

Principles of Research

Germano Mwabu

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© Kenya Institute for Public Policy Research and Analysis

Bishops Garden Towers, Bishops Road

PO Box 56445, Nairobi, Kenya

tel: +254 20 2719933/4; fax: +254 20 2719951

email: admin@kippra.or.ke

website: <http://www.kippra.org>

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This paper is based on a presentation made by the author in honor of Professor Mwangi S. Kimenyi, first Executive Director of the Kenya Institute for Public Policy Research and Analysis (KIPPRA), on completion of his first term as the Executive Director of the Institute. Readers familiar with the references listed at the end of this paper will recognize my enormous debt to these materials. However, I am solely responsible for any errors in this paper.

Germano Mwabu
Kenya Institute for Public Policy Research and Analysis
and
Department of Economics, University of Nairobi

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Structure of the Paper

In Section 1, I introduce the subject matter of research, with a theoretical discussion of characters in a research enterprise. I do a thought experiment that expels some characters and retains others. I introduce (also in an abstract way), the proper motive for research. I argue that research and research principles are an outcome of a mental activity called "thinking." Examples of principles are given from disciplines of economics and physics.

In Section 2, Einstein's definition of thinking is given, with an elaboration. A distinction is made between the world of concepts and the world of experiences and feelings (the real world). A concept is transformed into a principle when it is shown to be in accordance with the world of experience. The first remark in the presentation is introduced. A remark is a summary of the main points of an argument; it also extends an argument without the necessity of details. A remark is different from a hypothesis, a theorem, a lemma, etc. A hypothesis is a prediction flowing from a concept, whose truth content is to be verified or falsified with data; a theorem is what is demonstrated to be logically true without data; lemmas are successive steps to a theorem.

In Section 3, I deal with the difficult issues of basic and applied research. I explain the role of a policy analyst in the world of concepts and define research, giving examples. I show the complementarity between the work of a policy analyst and that of a theoretical researcher. Both types of researchers help to establish the bridge between the world of concepts and the world of experience. I argue that the bridge between the worlds of concepts and experience (consisting of principles and empirical regularities) is the proper foundation for public policy. Any policy without such a foundation is bound to fail or to be harmful, except in rare cases of luck. I restate principles of research.

In Section 4, I conclude with a vision of research and contributions to policy-making at KIPPRA.

In the references list, I show the reader the materials I consulted to prepare the presentation. It is hoped that the reader too will consult these original materials, both for curiosity and to extend or criticize the ideas in the presentation.

1. Introduction

In the Temple of Research are many mansions, and different indeed are researchers who occupy them (Seeling *et al*, 1954: p224-27). The occupants are led to research by different motives. Many take to research out of a sense of superior intellectual ability; research is their own special sport to which they look for satisfaction. Many others take to the Temple for utilitarian purposes—to seek fame or power.

Yet, the Temple is not a place to play intellectual games or to acquire power. It is not even meant to create knowledge for its own sake. It is designed to generate knowledge for development, with its other ends being incidental.

If the Angel of the Lord were to come and drive out of the Temple all those interested in sport and power, the group of researchers therein would be seriously depleted. Only a small number of researchers would remain.

Our Executive Director would be one of them, and that is why we admire him.

Those expelled from the Temple share common, worldly characteristics. However, those acceptable to the Angel are different from each other, and from those rejected. They tend to be uncommunicative, solitary and somewhat odd. What has brought them to the Temple?

One of the strongest motives that leads people to research is the desire to escape from the world of feelings and experiences to the world of rational thought. Thought¹ produces principles that guide research and everyday life.

¹ Alone or aided by prior knowledge and formal techniques, including instruments.

Principles help explain everyday experiences and other phenomena. Two illustrative examples of principles may be given:

- (i) Lack of human capital is the cause of poverty. This is the principle of production. Absence of wealth is explained by lack of a factor that produces wealth (Smith, 1776).
- (ii) Time is a property of the universe. The link between time and universe helps us understand that time, as we know it today, did not exist before the creation of the universe. It does not make sense to ask what God did *before* He created the universe because time is a property of the universe He created (Hawking, 1988).

A *principle* is an organizing, simplifying concept. It helps people to understand complex real life situations. A principle is a stylized and intelligible picture of the real world (Seeling *et al*, 1954; Wittgenstein, 1922). People replace the real world of experience with this simplified picture (model) in an attempt to understand and overcome it. This replacement of the real world with models is what the painter, the poet, the doctor, the farmer, the philosopher, the economist, the teacher, the preacher, the cleaner, the physicist...that is everybody...*does*, each in her own unique fashion, in an attempt to acquire knowledge. At any one point in time, there are many principles that are being generated and used by people to explain the same feature of the world (for example poverty). However, not *all* principles or models are valid. Even though no model or idea is not worth considering, only a few models become accepted as correct representations of the world. Needless to say, false models get accepted as correct ones are rejected.

We have seen that a principle is an outcome of a thought process. It is something produced by what we may call "thinking."

2. What is Thinking?

What precisely is thinking? Albert Einstein asked this question (Schilpp, 1979: p7) and answered it as follows:

When, on the reception of sense impressions, memory pictures emerge, this is not yet *thinking*². And, when such pictures or images form sequences, each member of which calls forth another sequence of images in the memory, this too is not yet *thinking*. However, when a *certain picture* turns up in many such sequences, then precisely by such a return – it (the picture) becomes an organizing element for such sequences. It is an organizing element because it produces order by connecting unrelated sequences to each other³. Such an element becomes a tool, a concept for simplifying reality.

When a mental activity is associated with a concept, it is called *thinking*. However, *thinking* can occur without *words* being attached to a concept. When words are attached to a concept, *thinking* becomes capable of being communicated. Our *thinking* goes on for the most part without the use of signs (words).

² In other words, if after some mental activity, a certain view of the world emerges, the process producing such an image cannot yet be called *thinking*.

³ The *thinking* process is as follows. A mental activity is initiated (perhaps by a desire to survive or to escape from a particular real life situation). The thought process first produces an image, then a sequence of many such images. After the first sequence of images, another sequence (about a phenomenon) emerges. As one continues to consider the phenomenon, many series of image sequences emerge. An autonomous evaluation then takes place of each sequence. If a particular pattern is found in each of the many series of thought images, then that pattern or picture is the new knowledge that has been created. The iterative mental process that produces the pattern that repeatedly emerges in a series of thought images is what is called “*thinking*.”

Remark 1:

Many concepts are probably lost every moment because there are no words to communicate or capture them. Using the well-known example of the market failure in economics, this phenomenon of the loss of concepts for lack of words may be termed a *language failure*. It leads to a sub-optimal supply of analytical concepts in the population.

3. Research

What is research? What place does a *policy analyst* occupy in the world of concepts? With regard to the second question, we may note that a policy analyst has to limit himself severely in choosing his area of research. He must content himself with using *existing* concepts to describe and analyze the domain of experience (the real world). In his *normal* activity, he must be satisfied to leave the *discovery* of concepts to the theoretical researcher. However, like the theoretical researcher, the policy analyst must think. He must engage in an intense mental activity. The distinguishing feature of this activity is a series of *iterative* sequences of thought *efforts*. Here, the applied researcher *thinks* in order to find empirical *regularities* in the real world. These regularities (e.g., food budget shares, inflation rates, price elasticities, suicide rates, etc) become the basis for framing public policy.

Remark 2:

Whereas conceptual modeling (simplification of reality via deduction) is associated with pure ideas, empirical modeling (simplification of reality via induction) is associated with observable behaviors or patterns. Typically, a very large number of *thought efforts* yield nothing in terms of models that can be used to understand reality. Therefore, *persistence* is key to success.

There is no logical bridge between the world of *concepts* and the world of *experience* (real world), which is the area of concern for the policy analyst. Sometimes, the world of concepts is accessible through intuition, and at other times only through rigorous experiments and analysis or both. The bridge between the two worlds is what Leibnitz referred to as the *pre-established harmony* (Seeling *et al*, 1954).

In simple terms, this pre-established harmony (the bridge) consists of *principles and empirical regularities* that guide us into our world of feelings and experiences, that is, the world of things. The bridge helps us explain the empirical things (economies, social institutions, weather, diseases, politics, wars, etc). The discovery of the bridge is a source of great *intellectual* satisfaction, as well as of great hope for poverty reduction, and *human development* more generally.

The process for discovering the bridge is what is called *research*. This point brings us to a close examination of the first question posed above, namely, what is research?

Research is a *systematic* process of discovering new knowledge or validating existing knowledge (CHRD, 1991). Since the process is systematic, it can be verified or falsified. No researcher can escape the *intense* scrutiny of his research process and findings by his peers, critics, rivals and knowledge seekers generally. If a research process is discredited, the associated findings are also discredited. The people who produced the findings are left alone, despite what they may continue to claim about the validity of their findings. They become like lone voices in the wilderness.

Remark 3:

The Kenya Institute for Public Policy Research and Analysis (KIPPRA) has so far, avoided the pain of being in the wilderness. However, wilderness is not reserved only for discredited research. The same fate

often awaits academic research, that is, research with little or no *immediate* policy content. Even so, the long-run impact of academic research can be very beneficial. The trade-off between basic and applied research should be carefully undertaken to avoid unnecessary postponement of improvements in living standards and to avert deprivation of higher standards in the future.

It is important to realize that research activity is everywhere, and is for everybody. Unfortunately, there is a lot of myth about research (and science and art). When a farmer is planting two different types of seeds side by side to compare yields, she is doing research. When a sociologist is questioning people about their attitudes towards family planning, he is doing research. A housewife is doing research when she is considering the best way to spend her limited food budget. When an astronomer is theorizing about the origins of stars, he is doing research, just like the physicist who is studying the nature of motion (in a vacuum) inside a laboratory. An economist is doing research when he is collecting data to compute the interest rate elasticity of gross investment; and so on and so forth.

Remark 4:

Research is not only for people who sit in research institutes and universities. Nonetheless, only a few of the many research findings produced daily can pass the strict standards that have been set for *acceptable knowledge* by the research community. Moreover, not every activity (mental or otherwise) is research. Research is a *purposeful, problem-solving* activity (This is why research proposals have clear sections reserved for the research problem and research objectives). Note here that a greater thinker is not necessarily a researcher, and conversely.

Three features of research may be elevated to principles within principles: creation of concepts, correspondence of concepts with reality, and application of the resultant knowledge.⁴

In summary, the following appear to be the key principles of research:

- The principle of *discovery*:

Acquisition of new tools (physical or conceptual) through the process of deduction (thought experiments) or induction (laboratory experiments or empirical observations) with or without the aid of statistical and mathematical modeling. Originality is the trademark of this process.

- The principle of *communication*:

Ability to communicate a new concept using a language (signs, words, symbols, etc) and capacity to communicate knowledge from its originator (researcher) to others. Without the first form of communication, knowledge generation is not possible; and without the second form, knowledge is not a public good. Note that non-excludability is the trademark of knowledge -which is why its inventors are granted patents.

- The principle of *correspondence* (of concepts with reality):

This is the idea that hypotheses (predictions based on theory or concepts set) must be supported by empirical evidence. The trademark of this principle is statistical significance of what is being predicted. Statistical

⁴ These include, respectively, principles of originality of concepts, statistical significance of their explanatory power and impatience in the application of newly accepted knowledge. The latter principle requires that the time lag between new knowledge (whether from basic or applied research) and its application be as short as possible).

significance is achieved if the margin of error of the prediction(s) is 5% or less.

- The principle of *inference* (based on empirical regularities or on prior inference⁵):

This is the ability to make conclusions about phenomena that are outside the range of experience—using only part of the experience or earlier inference. The commonest example of the former is statistical inference, that is, acquisition of information about true parameters of the population based on regularities from *sample* information. However, there are other more intuitive and more powerful forms of inference. For example, the inference that a mango is falling because it is being pulled down (not up) by some force emanating from a body (earth) that is nearest to it (This is Newton’s celebrated insight about gravitation). Consider another example. The observation that resources are scarce relative to needs and the consequent *inference* that people must, on average, try to maximize the benefit obtainable from resources or to minimize the cost of achieving a particular end (This is the basis of optimization assumption in the neoclassical economic theory). A third example. The casual observation that peasants in traditional, static agriculture cannot afford to misallocate farm resources and *survive*, because their endowment base is very slim. Therefore, the *inference* that traditional farmers are poor because of lack of resources, not because of their irrationality or culture (T. W. Schultz’s famous hypothesis that “farmers in traditional agriculture are *efficient* but *poor*”) (Schultz, 1963). Finally, consider the wrong intuitive *inference* of the person on the equator that the sun sets at approximately 6.30 pm everywhere in the world. This is one reason why empirical evidence is not *always* a secure source of knowledge. Recall from the principle of correspondence above

⁵ This is inference from (Seeling *et al*, 1954).

that pure thought is also not a secure source of knowledge. If pure reason were a source of assured knowledge, hypotheses testing would not be necessary. If neither evidence nor reason is a source of secure knowledge, what then is the source of assured knowledge?

- The principle of *uncertainty*:

This is the view that in the light of the above argument, all knowledge (including what appears to be secure) should be treated as tentative, and be tested constantly. Therefore, an attitude of doubt is helpful in judging research results. It is a precautionary attitude against type 1 error (accepting wrong results). (Type 2 error here is rejection of correct results, which is a less serious error).

- The principle of *persistence*:

The view that one should develop stamina to continue with a particular line of research despite severe criticism or initial failures.

- The principle of *application*:

This is the idea that (research) knowledge should be used to improve standards of living rather than just be admired.

- The principle of *trade-off* between basic and applied research:

This is the idea that both policy and academic research are desirable. However, because research resources are limited, undertaking one means foregoing the other. Since basic and applied research are not perfect substitutes in fulfilling human needs, society must choose the optimal combination of these forms of knowledge.

- The principle of *character*:

This is the dictum that researchers should cultivate attitudes of humility and generosity (acknowledgment of intellectual debts, tolerance of contrary points of view and the sharing of ideas), reflective of those

who serve in Temples. More generally, character is critical for success in research. Intellectual accomplishments are dependent on the nature of character to a far greater extent than is commonly acknowledged ((Seeling *et al*, 1954).

4. Conclusion

The bridge between the world of experiences and the world of concepts is the *foundation* for policies that improve the standards of living. However, great patience and perseverance are required in using this bridge to improve policy-making, and by extension, the living standards of the population. Our Director, Professor Mwangi S. Kimenyi, has made commendable efforts in linking research to policy making in our country.

May his love of policy research, and research generally, continue to illuminate his path in the future, and lead him to the solution of the most important political economy problem of the day, namely, the problem of extreme poverty. May he succeed in uniting capacity building with the research process into a single logical system. And may his unified and consistent system be used to improve living conditions everywhere.

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