

Seven Checks for Better Research

-- from the discussion for building up research appropriate for NILIM

FUJITA Koichi (Dr. Eng.), Executive Director for Research Affairs

Key words: Research on technology policy, objective / goal setting, research scenario, research management

1. Is "What issues should be solved and what world should be created?" clear and right?

This is the question asking whether there is a door (major objective) that connects between research and society, which is the starting point of research. The content of research should be so easily understood by people that they say, "O.K. We want you do it by any means." Some may think decisively that long-term, potential, or indirect issues are hard to grasp and therefore have less advantage in setting such an objective, but all the more reason, we should pursue persistently easy-to-understand explanation. Such attitude will lead to upgrade of the research itself and finding of new explanation indicators and frames.

In setting such a level of objective, it is essential to grasp the overall flow concerning the subject of research, select limited and important issues, and ensure concentration on them. To that end, policies and visions serve as an important clue. However, it should be avoided to incorporate an abstract / conceptual target image into goal setting as it is in excess of utilization as a trigger for thinking. When elaborating on research content, it should be replaced with recognition of real and specific issues based on the grasp / understanding of real phenomena. When using vision or concept, it should be tried "Whether three examples that explain it specifically can be surely prepared." Only with this try, possibility of starting with abstract theory and having a hard time later will be reduced.

2. Is the relation between major objective (world to create) and research goal clear?

There is occasionally a case where a great goal is set but becomes an accessory to the research and the logic remains unclear on explaining how the target world is created after the research goal is achieved. Particularly, attention should be paid to a case where the purpose of research is placed on progress in the relevant technical field or making one step forward on the existing research policy. This is a deep-seated problem since it is related to

the virtue of researchers, i.e. constant training of expertise. It is therefore desirable to have an attitude of thinking positively how one's expertise is involved in goal achievement without retreating into the shell.

It should also be avoided to choose abstract expressions for goal setting, such as "Enhancement of XXX" or "Preparation of guide to XXX," as well as confusion of means with goals. Goal should be set so that whether achievement thereof can be specifically determined. The true meaning of this is never to be severe with unsuccessful research but to maximize research findings. As long as research goal is specific, research is activated, and even if research is unsuccessful, useful findings for proceeding to next step can be obtained.

3. Is research process specified?

For example, such statement as "In order to build a peaceful world, collect and analyze cases, grasp inhibiting factors, study methods for solution, conduct comparative verification of their effectiveness, organize conditions of application, and document them as a practical guide" is not a research scenario, but "template." It is possible to conduct self-check on "Whether it did not end up with a mere use of template?" by checking "Whether the content could be written by non-researchers?" Research scenario can be written for the first time with understanding of actual conditions and accumulated expertise, and those written only with general culture are excluded.

Once research is started, it should not adhere to the research scenario examined in advance. Significance of research scenario is that it really brings flexibility in fulfilling research. Weak hypothesis is hard to lead to good applied operation.

4. Is positioning of the research appropriate?

Using the overall composition concerning the world to realize and various measures for realization (e.g. Fig. 1), mapping of the research should be conducted in

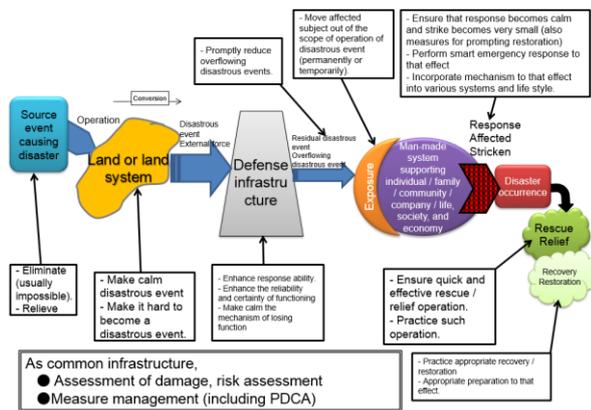


Figure 1. Example of Overall Composition --- Disaster Prevention / Mitigation Measures

Various measure types (box) are written in the "Flow of Occurrence of / Recovery from Disaster." Positioning of this research is examined with this Figure.

combination with various related activities. Based on this, significance of doing the research and influence / development of research findings (a gear wheel to be turned directly and gear wheels that start to turn in conjunction with it) should be confirmed. It is also necessary to grasp mutual relationship with other research activities, determine how to process required collaboration, and work out a coordinate strategy to achieve the goal, without ending up with mere fulfillment of own research. It is an essential factor for improving the quality of not only research but other work to be able to explain the positioning of the relevant research appropriately.

5. Is it clarified what to achieve exceeding predecessors?

Review of previous researches and clarification of the significance of the relevant research are widely known as basic rules for paper writing. The point here is not a thing like how to do research but that learning the efforts of predecessors made to maximize research findings is (all the more reason) important even in researches focused on the practice of measures. It should be grasped what predecessors succeed and failed to solve in their challenges and stated how to break through the remaining challenges with the relevant research.

Particularly when studying the system of nature such as rivers, since its existence and basic properties remain unchanged, failure to complete the research thoroughly may lead to following the predecessors' efforts uselessly and result in low evaluation of researches on the relevant field. Astute awareness of time-based positioning should also be ensured in order not to work out a research plan that is considered as the one that was created 20 years ago.

6. Are the points to appeal as research clear?

This section is related to the preceding section 5. It is important to be able to state briefly the characteristics unique to the research. When focused on the sources of breakthrough / development skills, they are nominated as follows:

Dramatic progress in phenomenon understanding and mechanism identification / dramatic progress in the method of quantification expression / dramatic progress in the information and data acquisition method / substantial expansion and fusion of the target (consideration factor) and resultant dramatic improvement in direct connection to the goal / organic combination between different types of events / conversion of the research base (regime) and novelty of focus / exploitation and utilization of new tools and means / exploitation of new ways of using tools and means / dramatic improvement in the feasibility of relevant measures / magnitudes of ripple effect and effect that causes conjunctive operation.

There is no superiority or inferiority among the above and they may be various. However, as long as it is research, there should be the points to appeal that makes even the researcher exciting. Efforts to explore and validate such points will directly lead to the enhancement of vitality to fulfill the research.

7. Is the research management that integrates various strong points established?

In view of the six sections described, it is found that a wide range of skills and abilities are required to build up a research, such as skills to overlook the whole to address a certain item, "agile" talent to fulfill the research for another item, and ability to bridge between the goal and content of the research for further another item. A single person cannot do all of these items unless he/she is a genius. Therefore, management that skillfully combines individuals and groups that demonstrate different characteristics is important. NILIM is also daily developing such activities that encourage researchers to work out good researches while conducting such management so that participants may be stimulated.

And, "even if it is now wasteland, it is possible to imagine big and tall trees growing from the seeds sown there." This is another way of self-check I was taught from predecessors.