

Nazarbayev University, Republic of Kazakhstan

Summary Report

Republic of Kazakhstan

Pilot Survey for Disseminating SME's Technologies for Technical Education System for Industrial Automation Technology

September, 2014

Japan International Cooperation Agency

Shinko Engineering Research Corp.

1. BACKGROUND

The Republic of Kazakhstan is a landlocked country in Central Asia, with a territory of 2.72 million km² and a population of 16.9 million. Kazakhstan attained independence from the Union of Soviet Socialist Republics in December, 1991. The government of Kazakhstan has established a centralized system by the strong leadership of President Nursultan Nazarbayev since the independence. From the 2000s onwards, Kazakhstan achieved the rapid economic growth led by the export of abundant natural resources. In 2011, Kazakhstan's nominal Gross Domestic Product (GDP) was US\$ 202.7 billion, and GDP per capita reached US\$ 11,983, which is the level of a middle income country. Kazakhstan is rich in natural resources including oil, coal, uranium, and many other minerals, drawing attention from all over the world. Meanwhile, it is a challenge for Kazakhstan to be less dependent on natural resources and diversify its economy for sustainable growth. The government of Kazakhstan has tried to promote the manufacturing industry and innovative technologies. Moreover, the government has given high priority to market-based economic growth in its national strategic plans such as *Kazakhstan-2030*¹ and the *Strategy of Industrial and Innovation Development for 2003–2015*.

From November 2012 to March 2013, in cooperation with the Ministry of Education and Science of Kazakhstan (hereinafter “MoES”), the team from Shinko Engineering Research Corp. (hereinafter “SERC”), an Industrial Automation Technology (hereinafter “IAT”) education system producer, and IC Net Limited conducted the project formulation survey to identify the needs for human resource development on IAT. The MoES is interested in introducing SERC's IAT technical education system to enhance the technical level of vocational education so that skilled human resources trained at vocational colleges can help modernize the manufacturing industry in Kazakhstan. As IAT has become one of the emergent needs of the manufacturing industry in order to increase competitiveness in cost, safety and quality of the products, SERC's technology and educational materials can contribute to developing human resources in an effective manner in enterprises as well as technical and vocational educational institutions.

2. OUTLINE OF THE PILOT SURVEY FOR DISSEMINATING SME'S TECHNOLOGIES

(1) Purpose

The main purpose of the survey is to examine the efficiency and effectiveness of the product provided by SERC on IAT technical education. The survey team will cooperate with Nazarbayev University and establish an Industrial Automation Technology Training Center (hereinafter “IAT Training Center”) at the university, and introduce SERC's IAT

¹http://www.akorda.kz/en/category/gos_programmi_razvitiya

technical education system named "Automation System Composer". At the IAT Training Center, the survey team will conduct a series of workshops for lecturers of the university to develop their teaching skills and accumulate knowledge on IAT, and show them how to maintain the system. The IAT Training Center will provide IAT training to selected university's students on terms to be determined, trainers in institutions for technical vocational education and training (hereinafter "TVET") and businessmen or technical staff of the manufacturing companies in Kazakhstan.

Another purpose of the survey is to improve the usability of the product provided by SERC. The survey team will collect information from observations during workshops at the IAT Training Center. Through this information, the survey team will improve the usability of the product to meet the needs of Kazakhstan's market.

(2) Activities

The following are the activities of the Pilot Survey:

a) Construction of the IAT Training structure

The survey team collaborated with Nazarbayev University as a counterpart and assisted to construct the IAT Training system at the University.

b) Installation of the IAT product and establishment of the IAT Training Center

Through discussions with Nazarbayev University, the survey team exported IAT product from Japan and installed it in the classroom of the School of Engineering. The IAT Training Center was established and opened in March 2014. In addition, the survey team developed the nine training materials such as equipment operation manual and textbooks.

c) Conducting workshops to the target group

The workshops were conducted as a cooperative task between Nazarbayev University and the survey team. The Department of Vocational and Technical Education of MoES and the National Agency for Technological Development (hereinafter "NATD") took part in the workshops with their own funds.

d) Promotion of the IAT Technical Education System to the related organization

The survey team implemented promotion activities of the IAT Technical Education System to the TVE institutions through some special programs such as opening and closing ceremony of the IAT workshops.

(3) Information of Product/ Technology to be Provided

The product information is as follows:

Name of the Product: Automation System Composer

SERC provides a comprehensive IAT technical education system consisting of IAT training product and the firm's original educational materials that enable integrated vocational education on both hardware and software. Automation System Composer is a unique system that makes it possible to learn a wide range of subjects in the industrial technology by simply assembling the modules on elements of IAT. It can construct automation production lines as a simulator of full factory automation lines and is a comprehensive practical learning system for all kinds of mechatronics technology. In addition, the system can be freely customized with over 200 different types of machinery modules. It is lightweight, compact, and perfectly suited for conducting on-the-spot training in mechanisms and controls. Chart 2-1 shows some of the modules developed by SERC. Chart 2-2 is a sample of the automation system by combination of the above modules.



Chart2-1: Automation System Composers modules



Chart 2-2: Sample of a Automation system by combination of the modules

(4) Counterpart Organization

Nazarbayev University is the counterpart organization of the present survey.

Nazarbayev University is an autonomous research university located in Astana, the national capital of Kazakhstan.

(5) Target Area and Beneficiaries

The target area is Nazarbayev University in Astana, Republic of Kazakhstan.

The main beneficiaries are teaching assistants and lab technicians of School of Engineering in Nazarbayev University, teachers in pilot vocational and technical colleges and staff selected by Ministry of Industrial and New Technology (hereinafter “MINT”).

(6) Duration

From July, 2013 to September, 2014

(7) Progress Schedule

The schedule of the survey is shown in below Table 2-1 and Table 2-12 shows workshop contents of each IAT workshop.

Table 2-1: Implementation Schedule

Activity	Term		2013										2014								
	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9					
Construction of IAT Training structure			■	■	■	■	■	■	■	■	■	■									
Installation of IAT product and establishment of IAT Training Center			■	■	■	■	■	■	■	■	■										
Conducting workshops to the target group part1											■	■	■	■							
Conducting workshops to the target group part2											■										
Promotion of IAT Education System to related organization				■			■				■	■	■	■	■						
Closing and Report Writing													■	■			■				

Index in Kazakhstan: ■ Voluntary in Japan: ■ in Japan: □

Table 2-2: IAT workshops

No	Lecturer's Name	Duration	Contents
1-1	Mr.Hideki Kumagai Mr.Naoto Mizoguchi	6 th Mar. 2014~ 14 th Mar. 2014	Introductory Workshop and Exercise (How to use Training Equipment and Basic Exercise of Operation Units)
1-2	Mr.Hideki Kuamgai Mr. Naoto Mizoguchi	17 th Mar. 2014~ 19 th Mar. 2014	Sequence Control (PLC Wiring, Program and Simple Control)
2	Mr.HiroshiYoshikawa	27 th Mar. 2014~ 4 th Apr. 2014	Automation Technology (History, Safety and Risk Assessment and Element of Automation System.)
3-1	Mr.Hideki Kumagai Mr. Naoto Mizoguchi	17 th Apr. 2014~ 29 th Apr. 2014	Mechatronics and Automation Line (Industrial Robot, Mechatronics Technology and Automation Line Technology)
	Mr.Hiroshi Mizuno	12 th May. 2014~ 13 th May 2014	Maintenance for the equipment
4-1	Mr. Hiroshi Mizuno	14 th Apr. 2014~ 16 th Apr. 2014	Machine Design (How to Design Automation Machine)
4-2	Mr. Hiroshi Mizuno	17 th Apr. 2014~ 21 st Apr. 2014	Machine Design Exercise (Exercise of Mechanical Design of Automation System)
5	Mr.Hideki Kumagai	22 th May. 014~ 28 th May. 2014	Automation System Integration Technology (Automation System Configuration and Control)

(8) Manning Schedule

The following are the survey team members and its assignment schedule.

Table 2-3: Manning Schedule

Name	Position	Company	Term
Mr. Hideki Kumagai	Project manager / IAT lecturer 1	SERC	26 Jul. 2013 ~ 7 Aug. 2013
			28 Feb. 2014 ~ 20 Mar. 2014
			15 Apr. 2014 ~ 30 Apr. 2014
			16 May. 2014 ~ 20 May. 2014
			24 May. 2014 ~ 31 May. 2014
			2 Jul. 2014 ~ 6 Jul. 2014

Mr. Takahiro Arimoto	IAT lecturer 2	SERC	16 Feb. 2014 ~ 26 Feb. 2014
Mr. Hiroshi Mizuno	IAT lecturer 3	SERC	9 May. 2014 ~ 24 May. 2014
Mr. Takujiro Ito	Chief Adviser / Dissemination planning	IC Net Ltd.	19 Jul. 2013 ~ 7 Aug. 2013
			17 Jan. 2014 ~ 29 Jan. 2014
			13 May. 2014 ~ 31 May. 2014
Mr. Kohei Hatta	Coordinator / Dissemination Activity	IC Net Ltd.	19 Jul. 2013 ~ 17 Aug. 2013
			22 Nov. 2013 ~ 21 Dec. 2013
			7 Jan. 2014 ~ 29 Jan. 2014
			24 Feb. 2014 ~ 20 Mar. 2014
			24 Mar. 2014 ~ 5 Apr. 2014
			9 May. 2014 ~ 28 May. 2014
Mr. Hiroshi Yoshikawa	IAT lecturer 4	Yoshikawa Professional Engineer Office	24 Mar. 2014 ~ 5 Apr. 2014
Mr. Naoto Mizoguchi	IAT lecturer 5	SERC	28 Feb. 2014 ~ 20 Mar. 2014
Mr. Shuichi Sugimura	IAT lecturer 6	SERC	24 Feb. 2014 ~ 6 Mar. 2014
			15 Apr. 2014 ~ 30 Apr. 2014

(9) Implementation Structure

The implementation structures of the survey are shown in below charts. In Japanese side, the Operation for Supporting Japanese SMEs Division, Domestic Strategy and Partnership Department of JICA Headquarters gave directions of the survey, and necessary guidance and assistance. JICA Kazakhstan liaison office cooperated with the Headquarter to proceed with the survey smoothly and supported the survey team in Kazakhstan.

SERC was the main implementer and the survey team consisted of Yoshikawa Professional Engineering Office (Automation Engineer), IC Net Limited (Project coordination technical service), Sumitomo Corporation (Central Eurasia) LLC (Local Consultant), and Senko Co. Ltd. (Logistics). Chart 2-3 shows the Japanese side structure.

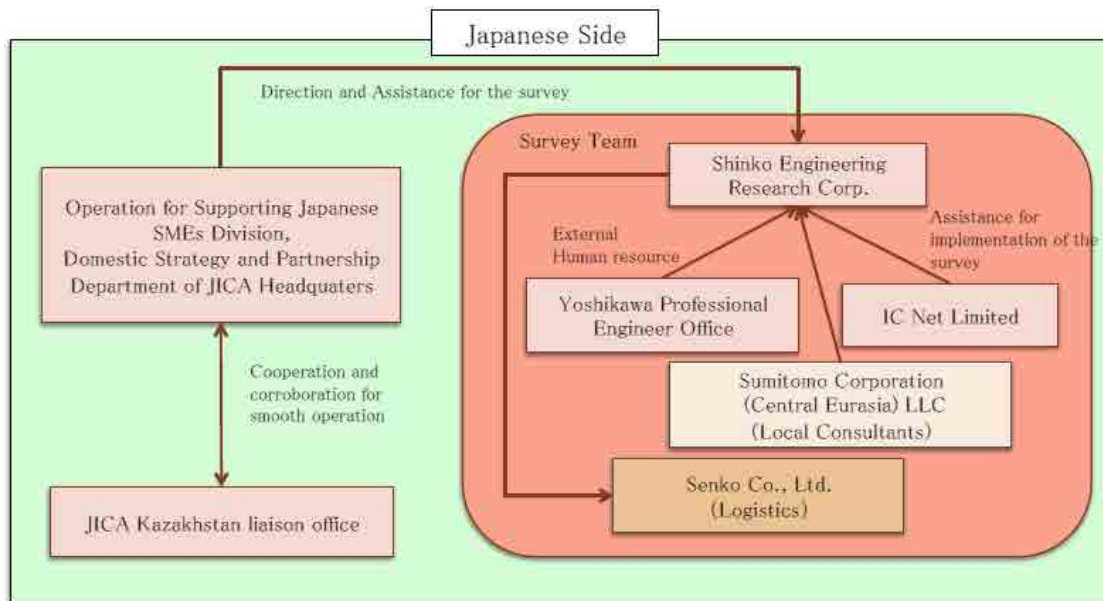


Chart2-3: Implementation system in Japan side

Nazarbayev University was the main counterpart of the survey and teaching assistants and lab technicians of the School of Engineering in the University participated to the workshops. They are expected to conduct IAT workshops at the University as IAT trainers. Nazarbayev University Research and Innovation System (hereinafter “NURIS”) provided technical supports to pass customs and import the product provided by the survey team. The University and NURIS keep the laboratory space and take in charge of maintenance and administration of the equipment with collaboration. MoES sent participants from pilot vocational and technical colleges, which were selected for the IAT pilot program implementation institutions. MINT also sent some participants to the workshops from NATD. NATD coordinated with Private Manufactories to let concerned personnel attend the workshops. Kasipkor was recently set under the umbrella of Nazarbayev University. This organization operates some vocational and technical colleges and has the plan to establish new TVE colleges. Chart 2-4 shows the implementation structure of the Kazakhstan side.

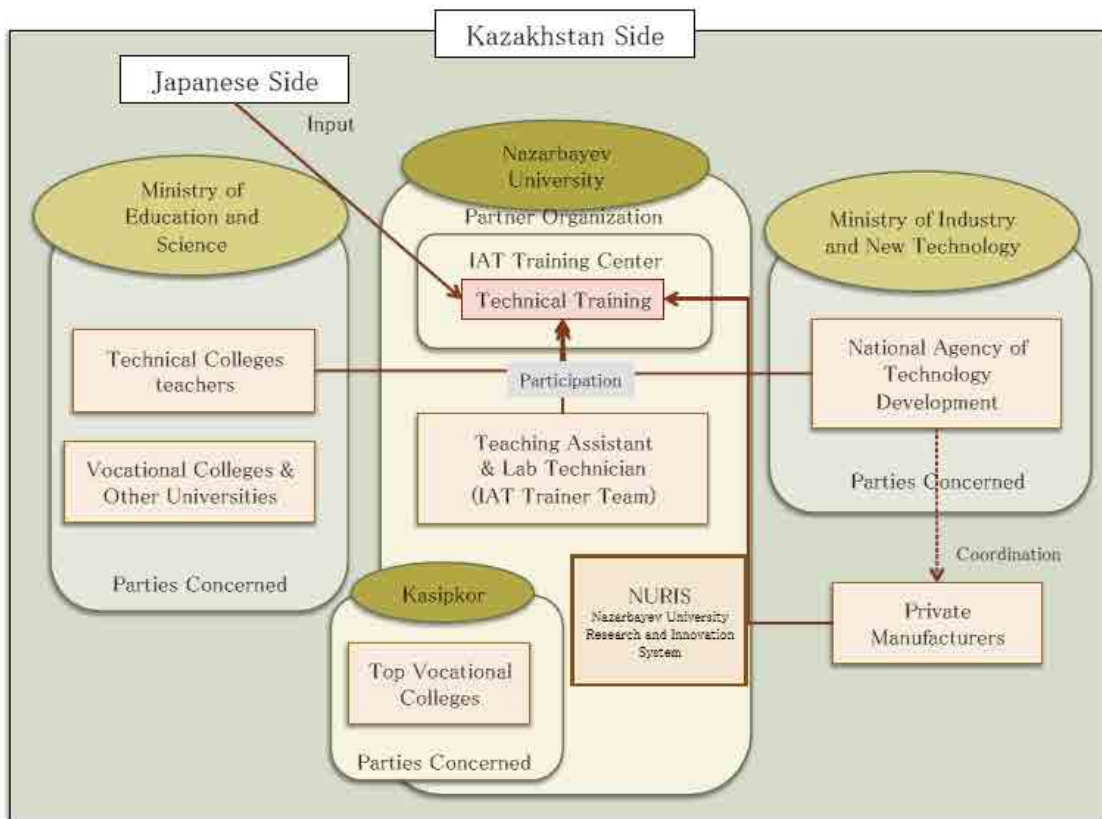


Chart2-4: Implementation system in Kazakhstan side

3. ACHIEVEMENT OF THE SURVEY

(1) Outputs and Outcomes of the Survey

The following are the most relevant outputs and outcomes of the survey:

- a. The IAT laboratory was established in Nazarbayev University, and made enable to conduct a practical workshop for participants, such as students, engineers and staff of commercial companies etc. on the basic of IAT.
- b. Staff of Nazarbayev University and NATD, and teachers of TVET institutions were trained. The University can continue to provide the basic workshop on IAT.
- c. IAT Basic Training program was developed and adapted to the Kazakhstan trainees. Also IAT Product operation manual was developed in English and Russian language.
- d. Through the demonstration of the IAT during the opening and closing ceremony at Nazarbayev University, the survey team could promote the “Automation System Composer” developed by SERC and provided the clearer image of what IAT is, how to conduct a practical training, and what the necessary product and environment for the training are. The related authorities and administrators of the technical human resource development, such as MINT, NATD, MoES, Kasipkor etc., got a better understanding

of the importance of IAT and training on the field.

- e. The HS code of the SERC's product, Automation System Composer, was obtained and the process for the import of the IAT equipment was clarified. This will be a good precedent for smooth import process of the equipment in the future.

(2) Self-reliant and Continual Activities to be Conducted by Counterpart Organization

The Nazarbayev University is preparing to incorporate IAT Training Center into the current program of the School of Engineering from the new academic year, which is starting from September 2014. For that purpose, 3 staff members of the School of Engineering attended a training tour in Japan during August 2014 at the expenses of the University and NURIS. The IAT Training Center is managed and maintained by NURIS, and a lab technician is assigned to be responsible for maintenance and utilization of the IAT Training Center and the product.

For the training of the engineers and trainers from other institutions, the University is considering having a lecture including the IAT workshop to engineers in the private sector and NATD related personnel at the IAT Training Center. For that purpose, the University is considering the possibility to transfer the IAT Training Center to the Science Park in the University, which is being established to conduct joint research and development activities with the private companies.

In addition, recently Kasipkor went under the umbrella of Nazarbayev University. This means that Nazarbayev University will provide leadership on Kasipkor in terms of administration of the colleges under the University and in order to make those colleges highest quality in Kazakhstan. To achieve this goal, the IAT Training Center will be used to educate and provide high quality educators in this field.

4. FUTURE PROSPECTS

(1) Impact and Effect on the Concerned Development Issues through Business

Development of the Product / Technology in Kazakhstan

There are impact and effect on the concerned development through business development of the product in Kazakhstan.

- a. As a result of the survey activities, the Nazarbayev University became capable of conducting practical training on Basic Industrial Automation Technology for the students of the School of Engineering, School of Science and Technology as well as other special training for outside engineers from the private sector and teachers from vocational and professional education institutions.

b. As a result of the promotion activities throughout the survey, the awareness on the need of IAT education systems was raised, and several vocational and professional education institutions in Kazakhstan presented their interests on the introduction of the "Automation System Composer" into their training program. The following are the institutions which presented their interest in purchasing the product developed by SERC.

- ***Ministry of Education and Science (MoES):***

There are four Technical and Vocational colleges selected by MoES as pilot colleges for introducing the IAT and participated in IAT training in Turkey during 2012 to 2014. Trainers from those colleges also were invited to the workshops at Nazarbayev University and they are proceeding to get permission to open a new course for IAT and purchase necessary product. MoES is planning to extend the experience and knowhow obtained in this field at the pilot colleges to other colleges.

- ***Kasipkor:***

Kasipkor is a holding organization created by the government of Kazakhstan in September 2011. The mission of Kasipkor is to prepare high class professionals for innovative development of Kazakhstan, and has two objectives, (1) to create and develop the new TVET infrastructure – network of the best colleges in Kazakhstan, and (2) to transfer the best experience and practices to the human resource development system in Kazakhstan. In 2014, Kasipkor was transferred under the administration of Nazarbayev University. Kasipkor is planning to start two World-Class colleges² and four interregional centers, then transfer to all regions through 10 partner colleges. The two World-Class colleges will be established in Astana and Almaty and those colleges are programmed to create School of Engineering. Kasipkor has presented their interest on introducing Industrial Automation Technology in the college's program.

- ***Ministry of Industry and New Technology (MINT)***

MINT is establishing eight Techno-parks all over the country under the administration of NATD. MINT presented their interests to establish an IAT training center in Alatau Technopark in Almaty and signed an MOU with SERC for technical support on IAT.

² These colleges are expected to provide professionals who can work in the global market and make a model for other TVET institutions.

(2) Lessons Learned and Recommendation through the Survey

The survey was concluded successfully by the support of Nazarbayev University, MINT and MoES. There are some issues to be considered for the future which are:

a. ***To accumulate practical knowledge and skills in the staff at Nazarbayev University.***

Although the IAT training was successful and some fundament for the IAT training at Nazarbayev University was established, the time spent for the technical transfer and the inputs of the survey was not enough to develop the professional skills of the participants. It is recommended to the Nazarbayev University to continue trainings of the participants, such as a field visit to Japanese factories, which are using factory automation system, as well as technical education institutions, which are conducting the IAT education. This will be very helpful for the staff to obtain clearer vision of what is the goal of the IAT training and how to conduct effective education.

b. ***To develop the automation system designers***

Most of the conventional training on IAT focused on operation of the specific product such as programing of PLC, operation of the motors, sensors, mechanism, etc. The IAT seminar focused to train participants by the organized and systematic learning way from the basic component to integrated automation technology, which could apply to any automation system without depending on a specific brand or machine. Also the IAT workshops include modules on 6 days automation machined designing workshop.

To enable the factory automation in Kazakhstan, it is necessary to develop human resource that is not only capable for operating automation lines but also for designing the factory automation system. For that, it is important to set some long-term strategies for developing technical staff of the university, such as long-term training or graduate program abroad.

5. ATTACHMENT: OUTLINE OF THE SURVEY (Attachment 1)

THE PILOT SURVEY FOR DISSEMINATING SME'S TECHNOLOGIES FOR TECHNICAL EDUCATION SYSTEM FOR INDUSTRIAL AUTOMATION TECHNOLOGY OF REPUBLIC KAZAKHSTAN

Outline of the Survey

- Proposed by : Shinko Engineering Research Corp., Setagaya-ku, Tokyo, Japan
- Counterpart Organization : Nazarbayev University, Republic of Kazakhstan.
- Target area and Beneficiaries : Nazarbayev University, Republic of Kazakhstan, Teaching Assistants, Lab Technicians
- Duration : From July, 2013 To September, 2014

● Concerned Development Issues in Kazakhstan ●

- Promotion of manufacturing industry
In the Strategy of industry and technical innovation from 2003 to 2015, the government addressed that the diversification of economy is the national goal. To achieve it, the modernization of industry is the key and IAT is being promoted. However it is difficult to educate people in this area as there is no human resources to teach it.
- Modernization of industries and improvement of quality and productivity
In Productivity 2020, the long term strategy of country development, modernization of industrial fields, improvement of quality and increase of productivity are important issues in Kazakhstan

match

● Proposed Products / Technologies ●

- Education system for Industrial Automation Technology : MM3000V Series
- Unique module system that allows flexibility and high performance to build up system and simulate by student's idea
 - Offer high quality and integrated technical education on Industrial Automation both with hardware and software
 - Used as teaching equipment for practical lessons of automatizing machine in polytechnic colleges, technical high school and over 70% of vocational high schools and colleges in Japan standard material for IAT

Implemented Activities in the Survey

- Installing Shinko's products education system in Nazarbayev University and establishing Industrial Automation Technology Training Center
- Conducting trainer's training workshop for University staff, who will be future lecturers of IAT workshop for stakeholders in outside of University
- Exploring effectiveness and suitability of the products and training contents
- Promoting the products among vocational colleges, other universities and commercial enterprises in Kazakhstan

Outputs and Outcomes of the Survey

- OUTPUT : Establishment of IAT Training Center, 41 days IAT workshop, 18 Certificated participants, 9 text materials for IAT workshop
- OUTCOMES : IAT education system has emerged and wide range stakeholders are aware of importance of IAT training.

Impact on the Concerned Development Issues in Kazakhstan

- Human resource development in the IAT field in Mid-term range and creation of SME in manufacturing
- Improvement of technical skill of staff in enterprises based on corporate in-service training in short term range

