

Program Design of Moonshot

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2 Features of “the Moonshot Research and Development Program”

Radical Innovation -- achieve purposes by purpose-oriented and intensive investment

(1) Based on the vision for the future society, set ambitious and enthralling targets and ideas for social challenges, etc., as solution which can bring an enormous impact, if it is realized, despite the difficulty to achieve (hereinafter referred to as “the Moonshot Targets”), for the purpose of realization of the targets, by bringing together the wisdom of worldwide researchers, under the leadership of the foremost researchers who lead the cutting-age research.

Disruptive Technology -- brought by emergent research, and acceleratingly developed and implemented

(2) Also, proactively promote the ambitious research and development to bring out the full potential of basic research of Japan, to discover the innovative research results and aid the development, with the tolerant attitude on failure, in consideration of the current situation where the knowledge and ideas in the stage of basic research have been applied to industries and society at incredible speed and started to result in the disruptive innovation in various categories.

Moonshot



Star Seeker



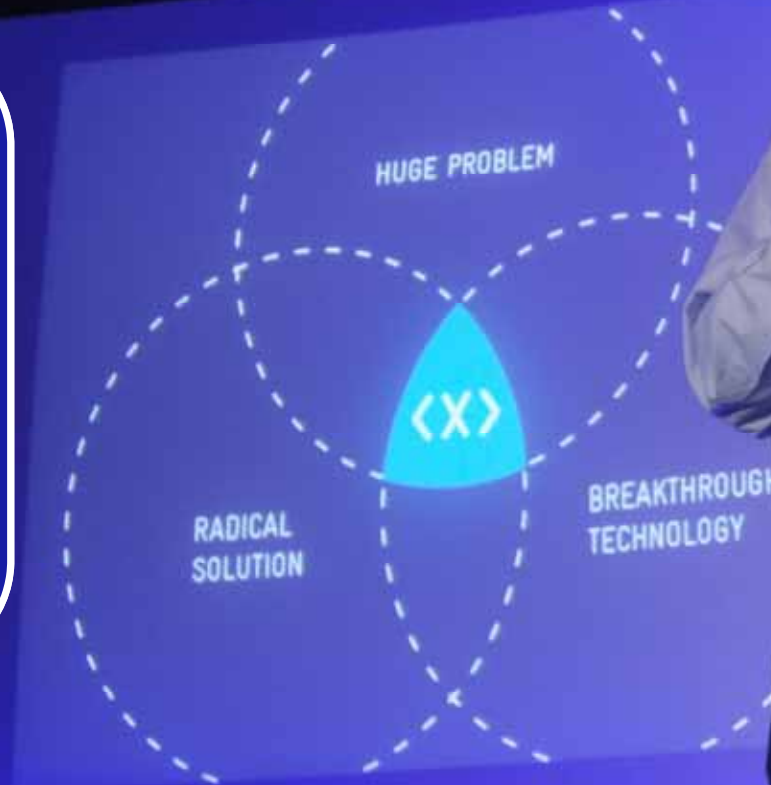
Google Solve for <X>

<X>

Huge Problem

Breakthrough Technology

Radical Solution



At The First Solve
for <X> Workshop



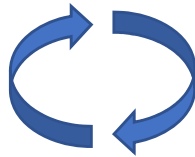
**Moonshot Thinking ---
Do not think about changing things for 10%,
Think about changing 10 folds**

**At The First Solve
for <X> Workshop**

Design of “Moonshot” Research and Development Program

Strategic research and development

Moonshot Project



Set clear and highly ambitious targets, then make intensive investment of resources. Fundamentally an engineering project. (Failure is not an option)

Purpose-oriented program for basic research and technology development



Exploratory research and basic technology development to aim at realization of established targets. (The approach based on the different concept from the Moonshot Project is desirable. Failure is tolerated.)

Emergent research

Focus area research



Focused and multi-dimensional research on important areas/themes. Ranging from basic to applied research.

Exploratory basic research



Identify what matters, then research the subject. Driven by personal curiosity, sense of mission – spontaneity is the key.

Features of Invention and Discovery Which Result in Game-Changing Disruptive Innovation

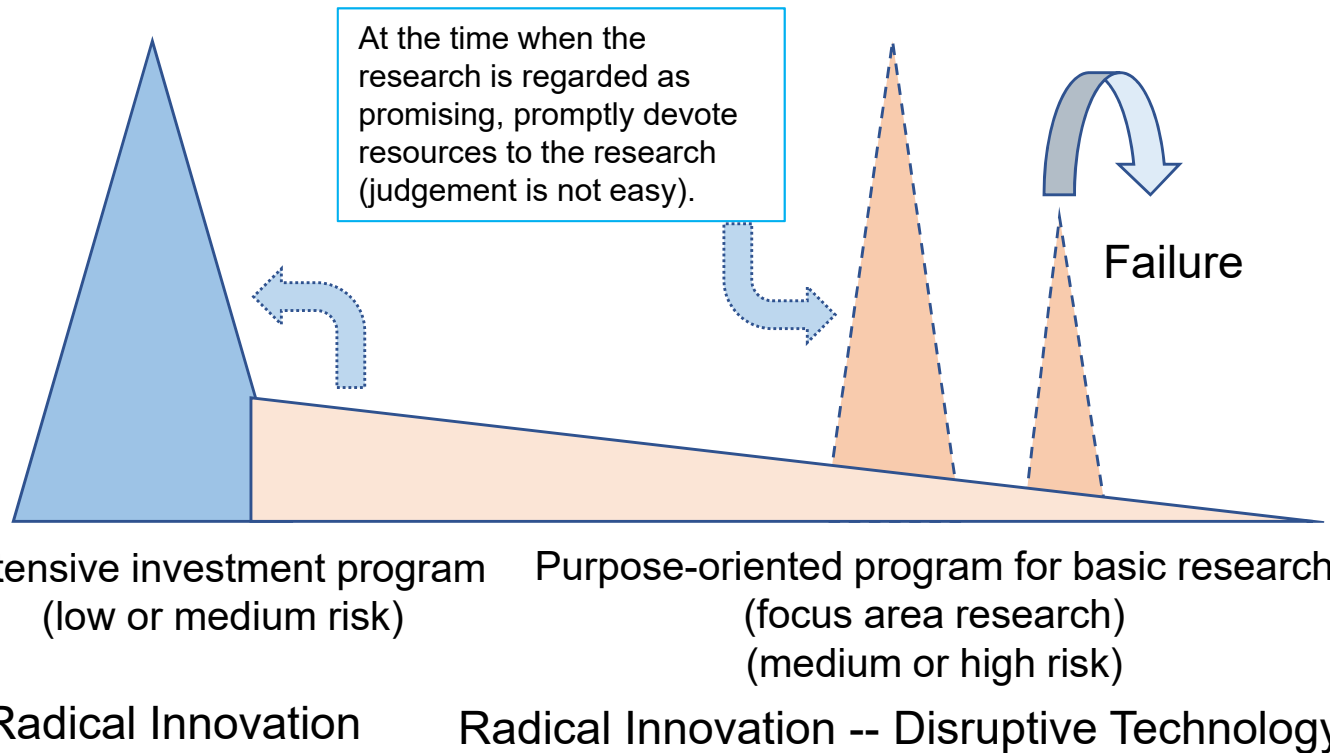
They tend to be almost unexpectedly brought by unprioritized areas which have not been regarded as apparently important.

Though such research is at the opposite end of the Moonshot Projects, drastic enhancement of financial support (e.g. Grant-in-Aid for Scientific Research, operating expense subsidy, etc.) to also promote the research in unprioritized areas which don't seem to be apparently important from the viewpoint of the balance of research and development funds in Japan is required. Furthermore, diversified research funding (including the large-scale donation) is extremely important.

- CRISPR-Cas9:
 - Discovery in the extremely minor research area which is the immune system of archaea
- Deep Learning:
 - Research results during “AI Winter”
- iPS Cells
 - Research during the time when it was not prioritized yet
 - iPS cells research was adopted in the area of “Translational Research for Intractable Immune Disorders and Infectious Diseases -Aiming at Creation of Novel Strategies Through Elucidation of Molecular Mechanisms of Pathogenesis-” of JST CREST (research supervisor: Tadamitsu Kishimoto, MD, PhD,), and only the research of Yamanaka group didn't directly relate to the theme of the area. There is a strong possibility that resources to realize iPS cells can't be procured without Dr. Kishimoto's foresight.

Idea of Program Design to Get 2 Features of “the Moonshot Research and Development Program” Linked Together

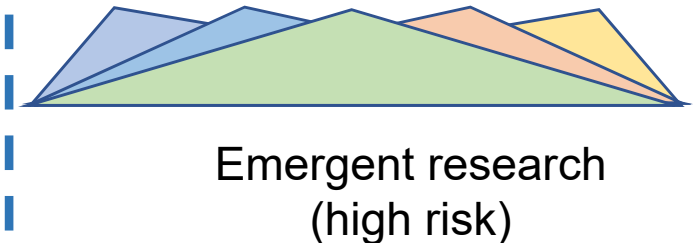
Moonshot Project is in charge of this side



Drastic enhancement of financial support (e.g. Grant-in-Aid for Scientific Research, operating expense subsidy, etc.) and diversified research funding are important.

The research is driven by researchers' personal curiosity, and perspective on problems, so the usefulness of the research is unclear (originally, the research is not driven by usefulness at the initial stage).

Invention and discovery which result in game-changing disruptive innovation tend to be brought by such areas.



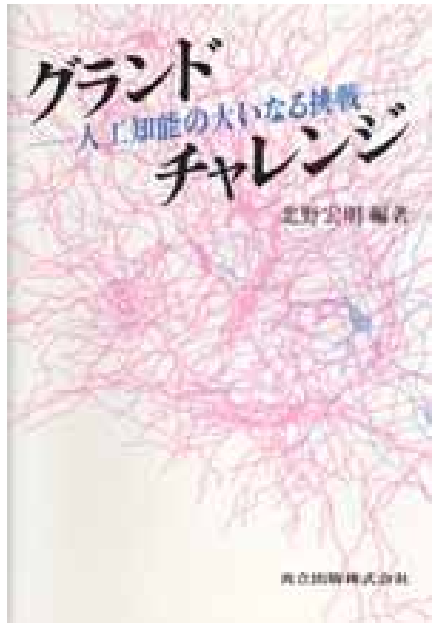
- Allocation of funds: the ratio between the intensive investment program and the purpose-oriented program for basic research ranges depending on areas (e.g. 8:2 or 2:8, etc.)
- Prompt change of segment: the intensive investment program <-> the purpose-oriented program for basic research
- Diversity of participants: encourage start-ups and overseas researchers to join the program

Points to Note on Program Design

- **Prospective proposals for Moonshot Project, and the start of Moonshot Project**
 - Thoroughly discuss promising proposals, and design the project
 - Hold workshops several times to establish the concept and ideas to be implemented
 - Announce the promising proposals which are not adopted this year, and continue to follow up
 - Support the establishment of concept and forming basis by the small amount research funds and workshops
 - Adjustment of launch date → Give projects “go” for launch, on a basis of what is already available
- **In the case that (1) and (2) of CSTI document coexist**
 - **Allocate a part of resources for the emergent research**
 - The framework of this time program only covers the intensive investment program and the purpose-oriented program for basic research.
 - To really generate “disruptive innovation”, the program without restriction on challenges other than “the Moonshot Research and Development Program” is required → Drastic enhancement of financial support (e.g. Grant-in-Aid for Scientific Research, operating expense subsidy, etc.) is essential.
 - In such case, we should aim to design the program which can be solution to problems of conventional basic research support system.
- **Agile system and human resources to enable the prompt devotion of resources to promising prospective research**
 - Research which has started to bring unexpected results → Verify and establish as science
 - → Research program for partial implementation, and engineering for technological establishment
 - → In the situation where the research and development is proceeding toward the implementation, a team develops the research into the business from several aspects.

Examples of History of Moonshot

1992



Examples of challenges proposed
 AI which can beat grandmasters of shogi
 AI which can beat grandmasters of go
 Full mapping of brain neural circuits
 Interactive agent
 Full access to all digital information

1995

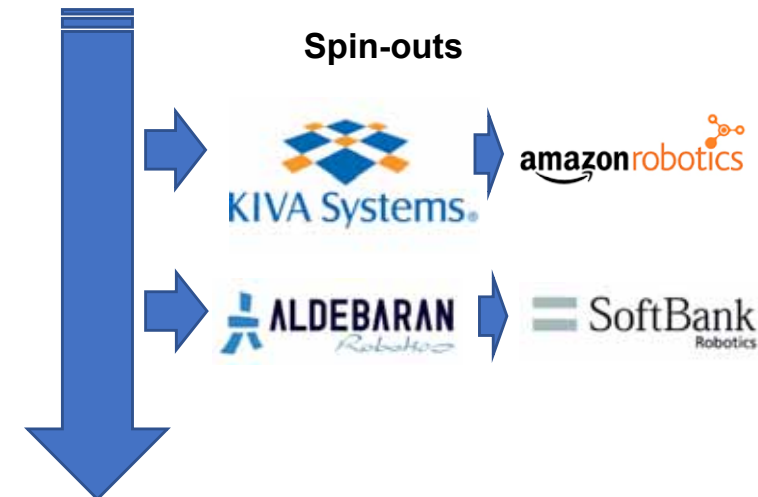


**Announce the concept in
 The 1995 International
 Joint Conference on AI
 (IJCAI-1995 Montreal).**

1997



**RoboCup-1997 Nagoya
 The First RoboCup**



Continue by 2050

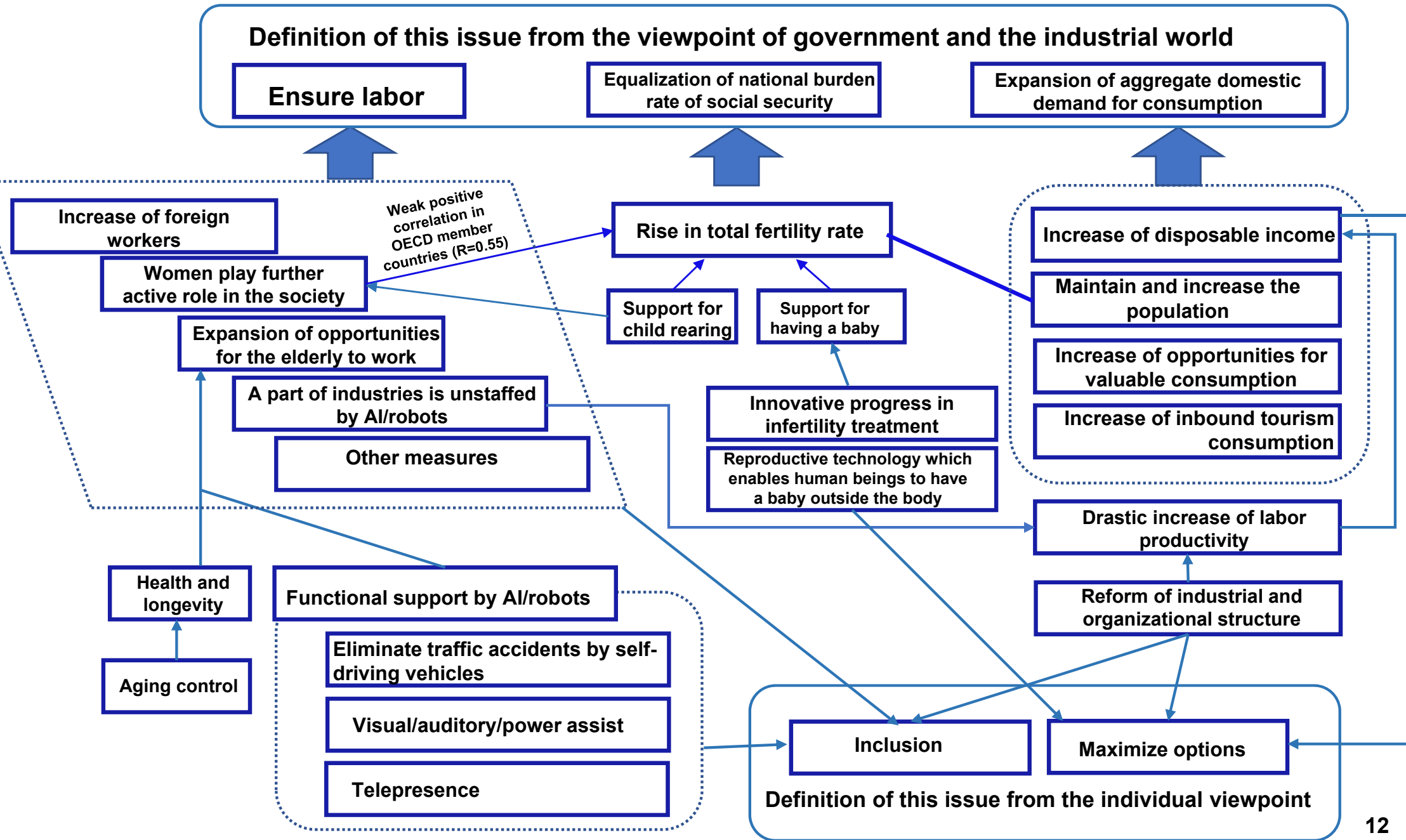
Setting Themes (Regarding the Moonshot Program This Time)

- Narrative is essential (examples are described as below)
 - Story of revitalization of Japan
 - **Aging society with decreasing population** → shortage of labor, increase of national burden rate of social security, drastic decline of aggregate demand (← from the viewpoint of government and the industrial world)
 - The elderly, women, foreigners play active role in the society → **Inclusion**
 - Labor is complemented by robots and AI → **A part of industries is unstaffed**
 - Expand the aggregate demand → **Drastic increase of labor productivity and income, valuable way of spending money**
 - Japan which offers solution to environmental problems, as a singularity
 - Not only not affecting environmental resources, but also generating solution to environmental problems
 - **Achieve the complete cycle** of energy, food, water, garbage, etc. (**no negative influence and reliance on outside Japan**)
 - Furthermore, import garbage, etc. to utilize as resources
 - Develop its technology, operation, basis of the system into the world
 - Japan which realizes the fantasy
 - **Space settlement** including Mars and the Moon
 - **Creation of automatic engine for scientific discovery** that is worthy of a Nobel Prize and far beyond

Japan is a repository of fantasy
(e.g. Gundam, Ghost in the Shell, etc.).

Case of how to overcome aging society with decreasing population (probably we need to redefine this issue)

The whole issue is too huge and complex to describe here, so only a part of related chart is shown as below. It does not mean that the parts which are not shown here are unimportant.



Case of super-long-term space stay (Mars, the Moon, L5, orbit)

