

Excellence and Innovation in Synergy toward a Leading University

Introduction

Designated National University Corporations aim at fundamentally improving the management of Japanese national universities to foster superior education and research leading to innovative solutions for problems the global community is faced with. A Designated National University Corporation is also dedicated to “challenge issues of society and lead the way to a new societal and economical system”.

As such, the objectives are intertwined with the *raison d'être* of Tohoku University and its role to serve as a global center of excellence, leading the development to a new society and economy in accordance to the *zeitgeist*. The university is committed to continuously reinforce its various functions in order to foster the next generation of talents and human resources, create innovations of the future, and internationally propagate these outcomes. Nonetheless, Tohoku University, situated at the heart of the Great East Japan Earthquake stricken area, will contribute to the restoration and renovation of the area. For that purpose, Tohoku University, as a Designated National University Corporation, will enhance the strengths and characteristics based on its tradition and achievements for the unending “excellence in education and research” and “innovation for a new societal and economical system” in synergy toward a Leading University.

Tohoku University is determined to take necessary steps to steadily reinvent a comprehensive, strategic, and flexible management system by 2030, thereby setting an example of reform applicable to other Japanese universities.

I. Ideas and Objectives of the Application

~ Why Tohoku University applies to be a Designated University ~

1. The Way to a Top-Thirty Leading University

We are currently standing at a critical point in human history, facing complex and difficult issues on a global scale, determining whether or not we can create a sustainable future for our civilization. As a local as well as global member of society, Tohoku University faces severe international competition, requiring drastic reforms, since stagnation will only lead to the deterioration of the quality in education and research.

The Designated National University Corporations System is not only a reinforcement of the National University Corporations but also a reform towards world leading education and research. In other words, this affects the essence of Tohoku University as a leading entity in the society of Japan. This application demonstrates our commitment to evolve into a leading university of Japan, backed by our past achievements and innovative research.

2. “Strengths & Characteristics” and “Weaknesses & Issues” of Tohoku University

(1) Overview

Tohoku University was established in 1907 as Japan’s third Imperial University. The University is a leader in its generation, contributing to the continuous development of society through a tradition of “research first”, an “open door” policy, and a “practice-oriented research and education”. These traits allowed the university to use research in order to create solutions for issues facing human societies while simultaneously fostering the next generation of leaders.

As one of the leading research universities, Tohoku University is currently home to 17,885 students (of which 1,455 are overseas students) and 3,193 academic staff (as of May 1, 2016) in 10 faculties, 16 graduate schools, 3 professional graduate schools, and 6 research institutes. We are also one of the world’s most productive research institutions in the fields of Materials Science, Physics, and Chemistry. It is said that Albert Einstein himself remarked, “Sendai is one of the cities most suited for academic research and Tohoku University is a force to be reckoned with.” Sendai, also called ‘Academic City Sendai’, is the largest city in the Tohoku region and Tohoku University is surrounded by verdant forests, making it one of the best research environments in Japan.

Under the leadership of our President and his “Tohoku University Global Vision”, the university has undertaken a variety of initiatives to surpass the bounds of nations and becoming one of the highest world-class universities. At the same time, as the only comprehensive university gravely impacted by the disaster of the Great East Japan Earthquake, Tohoku University has helped to establish projects for the restoration of the region and renewing Japan.

(2) A Self-Evaluation

We will identify the “Strengths & Characteristics” as well as “Weaknesses & Issues” of our university in order to determine which factors to enhance further and which problems to address. The analysis will be made from the perspective on how to accomplish the best synergy of “excellence in education and research” and “innovation for a new societal and economical system”.

◇ Excellence in Education and Research

[Main Strengths & Characteristics]

- According to the university rankings published by the Asahi Shimbun Company, Tohoku University was ranked 1st overall by high schools in Japan for 11 consecutive years. Furthermore, Tohoku University ranks 2nd among Japanese universities according to the “Times Higher Education Japan University Rankings 2017” published in March 2017. In order to support this rating, we have established an enhanced learning and living environment and the student to teacher ratio (5.6:1) ranks among the top 10 universities in the world, demonstrating that we accomplished an arrangement leading to attentive guidance. Furthermore, the Graduate School education of Tohoku University has a variety of original, cross-departmental, and interdisciplinary “Degree Programs” such as (a) the Program for Leading Graduate Schools, (b) the unique International Joint Graduate Programs, and (c) the

program of the Division for Interdisciplinary Advanced Research and Education. These programs are based on the high level of accomplishments of “The 21st Century Center of Excellence (21st Century COE) Program” and the “Global COE Program”. We intend to further enhance and flourish these programs.

- Tohoku University exhibits a notable number of achievements in several research areas such as Spintronics based on the accomplishments in fundamental research of Physics, Chemistry, and Material Science. As endorsement, the citation index rankings published by Thomson Reuters (2016 University ranking in Japan) indicates that Tohoku University ranks in the top five for the following subject areas: *Materials Science* (1st), *Pharmacology and Toxicology* (2nd), *Physics* (3rd), *Neuroscience* (3rd), *Engineering* (3rd), *Chemistry* (4th), *Earth Science* (4th), *Clinical Medicine* (4th), and *Immunology* (4th).
- Advancing national projects such as the Tohoku Medical Megabank in Life Science and Medicine also develop additional research capabilities within the university. Furthermore, the International Research Institute of Disaster Science, which was founded as a consequence of the Great East Japan Earthquake, is the first interdisciplinary research institute in 70 years blending social and natural sciences and becoming a core element of the university, establishing the new area of “Disaster Science” as an academic field.

[Main Weaknesses & Issues]

- The rapid advancements in technology and the globalization of society result in constant changes of requirements for academics as well. It is becoming increasingly difficult to swiftly respond to the demands regarding education and research within the traditional sectoral structure of the organization and improvements are of the utmost urgency.
- As seen in rankings of international universities, the international presence of Tohoku University has been decreasing in both education and research. Although the proportion of international co-authored articles is nearly 30% and thus quite high on a national level, it is about half if compared to western universities. Furthermore, the number of international researchers at Tohoku University is still small and the ratio of foreign students is also low. Additionally, due to employment-uncertainties, the number of young researchers who are willing to work toward creative and original solutions is shrinking. The creation of a strategic base of operations for education and research utilizing the limited resources is therefore inevitable for the revitalization.

◇ **Contributions to Society and Economy**

[Main Strengths & Characteristics]

- Tohoku University is currently engaging in a multitude of projects with the aim to foster human resources and provide cutting-edge research for the future of Japan. Most notable are the projects regarding the reconstruction after the Great East Japan Earthquake, mainly organized by the “Institute for Disaster Regeneration and Reconstruction Research”, including 8 principal projects, such as the International Research Project on Disaster Science and the Project for the

Reconstruction of Community Health Care, as well as more than 100 various projects for the restoration, all utilizing the aggregated capacities of our university. The outstanding achievements were presented at “The 3rd UN World Conference on Disaster Risk Prevention” and enclosed the “Sendai Framework for Disaster Prevention 2015-2030”.

- Tohoku University has constantly stepped up efforts to establish industry-academia collaborations, as can be seen from e.g. the 31st rank in Thomson Reuter’s ranking of “The World’s Most Innovative Universities”. Not only is the number of joint projects with private companies (881) and total research revenue from these enterprises (3,305,026,000 Yen) of Tohoku University ranked 4th in Japan, but the total value of grants awarded to the university for collaborative research with foreign corporations also ranks first in Japan (248,955,000 Yen). The “Center for Innovative Integrated Electronic Systems” is considered to be a successful model of industry-academia cooperation in Japan (awarded a Prime Minister’s Award in 2016) through the establishment of the world’s largest international industry-academia cooperation consortium involving many global companies. The university was approved status as a venture company by the MEXT Private-Public Innovation Program and invests in several university-led ventures capitals.
- Regarding the environment of our university (3.1 million m² in total), 4 campuses are located in the heart of Sendai within a circle of 4km diameter surrounded by nature in *Katahira* (Administrative Units, Associated Research Institutes), *Kawauchi* (Humanities and Social Sciences, General Education), *Aobayama* (Natural Sciences and Engineering), and *Seiryō* (Medicine). The campuses are connected via campus buses and subway. The University recently also purchased the property behind the *Aobayama* campus (810,000 m²) and began the construction of a new campus. As a place for collaborative research open to the public, this new campus will serve as a base of operations for an environment of education and research.

[Main Weaknesses & Issues]

- Confronted with the unprecedented speed in which society is currently changing and new issues are emerging, comprehensive universities have the responsibility to lead the progress by presenting viable options and solutions. Experiencing the Great East Japan Earthquake, Tohoku University in its entirety recognizes the importance of cross-sectoral and interdisciplinary research and has established “research with social impact” (27 projects) foreseeing the situation of the next several decades. However, proper Problem-Driven Research aimed at social problems, involving different areas on a broad scale, has yet to be implemented.
- Industry-academia cooperation of our university is currently concentrated mainly on the excellent research propagated in the different disciplines. However, related core functionalities are scattered over different campuses and are currently not working in synergy. The integration and reinforcement of industry-academia functionalities into one “under-one-roof”-type organization is inevitable. Since industry-academia cooperation is still in its first steps, a real “organization-to-organization” joint research has yet to be established.

※ As a characteristic of Tohoku University's governance, supporting the various activities in education, research and social contribution, our university was among the first National University Corporations that rejected a Presidential election by the voting of university members. Instead an appropriate President is elected through election committee, where at least half of the attendants were intellectuals not associated with the university. This selection method reduced internal politics associated with the elections and allowed for an honest discussion regarding the principles and a vision for the university as a whole, thus creating an environment in which it was easier for university members to respect and work with the new President, and for the new President to demonstrate his or her leadership.

3. The Way to a Leading University – the Major Role as a Designated National University Corporation.

Tohoku University is committed to continuously reinforce its various functions in order to foster the next generation of talents and human resources, create innovations of the future, and internationally propagate these outcomes. In order to accomplish these objectives, Tohoku University is determined to take necessary steps to steadily reinvent a comprehensive, strategic, and flexible management system by 2030, thereby setting an example of reform applicable to other Japanese universities. The following are the “basic objectives” determined through the analysis of “strengths & characteristics”, factors to be enhanced, and “weaknesses & issues”, factors to be improved. In order to establish these points best practices of foreign benchmark universities were considered as well (see ※).

(1) Excellence in Education and Research

- ◎ Tohoku University is reforming its current system by establishing an “Advanced Graduate School of Tohoku University”, which will provide educational governance and management functionality for the entire university with a focus on degree programs. Furthermore, the educational system will also be improved by developing characteristic degree programs which foster capable global human resources as well as establishing educational activities that are compatible with the environment of the university.
- ◎ Tohoku University has established a “Research Innovation System”, which provides research governance and management functionality for the entire university (a 3-layered system consisting of the Organization for Advanced Studies, the associated Research Institutes and Graduate Schools), as well as the development of a training system for young researchers. Additionally, the university is advancing the research promotion by focusing on fields with exceptional outcome or peculiar knowledge, which is deemed necessary to pass to future generations, as well as exploring new disciplines through interdisciplinary research.

(2) Contributions to Society and Economy

- ◎ As a university situated in the heart of the disaster area of the Great East Japan Earthquake, we have the responsibility to expand our capabilities in the field of “Disaster Science”. These include the establishment of practical disaster prevention studies, the development of individualized genomic medicine based on the results of the Tohoku Medical Megabank Project, as well as basic research and training regarding the decommission of nuclear reactors. In addition to the aforementioned activities, the university continues to reinforce world-wide disaster prevention in cooperation with international institutions, greatly contributing to the restoration of disaster-stricken areas. Furthermore, as a comprehensive university providing innovation of a new societal and economical system, Tohoku University will advance interdisciplinary studies including social sciences to solve important issues the global community is faced with.
- ◎ As an organization that actively seeks to expand its capabilities, we have forged the largest social square for cooperative research at a national university in Japan by utilizing the beneficial location of the New Aobayama Campus. This “Research Square for Industry-Academia Innovations” (“Cooperative Research Square”) offers opportunity for innovations through the intersection of knowledge, technology, and human resources based on the cooperative relationships between public and private sectors. This industry-academia partnership and the joint innovation of visions will introduce necessary solutions of social issues.

✂Cases at benchmark universities

Tohoku University is already advancing projects in collaboration with benchmark universities of the “Program for Promoting the Enhancement of Research Universities” and participates in several international university consortia. Suitable leading universities among these were chosen for direct on-site visits based on various criteria, such as (a) a traditional, yet present-oriented flexible management structure, (b) Problem-Driven Research activities in industry-academia cooperation, or (c) extensive reforms based on the President’s leadership. The results of the analyses were utilized in establishing the objectives.

- ① University of Cambridge (UK) 2017.1.10-13 “Tradition of highest level in research, expanding to industry-academia cooperation”
- ② University of Chicago (US) 2017.2.6-7 “Extensive reform of the management structure while maintaining a strong perspective on science”
- ③ University of Washington (US) 2016.11.29-12.2 “Unified Graduate School, advancing in industry-academia cooperation”
- ④ University of Melbourne (AUS) 2016.11.7-9 “Leading status through strategic planning and management”
- ⑤ Heidelberg University (GER) 2016.12.16 “Traditional comprehensive university implementing fundamental research in society”

II. Functional Reinforcements

In order to achieve the two basic objectives stated in I-3, Tohoku University will pursue a systematic implementation of further functional reinforcements. This task will be based on the following seven functional elements: “Acquisition and Development of Human Resources”, “Reinforcement of Research Capabilities”, “Consolidation of International Collaboration”, “Collaboration with Society (i) – Innovation of Society and Restoration from the Great East Japan Earthquake”, “Collaboration with Society (ii) – Creative Industry-academia Partnership”, “Innovation of University Administration (i) – Reinforcing the Functionality of Academic Governance”, and “Innovation of University Administration (ii) – Reinforcement of Financial Fundament”.

During the identification of the contents and objectives for each initiative, we also analyzed the objectives and substance of programs implemented by overseas benchmark universities, and incorporated ideas that will help to extend our university’s strengths or ameliorate its weaknesses.

1. Acquisition and Development of Human Resources

(1) Basic Concepts (at time of application)

A. Current state and self-evaluation

- ◇ Regarding the innovation of the Graduate Schools and their degree programs (in addition to thirteen 21st Century COE programs, twelve Global COE programs, International Joint Graduate Programs and the Program for Leading Graduate Schools) we have been developing our own distinctive and highly original cross-departmental degree programs. In graduate schools of the USA, such programs function as pure educational courses to award degrees. However, at Tohoku University there exists a clear theme and the educational courses across the Graduate Schools are organized to have the same goal regarding human resource development. The conferment of degrees is only executed by the Graduate Schools on behalf of the university.
- ◇ At the Division for International Joint Graduate Programs, interdisciplinary degree programs have been established, and the Program for Leading Graduate Schools has expanded the career paths of Ph.D. students in humanitarian studies. The Program for Leading Graduate Schools also pursues industry-academia cooperation in education by establishing innovative partnership platforms and maximizing the use of company internships, forming a model of organized industrial-academic collaborative education.
- ◇ In a student survey conducted by the university, more than 60% of Master students have no desire to progress to a Ph.D. program in the first place, many citing reasons such as “uncertainty of employment after graduation” (35%) and “financial constraints” (29%).
- ◇ Regarding career support for Ph.D. students, we have developed an Advanced Innovation Emergence School, and achieved high job placement rates for attending students. We have now

reached the stage of exploring possibilities for introducing this initiative as part of the university-wide curriculum.

- ◇ Although financial support for Ph.D. students is available, around 30% of doctoral students receive no assistance whatsoever, and the extension of financial support programs to these students is a pressing priority.
- ◇ Regarding the Graduate School admission, we offer on-site entrance examinations, financially support foreign students via scholarships, and have established international degree programs which are taught in English, thus steadily increasing our intake of talented international students. However, at the Graduate School level each individual school conducts its own entrance examination, which is not unified or consolidated in accordance with international standards.
- ◇ Regarding the acquisition and promotion of young researchers, the availability of secure employment positions is being impacted directly by factors such as restraint in overall personnel expenses, the extension of the standard retirement age, and the increase in fixed-term appointments supported only by competitive funding. Predicated on the strict quality management of faculty personnel, we have established the Frontier Research Institute for Interdisciplinary Sciences as a location where talented young researchers from across the world can devote themselves to cutting-edge research. This institute is steadily building a track record with a current cohort of approximately 60 young researchers, selected from an open field of international applicants around twenty times larger.

B. Project Direction

- ◇ Within the globalization and rapid advances in innovative technology of modern society, the conventional education of one single discipline does not match the necessary requirements of the future. In order to enhance our Graduate School system, we aim to establish 25 new degree programs by 2030 and have more than 50% of Ph.D. students participate in degree programs that go beyond departmental borders. We will also partner with leading overseas universities to establish ten or more international programs within the next five years by expanding the capabilities of the “Division for International Joint Graduate Programs” under the “Organization for Advanced Studies”, which will supervise all activities related to the degree programs.
- ◇ Thoroughgoing international standardization of student recruitment and selection methods will enable us to boost the proportion of international students in Ph.D. programs (35% by 2030, equal to levels at international leading universities). We will also extend the financial support to all Ph.D. students (ca. 2200 students).
- ◇ Beginning with the expansion of the Frontier Research Institute for Interdisciplinary Sciences, we will create locations to attract highly innovative young researchers from across the world.
- ◇ In addition to the analysis of research trends, we will strategically recruit researchers and continue the evaluation and accretion of data regarding our own members through e.g. the activities of the University Research Administration (URA).

(2) Specific Project Policies (including objectives)

① A Degree Program Cluster for interdisciplinarity, internationality, and industry-academia collaboration

- Within the globalization and rapid advances in innovative technology of the modern society, the qualifications required of academics are constantly changing, up to a point where the conventional education of one single Graduate School may not match the necessary requirements. Based on the confidence in the efficiency of our degree programs, we will form a world-leading base of operations for Graduate School education. In particular, the number of interdisciplinary degree programs were expanded from six to fifteen by 2020 ahead of the original schedule, and the Organization for Advanced Graduate School of Tohoku University was established in April 2021 to streamline university wide efforts. In order to further enhance our Graduate School system, we aim to double the number of cross-sectoral degree programs during the fourth mid-term period, establish 25 new degree programs under the Advanced Graduate School by 2030, and have more than 50% of doctoral students participate in degree programs that go beyond departmental borders. We will explore possibilities for flexible application of the existing rules for the conferral of degrees and enrollment management quotas by each Graduate School, in order to ensure prompt and appropriate decision-making to assure the quality of the degrees.
- Regarding “International Joint Graduate Programs”, we partnered with leading overseas universities and established ten international programs by 2021. Utilizing our foundation in research at the International Research Cluster as well as promoting joint international education at the International Joint Graduate School, we aim to increase the number of graduates of International Joint Graduate Programs by four times during the fourth mid-term period. If the currently applied standards for establishing a course (currently done separately for each department and partner university) can be altered, it will be possible to leverage our advantages as a Designated National University Corporation and collaborate pro-actively with leading universities to create an even larger number of joint degree programs.
- Regarding organized education in collaboration with the industry, we will develop a “Industry-Academia Innovation Platform for the Development of Human Resources”, which adds functions related to graduate school education to the existing industry-academia cooperation and will be used for “Industry-academia Frontier Graduate School Program Education” and “Entrepreneurship Education” as well as education programs for working adults. Furthermore, an Extension Center will be established to coordinate these programs and to serve as a basis for autonomous operation through generation of revenue from course fees.

② Acquisition of talented students by improving the appeal of Graduate Schools

- In order to establish an international environment for the Graduate School education, we will enhance the career and financial support for students as well as improve the international accessibility of our Graduate Schools.
- Regarding the career support, we will enhance the capabilities of the Innovation Emergence School by adding the core curriculum of the Emergence School to the common curricula of the Graduate Schools. For students, who are affiliated with a degree program, these lectures will be made mandatory.
- Regarding financial support, we continue to support all eligible Ph.D. students via comprehensive financial support packages such as the “Tohoku University Global Hagi Scholarship”. As a result, we were able to fulfill our goal to “provide financial support to 100% of Ph.D. students” significantly ahead of time. We are also planning to increase the number of Ph.D. students who receive additional support equivalent to the cost of living (1.8M JPY annually) to 40% until the end of the fourth mid-term period via programs such as the Advanced Graduate School Fellowship.
- Regarding the international accessibility, entrance examinations for international Graduate School programs will be adjusted according to global standards, and accessibility improved through the use of interviews and scores in tests such as TOEFL[®] and GRE[®] (Graduate Record Examination). Thoroughgoing international standardization of student recruitment and selection methods will enable us to boost the proportion of international students in doctoral programs (30.2% as of 2021) to 35% by 2030.

③ Attracting ingenious young researchers from all over the world

- In order to establish a location where young researchers can flourish, we will establish a wide variety of research sections within the Organization for Advanced Studies, such as (a) an “Advanced Institute for Material Science”, where interdisciplinary research with top-level Principal Investigators (PIs) is made possible, (b) a “Department for Research in New Disciplines”, where innovative research will be executed, and (c) the “Frontier Research Institute for Interdisciplinary Sciences”, where interdisciplinary research is performed autonomously. These Sections will provide an environment for specialized research activities and will host a basis of 200 talented young international researchers on a regular basis. These researchers affiliated with the Organization for Advanced Research will also have the opportunity to collaborate with the world’s top-level researchers at the “Tohoku Forum for Creativity”. In connection with the appointments of the Organization for Advanced Studies, we will also expand the tenure track system that guarantees fair competition among applicants, creating an attractive environment for young people.
- We will enhance the cross-appointments of international researchers, also utilizing the “International Education and Research Cluster” and the “Organization for Advanced Studies”, which will stimulate the human resources management by actively introducing cross-appointments,

as well as the top-management of the President, allowing cross-departmental strategies regarding personnel, organized in combination with strategic recruitment suggested upon a thorough analysis by e.g. URA.

- In order to motivate talented young researchers to be globally more active, we will create opportunities for autonomous research based on independent initiatives. We will also increase the number of young researchers involved in overseas exchange by 20% by the end of the fourth mid-term period compared to the third mid-term. In addition, we will further develop joint research projects and improve international mobility of students and young researchers by reinforcing partnerships with overseas universities and international consortia and other organizations.

2. Reinforcement of Research Capabilities

(1) Basic Concepts (at time of application)

A. Current status and self-evaluation

- ◇ Regarding the university's presence based on publications and citations, while Tohoku University still maintains a world leading position in areas where it traditionally excelled (such as Physics, Chemistry, Material Science, and Earth Science), its overall global ranking with respect to the number of citations has seen a downward trend over the years, as is the case with other Japanese universities.
- ◇ Regarding future challenges in emerging research areas, the Tohoku Medical Megabank Organization is contributing to the development of "Next-Generation Medical Care" by combining Data Science with Medical Research. In the field of Spintronics, research is being carried out consistently in industry-academia cooperation using state-of-the-art physics research to implement intelligence systems. In order to constantly produce outstanding achievements, it is necessary to embark on new challenges in emerging, interdisciplinary areas and utilize traditional strengths.
- ◇ Regarding excellence in Humanities and Social Sciences, significant achievements have often been made by individual researchers or small groups. However, Humanities/Social Sciences and Natural Science and Engineering have a mutually supplemental functionality, since approaches and conceptions differ from each other, thus contributing independently to science and technology. As a leading university, Tohoku University is expected to strategically establish a framework for interdisciplinary research and promote collaboration among researchers from a wide field of research areas.
- ◇ Regarding the World Premier International Research Centers Initiative (WPI) Program, the "Advanced Institute for Material Research" (AIMR) has pioneered cross-sectoral interdisciplinary research and provided a remarkable achievement in drastic improvement of research capabilities.
- ◇ Regarding the MEXT Program for Promoting the Enhancement of Research Universities, Tohoku University is carrying out initiatives such as (a) the enhancement of capabilities of University Research Administrators, (b) the "Tohoku Forum for Creativity", Japan's first international visitor research program, and (c) the delegation of young researchers to overseas institutions.

B. Project direction

- ◇ Classifying the organization of research into a 3-layered structure according to the individual mission, we will establish a new Research Innovation System which advances cross-sectoral interdisciplinary research and the formation of new strategic Research Centers through flexible reorganization of research units across departmental borders.
- ◇ Considering general criteria such as exceptional achievements, we select “Material Science” and “Spintronics” as research areas in which to prioritize our world-leading status. As our duty to society, the academic fields “Next-Generation Medical Care” and “Disaster Science” will be chosen for the first time as new research disciplines. We will create Leading Research Centers with focused financial aids and the guidance of the President.
- ◇ According to the analysis of our strengths and perspectives, we determined 9 principal research areas in which to create “International Education and Research Clusters”. These will function as a fundament for Leading Research Centers and add variety to our research.

(2) Specific Project Policies (including objectives)

① Installment of a three-layered “Research Innovation System”

- In order to accomplish strategic research, we will take the success of the “Advanced Institute for Material Research” (AIMR) as an example and establish a system capable to promote excellent research on an even higher level. In particular, the research system will consist of three layers, each given a clear mission. (a) The first layer, constituting of the top management, will organize the establishment of the Leading Research Centers, (b) the second layer will promote the interdisciplinary research beyond the departmental bounds, and (c) the third layer will deliberate in research based on the free inspiration of the departments’ members, thus establishing a three-layered “Research Innovation System”, where a flexible reorganization is made possible by swift response to priorities and evaluations of individual achievements. To further improve the “Research Innovation System”, we plan to promote at least one research center with top level performance to be included in the Core Research Cluster (see below) during the fourth mid-term period.

[First Layer] Under management of the “Organization for Advanced Studies” in the First Layer, we will implement (a) “4 Leading Research Centers” (see ②), (b) WPI-type Research Centers, e.g. the “Advanced Institute for Material Research” (AIMR), (c) the “Department for Research in New Disciplines”, advancing research in new areas utilizing special measures provided by the President, and (d) the “Frontier Research Institute for Interdisciplinary Studies”, allowing cutting-edge research in an independent environment for interdisciplinary fields.

[Second Layer] In addition to the “Tohoku University Research Alliance”, mainly consisting of the associated Research Institutes and Centers, we will install a General Director for Research

Alliance, in order to assure the adequate governance and enact new research disciplines based on our exceptional tradition. Furthermore, (a) an “International Education and Research Cluster”, (b) a “Center for Research with Social Impact”, and (c) the “Institute for Disaster Regeneration and Reconstruction Research” will be implemented in the Second Layer to allow flexible reorganization of research units across departmental borders, thus advancing interdisciplinary research for the entire university.

[Third Layer] This Layer is represented by the core disciplines investigated in traditional departments such as Graduate Schools and ensures a place for active research based on the free inspiration of the individual researchers.

② Creation of the Core Research Cluster

- Considering general criteria such as international presence (number of published articles, number of citations, etc.), we select “Material Science” and “Spintronics” as research areas in which to prioritize world-leading status. Utilizing our unique knowledge and experience, we also choose “Next-Generation Medical Care” and “Disaster Science” to introduce as new research disciplines. We will create Leading Research Centers under the leadership of the President and focused financial aid (First Layer). In order to create Research Centers, we will not only concentrate our leading researchers, but also utilize strategies in human resources (original Distinguished Professors, etc.) and finances (reinforcement of international networks and employment of international researchers via the President’s Budget, etc.).
- Regarding “Material Science”, while focusing on the WPI base “Advanced Institute for Material Research (AIMR)” contributing to cutting-edge research, we will concentrate our capabilities in order to establish a world leading research base. We will also advance the outstanding achievements utilizing the “Mathematical Science – Search for Micro Materials – Creation of Macro Materials”-Research-Pipeline, and use the results for the education of the next generation researchers as well as the implementation in society via cooperation with industry, academia and public.
- Regarding “Spintronics”, our university harbors many famous leading research groups noted for their pioneering work in areas such as “Magnetic Semiconductors” or “Spin-Flow”, thus already establishing a status as leading research base. Since this fundamental research is considered to have the potential of replacing traditional “Electronics” in the future, we will strategically congregate a wide variety of international researchers both in fundamental as well as applied fields of “Spintronics” and establish a Leading Research Center for a new discipline that might be called “Spin-Centered Science”. Furthermore, we will utilize the achievements of the “Center of Innovative Integrated Electronic Systems” as Japan’s largest Open & Closed Innovation Base, in order to lead technological improvements as well as social reforms based on our scientific accomplishments.

- Regarding “Next-Generation Medical Care”, the “Tohoku Medical Megabank Organization (ToMMo)” already constructs one of the world’s most enhanced composite biobanks, conducting cohort studies on a world-wide scale. In order to analyze the obtained data, leading Bioinformatics research groups are also participating in the analysis, thus creating an optimal environment for the proper advancement of “Next-Generation Medical Care”. In addition to the Genomics research consolidated at the “Tohoku Medical Megabank Organization”, we will establish a research base by gathering the outstanding capabilities in areas such as fundamental Life Science or Information Sciences and advance the fusion of Data Science and Artificial Intelligence with the accumulated information and data. Furthermore, in close collaboration with the Tohoku University Hospital (a Core Hospital for Clinical Research, retaining data from more than 800,000 clinical studies) the relation between genetic factors, environmental factors, and diseases will be investigated and developed into “Next-Generation Medical Care” reflecting individualized treatment and prevention.
- Regarding “Disaster Science”, based on the experiences of the Great East Japan Earthquake we are already establishing a leading status with the creation of the “International Research Institute of Disaster Science” which retains vast amounts of data concerning low-frequent mega disasters from the inspection of the Great East Japan Earthquake. Achievements are continuously presented on a global scale through the “Global Centre for Disaster Statistics” based on the “Sendai Disaster Prevention Framework (UN Resolution of 2015)”. In collaboration with Earth Science or Tsunami Engineering, “Disaster Science” will be established as a fusion of basic research in areas, such as Natural Science, Engineering, Medicine, Economics, with rudiments of our society and culture, such as History, Psychology, and Religion.

③ Improvement of the international presence

- In addition to the measures described in ② and in order to reinforce the capabilities as a comprehensive university as well as improve the international presence, we will promote education and research in 9 principal areas based on our strengths and perspectives in constant collaboration with international universities.
- In particular, using evidence-based objective analysis of the present situation and considering international tendencies, our university will establish “International Education and Research Cluster” (Second Layer) to promote the outstanding international joint research with leading universities. Each “International Education and Research Cluster” will contain a “Division for International Joint Graduate Programs (Joint Degree Program)” and participating Ph.D. students will receive a joint degree through international joint research. Due to the collaborative research of Ph.D. students together with the academic staff in face of the challenging joint research with leading foreign universities, an increase of outstanding international co-authored articles as well as the enhancement of the international network is expected. Furthermore, involving e.g. the “Tohoku Forum of Creativity” we will reinforce the partnership with influential international

universities and accelerate the interdisciplinary research, thus establishing an outstanding research base of operations.

- The 9 principal research areas are as follows: (i) Cosmic Physics, (ii) Material Science, (iii) Spintronics, (iv) Machine Science, (v) Life Science, (vi) Earth and Environmental Sciences, (vii) Disaster and Prevention Science, (viii) Japan Studies and (ix) Data Science. Related to the policies described in ②, we aim to establish Leading Research Centers which will add variety to our research.
- Regarding Humanities and Social Sciences represented by e.g. Japan Studies, Tohoku University has excellent research records in the fields of Philosophy, Religion, History, Linguistics, Psychology, Sociology, Law, Politics and Economy. However, research in these areas used to be pursued in a silo of respective departmental organizations. From now on, research units in the first and second layer will be formed for each important research topic and financially supported by utilizing the President's Budget to boost research activities and also increase the international presence. As one of the first important topics, we will initiate (viii) "Japan Studies", accumulating top-level academic staff from e.g. Philosophy, Religion, History and Sociology in order to establish an international research base from a new perspective.

3. Consolidation of International Collaboration

(1) Basic concept (at time of application)

A. Current status and self-assessment

- ◇ Tohoku University considered the period from the 2000's to mid-2010's as the "phase for the formation and expansion of international networks", and focused its efforts on building international networks. As such, the university became a member of APRU (Association of Pacific Rim Universities) and five other consortia, established academic exchange agreements with many world-leading universities (207 institutes across 35 countries) and installed 16 liaison offices across 11 countries. We recognize the time until 2030 as a phase to promote the cooperation of education and research by strategically utilizing relationships with overseas universities and research institutions. The "International Advisory Board" (held in 2016) highly recognizing the university's efforts for internationalization. However, it also pointed out the importance to further clarify the university's international strategy and international cooperation with strategic partners.
- ◇ It is important to reinforce strategies regarding international collaboration such as (a) the establishment of a "cutting-edge education and research cluster" at the "Tohoku Forum for Creativity" in cooperation with leading overseas universities and the advancement of the synergy of education and research with the "Division for International Joint Graduate Programs", (b) the creation of e.g. the "Tohoku University International Joint Laboratory Center", (c) the establishment of the "Center for Innovative Integrated Electronic Systems (CIES)" as an international base of operations for industry-academia collaboration, and (d) the establishment of a Micro System Integration Research Development Center, a Fraunhofer Institute, and a base of operations for

international industry-academia collaboration regarding MEMS (Micro Electro Mechanical System) in cooperation with Sendai City.

- ◇ Since the university acts as a base of operations for statistical data related to natural disasters for developing countries which participate in the United Nations Development Programme (UNDP), we advance the development of human resources related to Disaster Science on a world-wide scale.
- ◇ Tohoku University is one of the first national universities to embark on the development of an international campus environment seen in the installation of the cross-cultural student dormitory.

B. Project Direction

- ◇ We will organize international partnerships with stronger strategic significance and the President himself will engage in discussions with international partners to enhance relations.
- ◇ Centering on the outstanding “International Education and Research Cluster”, we will accelerate international cooperation in education and research activities.
- ◇ The University will enhance its systems for the collaboration with international organizations and businesses to solve issues which have an impact on the sustainability of society.
- ◇ We will promote international cooperation from within the university, by establishing a campus environment that will promote international exchange and understanding between different cultures.

(2) Specific Project Policies (including objectives)

① Strategic promotion of an international cooperation system

- We will enact the “Administration for the Promotion of Global Initiatives” as the supervising organization, responsible for the entire spectrum of activities regarding international cooperation. The functionality of this cooperation will be provided for education, research and cooperation with society via top management. Building on the previous collaboration with leading overseas universities and research institutions, we will clarify the general strategy and by utilizing the status and brand of a “Designated National University Corporation”, the President himself will engage in discussions with international partners to enhance relations, thus executing an international strategy which leads to international partnerships with stronger strategic significance.

② Development of a strategic international cooperation

- The International Education and Research Cluster mentioned in “Reinforcement of Research Capabilities ③”, will collaborate with international leading universities for each of the 9 principal research areas and advance the education and research at the Graduate Schools. Based on these activities, not only the education and research but also the social contribution will increase, leading to a more active university environment involving international organizations, thus increasing our international presence.
- Regarding the “Disaster and Prevention Science” in particular, we will intensify the collaboration with international organizations and governments to fulfil our duty as the only comprehensive university experiencing the Great East Japan Earthquake. Furthermore, focusing on the outstanding achievements of the Center for Innovative Integrated Electronic Systems, we will expand our international industry-academia cooperation in “Spintronics” and establish a model-case for Japan. Regarding “Machine Science”, based on the strength of our university in MEMS and composite materials, we will build a new international industry-academia cooperation platform in strategic collaboration with a leading university in the US. As for the increasingly important “Data Science”, we will reinforce the strategic collaboration with leading universities of the US, starting with the “Japan-US Innovation Hub Concept”.

③ Improvement of the university environment through “internationalization of the campus”

- The “cross-cultural dormitory” (1720 living quarters in total by 2018) serves as an educational resource for students, planning and performing educational programs and activities aimed at the development of internationally versatile sophisticates. We also promote an environment for the students to gain necessary abilities to act as global leaders via participation of international corporations in the administration of dormitories.
- We will continue to improve the environment for the internationalization of the campus peripherals via e.g. the promotion of a guesthouse for foreign researchers, a cafeteria serving Halal food, and on-campus self-driving shuttle bus services.

4. Collaboration with Society (i) – Innovation of Society and Restoration after the Great East Japan Earthquake,

(1) Basic Concepts (at time of application)

A. Current status and self-evaluation

- ◇ At times where human society is ever-changing with unprecedented speed, it is crucial to Tohoku University to provide impacts to society, by creating new knowledge, communicating said knowledge to society, and to evolve into a location which can stimulate new endeavors.
- ◇ Immediately after the Great East Japan Earthquake, Tohoku University founded the “Institute for Disaster Regeneration and Reconstruction Research”. By utilizing the university’s strengths, it organized eight key projects on themes including “Disaster Science” and “Community Medicine”,

and at the same time launched more than 100 projects assisting the reconstruction. These projects were promoted in collaboration with various domestic and foreign institutions with the aim to reestablish the everyday life of people in the disaster area as well as to educate human resources and provide cutting-edge research, leading to the future of Japan. At The 3rd UN World Conference on Disaster Risk Reduction (held in March, 2015), our university was able to share the experience and knowledge with the international community, presenting the outcome and conclusions regarding disaster prevention and mitigation on a world-wide scale. The experience and knowledge of the university was included in the “Sendai Disaster Prevention Framework 2015-2030” which also functions as a guidance for disaster prevention for the international community.

- ◇ The experience to suffer from the disaster of the Great East Japan Earthquake and the efforts towards restoration have ripened an identity for our members to be part of a “university aspiring to solve social issues”, which led to the initiation of “research with social impact” in 2016. So far we established 27 projects striving to solve social issues. In particular, there are eight issues targeted mainly by Humanities and Social Sciences and four where these disciplines play an important role in the process of implementation, giving Humanities and Social Sciences new roles and objectives.

B. Project Direction

- ◇ In order to contribute to the resolution of important issues of society, we will provide a cross-departmental organization to manage the “research with social impact” on a university-wide scale and utilize our strengths to continuously promote research aimed to solve social issues.
- ◇ As the only comprehensive university experiencing the Great East Japan Earthquake first hand, we will lead the restoration process as well as create innovations to solve social issues from a world-wide perspective. In particular, over the next 10 years we will advocate (a) the establishment of Disaster Science which is still an unexplored field, (b) the deployment of Next-Generation Medical Care to the disaster-stricken area and innovations for a better life based on the research results of the Tohoku Medical Megabank Project, and (c) the promotion of fundamental research and human resource development regarding the decommissioning of the nuclear reactor.
- ◇ Considering the importance of projects affiliated with the “research with social impact” as well as the “Institute for Disaster Regeneration and Reconstruction Research”, we will appoint a Vice-President for the overall management, closely working with the President and the Provost, and stimulate the projects by concentrating financial support from the President’s Budget.

(2) Specific Project Policies (including objectives)

① Deployment of cross-departmental and interdisciplinary research

- In order to solve the topics categorized in one of the seven themes of “research with social impact” (“realization of a sustainable environment”, “realization of a society of health and longevity”, “realization of safety and security”, “development of a country esteemed by the world”, “creation of a graceful and fulfilled future”, “looking at life and space toward an interactive future”, and a

“university that responds to the fundamentals of society”; 30 projects as of 2021), cross-departmental interdisciplinary research projects will be promoted on a university-wide scale. Each project will propel individual research, foreseeing the situation of the next several decades and collaborating with domestic and foreign institutions, to share the philosophy and the grand design necessary to implement the achievements within society. Promising projects will start their collaborative joint research with external organizations. Regarding crucial projects of social sciences, the President’s Budget will provide additional aid for the advancement. The knowledge gained through “Research with social impact” will be communicated on a global scale in cooperation with international organizations.

② Promotion of reconstruction and regeneration

- The “International Research Institute of Disaster Science” operates not only on a core capacity regarding “Disaster Science” but also contributes to the implementation of achievements in “Practical Disaster Prevention Science”. In particular, aiming towards a society resilient to low-frequency mega disasters based on the knowledge gained from the Great East Japan Earthquake and the analysis of the process regarding disaster control (pre-installed countermeasures, measures in the event of a disaster, recovery and regeneration), a “universal disaster reduction and support package” is developed. Through the analysis at the Global Center for Disaster Statistics, the status of disaster preventive measures will be accurately monitored all over the world, and the contribution of the package will improve world-wide prevention. Simultaneously, this will lead to the education of highly specialized human resources who will be able to execute adequate measures as well as swiftly respond in case of a disaster.
- The Tohoku Medical Megabank Organization advances the realization of individualized treatment and prevention by utilizing large scaled cohort studies as well as observing the health status of the local population affected by the disaster. In particular, based on the genomics analysis and the cohort data, a disease risk assessment method especially regarding the disaster area was developed. Furthermore, highly specialized human resources who will handle the societal implementation where fostered as well. Contributing to the recovery of the local medical care through these efforts, research aimed at the innovation of new medicaments and next generation medical instruments will be further advanced.
- Gathering a wide range of science and technologies involving Material Science and Nuclear Power Engineering, the “Center for Fundamental Research towards Nuclear Decommissioning” is working towards the realization of a safe decommissioning of the Fukushima Daiichi Nuclear Power Plant as well as research on deactivation of regular reactors. In order to contribute to the regeneration of the Fukushima Hamadori Area as well as Japan’s international competitiveness in the field of nuclear power, we established the “Engineering Program for Decommissioning Nuclear Reactors” aimed at the training and education of core human resources, who will be able to execute said decommission in a safe way.

- The lessons and knowledge obtained during the aftermath of the Great East Japan Earthquake are certainly a strength of Tohoku University and we continue to communicate our important findings in Disaster Science as well as Next Generation Medicine to both national and international communities to provide solutions to global societal issues. Furthermore, in order to contribute to the long-term revitalization of the disaster-stricken area around the Fukushima Daiichi Nuclear Power Plant, we promote various actions for environmental and industrial regeneration as well as the safe decommissioning of the reactor. During the fourth mid-term period, we plan to develop and establish at least 10 cases of scientific and technological achievements in Disaster Science, Next Generation Medicine and Nuclear Decommissioning to support regional and global communities.

5. Collaboration with Society (ii) – Creative Industry-academia Partnership

(1) Basic Concepts (at time of application)

A. Current status and self-evaluation

- ◇ In the spirit of “practice-oriented research and education”, Tohoku University has constantly stepped up efforts to establish industry-academia collaborations, as can be seen from e.g. the 31st rank in Thomson Reuter’s ranking of “The World’s Most Innovative Universities”.
- ◇ Although the number of joint research programs with private business organizations ranks in the top-class of our country, more than 80% do not exceed an annual expense of 3 million yen and the mobility of human and financial resources is low. Considering the fact that top universities of the USA are collaborating with global corporations, including organizations from Japan, there are only very few large-scaled “organization-to-organization” joint research programs.
- ◇ The management capabilities to fit the swift changes in the industry, necessary for joint projects, are currently underdeveloped.
- ◇ In comparison to the number of patent applications (454) and intellectual properties (2466), the ratio of license contracts is low and the revenue created from this licensing is only 66.4 million yen.
- ◇ Based on the approval of university-launched ventures by the MEXT’s Private-Public Innovation Program (revised budget for 2012), our university established a joint research system, aimed at the creation of venture businesses. The “Tohoku University Venture Partners Co., Ltd.” (THVP) was funded by Tohoku University to 100% and has so far invested in five corporations. However, there is still a need for an effective approach to create further Tohoku-University-launched venture businesses.
- ◇ The University has acquired a science park zone (ca. 4 ha) at the New Aobayama Campus, where currently an R&D cluster for the collaboration with the industry is being created. However, the main functionalities regarding industry-academia cooperation is located at the campus in Katahira and an under-one-roof facility for efficiency has to be provided as soon as possible.
- ◇ Regarding the field of Life Science, in recent years, the collaborative research funds with the private sector have drastically increased by 28% per annum and reached a scale equaling the field

of Material Science. Therefore, the establishment of a coordinative function for the cooperation between centers in this field is of utmost urgency.

B. Project Direction

- ◇ In order to enable the industry-academia cooperation, we will enact a drastic reinforcement of management capabilities.
- ◇ Tohoku University will promote a radical operational reform, including (a) the clarification of roles of the diverse organizations collaborating with the university, (b) the consolidation of functions, and (c) the reorganization of the organizational structure. Furthermore, a large-scale cooperative development with the industry (“Partnership for Innovation of Visions”), venture businesses emerging from Tohoku University as well as entrepreneurship education where a wide variety of people have the opportunity to participate will advance innovations of the university
- ◇ We will fully utilize the New Aobayama Campus and create a “Problem-Driven Research Campus” centered around the cooperative production of industry and university. Furthermore, we will reconstruct the functionality of the Seiryō Campus and create a new base for said production in order to systematically accommodate the requests from the industrial sector regarding the rapidly growing field of Life Science.

(2) Specific project policies (including objectives)

① Acceleration of innovations

- Regarding the reinforcement of functionality for industry-academia cooperation, Tohoku University will promote a radical operational reform, including the clarification of roles of the diverse organizations collaboration with the university, the consolidation of functions, and reorganization of the structure. In particular, we will pursue outsourcing, including the deployment of intellectual property management services to Technology Licensing Organizations (TLO). We will also appoint liaisons in charge of industry-academia collaboration for each main research base within the university and ensure university-wide operational service structures. The university will arrange for appropriate treatment and career paths to enable acquisition of high-level specialists. Furthermore, we will introduce indicators regarding the collaboration with industry and society for the performance evaluation of the academic staff and expand the utilization of the cross-appointment system.
- We will utilize high-level specialists and expand business tie-ups with TLOs, thus establishing an end-to-end intellectual property management, starting with the creation of said property and leading to the transference of technology and its commercialization. Furthermore, achievements in research can be considered an origin of new social values, and we will provide a system for the appropriate transformation, leading to an increase in license revenue.
- Our Co-Creation Research Center promotes large-scale industry-academia co-creation based on the strategic organization-to-organization commitment, with joint research revenue of 7.1B JPY

in 2021 as well as 43 joint research labs and departments. In order to establish a virtuous circle with industry and strategically accelerate industry-academia partnerships, the number of co-creation laboratories, joint research courses, and joint research divisions will be increased by 20% compared to 2021 by the end of the fourth mid-term period.

- To support business ideas, the university will actively utilize a gap fund and promote confirmation of feasibility as well as accelerate the creation intellectual property. In cooperation with the THVP we will enhance collaboration with external investment institutions and expand the investment pipeline in order to increase the number of Tohoku University-launched venture businesses by 50% by the end of the fourth mid-term period compared to 2021.
- In order to create a space where entrepreneurship can grow and where a wide variety of people have the opportunity to participate, we will cooperate with local venture capitals, accelerators, municipal governments and institutes organizing the infrastructure for small- and medium-sized enterprises and develop a program for the communication of knowledge necessary for the foundation of an enterprise. The topics of enterprise foundation or innovation will be discussed on a daily basis and will implement an environment to expand the necessary network.

② Advancement of collaboration with the industry - the New Aobayama Campus

- In order to construct one of the largest “under-one-roof” type base of operations for industry-academia cooperation at a national university (“Cooperative Research Square”), the different organizations spread across several campuses were consolidated at the new extension of the Aobayama Campus in 2018.
- To utilize the area of the new campus, we will establish (a) one of Japan’s largest R&D centers for integrated electronic systems and AI hardware, revolving around the Center for Innovative Integrated Electronic Systems, (b) a demonstrative research base for field robots, drones and next-generation moving bodies, (c) an R&D base for biological production and food processing, and (d) an R&D base for industry-academia cooperation utilizing the “Smart-Aging-College-linked Community”.

③ Advancement of collaboration with the industry - Life Science

- The Seiryō Campus is currently harboring several institutes and departments, including the Graduate Schools of Medical Sciences, the Tohoku University Hospital, the Clinical Research, Innovation and Education Center (CRIETO), the Department for Medical Development Promotion, the Institute of Development, Aging and Cancer, and the Tohoku Medical Megabank Organization. In order to advance large-scaled joint research, responding as an organization to the rapidly growing requirements from the industry-academia cooperation, we will create the “General Director for Life Science Research” and establish an “organization-to-organization” industry-academia cooperation management. Furthermore, we will advance joint research by providing

facilities for some of the satellite laboratories of the Graduate Schools of Pharmaceutical Sciences, Medical Engineering and Engineering, which are located in remote area.

6. The Innovation of University Management 1: Reinforcing the Functionality of Academic Governance

(1) Basic Concepts (at time of application)

A. Current state and self-evaluation

- ◇ Since its incorporation the university has executed prudent measures, effective reforms, and resource allocation based on assessments and allocated an internal auditing office directly controlled by the President. To pursue further changes and reforms for the exceptional education and research as well as the innovation of “new social and economic systems”, it is important to continuously reinforce our management capacities. We will therefore periodically review the state of the governance and continue to improve and reinforce our system in accordance to impulses by society.

B. Project Direction

- ◇ We will undertake improvements of the infrastructure, which reinforces the management and allows both the governance and management to act as an effective unity. Furthermore, we will expand the mechanisms (higher functionality of the management council, support for auditors, etc.) to control and oversee the university business management.
- ◇ We will promote quality assurance in an environment of international competition and assessments in order to ensure corporate accountability and transparency.

(2) Specific project policies (including objectives)

① Function of the Provost

- We installed a unique “Provost” in 2018, who will deputize the President with respect to education and research related matters, and act as an internal decision-maker (based on the communication and coordination between the executives and the departments). To an extent decided in advance, the President transfers control over parts of the budget (including personnel expenses) and executive power to the Provost, thus promoting the priority strategies as Designated National University Corporation. Best possible support is provided through appointment of high-quality management personnel (Strategic Planning Office) to assure high functionality.

② Effective functionality of governance and management

- Regarding the infrastructure to support governance functionality, we will increase the number of external Vice-Presidents, reevaluate the terms of deans, and advance the reinforcement of the support system for executives. Additionally, the management system was modified in 2017 such that facilities with common strategies and similar policies are united to one group (institutionalized; 40 organizations into 9 institutes/centers) under the responsibility of Vice-Presidents, thus enabling a flexible and responsive system as a Designated National University Corporation. Regarding the infrastructure to support the management functionality, improvements for (a) an appropriate

distribution of funds by the President and the executive board to matters regarding academic personnel will be introduced based on the reform policies, (b) the continuous expansion of the Institutional Research activities, (c) systemizing financial simulations, and (d) evidence based acquisition of human resources.

③ Transparency and reliability of governance

- Regarding an internal system to assure the quality of the activities within the university, we will examine and reinforce (a) the university-wide self-assessment and the evaluation system, (b) the self assessment and evaluation system of the departments and (c) the self assessment system for individual academics as well as introduce support for internal quality assurance by the “Evaluation-Analysis Office”. As external quality assurances, we will also utilize the opinion and evaluations obtained from an international advisory board, and external evaluations by the European University Association (EUA) for the first time as a Japanese university. These external evaluations will provide important international perspectives.
- As Designated National University Corporation supported by the general public of Japan, we will thoroughly disclose all necessary information regarding management, education and research.

7. The innovation of University management 2: Reinforcing the financial fundament.

(1) Basic Concepts (at time of application)

A. Current state and self-evaluation

- ◇ In recent years the operating budget of Tohoku University (excluding the Hospital) fluctuates around 105 billion yen. The details can roughly be broken down as follows: ca. 85 billion Yen (80%) from the Japanese government (operating funds, subsidies, etc.), ca. 10 billion Yen (10%) from the public sector (joint and commissioned research, license income etc.), and ca. 10 billion Yen (10%) in self-generated income (tuition fees, asset leasing, etc.). Although the university makes efforts to increase the external budget from the public sector, the current financial structure heavily depends on the funding by the government. It is an issue of utmost importance to secure a stable financial income, since it cannot be presumed that the operating funds (46 billion Yen) will increase.
- ◇ As a result of innovating the university-wide distribution system of funds, approximately 7 billion Yen per year are reserved for the President’s discretionary spending (President’s Budget), being an important financial source representing the strategic priorities of the President.
- ◇ Regarding joint research activities with private business organizations, our university ranks constantly among the top of national universities. In particular, the university ranks first in joint research with foreign businesses and therefore possesses sufficient potential to increase industry funding in the future.
- ◇ As an example for the utilization of assets, the “Center for Innovative Integrated Electronic Systems” located in the New Aobayama Campus was the first center of a university in Japan to be entirely funded by private organizations.

B. Project Direction

- ◇ In order to establish a stable financial fundament as a Specially Appointed National University Corporation, we will (a) construct a portfolio, including not only the governmental funding, but also income from the industry-academia cooperation and revenue from donations as well as the distribution of financial aid, (b) visualize the value of higher education utilizing the resources of the university in education and research, and (c) improve the structure of industry-academia cooperation. Furthermore, we plan to expand the income from joint research with private business organizations (16.5 billion Yen by 2030; 5x increment) and the revenue from donations as well as invest current assets (donations, property) and develop subsidiary companies (600 million Yen by 2030 from investment businesses; 10x increment), increasing the investment income (2.4 billion yen by 2030; 10x increment). Financial resources necessary can be sufficiently acquired by measures such as increasing the indirect expenditure, thus raising the amount of the President's Budget (15 billion Yen by 2030; 2x increment).
- ◇ Therefore, the priority strategies described in this document (including support for the international joint degree program (ca. 250 students), financial support for Ph.D. students (ca. 600 students), support for the Advanced Research Institutes, and acquisition of young exceptional teaching staff (ca. 200 people), etc.; ca. 5 billion yen) can be financed via the increased President's Budget.
- ◇ Under the recent changes in the Act on the Partial Revision of the National University Corporation Act (outlining a measure for effective usage of National University Corporation's assets etc.), we will maximize the use of Tohoku University's assets (cash, property, research equipment, etc.) and work toward ensuring a stable and continuous self-generated income.

(2) Specific project policies (including objectives)

① Increased funding via industry-academia collaboration

- In order to be attractive for the industry, Tohoku University will (a) establish a platform for the collaborative research of industry and university and strategic cooperation, (b) drastically reinforce the management functions to fit the swift changes in the industry, necessary for major joint projects, and (c) establish education and research programs contributing to the research fields the new cooperation creates, thus establishing a system for industry-academia cooperation, leading to investments from the industry.
- To secure adequate financial resources, we will increase the indirect expenses for projects of the "Partnership for the Innovation of Visions" with the industry and particularly large-scaled joint research projects that exceed a minimum threshold as an overhead expense to the President's Budget. By effectively distributing funds based on performance evaluations, an appropriate return on investments can be expected.
- We will advance the reinforcement of cooperation schemes with the highly specialized URA or external organizations in order to enable the effective management and utilization of intellectual

property and establish a unified management system for the transfer of technology and commercialization (intellectual property strategies, licensing, public relations, strategic outreach). The obtained license income will be reinvested in the expansion of the activities related to industry-academia cooperation.

- We will actively announce our patents and other intellectual property rights that can be made public (licensed) to attract human resources as well as financial investment, and we plan to increase the number of co-creation laboratories, joint research courses, and joint research divisions by 20% compared to 2021 by the end of the fourth mid-term period compared to the third mid-term. We also aim to develop various industry-university co-creation activities and increase private joint research revenues through these co-creation laboratories.

② Expansion of Endowments

- We will (a) set up a fundraising office which will function as the center for the Tohoku University Fund, (b) unify the contact methods to receive donations, (c) diversify the donation menu, (d) reinforce the *Shuyukai* network both locally and globally, (e) enhance the university's unique crowdfunding investment model, and (f) establish a mechanism which allows donor's to reflect their preferences in order to focus on the positive cycle of university support by donors who believe that higher education is important for Japan's future. Furthermore, we will reinforce the clerical structure and expand the international public relations to obtain donations from overseas as well.
- Through the advancements of Problem-Driven Research we will consolidate the collaboration with society and aim to expand the revenue obtained from donations three times (to 12 billion Yen per year) by 2030 and reinforce the management system (regulation via risk management, professionalized staff, etc.), leading to stable and flexible financial resources in a 500-million-yen magnitude.

③ Development of measures for an effective utilization of assets

- In order to utilize the New Aobayama Campus (Science Park Zone) and to apply results of our original Smart Aging Research, we will establish the first jointly operated community of elderly citizens, thus creating a new societal model in our rapidly aging society.
- We installed a "Tohoku University Asset Management Center" in 2018, which will manage and arrange e.g. the large community space of 133,690m² in the campus (the largest among national universities) or the clean rooms, in order to utilize the property of the university and build a relationship, beneficial to both the users and the administrative management.
- We plan to increase rental income from land and buildings as well as interest income using surplus funds such as donations by 20% by the end of the fourth mid-term period, through effective use of assets, strategic fund management of surplus funds such as donations, and efficient and strategic increase of asset management income through business development by

subsidiaries etc. at the Asset Management Center.

For the Future (2030) (In closing)

This concept paper describes Tohoku University's mission and its members' common wishes and dedication to become a true leading university with successful excellence-innovation synergy. We trust that fulfilling the specific measures mentioned here should enable us to make steadfast progresses by way of a great story arc for the future toward the achievement of our goals. We are committed to envisage the future, share the vision of what we wish to become, and enlist the combined efforts from each and every one of us so as to combat various global and social issues our society is faced with.