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Identification and creation of models for technology assessment created by a Scientific, Technological and Innovation Institution

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INTRODUCTION: In the present time, many of the developed and protected technologies are useless, they contribute to nothing simply because many inventors fear or neglect the innovation barrier. They develop the technical part, which oftentimes can represent a difficulty for technological analysis (BIANCHI et al., 2011), their development gets protected, and succumbs to obsolescence, this is a usual cycle for many technologies. It is crucial for inventors to have their Intellectual Properties (IP) commercialized, and for that to be possible, it must be thoroughly analyzed. But this analysis can be hard, because, according to (BAHIA and SAMPAIO, 2015), there is not a unique method to evaluate IP, and according to Schot (1997) this method must be generic because it must fit to all, or at least most, different developments. The necessity for this method is created especially after considering the possible impact that those technologies may have in human progress and how can they contribute by providing the best means to achieve a particular and beneficial end (AGAR, 2019). The impact of technologies in societies go a long way back, in the middle ages, Dittmar (2010) describes cities that possessed the Gutenberg printing press, one of the most significant technological developments ever made, had considerably greater growth than the ones that did not. In the last century, technologies had the capacity to revolutionize fields of study, Ligon (2004) describes the revolution in medicine after the discovery of penicillin by Alexander Flaming, and another example is the impact that innovation have in enhancing economies, described by Schumpeter (1943) and Dosi (1983), and presently

illustrated by looking at big companies that drive innovation such as Apple, that possess a Market Capitalization greater than the GDP, Gross Domestic Product, of 216 countries (KOLAKOWSKI, 2020). Therefore, the objective is to identify the guiding points to analyze the technologies created to support the Technology Transfer Office define the strategies of protection and commercialization of IP.

METHODOLOGY: Based on the priorly stablished objective, the preferred methodological technique for conducting this research was the Systematic Literature Review (SLR) that according to Kitchenham (2004) can identify and evaluate a big number of researches that can be meaningful to the study of a specific question, collaborating for the strong theoretical base built to properly verify certain concepts and ideas, and very importantly not to be biased by the researchers expectations. To construct such consistent review, it was necessary to be able to have parameters in order to curate information to display the theories correct. Through books and articles data, that were drawn to better sustain the weight of concepts, the chosen aspects to filter the bibliographical research were platforms of renown such as Google Scholar, Elsevier, ScienceDirect, Scopus and in theses platforms the keywords, title and words on the abstract and introduction were relevant to direct the search, with terms such as technology, technological development, evaluation, assessment and others. Afterwards the collection of main works and books with related topics, became clear the scarce number of papers that touched many of the studies that interest this research, turned evident the necessity to ferment the search through amplifying the scope of languages in books and articles consulted, researching through English, Portuguese and Spanish texts.

RESULTS E DISCUSSION: To perform the analysis of technology, became evident the necessity to separate the evaluation of the IP through 4 main sources of information and develop questions, representing a generic method of analysis, to help the group/individual/organization involved in trying to analyze the technology: The impact assessment considers information and feedback provided by the public and political powers, making the analysis consult sustainability aspects, legislation that can impact the performance, and taboos that the regions of production or application of the technology might have that profoundly could damage its' utility; Expert insights studies the

professional opinions of experts in related fields of the technological development, to advice where possible applications and missed technical aspects that may benefit, or damage, the technologies performance; Inventors' sight excludes the specific concerns about technicalities and touches broader concepts that can apply to any technology, to properly understand the dispositions of available resources and tasks; and the stakeholder's perspective created for the necessity to better understand concepts that have economical related consequences in the further development, to validate and better reverse engineer and know how to operate, produce, or offer the best form of the technology. Each becoming theoretically fundamental to supplement the analysis of technology by expressing certain necessary questions, that is considered the results of this work, to better prepare the invention to be commercialized. In this logic, considering the content that each perspective could display, it is fundamental the translation of the technology to each perspective understanding of what the technology does/is became important, because of the different concerns that each source have, and the list of subsequent questions, that assist the translation and gathering of curated information is extensive, better illustrated in the Figure 1, that helps organize the inquiries and make it fluid.

FINAL CONSIDERATIONS: Many technologies are inertial, they do not accelerate along the growing line of innovation and stand behind waiting for obsolescence. To justify their development, inventors should aim for their inventions to became innovations through commercialization, often troubled because the ability to effectively argue about the trajectory of the technology is limited to a few people. And by expanding the scope of sources that provide valuable feedback, it becomes evident, that the same way the access to information allows for more inventions to rise, it should and can allow for more innovations to happen. Therefore, by increasing the number of perspectives able to provide insights about the technology, the flux of information about possible and unforeseeable paths could not only be elucidated but many discovered. Four main perspectives were considered necessary for most, if not all, technological developments by this research, and to contribute to the group/individual that is gathering those advices and opinions, it was devised a list of questions, that represents the generic method,

directed to the main groups, that could theoretically help retracting valuable insights. The model of questions remains to be tested in practical terms and demonstrate what could be better and how effective it is.

Figure 1: Table of questions from the analysis

Impact Assessment:

Considering public concerns:
Is this a taboo in the selected region?
Would this activity be incentivized in activity the selected region?
Is it understandably good for society?
Do I consider this harmful to the environment?

Lesgislation:
Is there an existing legal barrier for the development or operation?
Is there any legal bonus or incentives to the development or activity?
What about the environment concern?

Crowdsourcing (Suggested method is in universities):
Do I understand its present utility?
Can it have any other application/use?
Do you understand what problems can it solve in its new usage?
Have you seen something like what is being shown?
Do you consider the technology innovative in your proposed use?

Inventors Sight:

Problem-solving and similar technologies:
What has the initial bibliographical research told me?
Were there similar technologies in well-known patent sites?
What does my technology offer that the others lack?
What are the main parameters that make mine unique?
Is the problem well defined?
What problem am I solving by developing this?
Have I formulated the whole problem correctly?
Do I know how to proceed?

Critical study of the technology:
Do I have a consistent plan towards the adapting to commercialization?
What is it?
Do I have the necessary resources to run the necessary tests?
Do I have a satisfactory deadline?
What are my main obstacles?
What could be the ideal solutions to these obstacles?
What are some of the possible solutions to these obstacles?
Is it viable to take a possible one if the ideal is not within reach?
Do I know what to do next?

Learning from past experience:
What could I do differently if I could?
Why didn't I?
What do I need to know and have to reverse engineer the technology?
In an overall sense, what does it lack?
What ability do I lack to continue or improve the intellectual property?
Do I know how to proceed?

Expert Insight:

Tecnique and Use:
Is the transmission clear in their concepts?
Can you summarize what it does?
Do you acknowledge any unused potential?
Is there something I am missing?
Is there any technical specificity to implement that could improve the results?
Is there any other application it could perform?
Any other field of application?
Could you name the functions the technology can perform?
Is there a mechanical problem to be dealt with?
What problem does it solve?
Can it solve more than this problem(s)?
What is the most basic function it can perform?
What are the main features that this invention can offer?
Is it like something that I have already seen?
Have I understood something wrong?
Is the obtained result the best it can perform so far?
What to do next to help the development?
Are there any further comments?

Perspective of Stakeholder:

Essence of the technology and subsequent development:
What is the objective, indicators, mission, and vision of this development?
What problem does this technology solve for the costumer/company ?
What is the biggest and the subsequent goals to be accomplished?
What are the tasks necessary to accomplish the subsequent goals?
Who is responsible and how much will it cost?
How much time do I need to finish every task?
Is there anything I could do to decrease the time needed?
If yes, why haven't I done it, is there an impediment?
Do I know how to continue?

Market related informations:
Where can this be reversed engineered?
Is the technology intended to be mass-produced?
Does it require a strictly controlled environment?
Can anyone operate the technology, or it requires certain degrees?
Can it be resumed in a short phrase based on utility?
How many errors were found when testing?
What is the market that it should be inserted?
What do I want to accomplish with this product/service?

Source: Author

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