University of Tsukuba

Conceptual Plan for a Designated National University Corporation in the Fourth Mid-Term Goal Period

Our vision: "Perfectly Comprehensive University" that solves global issues

A comprehensive university is understood to be a university that has various academic fields and engages in a broad range of education and research. However, we believe that a comprehensive university not only brings together various academic fields or conducts research and education in cooperation with various academic fields, but also **creates new academic disciplines** through transdisciplinary collaboration. This is what we believe to be a Perfectly Comprehensive University. In addition to the humanities, social sciences, natural sciences, engineering, agriculture and medicine, we have academic disciplines such as sport sciences, fine arts and design, and library information science that are not found in other universities. We also lead the world in research areas such as computational science, sport medical sciences, etc. We at the University of Tsukuba strive to **strengthen existing academic disciplines and promote transdisciplinary collaboration to create new academic disciplines that can offer novel solutions and innovation**. Based on this concept, we also aim to implement the results of our research and education into society. To be a perfectly comprehensive university, however, we have to overcome various barriers stemming from human characters, national borders, organizations and occupations.

As a pioneer of university reforms in Japan with a unique legacy, only the University of Tsukuba is **to be a Perfectly Comprehensive University that overcomes these challenges.** Therefore, we look ahead beyond the 4th Mid-term Goal Period of National Universities in Japan with the slogan **"Beyond the Borders,"** and **make ceaseless reforms to enhance research beyond disciplines, develop human resources, and implement research results to solve social issues**. To this end, we will strengthen **our governance and financial foundation as a designated national university.**

We have a unique structure of education and research organizations with low barriers between academic fields. We also have achieved an international outlook comparable to that of leading universities overseas. As the core institution of **Tsukuba Science City**, we have much experience in collaborating with institutions in the City. With these advantages, we will contribute to a sustainable human society solving global issues as **a leading comprehensive university that creates new knowledge for the future**.

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1. Review of Our Progress

The world today is beset by diverse problems such as deteriorating environment, energy availability, food and water shortage, and economic and regional inequality. Furthermore, as globalization proceeds, it brings with it a host of issues that we must resolve including the endangerment of biodiversity, international competition for natural resources, and financial crises. As a country challenged demographically and otherwise, Japan is being pressed to respond promptly to issues that countries around the world will face in the future such as a declining birthrate, an increasing aged population, a shrinking workforce, stagnant economic conditions and natural disasters.

To come to terms with such complex issues and to create a future based on their solutions, a sound **driving force** is needed. That driving force will be human resources who are capable of discovering what humans and only humans are supposed to do, possess a strong desire to further enhance their professional skills, have a solid knowledge of various academic fields, and **are able to design and create the society of the future**[1]**.** Only such human resources will have research capabilities for pioneering new research fields and innovation capabilities for bringing about social change in collaboration with diverse industries and organizations from all over the world.

(1) Legacy and history

The history of the University of Tsukuba dates back to the Normal School established by the government as the first higher education institution in Japan. Jigoro Kano, who served as the principal of the Tokyo Higher Normal School, made education in Japan available to international students and accepted more than 7,000 students from abroad. With the founding principle of "being open in every respect," our university was established in 1973. Our university is the only national university in Japan that was intended to be of world-class standard from its inception. As the core institution of Tsukuba Science City, which was planned as Japan's premier hub for science and technology, Tsukuba Science City has about 150 research institutes and centers including national research institutes such as the National Institute of Advanced Industrial Science and Technology and the High Energy Accelerator Research Organization. From the time of its inception up until the present, we have always been the core institution of Tsukuba Science City.

Before we started accepting students, our delegations visited European and the U.S. universities in search of outstanding practices of education that were absent from universities in Japan in order to provide education and research of the world's highest level. With some of these practices, we started accepting students. For example, we introduced **a number of education systems unparalleled in Japan, that is, independence of faculty organizations from education organizations** [2] , establishment of **three transdisciplinary clusters** of undergraduate schools across the arts and sciences[3] as well as the School of Medicine, the School of Health and

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[1] When asked what kind of society would exist in 2025, the prominent American computer scientist Alan Kay, who is often referred to as the "father of the personal computer," responded, "The best way to predict the future is to invent it."

[2] Aimed at eliminating the "harmful effects of the Japanese traditional faculty system" (such as its rigid, closed operations, lack of consideration for certain aspects of education, and difficulty in responding flexibly to research requests), which were quite prominent in the former imperial universities, this is the first structure of its kind introduced in Japan. The faculty members belonged to one of the 26 research institutes and while conducting their own basic ongoing research, the individual faculty members, went to cluster of colleges or schools or colleges, education organizations for undergraduate programs or graduate schools and graduate programs, education organizations for postgraduate courses, to provide educational and research instruction (separation of organizations to which faculty members belonged and education/research organizations organized according to function).

[3] Applying the proviso of Article 85 of the School Education Act (Article 53 at the time), the university was established under an education organization consisting of the First, Second and Third Clusters of Colleges, and the School of Medicine, School of Health and Physical Education, and School of Art and Design. Establishing the First Cluster of Colleges consisting of basic colleges (Humanities, Social Sciences, and Natural Sciences), the Second Cluster of Colleges consisting of applied colleges (Comparative Culture, Human Sciences, Biological Sciences, and Agriculture and Forestry), and the Third Cluster of Colleges consisting of engineering colleges (Policy and Planning Sciences, Information Sciences and Engineering Sciences), these clusters were positioned

Physical Education, and the School of Arts and Design; introduction of independent Master's and Doctoral programs; the abolition of the Faculty of Liberal Arts and introduction of new management structure (vice president system, advisory council,[4] university-wide **Human Affairs Committee**, etc.). These have allowed the president strong leadership. Therefore, we believe that our university, which has **achieved these innovations as a pioneer of university reform in Japan**, has already begun to become a Perfectly Comprehensive University.

With the independence of faculty organizations from education organizations, we introduced the following initiatives from the beginning. With regard to education, we adopted a **transdisciplinary cluster system** of undergraduate schools across the arts and sciences and incorporated a curriculum that spanned the boundaries of the clusters and colleges. With regard to research, we did not have any fixed research institutes attached to the university. Instead, the university promoted systematic transdisciplinary research through **fixed-term special projects.**

In the 1990s, however, along with the trend in placing emphasis on specialized fields, our students got fewer opportunities to take courses in other clusters and colleges. In 2007, we reorganized the original clusters of colleges into schools that focus on specialized fields. During this period, there was also a strategic focus on graduate schools, and in 2000 we shifted to a framework where faculty belonged to graduate schools for doctoral courses and programs. Consequently, while this made our position as a research university clearer, faculty recruitment increasingly reflected the intentions of the graduate schools, graduate programs and research centers. This meant that faculty recruitment could not necessarily meet the needs of undergraduate schools and colleges.

To solve these problems, we **restored the system of independence of faculty organizations from education organizations** in 2012. With regard to education, we will **shift to a university-wide degree program system**, the first case of its kind in Japan, and will reorganize our eight graduate schools into three[5] from AY2020. With regard to research, we have established our Academic Preparative Center system as incubators for creating transdisciplinary research centers in the future. This structure serves as the foundation for answering the challenges of education and research as a Perfectly Comprehensive University.

In terms of governance, we have established a **centralized framework** under the leadership of the president, whereby the **Human Resources Committee (Human Resources Planning Committee) of our headquarters plans and decides how many positions should be distributed to each faculty organization, and makes the final decision on the recruitment and promotion of faculty members**. This framework makes it possible to strengthen academic fields to meet academic and social needs and to actively and strategically recruit young faculty members. In addition, the university has made active efforts in human resource development and salary reform by introducing Japan's first tenure track system, implementing annual salary and combined earnings with external revenue, and introducing a new personnel system which manages numbers and positions of faculty members for each organization from a personnel expense perceptively converting the faculty personnel quota into personnel points. In addition, we have also established faculty-staff collaboration units such as the Office of University Management Reform, Office of Public Relations, and Office of Global Initiatives as a framework in

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as clusters that included transdisciplinarity within each cluster. These are education organizations corresponding to ordinary university colleges.

[4] An advisory body consisting of external experts, established to open the university to society. A body that formed the basis of the Governing Council after national universities were incorporated.

[5] In AY2020, the eight graduate schools will be reorganized into three new organizations corresponding to graduate schools: The Graduate School of Business Sciences, Humanities and Social Sciences, Graduate School of Science and Technology, and Graduate School of Comprehensive Human Sciences.

which faculty and administrative staff collaborate by utilizing their respective strengths. Furthermore, we have also invited a director of an overseas university to serve as a Governing Council member to bring an international perspective on management.

(2) Strengths and challenges

Research and the creation of new fields

In accordance with the Research Enhancement Plan adopted by the Program for Promoting the Enhancement of Research Universities of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), we established in 2013 an **International Tenure Track Program** to give young researchers opportunities to concentrate on joint research with leading overseas researchers for at least two years during the tenure track period. At approximately seven times the RU11 average, the ratio of top 1% papers by international tenure-track faculty has been particularly high, thereby reconfirming the potential of young researchers. In addition, we have promoted international collaboration in fields in which we have strengths such as particle physics, marine biology, and sport sciences by inviting overseas education and research units. However, in contrast to an average ratio of 27% young researchers (age 39 or under) at Type 3 national universities, the ratio at our university remains low at 21%. For sustainable enhancement of our strengths in various academic fields and rank among the world's leading universities, **large-scale strategic recruitment of young, internationally competitive researchers is an issue** that must be addressed.

Based on advanced, broad-ranging basic research and a transdisciplinary approach that flexibly spans these, we have made ceaseless efforts to create new research fields that will form the foundation of new academic disciplines such as cybernics and integrative sleep medical science where we are leading the world. In addition, we have created various new fields such as kansei, behavioral and brain sciences, Human Biology, Empowerment Informatics, and Humanics, which innovate our postgraduate education. Until now, however, individual researchers have engaged in collaboration based on their own initiatives. As a result, much of their work in research fields was inevitably on a small scale. To solve today's increasingly diverse and complex global issues, we need **to strategically focus on enhancing new fields** that we create bearing in mind world-leading strengths in our research fields and the needs of society.

Transdisciplinary education

In society with rapid technological innovation, diversification, and increasingly complex changes, we believe that the **human resources** who will be the driving force in solving global issues are required to learn the academic technique of determining on their own what questions to ask and finding solutions. They also need to be **capable of thinking in a solution-oriented manner (design-thinking) beyond the boundaries of academic disciplines and methodologies**. Our mission as a perfectly comprehensive university is to develop human resources who possess a high level of knowledge in various fields, perceive the essence of things, continue to pursue truth, and have specialized capabilities that demonstrate originality. Therefore, to create new "knowledge" and develop human resources capable of collaborating beyond the "barriers "of all borders and designing and implementing solutions to global issues, **we need a paradigm shift with regards to undergraduate education and further advancement of transdisciplinary research in graduate education.**

Tsukuba Science City

We have the advantage of being located in Tsukuba Science City. As a **core institution** in Tsukuba Science City, we promoted education and research and implement the results of these through collaboration with National R&D Agencies and companies. In fact, our university has the **most extensive track record in collaborating with institutions** in Tsukuba Science City. In the area of education as well, we introduced the **first Japanese "cooperative graduate school system"** in 1992, and in 2015, introduced **our unique "collaborative graduate school system"** based on consortium-style collaboration with companies and research institutes. In 2009, our university together with the National Institute of Advanced Industrial Science and Technology (AIST), the High Energy Accelerator Research Organization (KEK) and the National Institute for Materials Science (NIMS), institutions with a high level of research in Tsukuba Science City, established the Tsukuba Innovation Arena (TIA-nano) (University of Tokyo later joined) with the support of Keidanren (Japan Business Federation) to create innovation that leads to actual implementation. In 2011, Tsukuba Science City was designated as an International Strategic Zone and has become a testing site for future cities including initiatives such as the special robot zone. In 2019, Tsukuba Science City was also entrusted with a smart city project and a new mobility promotion project in collaboration with Ibaraki Prefecture, Tsukuba City and our University. To promote the practical application of research results in society, however, **we need to further enhance synergies with research organizations and make Tsukuba Science City provide an experimental field**.

We organize and host the Tsukuba Global Science Week. We also initiated the **Tsukuba Conference**, in which young researchers of prominent research institutions from many countries take part. We undertake various initiatives to enhance the profile of Tsukuba Science City on the global stage. While Tsukuba Science City has the potential to be a one of the best science cities in the world, **it has yet to collaborate across the innovation cities of the world for social implementation of research results**, and this too is an issue that needs to be addressed.

International outlook

Taking advantage of the Project for Establishing Core Universities for Internationalization familiarly known as the Global 30 Project (G30) supported by MEXT, we established programs taught in English and significantly increased the number of our international students **(attaining the highest ratio of international students among national universities until AY2018**) with the slogans **"Global Coexistence"** and **"Internationalization in Everyday Campus Life"**. In addition, through the Project for Promotion of Global Human Resources Development, we significantly enhanced our programs for sending Japanese students overseas. In parallel with these projects, we have also been promoting two-way exchanges with specified regions through four MEXT Re-inventing Japan Programs (Japan-Germany-Korea, ASEAN, Russia and Central Asia, and Central and South America), and MEXT Study-in-Japan Global Network Project in South America, Russia and CIS. Based on the success of these efforts, we proposed the **Campus-in-Campus (CiC)** initiative[6] **as a strategy for realizing international compatibility of education and global excellence in research**, and we have been making efforts in the MEXT Top Global University Project Type A. We share courses by means of our Course Jukebox system with

[6] A concept for actively utilizing research and educational resources inside and outside the university, beyond the boundaries of countries, institutions, and on-campus organizations. By September 2019, we had signed CIC agreements with the following 10 universities: University of Bordeaux (France), National Taiwan University (Taiwan), University of São Paulo (Brazil), Universiti Teknologi Malaysia (Malaysia), Communauté Université Grenoble Alpes (France), University of California, Irvine (U.S.), Utrecht University (Netherlands), Ohio State University (U.S.), Ruhr University Bochum (Germany), Al-Farabi Kazakh National University (Kazakhstan)

our CiC partner universities. We also share with them faculty and staff, degree programs, research units and office space. As a result of these efforts, we received the **highest S rating in our mid-term evaluation** in 2017. We are also ranked the **2nd among national universities in Japan** by **the Most international universities in the world 2019, THE.**

As of now, we have signed a total of 390 international exchange agreements with universities and research institutes in 70 countries and regions. However, our **ratio of international students in AY2019 fell to the second place among national universities in Japan**. For our university to become a Perfectly Comprehensive University alongside the world's best, we **must further enhance measures for recruiting excellent international students and our framework for fostering their development**.

At the same time, **a common issue** we share with other universities in Japan **is that we have not yet begun exporting our education system**. With our legacy and spirit of taking the lead in such challenges, **we will export our education system to the world**.

Industry-university joint research and diverse financial resources

Based on our philosophy of "transdisciplinary" since inception, we have worked to promote diverse research themes through collaboration in various areas. This is a major strength of us in responding to the needs of wide variety of industries. Therefore, with this strength, we enhance our organizational initiatives with the aim of obtaining external funds by increasing the scale of industry-university joint research. In terms of specific actions, we established the **Headquarters for International Industry-University Collaboration** in 2014, and have **increased the scale of our industry-university joint research** through the following two initiatives. The first is **Special Collaboration Projects** where we invite researchers in private companies and other organizations as professors in our university, and promote joint research with companies. The second is **R&D Centers** which promote joint research with private companies in response to social needs and which operate with external funds alone. As a result, we rapidly advanced to **the second place in Japan in the amount of funds received from oversea companies**, and in AY2018 this amount grew to **4.5 times of the amount received** in AY2014. While the **amount of funds received by joint research is rising**, the total amount of research funds is not sufficient yet. To strengthen the foundation for securing future financial resources, we must significantly strengthen industry-university joint research by increasing the number of international-standard industry-university co-authored papers, which is an evidence corresponding to social needs. We must also efficiently manage the funds obtained from donations and joint research.

Until now, seeds-driven research has been mainly conducted in industry-university joint research, due to faculty members' mind focusing on basic research. However, we must **increase large-scale, needs-driven industry-university joint research** that can respond adequately to needs for the **social implementation of research results** and the needs of industry.

We have the **third largest number of university-startups in Japan** following the University of Tokyo and Kyoto University. Except a few, however, many of our university-startups are small in scale. Dramatically increasing the number of startups and expanding joint research with the university will lead to reliably securing financial resources. Therefore, we must attract more investment from venture capitals and expand the startups' business. To achieve this, we need to **improve and support opportunities for startups to grow** not only in Japan but also **overseas** where large investments are common.

On the other hand, while we have also been acquiring donations, the Tokyo University of Education,

which is the predecessor of us, had many talented people who went on to the teaching profession after graduation, while few graduates are active in the industry. In addition, the University of Tsukuba's history is no longer than 50 years, and many of the graduates are relatively young. This makes raising money from donations a challenging task. Therefore, we need to **raise more endowments** through public activities of fundraisers to the associations including overseas alumni associations. To **further strengthen our financial foundation, we need to establishing social needs-based corporations (external firms)** (to be discussed later), in which the university can invest to promote industry-university joint research, **by leveraging our advantage as a designated national university.**

2. Strategic Goals and Specific Initiatives

Global issues are difficult problems that cannot be solved by a single nation or organization. They cannot be solved by single academic discipline, so that they are problems that must be solved with new academic disciplines. Only a Perfectly Comprehensive University can solve such issues. To become a Perfectly Comprehensive University, we have adopted the following three strategies: (1) enhance research beyond disciplines, (2) develop human resources beyond national and organizational borders, and (3) implement research results to solve global issues. Strengthening governance and our financial foundation to support these is discussed in **section 3** below.

Overseas benchmark universities in strategic goals and initiatives

With regard to human resource development and the social implementation of research results (Initiative (2)-③ and Initiative (3)-①), our benchmark university is **University of California, San Diego (UCSD)**. UCSD is the university that served as the model for our undergraduate school system. Founded in 1960, it is a relatively young university but constantly places in the top 50 in many world university rankings. Located in a science city with a concentration of high-tech industries, the university focuses on industry-university joint research.

With regard to strengthening research and human resources development (Initiative (1)-① and Initiative(2)-③), we refer to **the University of Freiburg (ALUF)**. Like us, ALUF follows a research strategy focused on research centers, and regularly revamps and optimizes many research centers based on performance assessments. In addition, ALUF has established an advanced research framework including the Freiburg Institute for Advanced Studies, which invites world-renowned researchers. We benchmarked their number of peer-reviewed papers, the number of top 1% journal papers, and the number of academic books published. ALUF ranks 86th in THE World Rankings.

For human resource development (Initiative (2)-①), we benchmarked **Olin College of Engineering (OLIN)** and **University of Oxford (UOX)**. OLIN is a young technical college. Its students, from the time of their entrance, engage in project-based learning (PBL) in diverse teams to deal with specific real-life social issues. OLIN has a curriculum that cultivates design-thinking. The institute has achieved high educational performance and ranks among the top universities in the U.S. in undergraduate engineering education. Sixty to seventy percent of its graduates proceed to postgraduate programs, although it does not have its own graduate school. We referred to **UOX** with regard to the independence of faculty organizations from education organizations at the time of the university's establishment. It has a system of individual instruction system referred to as "tutorials." In its undergraduate education programs, one tutor is assigned to every two to three students. The tutors have students write papers frequently based on a large body of literature, in which they must express their views on the questions and criticisms they are given.

In university rankings, the reputation score is an important index. Having a long history is a great advantage to a university in this respect. **We are currently ranked 28th in the world in the QS Top 50 under 50**, a ranking for universities 50 years or younger. On the other hand, we are ranked 270th in the QS World University Rankings. With our ongoing growth as a Perfectly Comprehensive University, we aim to be ranked **within the top 100** in the Fifth Mid-term Goal Period in various university rankings, and thereafter **within the top 50** as a touchstone.

(1) Enhance research beyond disciplines

To strengthen research beyond disciplines by solving the above issues, we set the following three goals. The first is to strengthen our research capabilities and to pass these on to the next generation. The second is to leverage our strengths to create new academic disciplines, with the understanding that existing research fields alone cannot adequately address today's increasingly diverse, complex global issues, and that new research fields are needed for their solutions. The third is to create new value in human society by promoting research that responds to social demands. We will **create new academic disciplines** that can only be realized by a Perfectly Comprehensive University by **integrating knowledge**, and **attracting diverse, outstanding knowledge from around the world** through the following initiatives.

Goals to be achieved: *Increase the number of peer-reviewed papers to 5,000 by AY2040,*
the number of top 1% journal papers to 180 by AY2040,
the number of books to 200 by AY2040.

International Benchmarks (AY2018)

	Peer-reviewed papers	Top 1% journal papers	Academic books
ALUF	3,944	123	126
University of Tsukuba	3,364	78	62

Initiative (1)-①: Go beyond global research standards by increasing international brain circulation

After strategic recruiting of young researchers on a large scale, we will nurture their development (for details, see the **section 3** below.). Specifically, we will leverage our CiC initiative and collaborate with invited overseas education and research units to create an international brain circulation of young researchers. We will increase the total number of overseas education and research units from 13 in AY2018 to 25 by AY2040. Furthermore, during the tenure-track period, we **foster young researchers with global experience** by providing opportunities for them to concentrate on collaboration with leading overseas researchers, and by **improving and expanding our International Tenure Track Program**, an initiative that has resulted in the publishing of high-quality international co-authored papers.

To strengthen research in faculty organizations, we will improve our research environment to support diverse research by further enhancing core and open facilities on campus. To strengthen group research, we will classify research centers as follows: R1: world-class research centers, R2: national-class research centers, R3: priority research centers, and R4: research units[7], and will reorganize and streamline these based on an assessment

[7] A body organized by a multi-disciplinary, diverse group of researchers under an accreditation system established with the objective

every five years including an interim assessment in the third year (R1, R2: peer review including top international researchers, R3: peer review by top researchers in Japan). We will also operate a **research center development cycle** to provide personnel, financial and other support based on classification. The university will select research centers that have demonstrated particularly high research results among R1 centers and provide university-wide support such as preferential treatment in the recruitment of international researchers by the Organization for the Development of Global Research Centers [8] and the internationalization of these centers' administrative organizations (with at least 50% of administrative staff proficient in English). Through these measures, we aim to increase the number of Grants-in-Aid for Scientific Research per faculty member from 0.66 in AY2018 to 0.9 by AY2040. We also aim to increase the number of peer-reviewed papers[9] from 3,364 in AY2018 as of AY2018 to 5,000 by AY2040. Increasing the total number of papers will make it possible to increase the number of top 1% papers from 78 at AY2018 present to 180 by AY2040.[10] In addition, we will increase the number of books[11] from 62 as in AY2018 to 200 in AY2040.

One candidate for world-class research centers is the **Center for Computational Science** (currently R1), which leads computer development and computer science research in Japan, and ranks among the world's leading research centers. The center is developing high-performance computers based on the concept of optimal application implementation and system construction, and engages in computational science research to solve issues involving physics and other fields. In computer development, the center is leading in the development of next-generation supercomputers in Japan. **Oakforest-PACS, the supercomputer jointly operated with the University of Tokyo, has been recognized as having the world's top storage performance, even outperforming RIKEN's "K" supercomputer.** The center has also developed the supercomputer Cygnus, which is superior in parallel computing essential for AI, and **has been leading in the development of next-generation supercomputers while participating in RIKEN's FUGAKU project.** To promote the development of computers and applications, the center will also concentrate its efforts on computational science research in the fields of physics, life sciences, global environment science, and computational informatics.

Another candidate is the **International Institute for Integrative Sleep Medicine, which has been selected as a World Premier Institute (WPI)**. Starting with its discovery of orexin, a neuropeptide that regulates sleep and wakefulness, the center has been a pioneer in establishing "sleep medicine" as a new field. The center conducts research activities to elucidate mechanisms that control sleep and waking, shed light on pathological conditions related to sleep disorders, and develop therapeutic medicine. The center has already achieved remarkable results in areas such as the discovery of genes that control sleep and the elucidation of a molecular mechanism in sleep-wake homeostasis. **The center sheds light on the meaning of sleep and also intends to undertake research on elucidating the mechanism of hibernation and its application in medicine.**

By developing research centers including these two research centers into research centers of the world's highest standards, we will bring together the best brains across national borders. We will double the number of

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of becoming a core research center in the future.

[8] An on-campus organization established in 2020. the organization aims to establish a framework that enables the implementation of the initiatives to sustainably generate advanced academic results and the creation of research centers of the world's highest standard including international joint use/joint research centers.

[9] Number of peer-reviewed papers (articles, reviews and conference papers) recorded in Scopus

[11] Number of papers (articles, reviews and conference papers) appearing in journals whose CiteScore index value based on the number of citations is within the top 1%

[11] Number of English books (books and book chapters) in Scopus

outstanding visiting international researchers from 1,711 in AY2016 (the second highest in Japan per faculty member) by AY2040.

Initiative (1)-②: Create new academic fields through transdisciplinary collaboration

We position transdisciplinary research units with development potential in an incubator system, **Academic Preparative Center system** and provide support such as staffing, the allocation of research funds, and the provision of space for conducting research based on research task. Under this system, we have created various research centers that have pioneered new fields of research and have been continuously selected for Grants-in-Aid for Scientific Research for new academic fields. These include the **Research Center for West Asian Civilization**, Japan's premier West Asian research center, the **Microbial Research Center for Sustainability**, which is now working on the JST ERATO program, and the **Tomonaga Center for the History of the Universe**, which continues the research of Nobel laureate Dr. Shinichiro Tomonaga. We intend to promote this system to create unique transdisciplinary research that will lead the world. In the future, we will also create novel post AI (Artificial Intelligence) research fields that elucidate human sensibilities by integrating knowledge such as world-leading computational science, advanced measurement science, kansei cognitive brain science, medicine, and information engineering. Leveraging our strengths as a Perfectly Comprehensive University, we will integrate disciplines such as humanities and social sciences, human sciences, the Internet of Humans (IoH), sleep science, sports and art, and we will conduct research that will **maximize human activities by integrating knowledge**. Furthermore, we will **create fields of research that will elucidate the mechanism by which individual emotions create behavior in society as a whole**. The research fields that we plan to promote through transdisciplinary research are described below.

Shimoda Marine Research Center, which continuously **publishes world-class papers on ocean acidification research** due to CO_2 seepage in Shikinejima, leads research which is unparalleled in the world. This center will conduct **research on sustainable ecology** to elucidate biological and geoscientific cyclical water systems that consist of mountains, rivers and oceans to solve global environmental problems including climate change and marine pollution, through transdisciplinary collaboration in research fields of marine ecology and mountain science.

Through transdisciplinary cooperation in the research areas of agriculture, biology, information engineering, the humanities and social sciences, we will undertake **food and bio-resource development research** that will solve issues related to the decline of the working population in developed countries and the shortage of food and bio-resources in developing countries through labor-saving production technologies utilizing AI and robots and strengthening of plant functions using **Japan's highest-level plant genome editing technology**, respectively.

To create research fields such as the above, we will increase the total number of certified research units aiming to undertake transdisciplinary research, which creates the seeds for new research fields, from 155 in AY2018 to 250 in AY2040. We will use our **research center development cycle** described in Initiative (1)-① for excellent transdisciplinary research units. We will support selected research units as research centers by allocation of personnel, reduction in educational efforts, and priority allocation of research expenses.

Initiative (1)-③: Implement new value for humanity through collaborative, society-oriented research

To implement new value for humanity, in addition to Initiative (1)-②, we will promote research that transcends the barriers of diverse organizations and research fields and meets transdisciplinary social needs. Until now, we have undertaken basic research commissioned by companies. To actively promote basic research based on

high demand from companies and society, we will establish **B2A research labs (business to academia research labs) (provisional name)**, to which we will invite industrial research departments. Industrial researchers will take initiative and make use of the technology and knowledge of our research facilities and faculty members to find quick solutions for their companies. Our goal is to establish ten B2A research labs by AY2040.

We will establish the following indicators as research results for creating new value. The **number of citations of papers published by U.S. universities such as UCSD, Harvard University and Stanford University** conforms the following pattern in order of frequency: industry-university co-authored papers >> international co-authored papers > domestic co-authored papers > co-house authored papers and > single-organization-papers. Japanese universities which follow a similar pattern include the University of Tokyo and Kyoto University. While small, the number of citations of industry-university co-authored papers of the University of Tsukuba also exceeds the number of citations of international co-authored papers. This is not the case for almost all other universities in Japan, where the number of industry-university co-authored papers is smaller than the number of international co-authored papers, clearly indicating the low quality and small number of industry-university co-authored papers in Japan. Just like a patent, an industry-university co-authored paper with a high number of citations is an indicator that an issue related to a social need has been solved. We will increase the number of citations for industry-university co-authored papers from 12.8 in AY2018 to 30 in AY2040, which is almost on a par with the U.S. universities mentioned above.

(2) Develop human resources without borders

To solve issues related to human resource development and international outlook described earlier, and to promote human resources development without boundaries, we have set the following four goals. The first is to develop human resources in undergraduate programs who not only have basic bachelor skills but also are capable of **problem-solving thinking (design-thinking)** to design future society including the ability to identify issues on their own. The second is to develop **human resources** in graduate school programs **who have not only a high level of specialization but also advanced transdisciplinarity**. The third is to **recruit excellent international students and nurture global leaders** from the viewpoint of securing comprehensive human resource skills in Japan, promoting the practice of internationalization in everyday campus life, and securing the diversity of students who will contribute to the internationalization of education. The fourth is to export the University of Tsukuba's education system to the world and feedback its experience to Japan's education system. We will undertake the following four initiatives.

Goal to be achieved: *Increase the number of international students to 5,000 (30%) by AY2030.*

International Benchmarks（AY2018）

International students (ratio)	UCSD 7,723 (23%)	ALUF 4,939 (23%)	University of Tsukuba 3,537 (21%)

Initiative (2)-①: Introduce design-thinking education across the university

We will introduce tutorial education across the university to cultivate solution-oriented thinking **(design-thinking)**. Through one-on-one tutoring, tutors in charge of students will spend adequate time with students immediately after enrollment, instructing them to raise their own awareness of academic issues through their study at university. Tutors will then make arrangements so that their students can study under teachers specialized in

various areas. For example, students with an interest in nursing care will engage in discussions with teachers who specialize in sociology, policy science, and psychology as well as nursing. They will also gain an understanding of nursing robots and take part in internships at rehabilitation sites. It is also conceivable that students interested in the formation of elementary particles will discuss the birth of the universe and matter with specialist teachers in mathematics, theoretical physics, and chemistry, enhance their theoretical capabilities, and learn methods of making advanced measurements of these through internships at overseas experiment facilities.

In the first and second years, in addition to transferable skills education that will lead to transdisciplinary learning thereafter, all students will receive instruction in basic and specialized courses necessary for the future they are planning. In the next stage, the focus will be on learning within their college-level groups, and in the process of deepening their knowledge in specialist areas, students will receive guidance from faculty members in related specialized fields in a manner that will link to content appropriate for receiving a degree from the university. Finally, students will undertake graduation research or graduation seminars under the guidance of a research advisor, rather than a tutor, in a specialized field or fields which will lead to employment or enrollment in graduate school. In AY2021, the university will introduce comprehensive selection (targeting approximately 25% of all students or approximately 400 students), and students enrolled under this selection process will be required to undertake study that will enable them to determine their area of specialization in the course of studying a broad-based curriculum for one year. We will raise the ratio of undergraduate students going on to higher level courses after graduation from 41.2% as of AY2018 to 70% in AY2040, and the continuing rate from Master's programs from 12.8% as of AY2018 to 30% in AY2040.

In tutorial education, the key will be to train teachers who can put tutorial education into practice and to guarantee the quality and quantity of TAs, TFs (teaching fellows) and RAs to support tutorial education. Faculty members must be familiar with the research of other faculty members and have caring, accurate tutorial skills that will enable individual students to fully demonstrate the abilities they possess. Through collaboration with partner universities in the U.S. and Europe, we will develop a tutor development program and implement systematic faculty development (FD). In addition to the merit of Japanese national university which has a low student-teacher ratio, only we, with the low barriers between organizations, can conduct tutorial education. Starting the tutorial program with 40 students, and then extending it to the size of colleges (80 to 120 students), undergraduate schools (200 to 400 students), and to approximately 1,600 students (excluding from the 2,100 students enrolled in the School of Medicine, etc., which are unable to join the program. All 1,600 faculty members will eventually engage in the program.

We will utilize the **TF system** for **training students** capable of supporting tutorial education. TFs are students beyond the TA level and are more like that of teacher. We have been running the system for years. From the perspective of providing financial assistance to graduate students as well, we will improve employment funding through the appropriation of donations and other funds. In addition, we will establish **tutorial centers** that will serve as places for connecting students' studies with society, and will conduct internships and joint projects with industry sponsors.

This method of education shifts the focus of education to a direction where students truly solve problems in society and pave the way for continuing their pursuit of learning and mastery of skills. Moreover, this method leads to an improvement in the assessment of individual students as student employability, which will also benefit companies. This method will also lead to improvement in both the quality and quantity of graduate students.

Initiative (2)-②: Introduce leading-edge transdisciplinary graduate education

In graduate school programs, we will promote research and education that transcends academic fields by shifting to a university-wide degree program system from AY2020. This will enable the development of a double mentor system[12] and reverse mentor system[13] in all fields in tandem with the extension of a transdisciplinary approach to degree programs, and may also lead to the creation of new transdisciplinary fields from students' self-motivated research activities. In doctoral courses in particular, the emphasis will be on elucidating the essence of things and acquiring specialist capabilities for demonstrating original creativity. Toward this end, we will take up themes such as the 13.8 billion-year history from the creation of the universe and matter to the birth of life, the creation of intelligence, the creation of civilization, and modern society, and **we will implement leading-edge transdisciplinary education spanning all education organizations and faculty members in all disciplines**.

In addition, we will promote international collaboration. To date, we have established **two international collaboration programs** (**joint degree programs**) and **15 double degree programs**. To further facilitate international learning in the future, we will convert into interactive contents our Course Jukebox which we have established with our overseas CiC partner universities, we will promote advanced organic utilization of educational resources within and outside the university. In this way, we will further internationalize the transdisciplinary research activities of graduate students. Contents created in this way can be mutually used for cooperative study in both undergraduate and graduate programs. We will drastically expand our digital archive to make it easier for undergraduate students to take courses offered by graduate schools and view lecture videos and contents including open courseware (OCW) that we have developed. We will enhance university communications both in Japan and abroad.

During the Fourth Mid-Term Goal Period, to embody the advanced transdisciplinary education, our university is aiming to nurture PhD degree holders who have the ability to change the world in response to unpredictable changes in society. We will establish the Graduate School of New Transdisciplinary Studies (provisional name), which will integrate degree programs across organizations and research fields. Ultimately, by reorganizing the graduate schools into one, we will eliminate barriers in all disciplines, and create a framework that enables students to engage in study not only in depth but also in breadth.

Initiative (2)-③ Recruit students from all over the world and nurture global leaders

Although our international student ratio is one of the highest among national universities, we must further enhance student diversity in order to maintain and improve capabilities of overall human resources and promote the development of leaders the global society. Therefore, we aim to achieve an international student ratio of at least 20 to 25%, which is on a par with top European and U.S. universities. Specifically, we aim to **admit 5,000 (30%) international students by AY2030,** including students participating in short-term enrollments and short stay programs. Therefore, as we work to establish and expand the international student framework for this undergraduate enrollment quota (starting at 5% and aiming for 15% in the future), we will expand programs that allow students to graduate and complete courses taught in English and special programs that allow admission of students whose Japanese language proficiency is less than N1 level on the Japanese Language Proficiency Test. We will further strengthen our recruitment of international students by utilizing our experience as an organizer university of the

[12] Student instruction based on joint research in a number of different fields.
[13] A system whereby students and teachers reverse roles and students who studied different fields teach mentor teachers the content of different fields, thereby contributing to the creation of a new paradigm.

Study-in-Japan Global Network Project and our 12 overseas offices. We will provide training for international students who will play active roles in Japan and international society by providing education in design-thinking at undergraduate level and a high level of specialization and advanced transdisciplinary skills at the graduate level, and by enhancing international students' employability including Japanese language proficiency and suggesting career development.

To insure the implementation of these measures, we will form a team consisting of the most capable members of the Department of Educational Promotion, the Department of Student Affairs, and the Office of Global Initiatives to create a unified, integrated management system through university-wide collaboration. Furthermore, we will establish a financial foundation which will include external funding (donations) to enhance financial assistance to secure outstanding international students, and we develop a system for assigning staff.

Initiative (2)-④: Export the University of Tsukuba's education system to the world

We have a plan to open a branch school of the university in Malaysia in response to requests and support from both the Malaysian and Japanese governments. If we achieve this, it will be the first overseas branch school established by a Japanese university.

The concept of this branch school is based on (1) cultivation of professional ethics and values through Japanese-language and Japanese-style education and (2) conferment of Japanese university degrees from a Japanese research university (this university). Furthermore, through transdisciplinary **problem-solving practical education** based on "transdisciplinary education in undergraduate programs at a comprehensive university" developed from a "cluster and institute system (see footnote 2 above)" at the time of the establishment of this university, we aim to nurture the development of men and women who will contribute to solutions to global issues facing Malaysia and countries of Southeast Asia. With the support of the governments of both countries, the overseas branch school is expected to have its first graduates in AY2027 or after.

Accepting students from Malaysia as well as its neighboring countries is a condition of the branch school, and the method of education is based on the undergraduate education reforms of our university described in Initiative (2)-①. At the same time, we will use the branch school as **a place for confirming the applicability of practical problem-solving education**, and will **build an education improvement cycle based on two-way exchanges (mutual student transfers) between the University of Tsukuba's head campus and overseas branch school**.

With the establishment of the first Japanese overseas branch school (overseas department), the University of Tsukuba will not only enhance its presence overseas but also develop Japanese-style education directly overseas. Through our cooperation with local educational institutions, companies and other organizations in Malaysia, we will continually improve this education model as we take the lead in the export and overseas development of Japanese higher education.

(3) Implement research results to solve global issues

To solve the issues related to industry-university joint research and activities of Tsukuba Science City mentioned above, and to implement research results in society that will contribute to solving global issues, we have set the following four goals. First, we will dramatically grow university-startups by creating **overseas** venues for them to develop not only in Japan but also **overseas to link** outstanding ideas and research results of university-startups **to social implementation**. Second, we will **deploy needs-driven industry-university joint research** that solves industrial issues while further expanding seeds-driven industry-university joint research developed from

basic research. Third, we will **enhance synergies among research institutes in Tsukuba Science City** and make **Tsukuba Science City provide an experimental field**. Fourth, we will promote **social implementation** of research results through **collaboration with innovation cities around the world**. Our specific initiatives are as follows.

Goals to be achieved: I*ncrease the total number of startups approximately three-fold by AY2040 (500 startups).*
double the funds raised by spinouts by AY2040. (10 billion yen).
Increase the number of citations of industry-university co-authored papers to 30 by AY2040.

International Benchmarks（AY2018）

	Startups in total	Funds raised by spinouts	Citations for industry-university co-authored papers
UCSD	(399)	14 billion yen	30.8
University of Tsukuba	144	5 billion yen	12.8

Initiative (3)-① Establish our Venture Ecosystem for international university-startups

The creation and development of startups launched by the university goes through the following stages:

Entrepreneurship education for faculty, students, and graduate students→Launching startups →
→Growth of the venture through procurement of funds by venture capitals→Acquisition of profits from business expansion →Returns to university (donations, securities, collaboration funds)

The objective of **our Venture Ecosystem** shown above is to return funds earned at each stage of the ecosystem to accelerate their circulation. The characteristics and strengths of the university in constructing a venture ecosystem include the fact that there are a large number of ventures originating from the university, which return funds to the university. In addition, the establishment of rules concerning the acceptance of donations through stock options and securities has been completed. Further efforts being made by the university include the provision of **support and practical international initiatives to enable the acquisition of significant funds raised from spin-outs** (in AY2018 and AY2019, **approximately 5.0 billion yen**).

Not only university faculty members, students and graduate students but also researchers and engineers from various institutions in Tsukuba Science City participate in the university's entrepreneurship education programs. We will further open this entrepreneurship education to society. We will increase the number of persons attending entrepreneurship training from 150 in AY2018 to 1,000 in AY2040. Furthermore, we aim to maximize our venture ecosystem by linking the study of entrepreneurship education to the launch of university-startups and further growing these into corporations that can be deployed internationally.

To do this, we will set up offices at the Laboratory for Intellectual Innovation (LII) and the Cambridge Innovation Center (CIC) in **Silicon Valley** and **Cambridge area of Boston,** respectively, where there are concentrations of startup support organizations, large companies and venture capitals. We will also build networks with local companies and financial relations, and search for needs in overseas markets. In addition to the deployment of university-startups, we will dispatch faculty, students, and graduate students who have received entrepreneurship education at the university and promote the launch and growth of ventures that can be deployed internationally by supporting practical initiatives such as searching for needs in overseas markets and obtaining investment from overseas enterprises and venture capital. Furthermore, by utilizing existing overseas education and research centers (12 centers) and assigning industry-university joint research managers with international negotiating capabilities to each center, we will build a network with local companies and financial institutions and **develop these into global**

innovation centers. Through these efforts, we will energize industry-university joint research not only in the U. S. but also in Europe and Asia, and promote international industry-university joint research. We will increase the amount received from joint research with university-startups from 200 million yen in AY2018 to 750 million yen by AY2040. To do this, we will increase the total number of startups from 144 in AY2018 to 500 by AY2040, and funds raised from spinouts from 5.0 billion yen in AY2018 to 10 billion yen by AY2040.

Initiative (3)-②: Enhance needs-driven R&D

Although efforts have been made to increase the scale of industry-university joint research through the Establishment of Special Collaboration Projects and R&D Centers up until now, most seeds-driven collaboration has been conducted. In addition to **B2A research labs** (see Initiative(1)-③), we will use investments made possible when we became a designated national university to establish external firms for **responding to social needs** where we can provide support in promoting the development of technologies, social movements, health and other research. External firms are assumed to be companies that provide needs-driven industry-university joint research, sports clubs that can contribute to society by leveraging physical research and education, which are strength of our university, and medical and health care companies that provides support for top athletes for prevention of injuries and enabling early comebacks. We will increase the number of external firms to three by AY2040, and the number of needs-driven industry-university joint research projects to 20 by AY2040. External firms will provide support in the development of technology to startups launched as a result of entrepreneurship education and ventures that are already active or expected to be active as university-startups, such as those operated by ENGINE[14] at MIT and Start-X[15] at Stanford University, and will promote the growth of university-startups. To promote support for the development of technology, we will assign a group of experts familiar with our promotion strategy and establish a system similar to the fund management system of prestigious universities in the U.S.

Initiative (3)-③: Make Tsukuba Science City provide a challenging experimental field

To implement new ideas and research results in society, we will collaborate with Ibaraki Prefecture and Tsukuba City, and receive public support in areas such as the easing of restrictions regarding automatic robot travel. Furthermore, we will make Tsukuba Science City provide a **challenging experimental field,** which will allow for failures and renewed attempts. At the challenging field, we will demonstrate our transdisciplinary, which is a strength of our university, implement in society world-leading research results in areas such as sleep sciences, sports medical science, and cybernics, and take on the challenge of **creating new services for the society of the future**. One example is the promotion of "Medical MaaS"[16] in a "mobility as a service" development research project in which a number of private companies led by Toyota Motor Corporation are collaborating with research organizations and administrative organizations of the University. In response to social demands for smart city creation, we also plan to realize a smart city concept utilizing cutting-edge technologies including AI and IoT centered on the **Tsukuba Future Cities Lab**, which we plan to set up as an open innovation organization to be established with the support of MEXT and the University of Tsukuba-based ventures PLIMES and CYBERDYNE Inc. By AY2040, we will conduct 10 projects using Tsukuba Science City as a future experiment field. In addition,

[14] An organization for supporting the development of technologies by venture companies and raising funds for them
[15] Same as above
[16] The abbreviation of "mobility as a service." This project plans to integrate services such as hospital reception procedures and the processing of medical treatment charges through facial recognition as patients board and alight from a hospital-bound bus.

the University's Center for Artificial Intelligence (C-AIR) and Tsukuba City will cooperate in a partnership with the city of Columbus and Translational Data Analytics Institute (TDAI), a research organization of Ohio State University for analyzing data, in the social implementation of a smart city concept in the U.S., which has received authorization by the university in partnership.

To support the activation of social implementation activities in Ibaraki Prefecture and Tsukuba City and realize these activities, we will dispatch faculty members of the university to the prefecture and city as necessary to share information on universities and local governments and negotiate with the government.

Furthermore, to bring about synergies in organizations within Tsukuba Science City and promote collaboration, we intend to implement with other organizations and local governments initiatives similar to the ***Awase-waza* Fund**, a fund that supports collaboration between the university and the National Institute of Advanced Industrial Science and Technology by providing funding.

Initiative (3)-④: Promote collaboration across global science cities

Tsukuba City, where the University is located, is **the only city** from Japan **that participates** in the High-Level Forum, a major international gathering of science cities managed by the city of Grenoble (France), and our university is a main member of the Tsukuba City Team. In 2015, we held the fourth forum in Tsukuba City, where an exchange of opinions and information on initiatives promoting innovation creation and ecosystem construction took place. Based on results of these forums, we will **collaborate with the University of Grenoble Alpes (France) and Ruhr University Bochum (Germany), which have world-class track records in informatics, AI and big data analysis, and are located in science cities**. We will share **issues arising from the implementation in actual cities of methods, technologies, and plans based on new concepts and discoveries in areas such as autonomous driving and IoH in cities, for example,** and we will collaborate in development technology in the social implementation of research results.

3. Strengthening our governance and the financial foundation

(1) Strengthening governance

The age of researchers at our university is shifted to older than that of other leading universities in Japan. To further enhance our strengths in a variety of fields in an ongoing manner and rank alongside other leading universities of the world, the **active, systematic recruitment on a large scale of young researchers who can play active roles on the international stage is an issue** we must address. We will further strengthen governance under the leadership of headquarters, and through rapid decision-making and the allocation of strategic human resources, we will support various initiatives under this plan and secure young faculty members who can pioneer new research fields and play active roles in international society.

① Headquarter-led strategic recruitment of faculty

When we recruit faculty members, deciding on the research fields in which they should be active is vital in achieving the mission of the organization. During the Third Mid-term Goal Period under the leadership of headquarters, we strategically allocated to departments *personnel points*, the amount of which is equivalent to those to recruit 200 assistant professors, where the number 200 corresponds to more than 13% of the total number of tenured and tenure-track faculty members at this university: President and vice presidents reviewed departments' plans for expanding fields, selected those that are attractive and conforming to the strategy of the university, and

allocated personnel points to those plans selected. The departments were encouraged to use the given personnel points to recruit young faculty members. In this way, a number of researchers became faculty members in this university, such as those to expand a 2-credit course in information technology into a 4-credit course including data science which is designed as compulsory for all students in this university, those in charge of the Center for Artificial Intelligence Research, and those who challenge new research fields, including topics in next-generation smart city research.

In each period from the Fourth to the Sixth Mid-term Goal Period, we will further enhance our strengths in various fields by actively recruiting young faculty members capable of playing roles in international society through our **personnel point cycle system**[17]**, which has been devised as a new strategic method for the headquarters to determine optimal allocation of personnel points to departments.** The expected effect of the new strategic method would be: 45 recruits/year x 20 years by AY2040; in other words, the recruitment of 900 young faculty, the size of which is almost equivalent to 60% of the total number of tenured and tenure-track faculty members at this university.

② **Diversified faculty/administrative staff and their functions**

Through the allocation of strategic personnel points that enable recruitment of faculty personnel equivalent to 60% of the total number of tenured and tenure-track faculty members, we will **promote the recruitment of personnel with diverse attributes including young persons, women and foreigners**. This initiative makes it possible to recruit new young faculty members equivalent to 3% of the total number of tenured and tenure-track faculty members each year. Therefore, since 2% of young faculty members cease to be classified as "young" every year, the ratio of young faculty members can be increased by 1% each year. Using this method, we will raise the ratio of young faculty members (39 or under) to the university's tenured and tenure-track faculty members, which is currently only 15%, to 25% by AY2030. Furthermore, with the understanding that the ratio of young faculty members hired through external funding has been high at around 50%, we will achieve an ideal young faculty member to full-time faculty member ratio of 30% by AY2030.

We will review work arrangements of faculty and staff members to ensure that they can actively participate based on their qualities and abilities. We will promote differentiation in roles of faculty members to facilitate the achievement of better results by designating those with outstanding research achievements as special senior professors (provisional name), and applying a personnel system suited to them to reduce educational duties so that they can devote themselves to research activities.[18] With regard to administrative staff, we will secure and train **generalist staff** responsible for university management as well as **expert staff** with specialized knowledge, such as URA (with the aim of building a framework of 40 people) and industry-university partnership coordinators, based on their respective characteristics. We will make efforts to enhance the roles and abilities of administrative staff as well as improve efficiency of business management through the use of AI and ICT, including further promotion of RPA (robotic process automation).

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[17]In the third period, personnel points were permanently granted to the departments concerned. However, under the new personnel point cycle system points are allocated for two years to departments to support their employment of new young faculty members. The departments are requested to prepare their own personnel points to continue the employment of those faculty members afterwards. The headquarters uses the returned points for new strategic allocations.

[18] A system that enables the university to (a) use external funds obtained by the teachers themselves as financial resources for salaries and to set salary incentives, (b) use external funds obtained as financial resources to continue the employment of teachers as full-time teachers even after mandatory retirement age, and (c) to completely relieve teachers of university duties for a certain period of time and pay their salaries from financial resources received from other institutions

③ Establishment of a University Management Bureau

We will **establish the University Management Bureau (provisional name) as an independent department under the direct control of the president**. The mission of the University Management Bureau will be to achieve sustainable, progressive university management and to strengthen the university base through the implementation of a continuous PDCA cycle as follows. The department will formulate a medium- to long-term university management strategy based on the future vision of the university(P), embed the plan in a strategy, and present it and give instructions concerning it to the executive department(D), manage the progress of the plan (C), and improve and fine-tune the university management strategy and plan (A). the University Management Bureau will be a collaborative organization of teachers and staff and will work to optimize the allocation of resources on and off campus by providing support in the integrated management of university information including marketing, customer relations management (CRM), financial analyses, and dissemination of university information as well as streamlined analyses and evidence-based decision-making. The department will have a Management Planning Committee (provisional name) consisting of teachers, administrative staff and outside experts (corporate managers, etc.), and will formulate planning and proposal systems for achieving agile management decision-making. In addition, by establishing organizations such as the Business Strategy Department, Marketing and Public Relations Strategy Department, Financial Planning Department, and Information Management Department under the University Management Bureau, we will strengthen the governance of the president by realizing professional university management.

(2) Strengthen our financial foundation

To establish a solid business foundation that will realize this plan, we will further strengthen the financial foundation by expanding financial resources through our Venture Ecosystem, creating a positive growth cycle of management resources through the strategic investment of funds, and dramatically increasing the acquisition of private funds (expansion of external funds through improvement in inter-organizational cooperation, acquisition of overseas funds through international development of industry-university joint research).

Goal to be achieved: *Increase total funds five-fold by AY2030,*
and investment profits and the amount of collaboration funds received four-fold by AY2040.

① Diversify funding sources and strengthen strategic funding management

Since successful examples of the establishment of university-startups including CYBDERDYNE Inc. exists in the university, we will leverage the venture ecosystem of the university with its features and strengths as described earlier in (3)-① to secure financial resources by accepting stock options from university-startups and converting these into cash, and by accepting donations through collaboration funds, donations and securities.

Furthermore, we will strengthen **various approaches to overseas alumni associations, to which many economically successful graduates belong**, and taking into consideration the availability of tax exemptions on transferable income tax for donors, we will further leverage these to strategically increase donations through negotiable securities. We will increase total funds five-fold from 1.3 billion yen in AY2018 to 7.0 billion yen by AY2030.

Based on the authorization of MEXT in 2018 in regard to the investment of surplus funds, we have been steadily purchasing and managing new financial products (structured deposits and corporate bonds) and achieving

favorable outcomes (**interest income as a ratio of donation obligations: third among universities in Japan**). In the future, we will **increase investment profits through efforts to increase investment** in financial products with high investment effects (real estate investment trusts, etc.) through the additional appointment of persons outside the university with practical experience in the management of funds and by outsourcing business. We will increase investment profits four-fold from 40 million yen in AY2018 to 150 million yen by AY2030.

② Increase external funding through large-scale, industry-university joint research

We have increased the external funding by joint research mainly through the university's unique systems, special collaboration projects and R&D centers. However, it is difficult to significantly increase external funds through these efforts alone. To solve this problem, companies and universities must overcome the barriers between organizations to significantly increase large-scale, industry-university joint research. As a strategy for achieving this, we will establish B2A research labs（Initiative(1)-③） and increase external funding through the **promotion of large-scale, needs-driven industry-university joint research**. In addition, if the university can invest in external firms that respond to social needs (Initiative (3)-②) mentioned earlier and succeeds in development research through these, these external firms will obtain the benefits of implementing those results in society and will increase the university's external funds from the returns it receives from these collaborations.

Through the above initiatives, we will further enhance large-scale collaboration with private companies, and increase the amount we receive from collaboration with companies four-fold from 1.7 billion yen in AY2018 to approximately 6.2 billion yen in AY2040. In addition, raising the indirect funding ratio from 10-20% to 30% will dramatically increase external funding revenue.

③ Increase funding through international, industry-university joint research

In the U.S., venture capital investments exceed 9,000 billion yen but in Japan are equivalent to a little under 200 billion yen, about 1/50th the amount in the U.S. Thus, the lack of large-scale investment is a major issue in developing ventures in Japan. Therefore, we will expand large-scale, joint research with the university through growth of university-startups based on large-scale investment in the U.S., which will lead to the acquisition of external funds of the university through the **dramatic development of our Venture Ecosystem**. We will increase the funds received by collaboration with university-startups from 200 million yen in AY2018 to 750 million yen in AY2040.

(Appendix)

Strategy to be "Perfectly Comprehensive University" that Solves Global Issues