

Strategies to Obtain Research Funding for Hamamatsu University School of Medicine, a Rural Medical College in Japan

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Abstract: *Japan's operating budget for its national universities has been reduced since 2004 year by year, leaving a tight competition among universities in securing research funding. Urban universities with several prominent researchers can operate by securing competitive funding, joint research with companies, and donations, whereas small rural universities struggle with finances. How should small rural universities survive in the future? The vision and mission of Hamamatsu University School of Medicine (HUSM), a rural medical college, is to play a central role in the local community medicine through medical photonics research and academia-industry-government collaboration. HUSM is a member of the regional industrial cluster, and research administrators (RAs) have promoted the medical photonics filed through activities such as education, matching, funding, research and development support, technology transfer, and sales promotion support to make the university distinctive. RAs collaborate with universities, companies, and local governments in the same region to conduct joint research and commercialize products as though these units were a single organization. As a result, the number of joint research projects and the amount of revenue from joint research have increased every year. The government has recognized this unique approach. Furthermore, university consolidation is being pursued as a cost-saving measure to increase the money spent on research. Consolidation can strengthen the ability of university research, and can result in more joint research with companies and more research funding.*

Introduction

As of 2020, Japan has 86 national, 93 public, and 607 private universities. Until 2004, national universities were internal organizations of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) that allocated a budget to universities each year. MEXT is one of Japan's administrative agencies that promote education, academics, sports, culture, and science and technology. The organization supports operating subsidies to compensate national universities' revenue shortfall due to their incorporation. The Cabinet Office (CAO, 2002) decided in April 1999 that the transformation of national universities into independent administrative institutions would be examined. The CAO of Japan is a collegial body that has executive power and is responsible for planning and coordinating on important policy matters. The CAO believed that by incorporating national universities, they would be able to run them in a top-down management similar to the private sector and train the world's best students in a competitive environment. This examination was part of university reforms while respecting the autonomy of universities. The CAO tried to reinvigorate universities by strengthening university presidents'

authority and including education and research in budget allocations. The National University Corporation Act was enacted in July 2003 and took effect in October 2003. In April 2004, they became independent 89 national university corporations, and 86 corporations were established in April 2020 (MEXT, 2020a). The main research sources of income for national university corporations are operating subsidies and grants-in-aid scientific research (KAKENHI). With the operating subsidies declining every subsequent year, it is imperative that research funding be obtained through KAKENHI funding, other competitive funds, and joint research with private companies. The training project of research administrators (RAs), i.e., to assist in obtaining research funding, was initiated by MEXT in 2011.

Operating Subsidies

Operating subsidies in Japan fall under the “Historically-determined allocation” of block grants (Pruvot et al., 2015). It allocates a fixed amount based on the previous year’s amount. MEXT is currently in the third medium-term goal for 2017–2022 (National Institution for Academic Degrees and Quality Enhancement of Higher Education, 2018). Each national university corporation conducts education and research activities based on its medium-term goals and plans. Medium-term goals 6-year targets are set by the minister of MEXT based on national university corporations’ opinions. Medium-term plans are prepared by each national university corporation and approved by the minister of MEXT for the achievement of the medium-term goals. Operating subsidy is a fundamental income source for each national university corporation, but its uses are not specified. However, the “Basic Policies for Economic and Fiscal Policy Management and Structural Reform 2006” (Prime Minister’s Office of Japan, 2006) indicated that efficiency has to be enhanced and the budgeted amount for each fiscal year (FY) would be decreased by 1% compared with the previous year (Japan Association of National Universities, 2018; Takeuchi, 2019).

In February 2007, a private member of the Council on Economic and Fiscal Policy proposed that the allocation of national university subsidies should be modified “based on effort and results.” These expenses had been reduced by 0.8%–1.9% in FY 2010 and were 13% lower in FY 2013 than in FY 2004. The budgeted amount for FY 2019 was \$10,158 million (equivalent to 108 JPY). Among other countries, Germany had a 20% increase and the UK saw a 20% reduction in comparison with 2008. In Germany, this is due to an increase in public funding from the federal government as universities that came to be run by each state and the federal government from previously being run by each state. In the UK, this is due to the suspension of operating subsidies for education (Hayashi, 2015; Universities UK, 2016).

Priority Support Quota

Priority support quota (MEXT, 2020b) is the portion of the operating subsidy based on an assessment of the progress of each university’s vision and strategy to deliver the selected framework. It is allocated on an evaluation of “based on effort and results,” and based on gradient allocation according to the progress of university reforms starting in FY 2016 (Takeuchi, 2019). The amount

started at \$926 million, increased to \$9,259 million in FY 2019 and will continue to increase. For the third period of the medium-term target from FY 2016, “three priority support frameworks” were created to help each university demonstrate its strengths and characteristics. These three frameworks promote (1) human resource development and research to meet local needs, (2) the formation of outstanding educational and research centers and networks in each field, and (3) education and research excellence at par with the world’s top universities (Takeuchi, 2019). Each university would select one of the three frameworks presented by MEXT and create a “vision” and “strategy” to realize their selected framework. The vision and strategy would be based on the medium-term goals for the third term. MEXT evaluates the progress of the strategy annually based on external experts’ opinions. A portion of the operating grants would be allocated based on an assessment. A total of 55, 15, and 16 universities selected the first, second, and third priority support, respectively. National universities have proactively set key performance indicators (KPIs) to determine the status of achievement of the strategies and are establishing a plan-do-check-act cycle while implementing initiatives to strengthen their autonomous functions (Otsuka, 2017).

Several study groups of experts in national university corporations have been held to discuss and evaluate the results. The evaluation aims to determine the progress of the KPIs set by the national university corporation. If progress is not identified, then its causes are analyzed and future measures are checked to examine whether they are presented. The evaluation is converted into a score based on a conversion table, and the budget allocation rate is determined. Unlike in Japan, only countries such as the UK and New Zealand have operating subsidies for research. In the UK, the question of the impact on society, economy, and culture, as well as on academia, has been considered. In 1986, the research excellence framework (RAE) was launched. RAE allocates research funding according to three indicators: the number of research projects, a discipline-specific cost index, and weighting by evaluation results (mainstream quality-related research funding) (Hayashi, 2015; Universities UK, 2016). In New Zealand, performance-based research funding (PBRF) began in 2003, based on the UK’s RAE. In the PBRF, the evaluation unit is an individual’s research results and the funds are allocated in aggregate by the university (Hayashi, 2015; Mizuta, 2007).

Grants-in-Aid for Scientific Research

Grants-in-Aid for Scientific Research (KAKENHI) is a competitive fund that aims to significantly advance all types of academic research, from basic to applied, in all fields, from humanities and social sciences to natural sciences (Japan Society for the Promotion of Science [JSPS], 2020). Its budget was \$2,196 million for FY 2019, and it is the national university corporation’s primary revenue along with operating subsidies. The number of applications and adoptions were 101,857 and 28,892, respectively, a 28.4% adoption rate. Medical science has a relatively high adoption rate. Universities have been compensating for the annual decrease in operating subsidies by obtaining competitive funds, including KAKENSHI.

Hamamatsu University School of Medicine

Hamamatsu University School of Medicine (HUSM) is a national university corporation located in Hamamatsu City, Shizuoka Prefecture, Japan. HUSM consists of the School of Medicine and School of Nursing, with 120 and 70 students, respectively, every academic year. The Graduate School of Medicine consists of the Department of Medicine (doctoral program), Cooperative Major in Medical Photonics (doctoral program), and Nursing (master's program), with 30, 3, and 16 students, respectively, every academic year. HUSM has 1,402 staff, including researchers, doctors, paramedical workers, and administrative staff, of which 392 researchers and only two are RAs. HUSM's vision and mission is "to play a central role in local community medicine" through medical photonics research and academia-industry-government collaboration.

HUSM has established the Preeminent Medical Photonics Education & Research Center and is conducting research from basic medicine to medical treatment to strengthen the functions of research and development (R&D) and human resource development. Cooperative Major in Medical Photonics was established with the neighboring Shizuoka University (SU) in FY 2018. Moreover, highly specialized personnel in biomedical engineering collaboration based on medical photonics have been developed. Furthermore, the Promotion Center for Medical Collaboration and Intellectual Property (MCIP) has been established in FY 2019 to expand the cooperation between universities, industries, government, finance, and key hospitals in the region. MCIP has two affiliated RAs with diverse functions: (1) discovering the university's medical needs and technical seeds; (2) matching the needs and seeds with companies; (3) reviewing donations and joint and contract research and signing contracts; (4) managing intellectual property, including filing, maintenance, assignment, and licensing; (5) managing research materials; (6) providing supporting for starting a business; (7) lending equipment, such as positron emission computerized tomography, computerized tomography, and magnetic resonance imaging among others, and supporting technically; (8) obtaining and helping to obtain public funding for researchers; and (9) disseminating information inside and outside the university.

HUSM's revenue for FY 2018 was \$318 million, of which operating subsidies and research and endowment income (including KAKENHI) accounted for 16.9% and 7.8%, respectively (see Figure 1).

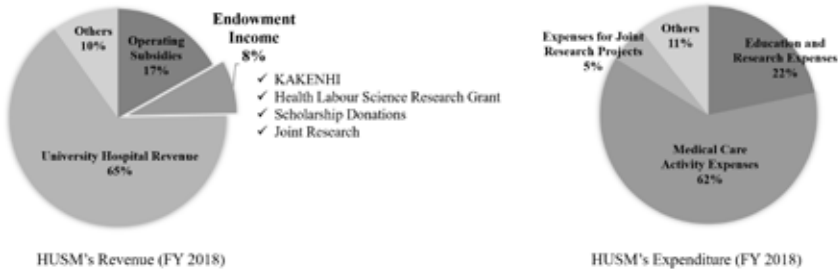


Figure 1. HUSM's Revenue and Expenditure (FY 2018)

The breakdown (in thousands) was \$3,929, \$5,938, \$8,819, and \$603 in 205 KAKENHI and Health Labour Sciences Research Grant, 517 scholarship donations, 6,800 funded research, and 87 joint research with private companies and others, respectively. Scholarship donations refer to expenses to encourage education and research, such as academic research expenses. Although 65.4% of the revenue was from the university hospital, medical expenses accounted for 62.0% of the total expenditure. Education and research expenses accounted for 21.7%.

Regional Medical Device Clusters in Japan

Regional industrial clusters in Japan have been established to promote R&D of various products through METI's industrial cluster policy since 2001 and MEXT's knowledge cluster initiative since 2002. These regional industrial clusters include the medical device cluster.

In 2019, the global medical device market was at \$479 billion, which will continuously grow because of an aging population and expanding demand from emerging economies. The Japanese global medical device market was at \$36.5 billion, which accounted for 7.8% of the world's total. The export value has fallen by 6% year over year (YOY), whereas the import value has a 6% YOY increase. This finding poses a challenge of excess imports. The share of large Japanese companies is also declining annually.

In 2014, the Law on the Promotion of Research, Development, and Dissemination of Medical Devices to Improve the Quality of Medical Care Received by the People was enforced. The law aims to speed up the practical application of effective and safe medical devices; develop clusters on companies, universities, and hospitals; and encourage SMEs with advanced manufacturing technologies to enter the business. Thus, the development of medical devices in clusters was promoted. Medical devices require various elemental technologies and parts. SMEs with unique manufacturing technologies can play an active role because existing high-mix low-volume products may be enhanced.

Shizuoka Prefecture, where Hamamatsu Region is located, is home to several laboratories and manufacturing sites for large- and medium-sized pharmaceutical and medical device companies, including foreign companies. Shizuoka Prefecture accounted for 10% and 18% of the nation's production value for pharmaceuticals and medical devices, respectively, in 2018. Thus far, Shizuoka Prefecture is the highest in the country among other regions and continues to be the first in the country (Shizuoka Prefecture, 2019). Various SMEs also support the production of automobiles, paper, and electrical equipment.

The regional industry clusters constitute an intra-regional network of academia-industry-government, industry, and cross-industry collaborations throughout the country. These collaborations strengthen the international competitiveness of industry and revitalize the local economy. Shizuoka Prefecture also has a Fujinokuni Advanced Medical Care Zone. It has an extremely strong government-driven industrial policy. Each prefecture applies to the national government for funding to form clusters, and the new organization plays a central role as a secretariat.

Objectives and Methods

The objective of this review is to determine ways in which small rural universities survive in the face of declining research funding. The case of HUSM was used as an example.

The operating subsidies received by Japanese national universities, the selection and evaluation of priority support quotas, and the amount of KAKENHI funding received were derived from MEXT and JSPS data. The vision and mission, KPIs, strategies, number of researchers, and income and expenditures of each university were studied from data provided by each university's website and their annual reports. The survey of university and company attitudes was collected through National Institute of Science and Technology Policy (NISTEP) data, while the survey of community attitudes was outsourced to Dentsu Inc. with funding from HUSM.

As a preliminary study, the relationship between the number of researchers at all the national universities and the GDP of the location is presented in Figure 2 (Economic and Social Research Institute, 2019; Japan Association of National Universities, 2019).

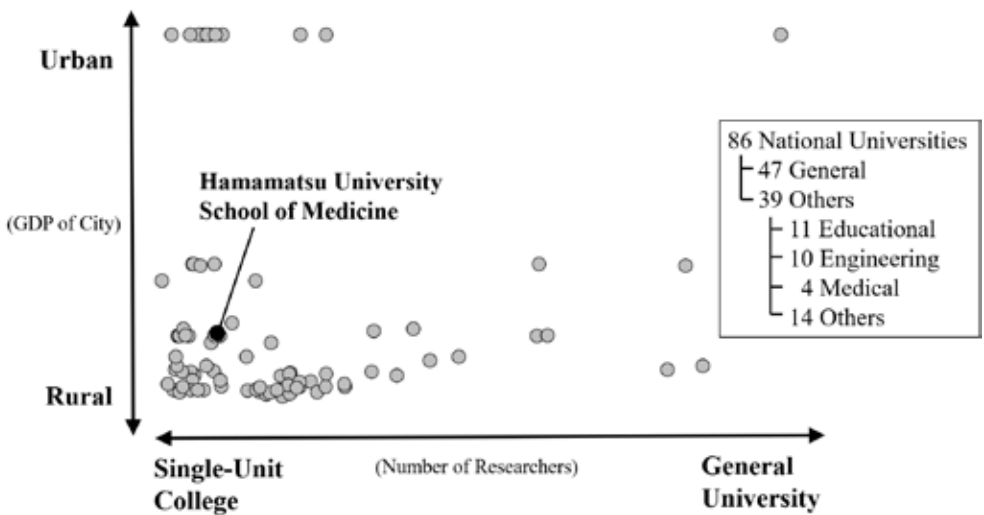


Figure 2. Classification of the National University

The number of researchers indicates whether the institution is generally a large university or a small college, and the GDP of the city indicates whether it is an urban or a rural university. Almost all the universities are small and located in the countryside. Figure 3 shows the correlation between operating subsidies and KAKENHI (MEXT, 2020b; JSPS, 2020).

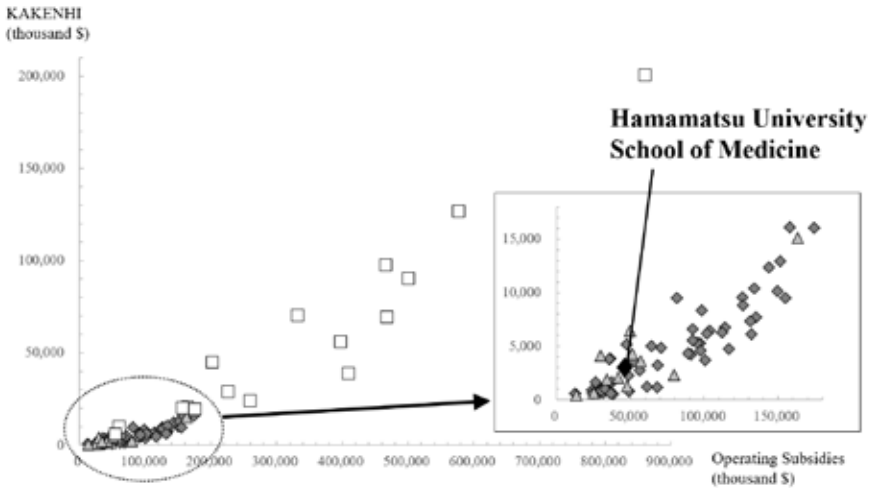


Figure 3. The Correlation between the Two Major Incomes (FY 2018)

- Each university selected one of three priority support frameworks;
- △ (1) human resource development and research to meet local needs,
 - ◆ (2) the formation of outstanding educational and research centers and networks in each field, and
 - (3) education and research excellence at par with the world's top universities

Regardless of the priority support framework, universities that receive a large amount of operating subsidies also receive more KAKENHI funding. Rural single-unit colleges get less money for both, suggesting that the research environment, including finances, is strained.

Findings and Outcomes

HUSM ranked 56th in operating subsidies awards with \$48,898 thousand in FY 2018. HUSM has selected the first-priority support framework of operating subsidies, that is, to promote human resource development and research to meet local needs. The visions are “developing new medical technologies that combine optical technology with other advanced technologies,” “training medical photonics leaders and doctors and other medical professionals with medical photonics background,” and “partnering with local communities to promote innovation.” One of the KPIs is the “number of joint research projects with local companies.” Based on KPI evaluation, HUSM received a “b” rating for FY 2019, second in the four-rank evaluation. Moreover, a budget allocation rate was determined based on the evaluation, and total \$48,898 thousand were allocated to HUSM (MEXT, 2020a).

Table 1. Operating Subsidies and KAKENHI per Researcher (FY 2018)

Managerial procedures and tools						
	Number of Researchers	Amount Received (TS)	Per Researcher (TS)	Adoption Rate (%)	Amount Received (TS)	Per Researcher (TS)
HUSM (R-S)	329	48,898	149	30.1	3,515	10.68
AMU (R-S)	364	48,741	134	26.1	2,265	6.22
SUMS (R-S)	387	52,370	135	33.3	3,592	9.28
TMDU (U-S)	884	163,185	185	35.8	15,072	17.05
SU (R-G)	700	98,167	140	22.4	8,332	11.90
UT (U-G)	3,858	859,806	223	37.4	200,815	52.05

HUSM: Hamamatsu University School of Medicine, AMU: Asahikawa Medical University, SUMS: Shiga University of Medical Science, TMDU: Tokyo Medical and Dental University, SU: Shizuoka University, UT: the University of Tokyo, R: Rural, U: Urban, S: Single-Unit College, G: General University

Hamamatsu University School of Medicine ranked 76th in KAKENHI awards with \$3.89 million in FY 2018. The average adoption rate was 28.4%, while top-ranking universities had a high adoption rate of more than 60% (JSPS, 2020). Figure 4 shows the amount of KAKENHI funding awarded to each researcher.

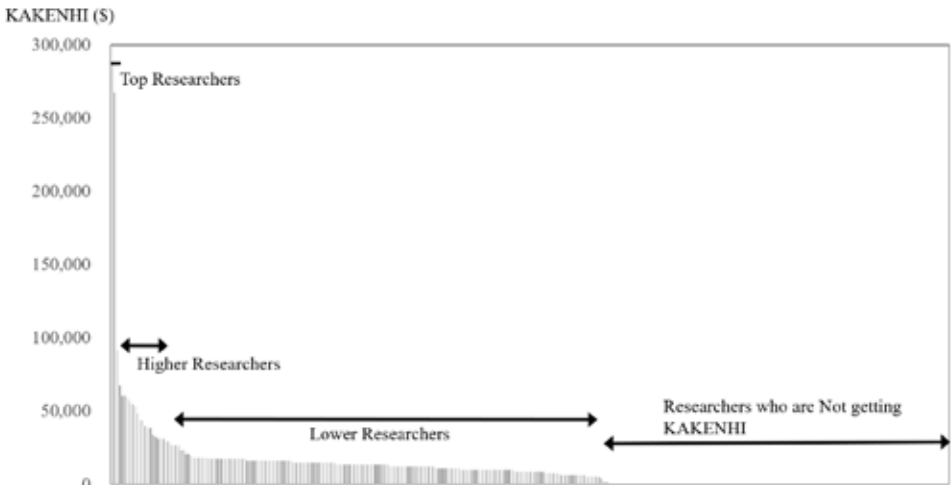


Figure 4. HUSM's KAKENHI per Researcher (FY 2018)

Only two researchers received more than \$250,000, and 21 researchers received more than \$30,000. Of the remaining 300-plus researchers, 133 received no funding. RAs conduct briefing sessions, document preparation seminars, peer review by top and high-level researchers, and check forms to help researchers obtain KAKENHI funding.

In addition to research funding through operating subsidies and KAKENHI, HUSM increases joint research with local companies, which is consistent with the vision/mission and KPI. HUSM had various collaborations with companies in the same prefecture and SMEs. HUSM works mainly with nearby SMEs in developing medical and assistive devices (MEXT, 2019b). This is because of the RA's efforts in education, matching, funding, R&D support, technology transfer and sales promotion support to SMEs based on HUSM's vision and mission (Amano-Ito, 2020).

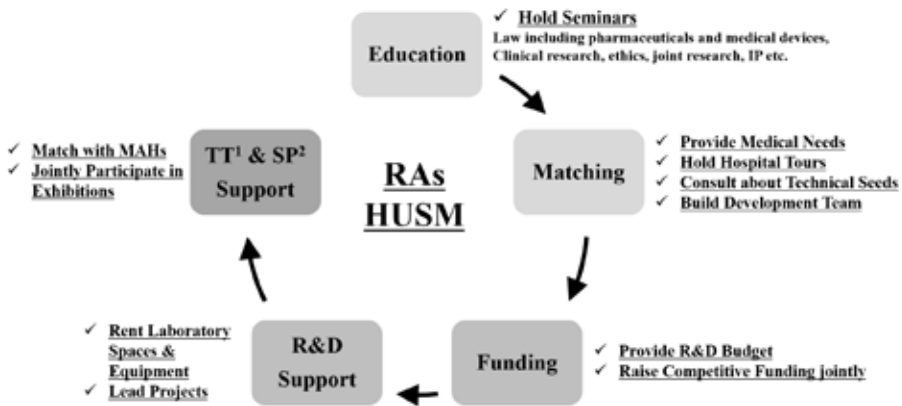


Figure 5. Ecosystem of Medical Device Development (Partial revision of Figure by Amano-Ito, 2020)

¹technology transfer, ²sales promotion.

In particular, HUSM provides gap funding for university-industry collaboration in the Hamamatsu Region. GAP funds promote technology transfer from within to outside the university. It differs from the US funds provided autonomously and flexibly by universities to laboratories to promote university technology transfer and create university-born ventures. Although funds similar to the amounts available in the United States have not existed in Japan, local governments and regional banks in the Hamamatsu Region have long been distributing similar funds. Hamamatsu University School of Medicine (HUSM) has been a beneficiary of the fund. As a result, the number of collaborations and the collaboration revenue have also increased over the years. In FY 2019, there were 93 collaborations amounting to \$719,000 in revenue. There has also been an annual increase in the number of collaborations with regional companies on “light.” There were 38 collaborations in FY 2019.

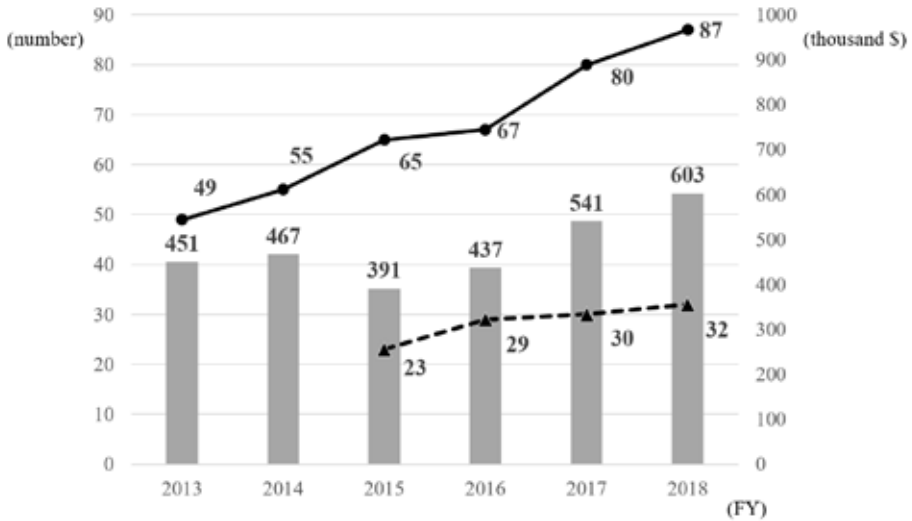


Figure 6. Joint Research with Companies

● Number of Joint Researches, ▲ Number of joint research projects about "light" with local companies, ■ Joint Research Revenues

Figure 7 shows the relationship between the amount of KAKENHI funding obtained and the amount of joint research provided to researchers who started new collaborative research with companies in FY 2018 (National Institute of Information, 2020). The researchers did not receive a large amount of money for their collaboration, and some of them received no money. The researchers who were aiming to obtain KAKENHI funding were not interested in collaborating with companies, while those who were promoting industry-academia collaboration were not able to focus on pure academic science. None of the findings were related to age or position of researchers. The HUSM's vision/mission, KPIs and the goal of obtaining KAKENHI funding conflict with one another. HUSM researchers make the choice as to which policy to follow, and the RAs support both objectives.

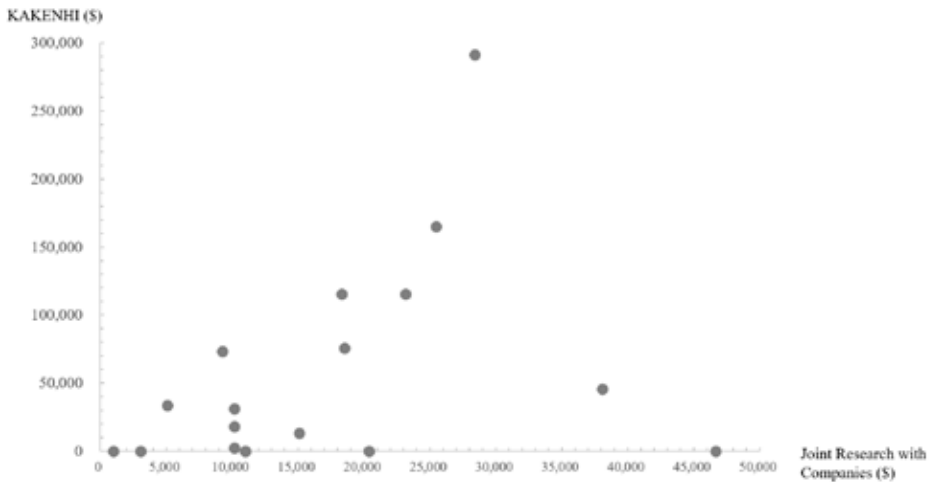


Figure 7. The Relationship between Joint Research and KAKENHI (FY 2018)

HUSM Status and Comparison with Other Universities

Asahikawa Medical University (AMU) and Shiga University of Medical Science (SUMS) are regional medical colleges similar to HUSM. They have also selected the first-priority support framework of operating subsidies. AMU and SUMS also received a “b” rating and were allocated \$48,741 thousand and \$52,370 thousand, respectively (see Table 1) (MEXT, 2020). By contrast, Tokyo Medical and Dental University (TMDU) has selected the second-priority support framework of operating subsidies to promote the formation of outstanding educational and research centers and networks in each field. TMDU received a top “a” rating from its evaluation and was allocated \$163,185 thousand. KPIs of TMDU are the “number of joint research contracts” and “number of papers in collaboration with other fields.” Furthermore, Table 1 presents data from SU, a rural general university in the same region as HUSM, and the University of Tokyo, an urban general university, for comparison. The total amount of operational subsidies is higher in urban areas and supports more researchers, and the amount of money per researcher is also larger. The same is true for KAKENHI funding. Among regional medical colleges, HUSM has one of the largest amounts of operating subsidies and KAKENHI funding per researcher. The regional medical colleges have lower operating subsidies, KAKENHI awards, and research scale than Japanese universities in general. It shows that they need to diversify their financial resources to survive by expanding their funds and income and effectively using and managing their assets instead of relying on operating subsidies and scientific research funds.

Of the 87 joint research projects with private companies, 25 were conducted by companies in Shizuoka Prefecture and 25 by small- and medium-sized enterprises (SMEs). Two of the 27 cases at AMU were from local companies within the prefecture, and 14 were from SMEs, whereas none of the 27 cases at SUMS were from local companies within the prefecture, and 13 were from SMEs (MEXT, 2020b).

According to a survey (NISTEP, 2020a, 2020b), 46% of universities in Japan aimed to work with SMEs, whereas 31% aimed to work with nearby companies. By contrast, 41% of companies aimed to work with nearby universities. Universities and companies aimed to work together in the same region, to a certain extent, regardless of size. The survey showed that universities and companies did not actively develop human resources who can innovate local needs that address problems in the region, and did not actively engage in research that meets local needs that solve problems in the region. The ratings were lower than the results of the FY 2016 survey. Comments about human resource development include “Regional project creations are often transitory, continuity issues exist” and “Researchers have few opportunities to understand regional development needs.” Research comments include “The research is not accompanied by a track record” and “Joint research is conducted between universities and companies in the same region but is inconsistent with the region’s issues.”

HUSM and Regional Medical Device Clusters in Hamamatsu

In the Hamamatsu Region, the optical industry is linked to medical devices to form a university (HUSM)-driven cluster.

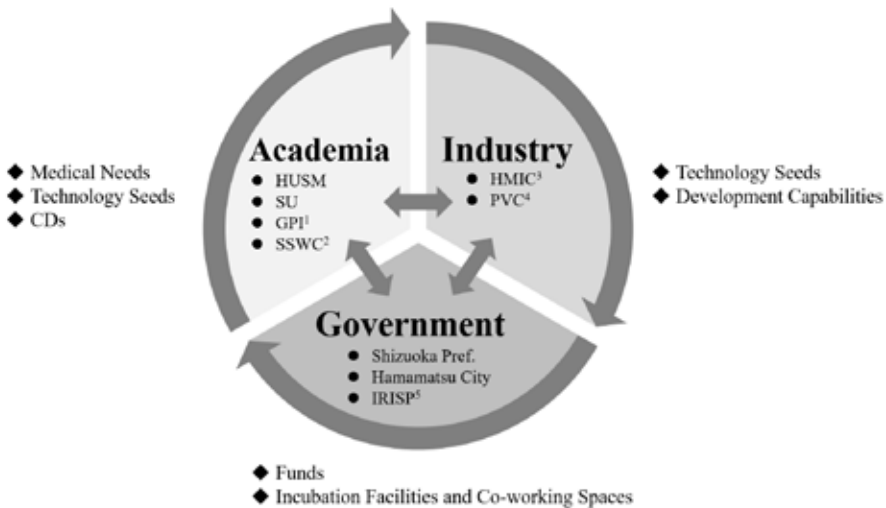


Figure 8.
Medical Device Cluster in the Hamamatsu Region

¹The Graduate School for the Creation of New Photonics Industries

²Seirei Social Welfare Community

³Hamamatsu Medical Industry Collaboration Collegium, Hamamatsu Chamber of Commerce and Industry

⁴Photon Valley Center, Hamamatsu Agency for Innovation

⁵Industrial Research Institute of Shizuoka Prefecture

Japan's regional industry clusters (Development Bank of Japan [DBJ], 2017a, 2017b; Kitajima, 2015, 2016, 2017) are established through government project funding and rely on their human resources and funding in 3–5 years when their funds finish (DBJ, 2013, 2017a, 2017b). However, the clusters' independence does not work because of the lack of understanding of the participating companies, universities, and hospitals' situation because clusters are established and operated under local government initiative. The cluster projects end before a good relationship between parties is built. Local government officials are transferred every 2–3 years. Thus, the secretariat is left with no knowledge. This stance is adopted because the participants do not have the initiative and reluctantly cooperate with the local government. The participants perceive that the cluster is free because of the government and municipalities' cluster. Moreover, they cannot perceive that they pay their dues after the government funding ends. Unlike Porter's (2008) definition of cluster, clusters include study groups that do not aim to commercialize and only learn about the medical device industry through seminars. Few major companies participate in the cluster and transferring the knowledge and expertise of corporate personnel to the outside is difficult. In many cases, specific companies' technology seeds are used as a starting point for development instead of being developed by the participants. Therefore, continuous operation of clusters in Japan is difficult. In this context, the cluster led by HUSM stands out as a distinctive feature and provides funding to HUSM because of its continuity and the creation of collaborations between industry, academia, and medical engineering in the field of optics and medical devices.

Medical and Assistive Device Development Cases in the Hamamatsu Region

The Hamamatsu cluster has produced 85 prototypes and launched 12 medical and assistive devices in the past eight years. These included a laryngeal stroboscope, oximeter, bite guard, and periosteum elevator, and assistive devices (Amano-Ito, 2020). RAs in the cluster operated in a unique method where medical doctors and healthcare workers in universities, hospitals, and nursing care facilities present their medical needs and ideas. The Hamamatsu Chamber of Commerce and Industry (HCCI) search for companies that are members of the Hamamatsu Medical-Industrial Cooperative Research Association (HMIC) that match their needs. Universities such as HUSM and others, Shizuoka Prefecture, Hamamatsu City, and local banks subsidize R&D and provide a place of open innovation. Furthermore, hospitals and nursing care facilities provide a place for clinical study and may also be the eventual purchasers. HCCI, together with universities, hospitals, and nursing care facilities, holds seminars about medical and assistive devices and hospital tours for HMIC members. HCCI also supports exhibits at trade shows when selling the products. The Hamamatsu regional cluster could respond immediately to the demand for devices and supplies necessary for controlling the COVID-19 infection (Amano & Makino, 2020; HCCI, 2020).

Other Funding Methods in HUSM

HUSM expects to increase revenues by increasing the indirect cost of research collaborations with companies from 10% to 30% of direct costs, starting in FY 2020. Unlike in the US, salaries, benefits, scholarships, and living expenses among others of researchers in Japan are paid from

indirect cost, not direct cost. The shortfall is covered by each university's operating subsidies. MEXT has issued a notice to raise university indirect cost and income. Big companies frequently complain about the increased ratio and reduce the direct cost.

Other funding methods include continuous acquisition of major government projects and raising funds, such as endowments, donations, and fundraising (crowdfunding). Before fundraising, a survey (unpublished) of the HUSM image was conducted on local companies and residents. The survey "contributed to community health care" and "provided high-level community service." They also approved the use of donations as "educational support to train the next generation of medical professionals." It is possible to fund such uses from local residents.

Universities within the same region could be consolidated to reduce costs and increase revenues. A new national university corporation could be established to manage multiple universities under an "umbrella system" (MEXT, 2019a). Small- and medium-sized universities are believed to be absorbed by large universities in the consolidation. However, this system would allow for rationalization and autonomy in each university.

HUSM and SU, located in HUSM's area, would establish the Shizuoka National University Organization in April 2021. HUSM's School of Medicine and Hospital and the faculty of engineering and informatics on SU's Hamamatsu campus would be integrated. Moreover, medical-engineering and regional cooperation would be further activated. The new university corporation would resolve social issues in cooperation with the region as a "hub of knowledge" for regional development. SU has been promoting a multi-faculty program, that is, the School of Regional Development, and working on regional revitalization in mountainous areas. Solutions to problems such as nursing care and depopulation of medical care in the future would increase because of the population's aging. The integration of universities is expected to bring in medical knowledge that would expand their activities.

HUSM is expected to enhance its effectiveness in education. The content of the general education course and the system for fostering communication skills as a doctor and paramedical worker would be enhanced. Combining SU's technological seeds with medical care would enable us to conduct novel research and explore new fields. However, the integration from SU has persistent opposition, and issues of how to make it converge exist.

Certain colleges also consider consolidating with other single colleges in other regions. For example, the Otaru University of Commerce, Obihiro University of Agriculture and Veterinary Medicine, and Kitami Institute of Technology would establish the Hokkaido United University Corporation in April 2022 to strengthen their education and research functions and thus meet society's needs and contribute to Hokkaido's economic and industrial development, as one of the regional cities. Moreover, the Nara Women's University and the Nara University of Education would establish an engineering joint education program to produce engineering personnel in Nara, one of the regional cities. Thus, Nara National University Corporation would be established in April 2022.

Acquiring Additional Funding across the Region and Future Directions

HUSM has social contribution programs, such as community medicine, public health, and community education. They also allocate research funds to outstanding proposals from university researchers, doctors, and paramedical workers. They hold experimental classes and public lectures for local citizens using awarded research funds. RAs also create an information sharing system with other RAs in the same region. By contrast, SU has launched the “project for promoting research through collaboration in biomedical engineering innovation research” to promote joint research with HUSM.

HUSM has a room and desk for RAs and staff at SU, local governments and regional banks, and vice versa. They are free to come and go with each other. When they hire an RA and staff, they educate and train each other. There are only two RAs in HUSM. It is short-staffed and there are no applicants for new hires. Therefore, RAs and staffs complement each other in the region. RAs in HUSM and SU connect medical researchers, doctors, and paramedical workers at HUSM with engineering and informatics researchers at SU.

RAs from each university list their researchers, and RAs from both universities visit them. They connect researchers with matching needs. They present their researchers to each other in a camp style. HUSM’s doctors and paramedical workers are matched with SU’s researchers when RAs do not search for companies that embody their medical needs and ideas or when the research is at an early stage. HUSM researchers and SU researchers hold joint research presentations, which can lead to joint research. The product has been successfully commercialized by students of the cooperative major in medical photonics co-founded by HUSM and SU in 2018, and as of 2020 they are working with the Graduate School for the Creation of New Photonics Industries (GPI) in the same region to collaborate, commercialize, and start a business.

No contract is signed in inter-university research collaborations, and researchers are often free to pursue their research. RAs make referrals for public research funding as needed and introduce a regional bank for research funding. When the research has progressed, RAs connect researchers to local companies. Then, HUSM’s doctors and paramedical workers collaborate with SU’s researchers and regional SMEs on the project. The entire region collaborates to obtain major public research funding. The seeds of research between HUSM and SU continue to emerge constantly and become the research project of the Hamamatsu regional cluster.

Conclusion

Operating subsidies to a national university corporation have been decreasing annually. Although a priority support quota has been established, this system favors general and urban universities and discards regional universities. In the case of the KAKENHI, regional single-department colleges have low application numbers and amount of money adopted. This finding indicates that they cannot receive any indirect costs. These universities are increasingly becoming unattractive because of a lack of facilities, human resources, and funding. Hence, HUSM collaborates with the local community with the keyword “light” to generate income from joint research and sales

of medical and assistive devices. Moreover, they also plan to merge with SU in the same region to reduce costs. The university's brand power is enhanced through unique initiatives.

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