringe a small subset of all the patents that are actually essential to the 3GPP 5G standard. In addition, whether a specific device infringes actually essential patents also depends on whether the patent in question is only essential to an **optional normative feature** (which may or may not have been implemented in the device), and whether the patent in question is essential for the specific version of the standard implemented by the device. (At Dimension A2 in Section 9.2.1, we discuss transparent data on devices categories and optional normative features that allows for the 'translation' from essentiality to infringement.)

5. **This study also explored an alternative approach to the regular essentiality definition.** Essentiality assessment has significant similarities to novelty assessment as performed in the examination process by patent offices. Instead of asking the question "does a product that conforms to the standard necessarily infringe the patent?"[156] you could ask: "assuming that the text of the standard would already have been disclosed before the patent was filed, would the patent then still meet the novelty requirement?". **Both the pilot experiment outcome and extensive discussions with stakeholders indicate that the second question can form an alternative basis for essentiality assessment**, even though there might be rare border-line cases in which the answers to these two questions differ.[157] We tested both definitions during the pilot experiment and con-

[150] These include "commercial essentiality", "indirect infringement", and the Doctrine of Equivalents.

[151] One of these edge cases would be where the standard merely *discloses* a particular solution to a problem but does not *require* it (in the sense that it is normative element of the standard.

[152] Patent pools are consistent with this: they only assess granted patents against adopted standards documents.

[153] Patent validity, in short, refers to whether a patent meets the patentability criteria (including novelty and non-obviousness) in the jurisdiction in question. In principle, a granted patent is assumed to be valid unless invalidated by an authoritative court.

[154] Patent enforceability, in short, means that a patent is granted, that all formal requirements are met (including the payment of renewal fees for the patent), and that it has not expired.

[155] Wherever we use the word infringement, note that if a patent is actually licensed, it is not infringing.

[156] To clarify the difference, we deliberately use a looser definition of essentiality. See Section 8.1.1, Footnote 50 on the definition of essentiality as used in ETSI.

[157] The second question does not include the concept of "infringement", and because of specific aspects relating to infringement (such as the Doctrine of Equivalents, which exists in some but not all European countries) the answers to the two questions may differ.

firm that the results are very similar. This alternative is interesting for organisations that may be willing to perform essentiality assessments but are not in a position to use a definition that relies on the concept of infringement (which may be the case for some patent offices).

6. **In order to be properly able to assess essentiality, it is important that standards are drafted in such a way that it can be well determined which part of the text are (mandatory or optional) normative elements, and which parts are not (e.g. recommendations, possibilities, and informative statements).** Most SDOs have rules which define how specific words and/or how the document structure signals what is normative or not (see Dimension A3 in Section 9.2.1), but it is important that such rules are well respected by those that draft standards.

7. **On the side of the patent, it is the claims that determine the scope of exclusive rights conferred by the patent, and therefore determine the essentiality.** The description and drawings are to be taken into account when interpreting the claim.

10.2 | Key findings for existing essentiality assessment mechanisms

There is a very wide range of essentiality assessments available. They differ considerably in design, efforts, and quality. The below findings on these existing mechanisms are on the basis of desk research.

8. **Claim charts play a key role in high-quality essentiality assessments**. In patent pools, actual assessments are outsourced to independent, specialist third parties, who receive such claim charts as input. Individual companies prepare claim charts also for their own, standard-based licensing programs. The availability of claim charts is found to have great positive impact on the quality of the outcomes and efficiency of essentiality assessment. Here, efficiency refers to the resources required to reach that quality. (See also key finding 1 above, about unbounded assessments.)

9. **To date, patent pools have the most sophisticated systems in place for essentiality assessment.** These systems have the following characteristics: (1) it is a voluntary process for patent owners to participate, (2) claim charts play a key role, (3) actual assessments are outsourced to independent, specialist third parties, (4) there are well-developed appeal processes in place, (5) there is a specific choice in terms of transparency and (6) the outcomes are generally considered to be highly accurate. A new, large-scale system for essentiality assessment can learn a great deal from the rich experiences of patent pools.

10. **During discussions we had with patent pools, it was acknowledged that, theoretically speaking, the outcome of the assessment could depend on whether particular jurisdiction recognises the Doctrine of Equivalents, or induced infringement, or other specific national aspects. Yet, it was explained that in practice, such differences hardly ever matter for essentiality assessments.**

11. **Large scale essentiality assessments performed for court cases show there are substantial differences in (comparable[158]) essentiality rates[159] across firms and across technology generations.** In one court case analysis we reviewed, the overall essentiality rate found for disclosed GSM patents is 28% higher than that of disclosed UMTS patents. In another case we reviewed, the essentiality rate of one selected, large patent owner was 69% higher

[158] Often, essentiality dates cannot be compared because they used different selection criteria or assessment procedures.

[159] The 'essentiality rate' is the total number of patents found to be essential, divided by the total number of patents investigated for essentiality. Such a rate could be calculated for all companies that own patents relevant for a given standard, or for one specific patent owner. Often, the denominator in this division (i.e. 'total number of patents investigated') is the total number of patents disclosed at an SDO as potentially essential for a given standard, but the denominator can also be another set of patents, such as a set preselected by a patent owner.

than the rate of the other selected, large patent owner for this analysis. **Such differences confirm there is merit in (transparent) information on essentiality: one cannot simply assume that all companies, over all technologies, have similar essentiality rates.**

12. **The courts recognised that the large-scale essentiality assessments performed by experts were not perfect and sometimes subject to flaws. Still, the courts held the view that such assessments have merit.** In fact, in all the three landmark court cases we reviewed, the results of these assessments were ultimately used to reach a verdict (sometimes after the court made adjustments).

13. **For several reasons, market parties have not made use of the Japanese advisory opinion for essentiality, known as Hantei-E (as of 10 March 2020).** Our conversation with staff of the JPO indicated that the likely reasons are the several stringent admission criteria,[160] the test itself is narrowly defined,[161] and only one single patent is investigated, which means no insights are generated on essentiality at the portfolio level. The procedure was revised in June 2019, and the significant changes (including but not limited to: support for check on optional features, allowing confidentiality for some documents, allowing for requesting an opinion that a virtual object - based on the standard - does *not* fall within the technical scope of the patented invention, allowing multiple standards documents; see Section 5.3) might make the system more appealing to potential users.

14. **In recent years, various commercial assessment studies and services related to essentiality have been published and introduced.** These usually start as lists of patents disclosed as potentially essential. The definition of essentiality varies, and several studies actually measure something entirely different (such as 'seminal patents'). Although detailed information on their methodology and actual execution is often incomplete or not publicly available, we observe a great diversity in design, operational choices and resource investment. It is hard to assess the quality of the outcomes of these efforts, as there is no accountability, no appeal procedure, and no evaluation of the outcomes, etc. Some services allow for additional input to be submitted by patent owners, but this may result in bias with regard to the firms that did not do so.

15. While the cases we looked at confirm that essentiality assessments that are accurate, impartial and trustworthy (e.g. in patent pools) can have value, **none of the existing assessment mechanisms we looked at establish a formal legal status of essentiality (unless agreed between parties in a private contract, e.g. in patent pools).** Parties disagreeing on the outcome of the essentiality assessment can challenge the assessment in court.

16. **Concerning the efforts for assessments in existing schemes, we observed for commercial studies and court cases an approximate range from 0.3 to 6 person-hours per individual patent, and approximately 2 to 3 person-days for patent pools.** Obviously, there is a link between the accuracy and the time spent.

    Concerning the qualifications of assessors in existing schemes, we found technical engineers (both senior and supervised junior), patent attorneys, and patent lawyers. We find that commercial studies mostly rely on technical engineers, court cases mostly on senior technical engineers and patent attorneys (in-house or external; these people may be but do not always appear as experts in the case itself) and sometimes outsource to larger teams of less senior staff supervised by a senior expert. Patent pools mostly rely on patent attorneys or law firms that specialise in essentiality assessments.

    Concerning the costs of assessments in existing schemes, we observed a range from

[160] The requesting party must be willing to attest the patent is essential (so the procedure cannot be initiated by a party that believes a patent is non-essential), both parties must declare that there is a dispute (if one party denies the dispute, the case is not admissible), and both parties must agree to their roles in the procedure.

[161] The requesting party must define a virtual object based on the standard, this object may not include optional (normative) features, and must indicate a specific part of the standard (hence, the procedure will not consider that the patent may be essential for another part of the standard, and therefore can never result in a conclusion that a patent is non-essential – it can only result in a statement that it is essential for that specific part of the standard.

approximately € 300 to € 10,000 per patent. For commercial studies we see a range from € 300 (for very 'light' assessments and/or assessment outsourced to low-wage countries) to € 9,000 (for 'full assessment') per patent, and in pools a range from € 5,000 to € 10,000 average costs for assessing a European patent. Obviously, there is a link between the quality (read: accuracy) and the costs.

Table 22 provides an overview of the three above points. Note that the procedures and depth of the work differ greatly between the different type of efforts.

	Time spent	Qualification of assessors	Costs of assessment (estimates)
Commercial studies	Very diverse	Technical engineers (mostly)	€ 300 to € 9,000
Court cases	20 minutes to 6 hours per patent, longer for selected patents	Senior technical engineers and patent attorneys. Sometimes larger teams of less senior staff supervised by a senior expert.	Lowest € 300, highest unknown
Patent pools	2-3 days	Specialised patent attorneys or law firms	€ 5,000 to € 10,000 for a European patent

TABLE 22: TYPICAL TIME, COSTS AND ASSESSOR QUALIFICATIONS IN EXISTING ASSESSMENT SCHEMES.

10.3 | Key findings for Artificial Intelligence (AI)-based approaches

In our study, we also looked at possibilities to use AI-based and other automated approaches for essentiality assessments. Our findings here are based on extensive discussions with stakeholders. (This is not a case study of an existing mechanism, as we did for patent pools and court cases.)

17. **AI-based and other automated approaches for essentiality assessment (e.g. based on semantic similarity) are promising.** We acknowledge that such approaches may be valuable as assisting tools and potentially improve the efficiency of human essentiality assessment (in terms of higher quality or less required resources).

18. **For several reasons we believe automated approaches will not be able to replace human efforts in the short or medium term**. These reasons include: (1) The meaning, interpretation, and precise scope of words and terminology (both in patents and standards) is of utmost importance by cannot easily be properly 'understood' by an automated system; (2) semantic approaches can face difficulties dealing with changes in terminology over time; (3) patents are written in a different (natural) language standards; (4) a technology or solution required to implement the standard may not be explicitly mentioned in the standard's text (i.e. implied by the standard); (5) an essentiality assessment should consider possible alternatives to the patent under investigation that may also satisfy the standard; (6) An AI system would require a (not yet existing) reference training set, with a sufficiently large number of assessments, both positive and negative, of a very high confidence level.

19. **Even if above challenges are solved, we still need to be aware of other challenges** like anticipation (by those that file patents or submit technical proposals for standards), and acceptance of such AI systems by stakeholders (see Section 6.3).

20. **The introduction of an (regular) assessment creates the opportunity to build a large reference data set, which could be used to develop and validate a future AI-based mechanism.** Once such a set is there and a system is successfully developed and validated, then it could play an important role in assisting human assessors (e.g. by reducing the set of patents they need to manually asses) or, in the further future, perhaps even replace human efforts. But even when technical challenges are solved, one still needs to be aware of other challenges, like anticipation (by those that file patents or submit technical proposals for standards), acceptance of such AI systems by stakeholders, and inherent limitations of such systems in this context.

10.4 | Key findings for technical feasibility

Our findings on technical feasibility are based on a pilot experiment conducted in Spring and Summer of 2019, with 28 different persons performing a total of 205 assessments, spending a total of 176 working days on performing the assessments.

21. **Our experiment confirmed that essentiality assessments on a larger scale, where approximately 7 hours are spent per assessment, are technically feasible. We compare outcomes of assessors with various backgrounds with the outcomes of assessment of the same patents done by patent pools, seen here as the gold standard.** The most consistent results are achieved by individuals who work at a patent office as patent examiners and are provided with a claim chart. They achieve a consistency rate of 84% (while spending considerably less time than the pool assessors). In our experiments, assessors that work as senior engineer in academia score below that (75% consistency rate, without input claim charts). (Note again that even in an experiment where assessments were (again) done by the pools themselves, it is not guaranteed that the outcomes this time would be 100% consistent to the earlier findings.)

22. **We expect this performance will increase in a future essentiality assessment system.** Firstly, we made a number of choices to meet the scientific requirements for experiment design (see Section 8.3 for details). Among other things, we did not allow assessors to communicate with the patent owner in order to ask for clarification, to consult additional (public) information sources, such as the patent prosecution history, or to discuss cases with colleague assessors. In practice, such restrictions can be lifted, and performance will increase. Secondly, in an actual implementation, there are (more) opportunities to seek specialisation, for instance by allocating patents to assessors according to their key technological competences, and by individual specialisation on specific standards and even parts of standards (e.g. a radio interface, or core network). Thirdly, there are strong reasons to expect significant learning effects both on the individual and group level, also as a result of specialised training. Fourthly, the system could implement features that improve accuracy, such as allowing parties (patent owners and/or third parties) to challenge the results of the assessment. Altogether, we anticipate substantially higher consistency scores, even though these could not be quantified in our study.

10.5 | Key findings for institutional feasibility

Our investigation on the institutional feasibility of essentiality assessment is based on a variety of sources, including a stakeholder workshop we organised in October 2019 in Brussels, with 23 participants selected from all different stakeholder categories, including SMEs, as well as a large number of meetings and discussions (see Section 9.1 for details), as well as all the other work packages performed in the context of this study (literature survey, patent pools, Hantei-E, court cases, and landscape analysis).

23. **We conclude that setting up a system essentiality assessment is institutionally feasible.** Setting up such a system does require choosing between a consistent set of design choices across many interrelated dimensions, which do involve several challenges and trade-offs. There are several scenarios that offer such a consistent set of design choices.

24. **Many stakeholders expressed a clear interest in increased availability of transparent data on the essentiality of patents for standards. This interest is coming from different stakeholder categories: implementers, patent owners and courts**. In addition, SDOs have expressed interest in information on actual essentiality. While actors in these categories sometimes have different reasons for their interest, there are also commonalities, like the potential for smoother and faster licensing negotiations, reducing transaction costs in general, for parties that are in principle willing to enter into a license.

25. **The above-mentioned interest is mostly expressed in relation to mobile telecommunications (e.g. the 3GPP technical specifications for 3G, 4G and 5G communications) and for wire-**

less networking standards (e.g. IEEE 802.11 series, often referred to as "Wi-Fi"). But the future may bring demand for other standards. The emergence of IoT, Industry 4.0 and changes in vertical industries, as well as the anticipated role of standards in solutions helping to address Grand Societal Challenges (standards for smart grids, Intelligent Transport Systems, etc.) may lead to a need for transparent data on essentiality for other, more domain-specific standards. Because it is hard to predict for which precise standards there will be a future interest in transparent data on essentiality, it is advisable to set up any mechanism for essentiality assessments.

26. **This study distinguishes five types of transparent data on essentiality.**

    I. The first type, '*numerator data*', is information on the actual SEPs portfolio by of a specific patent owner for a specific standard. This data type is relevant for all stakeholders and requires a high degree of confidence.

    II. The second type, '*denominator data*', is information on actual SEPs owned by *all* relevant patent owners for a specific standard. In combination with numerator data, it can indicate the size (extent) of the SEPs portfolio owned by a specific patent owner in relation to all SEPs for the standard in question. Being able to do so is crucial for one of the licensing principles expressed by the European Commission, which states that, in defining a FRAND value, an individual SEP cannot be considered in isolation, and one needs to take into account a reasonable aggregate rate for the standard [17]. This data type is relevant for all stakeholders, and only requires a moderate level of confidence, which could also be satisfied by sampled data.

    III. The third type, 'validated summary claim charts', is a one-page summary that maps claims in the actual essential patents to relevant parts specific standards documents, also considering device categories and optional normative features. Such data helps to understand why and how a patent is essential, and also allows one to determine whether a patent is indeed used by a specific product (as a specific product usually does not implement all the normative elements of a standard). This data types both benefits patent owners and implementers in a number of ways (see Table 17) but also benefits the patent owner specifically in an infringement context and helping it to meet one of the key requirements of the Huawei/ZTE legal framework.

    IV. The fourth type, 'detailed assessment outcomes', provides extensive information on both patents assessed to be essential and those for which essentiality was not found. This type of data is especially valuable for patent owners, for instance when they want to challenge the outcomes of an assessment, or when they need to prove possible infringement.

    V. The fifth type, '*current ownership data*' provides, as the name suggest, information on the current owner of the patent in question. Without this data, knowledge about essentiality of a given patent has considerably less relevance, and without it, it's hard to create the numerator data mentioned above.

27. **A system for essentiality assessments should not strive for generating a single set of aggregated, static numbers (like essentiality rate percentages).** Such numbers would not cater for specific situations and for the specific needs of those that would like to use that data, and don't reflect that the data changes over time. Instead, a system for essentiality assessments should make accessible the underlying data points, where the user of the data, using relatively simple filters (which standards and documents, flags for device categories and for optional features, etc.), can create the information that is relevant for that used in the business context.

28. **On the basis of our pilot experiment, the experiences of patent pools and the views of experts, we conclude that the availability of claim charts (made available by the patent owner) as input for an assessment procedure is an important aspect of designing a system that combines high performance with high efficiency.** Equally, it is important to acknowledge these charts are usually made and provided by the patent owner with an interest in a positive outcome, and sometimes may go at greater length to, for instance, extend the scope of some patent claim beyond the limitations introduced during the prosecution or take one advantageous interpretation of the standard while introducing unwritten additional requirements. Therefore, in any mechanism, assessors should be well instructed and gain experience

in critically reading such input claim charts, and assessments using such charts as input should remain rigorous and thorough. Essentiality assessments are however also possible without access to claim charts. In that case. The claims for consideration must be selected by the assessor (and patents often have many claims). This makes the assessment more demanding. As a result, the level of accuracy will likely be lower and the amount of required resources higher.

29. **This study identifies nine scenarios for a large-scale essentiality assessment mechanism.** Basically, a scenario is a set of consistent design choices over the 19 dimensions identified in this study. Table 23 shows the degree by which these scenarios generate transparent data on essentiality, and the degree by which their implementation is feasible.

	SCENARIOS								
	0: Status quo	A: Self-assessment	B: All SDO disclosed patents	C: Sampled SDO disclosed patents	D: Voluntarily requested by patent owner	E: As D plus third-party requests	F: As D plus sampled disclosed SDO patent	G: AI-based system	H: As D plus assistive AI system
Degree to which transparent data on essentiality is generated [Main limitation]	**Low** *[No data at all]*	**Low** *[No impartial data, diversity of definitions and tests]*	**Medium** *[No type III or type IV or ownership data]*	**Low to medium** *[Limited numerator data, type III or type IV or ownership data]*	**Medium** *[No denominator data. For non-participating firms, no numerator data and no ownership data]*		**Medium to high** *[For non-participating firms, less detailed numerator data and no ownership data]*	**Low to medium** *[Depends on public acceptance; no type III or type IV or ownership data]*	**High** *[For non-participating firms, no ownership data]*
Feasibility of implementation [Main challenge]	**High**	**Low** *[willingness]*	**Low** *[financing, capacity]*	**Medium** *[financing]*	**Medium to high** [participation]		**Medium to high** *[participation, financing]*	**Not yet**; possible in the (distant) future?	**Not yet**; possible in the (nearer) future? [participation]

TABLE 23: OVERALL SCORES OF THE SCENARIOS ON (A) THE GENERATION OF TRANSPARENT DATA ON ESSENTIALITY AND (B) IMPLEMENTATION FEASIBILITY. Type III data is 'validated summary claim charts' data; type IV data is 'detailed assessment outcomes' data. Dark orange indicates a low degree or a low feasibility, yellow medium, and green high.

30. Below, we briefly discuss the **most promising scenarios**, which are the ones that score at least 'medium' in terms of the degree to which they meet the stakeholders' interest for transparent data on essentiality.

Scenario B ('Systematic assessment of all disclosed SDO patents') requires a lot of resources and is the costliest scenario. That said, this scheme is entirely independent of stakeholder involvement, and if the European Commission wishes to go ahead without having to rely on the choices of others, and is willing to bear the costs (for illustration: this is estimated at 72 person-years[162] for global SEP exposure information on the current state of 2G/GSM, 3G/UMTS/WCDMA, 4G/LTE and 5G; note that with this illustration we are not suggesting that a transparency system should only focus on these standards), this is a scenario that would allow that.

Scenario D ('Assessment of patents voluntarily requested by patent owner') seeks to actively involve stakeholders and maintains benefits for them to participate. This involvement also opens up the possibility for additional data, that can help licensing negotiations between patent owners and willing licensees to be smoother and faster. It also helps patent owners to be able to seek injunctive relief if they have to deal with non-willing licensees. The voluntary involvement is also likely to increase overall support for the mechanism, create possibilities for a self-supporting financing structure, and achieve better overall accuracy and cost-efficiency.

Scenario F combines the strengths of scenario (D) with a system to collect data on non-participating firms, and therefore scores again higher in terms of creating

[162] For the assumptions on which this number was derived, see Dimension B6 in Section 9.2.2 as well as Table 20 and its notes.

transparency. The additional data for non-participating firms is based on assessments of a random sample of granted patents disclosed as 'may or may not become essential' at SDOs. In terms of overall feasibility (including financing), this scores as high as Scenario D, making it perhaps the most attractive of our scenarios.

Two other scenarios use some form of automated assessment like Artificial Intelligence (AI). While promising, we think these two scenarios are not yet feasible in the short term but may become feasible in the future.

31. **Stakeholders from different perspectives indicate they would support a system for essentiality assessment.** However, only once final decisions on system designs have been made (and published) and the system is in operation, will we see the actual support for a specific design. The scenarios we present that are based on voluntary participation need to maintain their beneficial character to get patent owners involved. To increase support, it is advisable to involve stakeholders through the different stages of requirements, specification and design of any essentiality assessment system. As standardisation is global and involves patents at national and international levels, it is also important that the system must be open to skilled assessors specialised in these different legislations, for gaining credibility and trust from all stakeholders.

32. **Many stakeholders embrace the principle of 'all benefiters should pay'.** While determining the allocation of costs and finding a way to collect financial contributions may be difficult, the voluntary participation scenarios we discussed (D, E, F and H) offer good opportunities to collect contributions that are then shared among the benefiters, in a market-based mechanism. While it is obvious that the type of system we are talking about requires significant resources (estimated between 5 and 72 person-years for the current ETSI/3GPP cellular standards, depending on its design), workshop participants pointed out that such investments are minor if seen from the perspective of the high potential value these essential patents represent, the considerable costs associated with acquiring and exploiting these legal rights, and the potential benefits if SEP transaction costs, tension and legal battles were reduced.

33. **While a transparency system does also serve a public benefit, it would be beneficial if the system was self-financing** (from all benefiting stakeholders in the total ecosystem). This would reflect the utility and value that the stakeholders see in the system. At the same time, some scenarios would benefit from partial (pre)financing, for instance from a public institution.

10.6 | Recommendations

Considering:

(i) that we have observed an interest in transparent data on essentiality of patents for standards, from implementers, patent owners and courts alike;

(ii) such data can provide important benefits to stakeholders; among other things, it can help to (a) facilitate smoother and faster SEP licensing negotiations, requiring fewer resources and resulting in lower transaction costs in general; (b) reduce legal tension and 'unnecessary' court cases;[163] (c) enable determination of SEP exposure for a given product, and the determination of the current owners of these SEPs; (d) enable more accurate assessment of reasonableness of individual royalty rates, and more. Standards that require the use of patented technology are becoming more widespread, following developments such as IoT, Industry 4.0, connected cars and many more, which are reshaping their respective landscapes and ecosystems. Many companies, especially SMEs, will be part of future license negotiations, and the benefits described earlier are particularly relevant in such a scenario;

(iii) our study finds that establishing a system for generating such data seems both technically and institutionally feasible;

[163] We acknowledge that litigation is not necessarily a bad thing; the option to go to court is a crucial element in FRAND-based IPR policies at SDOs. Nevertheless, if court cases could be prevented by improving the availability of transparent data on essentiality, this would be a gain.

we make the below recommendations, both towards policy makers in general as well as to the European Commission in particular (being the commissioning body of this study), patent owners, implementers of standards, patent offices and patent organisations, patent pools, Standards Developing Organisations (SDOs), and, finally, to all stakeholders:

a) **We recommend policy makers to pursue the development and implementation of a system for essentiality assessments. We recommend them to further formulate the precise requirements for such a system, identify the demand for a specific design, and assess its impact when creating a new legal framework, while taking into account the issues and risks relating to any particular approach.** Because both the product markets and patent licenses in standards-related markets have a predominantly global character, we also recommend policy makers to collaborate with similar institutions from other regions/countries to work towards an open and harmonised approach.

b) **We recommend that policy makers engage with all stakeholders in the above process, as acceptance by stakeholders is a key success factor.** Among other things, this requires the system to be designed and operated in such a way that it earns trust. To achieve this, it is important to ensure high levels for reliability, thoroughness, and impartiality. It is also beneficial to keep information up to date as appropriate.

c) **When designing a system for essentiality assessments, we recommend to specifically consider the three most promising scenarios we identify.** These are:

- *A scenario where all patents disclosed to SDOs as potentially essential are systematically assessed (Scenario B in this report).* The advantage of this scenario is that it satisfies many (but not all) expressed interests for transparent data on essentiality, and its implementation is independent of the willingness of parties to participate or provide input: data is created for the full landscape. A major downside is that it requires very significant resources, which might be hard to raise in a self-financing manner. It also does not generate information on patent ownership, which is important for many users of such data. Moreover, it requires that the SDO in question publishes all the disclosed patents' identities, and this is not the case for SDOs that allow blanket disclosures.

- *A scenario in which assessments are initiated at the request of the patent owner, who then also provides valuable input claim charts as input to the process (Scenario D).* The advantage of this scenario is that it generates rich data on essentiality, including ownership data and detailed data that can help to make patent licensing negotiations smoother and faster, which already provides a benefit for patent owners to participate. The involvement of the current patent owners also allows for higher quality and more cost-efficient assessments and is likely to increase acceptance in the market. Furthermore, it requires considerably fewer resources than Scenario B, and allows for a self-financing model in which all those who benefit are contributing their share. A major downside is that it relies on voluntary participation by patent owners, and for those parties that choose not participate, no data is generated (and, in case participation is low, no comprehensive overview of the total essentiality landscape is created).

- *A scenario that combines elements of Scenarios B and D, and assessments initiated at the request of the patent owner are complemented with an assessment of patents disclosed to SDOs.* For the latter part, however, a representative sample is taken of disclosed granted patents instead of a systematic review of each and all patents. This scenario combines the key advantages of the two above scenarios.

d) **We recommend that, in designing a system, to take into account the various business and licensing models of SEP owners.**

e) **We recommend to recognise the specific situation of SMEs.** For SMEs that implement standards, it is important that transparent information on essentiality is available at the product category and optional feature level, enabling them to determine the relevant SEPs for their specific products (for instance an IoT device that uses a the 3GPP NB-IoT protocol, which only implements a very specific part of the total 5G standard). It has to be taken into account that some

SMEs might not be able to mobilise as much knowledge or skills to interpret/process that information in a business context. For SMEs that are potential owners of SEPs, the assessment system should be designed in such a way that it does not create unnecessary obstacles to participate, and that the anticipated benefits clearly outweigh the costs.

f) **We recommend to strive for a self-financing system for essentiality assessments,** in which all benefitting stakeholders in the ecosystem contribute. This would reflect the utility and value that the stakeholders see in the system.

g) **We recommend the European Commission to arrange for a small, supervising body to design and define the procedures, to oversee the system, to harmonise internationally with the different regions/countries concerned, and to have overall responsibility for quality and performance.** Actual assessment tasks can then be outsourced to existing organisations, especially those that already have experience with similar tasks, such as patent offices and patent organisations, as well as law firms and patent attorney firms that already perform essentiality assessments. A certification scheme is a good way to ensure that these organisations perform the assessment in a harmonised manner and meet the requirements for reliability, impartiality, quality and performance.

h) **We recommend to consider the detailed assessment procedure developed in our pilot experiment as input when specifying and designing a system.** This procedure is described in Chapter 8. Our procedure was developed in close collaboration with patent offices and with input from experts. We furthermore recommend embracing the specific, future improvements we identified in our pilot experiment (see Section 8.3). Among other things, such improvements include technical specialisation, collaboration between assessors and between assessors and patent owners, and training and learning in individual as well as group settings.

i) **We recommend to explore Artificial Intelligence (AI) based approaches to support essentiality assessments in the future. We recommend starting by arranging essentiality assessment records to be collected so they can be used for developing (including training and validating) AI systems for this specific task.** One option is to have a future competition, where external parties get access to a dataset for training and testing purposes in order to develop AI-based systems. The performance of these contenders is then validated (using a different part of the data set), and the best design can be selected to play a complementary role (e.g. pre-screening) in the essentiality assessment system.

j) **We recommend that patent owners consider how a system for essentiality assessment can benefit them.** In specific, we recommend them to consider how 'validated summary claim charts' (this is a one-page summary mentioning claim numbers and sections in standards documents; see Section 9.2.1) can help them to conclude smoother and faster licensing negotiations with willing prospective licensees and enable them to act better when facing unwilling prospective licensees.

k) **We recommend that implementers consider how a system for essentiality assessments can benefit them and how they can contribute to support or facilitate such a system.** A potential benefit for implementers is that such a system can help them check if license offers by patent owners are fair and reasonable. A possible form of support could be an indication of their willingness to cooperate proactively and constructively when transparent, impartial information is available on actual essentiality resulting from the application of a defined and published methodology.

l) **We recommend that the European Patent Office (EPO), national patent offices and/or patent organisations consider playing an active role in carrying out assessments in a system for essentiality assessments to be introduced.** This study identified that these organisations are very well positioned in terms of knowledge and skills to perform this task, and widely trusted to be impartial and objective.

m) **We recommend that patent pools and their members investigate whether the assessments they perform (and have performed) can serve as an input to a new system for essentiality assessment** and engage in discussion with the European Commission with the aim of evaluating whether a fast track procedure can be implemented.

n) **We recommend that patent pools and their members investigate how essentiality assessments under the new assessment system can play a role in their own patent inclusions procedures.** Patent pools could benefit from the efficiencies and effectiveness of assessments done under the new assessment system, if these meet their requirements for those assessments, possibly in the form of input to additional own assessments.

o) **We recommend that Standards Developing Organisations (SDOs) implement improvements in their disclosure rules/procedures and (access to) disclosure data**, while ensuring that such steps do not compromise the current roles these processes and databases have in their own processes and policies. Such steps would not only facilitate (external) essentiality assessments but also provide added value for their members and stakeholders otherwise. We recommend that SDOs specifically consider improvements in:

   a. *data specificness* (e.g. data on the individual patent identity and on the specific standard, document, document version or specific sections or parts within such documents),

   b. *data quality* (e.g. updating unharmonised records and orphans, and complement incomplete disclosures), and

   c. *keeping data up to date* (e.g. by updates of disclosures).

p) **We recommend that all stakeholders mentioned above adopt a constructive and collaborative stance towards the potential creation of a system for essentiality assessments.** While there are certainly differences between parties, the availability of transparent data on actual essentiality in the long term will benefit all benevolent parties in the market, will reduce transaction costs and friction. In the current practice, information is usually shared under NDAs, and it often takes months if not years to agree on them. It takes courage to move to a new practice, in which documents such as *validated summary claim charts* (see above) are shared without NDAs, or perhaps even made public. Yet, such a change is likely to eventually offer great benefits to both patent owners and (willing) licensees. Maintaining an opaque environment in an increasingly complex and diversified area of technological uptake appears to bear high risks. Forward-looking steps will require parties to think in terms of possibilities, not objections.

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LIST OF ABBREVIATIONS

List of abbreviations

3GPP	3rd Generation Partnership Project
AAC	Advanced Audio Coding
AI	Artificial Intelligence
AVC	MPEG-4 Advanced Video Coding
BD	Blu-ray Disc
C-ITS	Cooperative-Intelligent Transport Systems
CD	Compact Disc
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization.
CJEU	Court of Justice of the European Union
DOCDB	Documentation Database
DVD	Digital Versatile Disc
EC	European Commission
EDGE	Enhanced Data Rates for GSM Evolution
EEA	European Economic Area
EFTA	European Free Trade Association
eMTC	enhanced Machine-Type Communication
EPO	European Patent Office
ESO	European Standards Organisation
ETSI	European Telecommunications Standards Institute
EU	European Union
FRAND	Fair, Reasonable and Non-discriminatory
GIPP	EC Expert Group on Industrial Property Policy
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
Hantei-E	Japanese advisory opinion for essentiality
HEVC	High Efficiency Video Coding
HSPDA	High Speed Packet Access
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
INPADOC	International Patent Documentation
IPEC	International Patent Evaluation Consortium
IPR	Intellectual Property Rights
ISO	International Organization for Standardization
ITU	International Telecommunication Union
JETRO	Japan External Trade Organization
JPO	Japan Patent Office
JRC	Joint Research Centre

LOA	Patent Letters of Assurance
LTE	Long Term Evolution
LTE-A	Long Term Evolution Advanced
MIMO	Multiple-Input Multiple-Output
MPEG	Moving Picture Experts Group
NB-IoT	Narrowband Internet of Things
NDA	Non-disclosure agreement
NGMN	Next Generation Mobile Networks Alliance i
PATSTAT	EPO Worldwide Patent Statistical Database
RAN	Radio Access Network
ROM	Read Only Memory
SDO	Standards Developing Organisation
SEP	Standard Essential Patent
SIM	Subscriber Identification Module
SME	Small and medium-sized enterprises
TS	Technical Specification
UE	User Equipment
UHD	Ultra HD [Blu-ray]
UMTS	Universal Mobile Telecommunications System
USPTO	United States Patent and Trademark Office
WCMDA	Wideband Code Division Multiple Access
WIPO	World Intellectual Property Organization
WLAN	Wireless Local Area Network

ANNEXES

- ANNEX 1. LITERATURE REVIEW
- ANNEX 2. EXPERIMENT DESIGN
- ANNEX 3. LIST OF STAKEHOLDER WORKSHOP PARTICIPANTS

Annexes

Annex 1 | Literature review

In this Annex, we present an overview of the sources used for our literature review.

Academic contributions

Academic contributions on the topic of essentiality assessments are rather rare. Methodologies in the contributions presented differ substantially from those mentioned in the reports. Two of the following contributions compare patents to other patents rather than patents to standards. However, their methodologies are closely related to our field of interest and are thus relevant for designing an essentiality assessment mechanism.

All three contributions rely on semantic similarity between patents or patents and standards. In addition, they use manual assessments of essentiality as validity checks.

Author	Basic idea	Standards included	Information on the assessment process
Younge & Kuhn [47]	Computation of semantic similarity between patents + conduction of manual validity checks	(not applicable)	(not applicable)
Arts et al. [4]	Computation of semantic similarity between patents + conduction of manual validity checks	(not applicable)	(not applicable)

TABLE 24: OVERVIEW OF RELEVANT ACADEMIC CONTRIBUTIONS.

Institutionalised essentiality assessments: 3G3P

The work by Goldstein & Kearsey [23] guides practitioners and stakeholders through the entire process of planning and implementing a patent licensing program, from start to finish. Based on the authors' experience of setting up such a platform for licensing patents related to the 3G mobile communication standard, this book focuses on the 3G Patent Platform Partnership (3G3P).

Author	Basic idea	Standards included	Information on the assessment process
Goldstein & Kearsey [23]	Describe the experience of a system implemented by the 3G Patent Platform Partnership (3G3P)	3G standard	• Assessors: From the International Patent Evaluation Consortium (IPEC, a consortium of several patent law firms); a panel of patent lawyers and agents from the firms in the consortium (3 evaluators, including one lead evaluator) • Assessment: Patent owner provides an input claim chart, on which the assessment is based • Cost: Lead evaluator devotes on average two working days to assessing each application

TABLE 25: OVERVIEW OF RELEVANT LITERATURE ON INSTITUTIONAL ESSENTIALITY ASSESSMENTS.

Commercial contributions

The majority of the reports covering essentiality assessment methods can be classified as commercial contributions and have mostly been prepared by specialised consultancies.

For the most part, the reports listed below rely on manual assessments of essentiality. This implies that individual assessors or a group of assessors compare declared SEPs, or claims thereof, to the relevant standards. iRunway [28] do not use declared SEPs but rely on their own portfolio analysis technology to identify what they call "seminal 4G-LTE patents". However, we were unable to capture further details on their exact methodology. The report prepared by Charles River Associates [13] for the European Commission does not focus on actual essentiality assessments, but elaborates on potential ones.

Author	Basic idea	Standards included	Information on the assessment process
Fairfield [20], [21], [22] based on an academic paper by Goodman & Myers [24]	Manual assessments of essentiality	WCDMA, CDMA2000 (2005) GSM standard (Release 6.0) (2007) WCDMA (Release 7.0) (2009) LTE and SAE, 3GPP Release 8.0 (2010)	• Assessors: Panel of technical experts (telecom engineers) • Assessment: Whether technology described in at least one independent claim is necessary to implement the standard
Article One Partners [3]	Analysis of undisclosed third-party data conducting manual essentiality and novelty evaluation	ETSI LTE specifications as of November 18, 2011	• Assessment: Extent to which each patent's claims conform with standards
Cyber Creative Institute Co. Ltd. [13]	Manual assessments of essentiality	ETSI declarations as of July 2011/ March 2012 / November 2012 LTE/SAE standard: TS24.301, TS23.401, TS23.272, TS24.301, TS33.401, TS 36	• Assessors: "Technical people"
Jefferies [33][164]	Manual assessments of essentiality	LTE (more detailed information missing)	• Assessors: physics PhDs, wireless engineers, patent legal specialists, and former patent office employees
iRunway [28]	Semi-automatic identification of important 4G-LTE patents	4G-LTE standard	–
PA Consulting Group [36][165]	Manual assessments of essentiality	ETSI declarations as of July 2013 3GPP-LTE specifications of Release 11	Confidential report Information from the ETSI document: • Assessors: Team of engineers involved in developing related technologies • Assessment: Comparison of independent claims to relevant sections of specifications • Cost: € 300 to € 500 per patent
Charles River Associates [10]	Suggestion for essentiality assessment scheme	(not applicable)	• Cost: For one patent, "medium" assessment would cost around € 4,500 and full assessment € 9,000.

TABLE 26: COMMERCIAL PUBLICATIONS ON ESSENTIALITY ASSESSMENT SCHEMES.

[164] In their Company Note on RIM, Jefferies reference their Industry Note "Smartphone Patent Wars Far From Over: Deep Dive Into Essential LTE Patents" – however, we were not able to source this report.

[165] This report is not public, it can be purchased together with the associated database.

Instructions for assessors

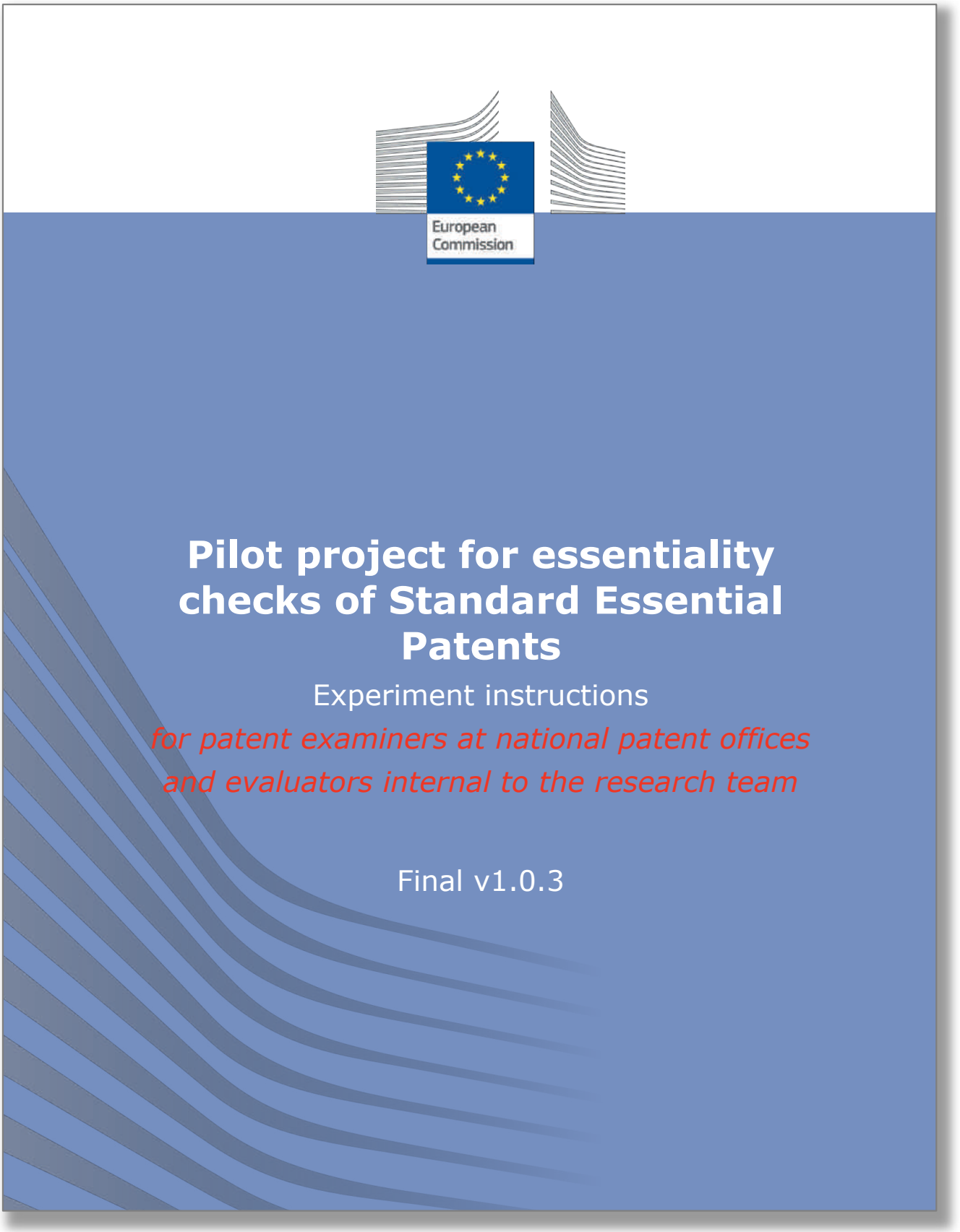


Table of Contents

1 Introduction

1.1 About the study

The European Commission Joint Research Centre (JRC) in cooperation with DG GROW has requested our research consortium to perform a feasibility study on essentiality checking mechanisms for standard-essential patents (SEPs). The objective of the project is to assess the feasibility of essentiality testing mechanisms both a technical as well as institutional point of view. The study may prepares proposals for how to develop such mechanisms. To this end, the study will consist of an analysis of various existing essentiality testing mechanisms, among which those employed by patent pools, the Japanese patent office (Hantei advisory opinion) and in legal cases. From these insights, various possible mechanisms are defined, whose technical merits are tested in an experiment.

In this experiment, a large number of evaluators (among which are engineers, attorneys, and patent examiners) are asked to perform essentiality tests on various example cases (based on real-world patents and essentiality information). This experiment allows the researchers to find out which mechanisms are suitable, and which are not, and how they are influenced by various parameters.

1.2 About this document

This document is intended for patent offices who are participating in the experiment described above and have agreed to have a number of their patent examiners carry out essentiality tests.

The document is written as a guide for the evaluators as well as the coordinators at each patent office.

1.3 Rules of the game

Confidentiality

For methodological reasons, it is crucial to adhere to the following confidentiality rules (some of which will be formalized through NDAs):

- For methodological reasons, it is crucial that the contents of this document shall remain confidential between the European Commission/JRC, the research team, and the involved persons from the patent office.
- Evaluators shall not share any materials provided to them, nor the outcomes of their evaluations, with others. Evaluators shall remove all data provided to them directly after finishing an evaluation.
- Evaluators shall not discuss the exercise with others (within or outside the PO) before the final deadline of the evaluation period (31/7). Any questions should be directed to the research team directly.

Identifiability

This exercise is *not* a race. We will not be comparing evaluators or POs, nor sharing results identifiable to any evaluator or office. The exercise is about learning about the mechanisms, not about who is the best evaluator or PO, nor about the quality of certain SEPs portfolios.

Therefore:

- The research team will not share outcomes in a way that is deducible to particular organisations, evaluators or patents with anyone outside the research team. Any outcomes that are shared will be anonymous with respect to individual organisations, evaluators and patents.
- SEP owners in particular will *not* get any feedback on the evaluation results for cases referencing their patents.
- Evaluators shall not attempt to find out more information about the cases provided (e.g. by looking up the patent or similar patents, looking up patent pool information, et cetera) for evaluation during the evaluation period.

Methodological considerations

- Instructions should be closely followed.
- Evaluators cannot re-assign work to other evaluators or POs. An evaluator should stick to the patent set specifically assigned to him/her by the researchers. Should there be any reason to re-assign work, please contact the researchers.
- Evaluators should perform the tasks alone and not accept any interference by others.

1.4 Planning and logistics

The experiment is planned to take place between June 6 and July 31, 2019. Evaluators

This means that the researchers will provide the necessary (final) instructions as well as any data required from June 6 onwards. Evaluators can perform the essentiality testing tasks at any time before the deadline of July 31, before which we expect the evaluators to have finished all cases assigned to them.

Around June 6, we will send each evaluator a link by e-mail, pointing to the first case to be evaluated. After completion of an evaluation, the evaluator will receive a new link for the next case. This link can be saved/bookmarked.

In case an evaluator experiences difficulties, forgets a link, et cetera: please contact the researchers.

Technical requirements

The cases for evaluation will be provided through an online form. Any documents are linked from the form as PDF documents, possibly in a ZIP file. Evaluators fill in their evaluation through the online form.

Evaluators need to have a PDF reader (Google Chrome will do), an unzip tool such as WinZip or 7-Zip, internet access, and a recent web browser.

1.5 Point of contact

- In case of any question or issue related to the experiment, please contact Tommy van der Vorst (vandervorst@dialogic.nl, +31302150593) or Rudi Bekkers (r.n.a.bekkers@tue.nl).
- Please do not contact anyone else, not even fellow evaluators, in case of an issues or question.

2 Instructions for evaluators

2.1 Objectives

The European Commission Joint Research Centre (JRC) in cooperation with DG GROW has requested our research consortium to perform a feasibility study on essentiality checking mechanisms for standard-essential patents (SEPs). The objective of the project is to assess the feasibility of essentiality testing mechanisms both from a technical as well as from an institutional point of view. To this end, the study will consist of an analysis of various existing essentiality testing mechanisms, among which those employed by patent pools, the Japanese patent office (Hantei advisory opinion) and in legal cases. From these insights, various possible mechanisms are defined, whose technical merits are tested in an experiment.

In this experiment, a large number of evaluators (among which are engineers, attorneys, and patent examiners) are asked to perform essentiality tests on various example cases (based on real-world patents and essentiality information). This experiment allows the researchers to find out which mechanisms are suitable, and which are not, and how they are influenced by various parameters.

This exercise is *not* a race. We will not be comparing evaluators or POs, nor sharing results identifiable to any evaluator or office. The exercise is about learning about the mechanisms, not about who is the best evaluator or PO, nor about the quality of certain SEPs portfolios. Please provide honest answers over the course of the experiment.

2.2 Definitions

For the purposes of this exercise, the following definitions are used.

A patent is *essential* with respect to a particular standard if it is not possible to comply with the standard without infringing that patent.[1]

More specifically:

- Essentiality should take into account normal technical practice and the state of the art generally available *at the time of standardization.*
- A patent is essential even if it would only be infringed when implementing *optional* features of the standard.
- The costs of alternative (non-infringing) implementations should not be taken into account when deciding on essentiality (i.e. 'commercial essentiality' is not considered here).

There may be a very specific situation where the following applies:

- If an unpatented alternative is available that complies with the standard, then the patent cannot be essential. If there exist alternatives, but all are patented, then they are all considered essential.

[1] This definition is inspired by the definition adopted by ETSI.

Note that this exercise does not take into account the validity of a patent, nor the enforceability of a patent (e.g. whether the patent has expired, has been declared invalid by a court, et cetera).[2]

A 'linkage' is defined as a specific combination of (1) a single patent claim, and (2) one or more paragraphs, figures and/or other elements in the standard document, related to that claim, positively determining *essentiality* of the patent with respect to the standard. A claim chart lists one or more linkage candidate(s).

2.3 Evaluation procedure

Who will perform the evaluation?

- Evaluators are assigned cases by the researchers in a specific order.
- Evaluators cannot share or redistribute the cases assigned to them. In case reassignment is necessary, evaluators shall contact the researchers.
- Evaluators shall not discuss the evaluations with anyone.

How should an evaluator perform the evaluation procedure?

For each case to be evaluated, you as an evaluator:

1. Obtain the input documents (patent, standard, possibly a claim chart)
2. Consider the essentiality definition provided (below).
3. Take a look at the score sheet (below).
4. Given the definition, provide an assessment whether the evaluator believes the patent to be essential to the standard.
5. Fill in the answers and an evaluation in the form.

You will be provided with a link to an online form for the first case by e-mail. After completion of the first case the system will provide you with a link to subsequent cases.

Note: due to the experimental methodology, it is possible that all of the cases provided to you are essential patents, none of the patents are essential, or anything in between.

Which documents should the evaluator use?

- Evaluators shall base their evaluation of essentiality on the documents provided (per case this is one or more standards documents, one anonymized patent grant publication, and possibly a claim chart document).
- Evaluators shall not use other versions of the documents provided.
- Evaluators may look up *technical* information from other sources (technical handbooks, academic papers, web sites, et cetera) in order to aid their understanding of the technology described in the patent and/or the standard.
- Evaluators may look up other 3GPP standards documents, but only if they are part of the same 3GPP release.

[2] Nor are we considering whether a specific standards-based product infringes the patent. After all, such a specific product may only implement a part of the standard (e.g. only the part for mobile terminals) or might not implement all optional features.

- Evaluators shall NOT look up (or do internet searches that may result in) information related to the *patent* or the *patent owner* (evaluators should not perform a web search on the patent title or text, for instance, but can look up technical terminology).

Which parts of the patent provided should be considered?

If the provided patent includes text in multiple languages, then the evaluator shall only consider the English texts.

If no claim chart was provided:

- The evaluator may consider any element of the standard document provided.

If a claim chart was provided:

- The evaluator verifies essentiality by verifying only the candidate linkages between patent and standard text described in the claim chart (i.e. only looking at the parts of the standard and the patent that are referenced). The evaluator shall not consider any candidate linkages other than the ones in the claim chart.
- Where necessary, the evaluator *may* consult other (not referenced) parts of the provided standard document (e.g. to check whether the composition of features is actually as intended in the standard).

Which parts of the patent provided should be considered?

If no claim chart was provided:

- The determination of essentiality shall exclusively be based on the claims.
- Other parts of the patent may be used for understanding the claims.

If a claim chart was provided:

- The evaluator verifies essentiality by verifying only the linkages between patent and standard text described in the claim chart (i.e. only looking at the parts of the patent that are referenced). The evaluator shall not consider any linkages other than the ones in the claim chart.
- Other parts of the patent may be used for understanding the claims.

An example claim chart template is provided at the end of this document.

When should an evaluator consider the patent essential?

The patent shall be considered essential by the evaluator when the evaluator is confident in (at least) one of the linkages. After confirming one linkage, the evaluator does not need to consider other candidate linkages.

If no claim chart was provided:

- The evaluator will attempt to construct a linkage. For the convenience of the evaluator, a template is provided in Annex 1: Empty claim chart template).

If a claim chart was provided:

- The linkage shall be one of the candidate linkages from the claim chart.

How much time should an evaluator spend?

- The evaluator shall decide on the amount of time spent per patent (i.e. will continue until the evaluator is sufficiently confident).

2.4 Example evaluations

To illustrate more clearly what kind of evaluation we are looking for in the experiment, we provide example evaluations based on a fictitious standard. First, the example standard is defined as follows:

> *Standard TS99.888: "A UE shall include function A, function B and function C. Optionally, a mobile terminal may include function D. A base station shall include function A, function B and function E.*

Standard case of essentiality

Below is an annotated claim chart for an example patent A. The colors indicate how the patent relates to the standard (note that 'real' cases in the experiment may or may not have claim charts, and the level of detail of the claim charts provided may differ between cases).

Patent A	Standard TS99.888
Claim 1: A mobile telecommunications device comprising functions A, B and C	A UE shall include function A, function B and function C.

Essentiality assessment: the standard requires that a UE includes A, B and C, and thus it is not possible to make a UE conforming to the standard without necessarily infringing patent A. Hence, patent A is essential to the standard.

Patent-side scoping

Patent B	Standard TS99.888
Claim 1: A base station device comprising functions A, B and C	A UE shall include function A, function B and function C.

Essentiality assessment: the standard requires that a UE includes A, B and C. Yet, the scope of the patent only covers *base stations* that comprising functions A, B and C. Hence, the patent is not necessarily infringed by implementing (this part of) the standard. Hence, patent B is ***not*** essential to the standard.

3 Feedback form

Note: do not fill in the form below. Evaluators will receive a link through which they can access their cases and will be provided with an online version of this form, that should be filled in.

Score page

The following documents are provided (these are examples): instruction leaflet, patent, standard document, empty claim chart template.

1 Is this patent essential with respect to the standard provided?

- ○ Yes
- ○ No

2 How confident are you in your evaluation of essentiality?

	very uncertain	quite uncertain	Undecided	quite certain	very certain
I am:	○	○	○	○	○

Please proceed to the explanation page.

* mandatory question

Explanation of the essentiality

The questions in this block should only be answered if the question *"Is this patent essential with respect to the standard provided? "* has been answered with "Yes" .

3 Specify the number of the claim that is essential.

4 Specify at least one associated relevant section in the standard document.

5 Specify the device categories (if any) for which the patent would be essential for implementation of the mobile communication standard.

- Terminals (e.g. UE)
- Base station (e.g. BS / NodeB / eNB)
- Core network element (e.g. RNC, CN, SGSN, GGSN, SAE-GW, EPC)
- Other (e.g. SIM, eSIM)

6 Would you consider this patent ONLY to cover an optional feature(s)?

- ○ Yes
- ○ No
- ○ Not sure

7 How much time did you spend evaluating (including filling in this page)?

Choose...

Choose...

8 Have you seen this patent before and/or did you recognize a specific applicant?

- ○ Yes
- ○ No

9 Did you encounter any issues evaluating this patent (i.e. did you have to assume anything, was information missing)?

10 Please proceed to the feedback page.

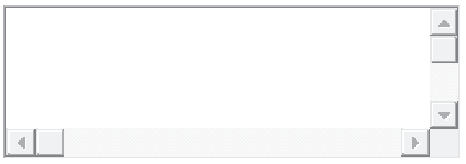
* mandatory question

Feedback page

Please report the feedback honestly, we are not comparing nor sharing individual performance data.

11 Is anything missing (in terms of data, knowledge, tools, training, et cetera) to perform a proper evaluation of essentiality? What additional resources would improve the ability to perform a proper evaluation?

12 Do you have any recommendations to the researchers and/or the European Commission with respect to systematic essentiality testing?



13 Did you spend more or less time than expected?

	Much less	A little less	Not more, not less	A little more	Much more
I spent:	○	○	○	○	○

14 Please elaborate on the time you spent.

15 Do you feel you became more skilled in evaluating essentiality over the course of the different cases?

	Not at all	Slightly	Moderately	Considerably	A great deal
My skills improved:	○	○	○	○	○

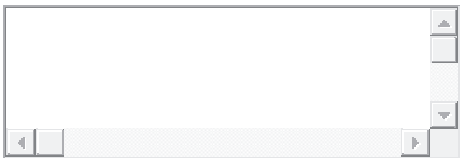
16 How helpful did you find the provided claim chart?

[This question is only visible if a claim chart was provided]

Not at all helpful	Slightly helpful	Moderately helpful	Very helpful	Extremely helpful

The claim chart was: ○ ○ ○ ○ ○

17 Do you feel qualified to perform essentiality testing in the way done it is requested in this experiment? Does the task align well with your regular activities, experience in the technical domain, experience in standard-setting processes, et cetera? Which qualifications do you think are required?



18 Do you have any further comments or suggestions with respect to this experiment, the project, your experience in it and/or essentiality testing in general?

The answers provided will be shown in future cases, so they can be updated at any time.

* mandatory question

Delete documents page

Please delete all documents now.

You have finalized the evaluation procedure for this case. You are now obliged to delete all case related documents and notes.

√ Yes, I deleted all documents and notes.

Thank you. Please proceed to submit this case.

Annex 1: Empty claim chart template

Claim number	Standard document and version	Relevant section(s) in the standard document
Example:		
Claim 1	TS99.888 V9.3.1	§4.3.1, §4.3.2, Figure 2-1

Colorized text mapping

Claim text	Standard document text
Example:	
Claim 1	TS99.888 V9.3.1
Claim 1: A mobile telecommunications device comprising functions A, B and C	A UE shall include function A, function B and function C.

Instructions for assessors using the novelty-based test

Assessors at the patent office who decided to use the novelty-based test instead of the regular essentiality assessment received the same set of instructions as the internal assessors (shown in Annex 1), except Section 2.2 of the instructions, which reads as follows:

2.2 Definitions

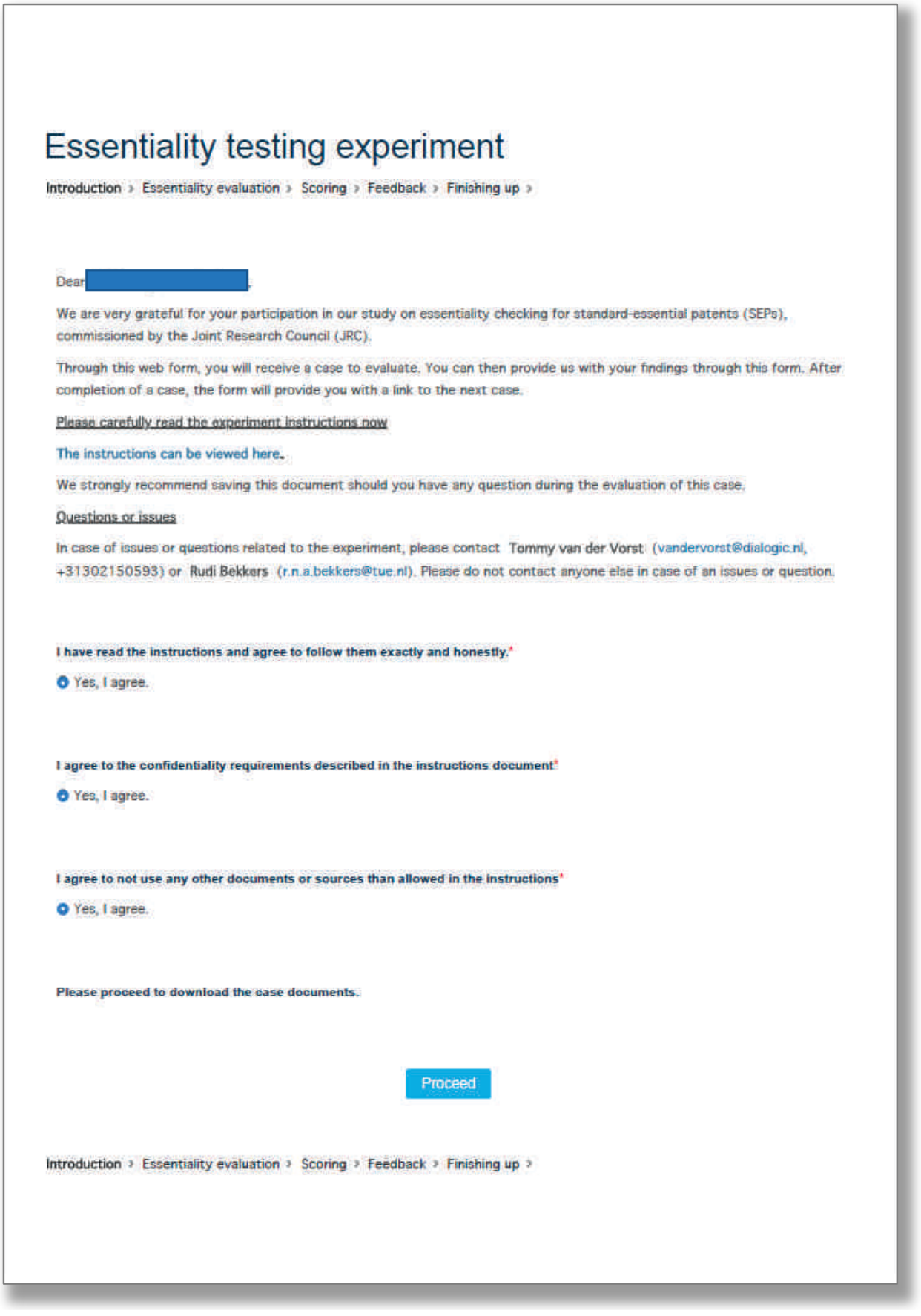
For the purposes of this experiment, we define 'novelty-based essentiality test' as follows:

> *Evaluation of whether the patent meets the novelty requirement in the (imaginary) hypothetical situation where the relevant standard document already would have been in the public domain before the filing date of the patent.*

Note that this exercise does not take into account the validity of a patent, nor the enforceability of a patent (e.g. whether the patent has expired, has been declared invalid by a court, et cetera).[1]

A 'linkage' is defined as a specific combination of (1) a single patent claim, and (2) one or more paragraphs, figures and/or other elements in the standard document, related to that claim, positively determining *essentiality* of the patent with respect to the standard. A claim chart lists one or more linkage candidate(s).

Feedback form for participants



Essentiality testing experiment

Introduction › Essentiality evaluation › Scoring › Feedback › Finishing up ›

Dear [redacted],

We are very grateful for your participation in our study on essentiality checking for standard-essential patents (SEPs), commissioned by the Joint Research Council (JRC).

Through this web form, you will receive a case to evaluate. You can then provide us with your findings through this form. After completion of a case, the form will provide you with a link to the next case.

Please carefully read the experiment instructions now

The instructions can be viewed here.

We strongly recommend saving this document should you have any question during the evaluation of this case.

Questions or issues

In case of issues or questions related to the experiment, please contact Tommy van der Vorst (vandervorst@dialogic.nl, +31302150593) or Rudi Bekkers (r.n.a.bekkers@tue.nl). Please do not contact anyone else in case of an issues or question.

I have read the instructions and agree to follow them exactly and honestly.*

◉ Yes, I agree.

I agree to the confidentiality requirements described in the instructions document*

◉ Yes, I agree.

I agree to not use any other documents or sources than allowed in the instructions*

◉ Yes, I agree.

Please proceed to download the case documents.

Proceed

Introduction › Essentiality evaluation › Scoring › Feedback › Finishing up ›

Essentiality testing experiment

Introduction > **Essentiality evaluation** > Scoring > Feedback > Finishing up >

Please download the documents for this case and begin evaluation

Download documents to consider for this case

After downloading, you may start your essentiality assessment.

Now is also a good time to copy the link to this form in case you want to return to this form later:

https://XXX

Once you have finished your evaluation, click 'proceed' to continue to the score page.

Proceed

Introduction > **Essentiality evaluation** > Scoring > Feedback > Finishing up >

dialogic

Essentiality testing experiment

Introduction > Essentiality evaluation > Scoring > Feedback > Finishing up >

Is this patent essential with respect to the standard provided? *

- ○ Yes
- ○ No

How confident are you in your evaluation of essentiality? *

	very uncertain	quite uncertain	Undecided	quite certain	very certain
I am:	○	○	○	○	○

Please proceed to the explanation page.

* mandatory question

Proceed

Introduction > Essentiality evaluation > Scoring > Feedback > Finishing up >

dialogic

Essentiality testing experiment

Introduction > Essentiality evaluation > Scoring > Explanation > Feedback > Finishing up >

Specify the number of the claim that is essential.*

Specify at least one associated relevant section in the standard document.*

Specify the device categories (if any) for which the patent would be essential for implementation of the mobile communication standard.*

- ☐ Terminals (e.g. UE)
- ☐ Base station (e.g. BS / NodeB / eNB)
- ☐ Core network element (e.g. RNC, CN, SGSN, GGSN, SAE-GW, EPC)
- ☐ Other (e.g. SIM, eSIM)

Would you consider this patent ONLY to cover an optional feature(s)?*

- ○ Yes
- ○ No
- ○ Not sure

How much time did you spend evaluating (including filling in this page)?*

[please use rounded hours]

Have you seen this patent before and/or did you recognize a specific applicant?*

- ○ Yes
- ○ No

Did you encounter any issues evaluating this patent (i.e. did you have to assume anything, was information missing)?

Please proceed to the feedback page.

* mandatory question

Proceed

Essentiality testing experiment

Introduction › Essentiality evaluation › Scoring › Explanation › **Feedback** › Finishing up ›

Please report the feedback honestly, we are not comparing nor sharing individual performance data. The answers provided will be saved and shown after the next evaluation, to be updated if needed

Is anything missing (in terms of data, knowledge, tools, training, et cetera) to perform a proper evaluation of essentiality? What additional resources would improve the ability to perform a proper evaluation?

Do you have any recommendations to the researchers and/or the European Commission with respect to systematic essentiality testing?

Did you spend more or less time than expected?*

	Much less	A little less	Not more, not less	A little more	Much more
I spent:	○	○	○	○	○

You can elaborate on the time you spent.

Do you feel qualified to perform essentiality testing in the way done it is requested in this experiment? Does the task align well with your regular activities, experience in the technical domain, experience in standard-setting processes, et cetera? *

Do you have any further comments or suggestions with respect to this experiment, the project, your experience in it and/or essentiality testing in general?

* mandatory question

Proceed


Essentiality testing experiment
Introduction › Essentiality evaluation › Scoring › Explanation › Feedback › Finishing up ›
You have finalized the evaluation procedure for this case. You are now obliged to delete all case related documents and notes.
Yes, I deleted all documents and notes.
Submit
Introduction › Essentiality evaluation › Scoring › Explanation › Feedback › Finishing up ›
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Annex 3 | List of Stakeholder Workshop participants

Participants

Adriana van Rooden

Anne von Zukowski

Christian Loyau

Edgar Brinkman

Emilio Davila Gonzalez

Earl Nied

Georg Kreuz

Heinz Goddar

Harald Heiske

Heinz Polsterer

Ignacio de Castro

Jako Eleveld

Konstantinos Karachalios

Kazuyuki Tanji

Mathew Heim

Mats Sagførd

Nikolaus Thumm

Peter Kammermeier

Patrick McCutcheon

Sireesha Ancha

Spiro Dhapi

Sabine Keim

Serge Raes

Sebastiano Toffaletti

Tim Frain

Thomas Reibe

Willem Hoyng

Yann Ménière

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