Research serendipity: A challenge for changing

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Abstract. Research is a part of every activity of human life, and the tri dharma of higher education only reaffirms that task for each academician. Research is not just a coincidence like that, but it is a possibility and opportunity, or not incidentally, for life itself. Because, however, every interest will urge to become the human needs, research becomes a solution so as not to contribute negatively to social and personal well-being. This is stated as research serendipity, which ontologically states that a research will supported by another research and will also give birth to another research.

1. Introduction
Naturally, every human being will make observations, show concern, make judgments, or subsequently contribute to something [1, 2]. Humans as social actors will not only use the resources around them for the common good, but that use will make a positive contribution so that welfare increases [3]. However, humans as individuals consume the whole both tangible and intangible for their interests, and in essence this contributes negatively to welfare [4]. To deal with this, scientist conduct research, and the research proves the existence of these contributions and create options [5]. Of course, research also requires resources.

However, there is a lot of researches that has been done by Indonesia scientists, but some are only stored as reports, even in some cases the research may overlap with one another [6]. This paper aims to express research as a serendipity or incidental.

2. A review and motivation
From the beginning until now, research has become the encouragement and the energy for a country to be excellence (a country’s superiority). A country with little (a small budget) research will not be able to compete against other countries with more research budgets, whether in the development of science, technology, or the knowledge, even though that country has abundant natural resources [7, 8]. It may be that countries, with rich natural resources, are trapped into that wealth. The nation be poor in a container known as a un-wisdom country because that sufficiency [9]. It has become a message that natural resources are valuable according to needs. The provision of the added value depends on science and technology, not on the number of people and a lot of debt [10]. Because, the success achievement of the well-done, prosperity, and welfare dose not lied in natural resources, but lies in the mastery of knowledge.

The wealth of these natural resources trapped an agrarian country to become poor, even its leader is not confident about the ability of their people, including their ability to lead their people for mastering the science and technology [11, 12]. That research, only as a complement to
Table 1. Technology Readiness Level (TRL)

| Stage | Description |
|-------|-------------|
| 1     | Basic research has been conducted. |
| 2     | Applied research has been carried out. |
| 3     | Research results have proven the feasibility of innovation. |
| 4     | Innovation performance has been tested on a laboratory scale. |
| 5     | Technology for innovation has been developed. |
| 6     | All innovation performance has been proven in the field. |
| 7     | The prototype of innovation is ready for an industrial scale. |
| 8     | Innovations have been proven to be produced on an industrial scale. |
| 9     | Innovations are ready to be marketed and circulated. |

Figure 1. A bridge consists of TRL stages

sufferers in the budget every year, so to eat even have to bring it from other countries, or so the food must being food from other places [13]. The available natural resources are sold to other countries at low prices, even when carrying out the developments, including the infrastructure development the main objective is to channel these natural resources in order to more cheaply to the buyer country [14]. It happens, because the country / state see a momentary advantage of the exchange so that the stomach of poverty is full [15], while universities / research institutions, or researchers see the importance of something based on the technology readiness level (TRL), such as Table 1 [16, 17, 18]. Thus, a study those completed at one stage of TRL will be forced to enter the next TRL stage, so that the research outcomes contribute to a quick return of the budget through research products [19]. This is based on treatment, i.e. the research with appropriate outcomes is still audited based on budget use. A few studies that go directly to the higher TRL stage, not the basic TRL, few of them are able to cross the bridge of the TRL stages, not a few of them fall into a death valley [20], see Figure 1.

The stages of TRL are as the test stones [21]. It is to determine whether a research continues to or goes back to a previous stage. The choices must be determined expertly by the researcher. Many researches cannot linearly continued to other researches with increasing TRL. If the choice made is based on a lack of understanding of TRL, the research will soon be at least only remain on the shelf of the collection of reports, and then the report ended up as the garbage [22, 23].

TRL as a bridge for producing the appropriate output, but the bridge like fragile pieces that will drop the research into a death valley. Each stage of the TRL is a separate piece, and has
Figure 2. A bridge consists of TRL stages and the road map

no clear border. The border can shrink and enlarge depending on the readability of researchers, or the support of knowledge known as the already known. Each piece of the TRL stage that continues to grow, will consume excessive time and costs so that the implementation of research is inefficient compared to the outcomes that must be get. A research is to complete the life puzzle [24]. Each stage of the TRL is interrelated with the others. Understanding the TRL stages and implicating it through the acquisition of knowledge: references and experiences that have been passed [25]. Unfortunately, sometimes research by research has been linearly sequenced according to the TRL stage also requires other researches with lower TRL stages to support it. That way, even though research has potential, it also has the possibility and opportunity not only to advance to the next stage, but also to find ways to produce fundamental finding again [27].

Potential, possibility, and opportunity in research are referred to as the research serendipity [28].

3. Toward the interests as an approach

Each stage of the TRL is to prevent the research from un-continuing, each research must reach the next stage in a linear fashion, and then contribute to prosperity and social welfare [29]. It is that called as the well-done. Thus, the main key to the success of research is the existence of outcomes [30]. The main evidence of a research has been done well is if there is publication. Publication is basic evidence, therefore every basic research mandatory output to be publication [31]. Every research, through the submission of proposals, where ideas, phenomena and paradigms are integrated and systematically presented in a scientific framework [32]. Novelty will be seen from the sequence, and the main obligation to claim it at a scientific meeting. It is not impossible, what we think is also thought by others, who is the first to disseminate it, he/she has the idea. It is called the claim of idea [33].

Although reviews to about the related references link the TRL stages that the research must fulfill. The stages are still not strongly attached. The real binding is when the researcher is able to present it in the form of a research road map [34]. Every research needs a road map as guide to achieve outcomes and meet certain TRL stages. As such, the road map becomes a glue for the stages of the TRL as one unity. Moreover, the existence of a research road map at each level of the work unit from the study program until the university will unite the pieces of the research puzzle separately so that research supports one another, and does not overlap. Therefore, to support the conducting a research, each parts of the research complements in ontology must pass the test: about what is, what for, and existence [35].
Figure 3. The growth of Scopus indexed scientific publications documents for ASEAN countries.

Figure 4. Search for documents "state of the art" in Sinta.

Besides the reference as resource of something that is already known [36]. There are experiences that researchers have gone through or things that are of interests to the social environment of the community [37, 39], or urgent and risky needs cannot but must not be met.

4. Discussion: The challenge for changing

Although, the road map has woven the TRL stages into a single unit [38], always as a bridge that crosses the death valley is unstable [40]. Moreover, two or more researches compete to achieve outcomes that are sometimes similar in problem statements, objectives, or targets. Therefore, the lack of reading power, not a few researches to repeat existing research. After all, understanding the latest development in a study, is absolutely essential to get novelty in research. If the research evidence is seen presented from year to year in the form of publications,
Table 2. Demand Readiness Level (DRL)

| Stage | Description |
|-------|-------------|
| 1     | The feeling that there is the deficient "something". |
| 2     | Specific needs for innovation have been identified. |
| 3     | Specific needs and innovation functionality are identified. |
| 4     | Innovation functionality can be promised in measurable. |
| 5     | The "systematic" readiness for downstreaming the innovation is desirable. |
| 6     | Proof of the availability of capabilities to realize innovation. |
| 7     | Proof of availability / adequacy of all innovation resources. |
| 8     | Proof of availability of experts / resource persons with the required competencies. |
| 9     | Can show with evidence of ability to answer market needs. |

see Figure 3 (from Sinta\(^1\) - Science and Technology Index), and it shows that for Indonesia the culture of writing research evidence is not yet stable. Anyway, the implementation of research in Indonesia is carried out with poor reading power, which also results in scientific publications which are not comparable either in quantity and quality. Just imagine, not a few professors who do not have publications that show professionals in their fields. The number of Scopus indexed scientific publications documents every year, from 2015 to 2018, is 8,499, 12,517, 20,562, and 34,407, compared with the number of Associate Professor (in Bahasa "Lektor Kepala") and number of Professor (in Bahasa "Profesor"), each is 21,457 and 4,407, where Assistant (in Bahasa "Asisten Ahli"), Lector (in Bahasa "Lektor"), Educational staff (in Bahasa "Tenaga Kependidikan"), and Teacher/Instructor (in Bahasa "Tenaga Pengajar"), see Figure 3. Even so, starting in 2016 in Indonesia there has been the research serendipity about several researchers and increasing every year. This is evidenced by the exponentially increasing number of Scopus indexed publications documents. That mostly relates to claims of ideas.

A professor is the authority owner of science in his field. To prove that and it is not easy to prove, there are very few or almost no professors in Indonesia who show their loyalty by writing the development of their knowledge (as a state-of-the-art) in a scientific publication [41], see Figure 4. This shows the lack of mastery of science and technology (or knowledge), and this requires research after research to be able to contribute in the form of innovation. Not many professors in Indonesia have the research serendipity, or have potential, able to seize possibilities and opportunities of research.

Apart from higher TRL stage, a research has an innovation as an outcome. To answer that challenge, a researcher (Paun) tries to find a shortcut, so that research in the field of technology as a TRL stage leap, by outlining the DRL stage based on importance [42]. This stage, based on the conflicting two sides of interests, namely the interests of technology or innovation that serves social welfare, on the other hand the interests or innovations related to scientific basis, including the experts for that. DRL is described in Table. 2. Thus, the application of DRL requires iteration for each TRL stage, of course, in the portion of the different DRL stages. It causes the research series to take turns rolling on continuously.

Research, however, continues rolling on. The formulation of the research problem will provoke all phenomena to coincide with the paradigm. The rolling on propagate against what is possible and place the outcomes as a process of scientific study or experiments in the laboratory. Therefore, every research must have a strong foundation, usually as basic research, and the research is applied, at least starting from the laboratory, and supported by laboratories that have standards, and that all have evidence of scientific publications, patents, and then in the form of product, and also marketed. In order for the research to be feasible, the TRL and the

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1 http://sinta2.ristekdikti.go.id/home/benchmark
DRL marriages are carried out in such a way by adding two values (from one TRL stage and DRL stage respectively) and the result is a value more than 10, see Figure 5, or

\[ TRL + DRL \geq 10 \] (1)

With this basis, it is possible to revive the potential for research that is stored on research report shelves or wasted as trash in the death valley. It is not impossible that research has been forgotten for a long time, beneficial for social welfare later on. For example, in the case of XML (Extensible Markup Language) [43]. Therefore, a research is not incidental.

When, "no research without publication" has been proven [31]. Assumptions of: "No community service without research"; "No innovation without community service"; "No engagement without innovation"; and "No competence without engagement", will have the proofs. The proofs are a challenge for research in which change relates to the use of procedures [44].

5. Conclusion
A research requires other researches and directly produce different researches at the next opportunity. Potential, is what has been available, both knowledge and experience, both the availability of technology based on TRL and demand based on DRL, whereby the possibility and opportunity of research cannot be inherent in their interests. So, the farthest goal of a research is to build that welfare.

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