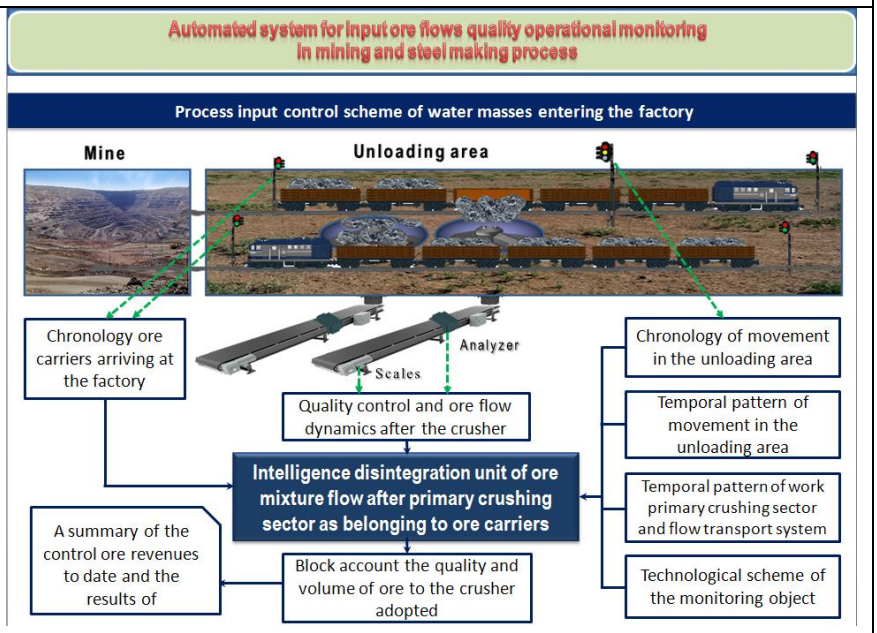
TECHNOLOGY COMMERCIALIZATION STRATEGY

1. Project Passport

Organization:	Limited Liability Partnership LLP "TST-16"
Project Leader:	Tukeyev Ualsher
Group:	№ APP-SSG-16/0330P
Project Name:	Automated on-line monitoring system of incoming ore flows for mining and processing plants
Short informal name of the project:	AS OMKKR
Illustration:	
Priority area:	IT Technologies in the mining and processing complex
Amount of grant:	195 000 000 tenge
Address for correspondence:	050000, RK, Almaty, Amangeldy street, 40/112
Email:	tst16a@gmail.com
Contact details:	+77272796185
Company web site:	
Full name and contact details of Commerciali-zation specialist:	Axelrod Valeriy Yuriyevich +77272796185

2. Analysis of technology readiness to commercialization

Prerequisite and unfilled need:	For the effective operation of mining and processing enterprises, it is important to have up-to-date information on the characteristics of ores entering the processing. The technologies of controlling the qualitative and quantitative characteristics of the input ore-streams that work today have insufficient efficiency and accuracy, which leads to significant, unjustified and irretrievable losses of mining and processing enterprises (GOK). Moreover, there are no objective information conditions for reducing such costs, since from the moment of "testing" to the moment of obtaining analytical control results there is a long time (several hours) when management decisions made on this information basis are at least useless, and sometimes simply harmful. For the same reasons, the objectivity of taking managerial and dispatch decisions by the main production and dispatch service of the GOK in order to adjust the volumes of ore supplies from the mines is reduced. In addition, it is practically impossible to obtain an objective information basis for the cost-effective interaction of mining and processing operations, without which it is impossible to effectively manage the mining and processing enterprise as a whole. Considering the importance of stable and rhythmic work of mining and metallurgical enterprises for the economy of the state, evident the demand and importance of the problem under consideration for both domestic and foreign mining and processing enterprises
Brief technology description:	The technology is based on an original heuristic technique for processing temporal and chronological information on the technological processes of the supply and reception of ore to the concentrating mill The essence of the proposed technology for operational monitoring of the characteristics of the input ore flows of crushing compartment of mining and processing enterprises is as follows: • By the chronology of the arrival processes of wagons with ore from mines to the ore preparation complex, the chronology of their unloading, taking into account information about the situation in the unloading zone (crusher operation and the degree of their loading), as well as taking into account the volumetric weight and quality characteristics of the processed ore after a large crushing, are restored, with a high degree of efficiency and accuracy, the characteristics of the input ore flows. In other words, real-time analytical control of the processed ore after a major crushing is carried out by forming its information model, which is segmented over the temporal information about the chronological characteristics of ore transport in the unloading zone, on the basis of which only and possibly, the actual recovery of adequate input characteristics of ore. • On the basis of the restored characteristics of the input ore flows and the timetables for the movement of ore transport, operative estimates of the characteristics of the ore masses are computed, which is fed to the PF by on multithreaded scheme from different mines.

Functional purpose of technology:	This system allows the operative accounting of the volume and quality of ore flows from quarries, on the basis of which the required technological regimes for their processing are determined and the share of the mine's profitability in the final product of the ore enrichment process is calculated.
Technology application:	The sphere of application of the technology of operational monitoring of the characteristics of the inlet ore flows encompasses information-analytical and production-dispatching automated real-time systems for enterprises mining and processing of mineral raw materials Such systems of production control and quality management of finished products are a necessary service basis for the effective positioning of such enterprises in the market of raw materials for metallurgy. First of all, the effect from the introduction of such a system improves coordination and improves the rhythm of the work of the main processing facilities of the GOK, which allows us to make adequate management decisions at operational changes in the types and quality of ore processed.
Features and advantages of technology:	**Features** 1. The technology is initially focused on providing the target functionality of the input control in real time, which is achieved by solving the inverse problem of the logical disintegration of the temporal model of the ore flow after a major crushing, taking into account information on the dynamics of positioning and unloading transport units with ore into the hoppers of the large crushing unit **2.** Objectivity of the assessment of qualitative and quantitative characteristics of ore flows is achieved through measurements in one control point and using a single software and hardware complex. **Advantages** 1. The time for determining the quality of ores from mines is reduced: traditional two or three days are reduced to real time, i.e. To the rate of the technological process. 2. Operational management of the mine - crushing - enrichment processing chain is ensured. 3. A real informational basis is created for objective self-supporting relationships between the mining and beneficiation
Innovative aspects of technology:	1. This technology is innovative. This is confirmed by the fact of granting patents on it from the competent authorized state bodies. 2. This technology is unique, because: • direct analogs by the method of control and design in the form of an automated system for operational monitoring of the characteristics of input ore flows are not available. • This technology provides a high level of efficiency and objectivity in assessing the qualitative and quantitative characteristics of ore flows at comparable indicators of accuracy and reliability of operation in real time mode of today's technologies due to measurements at one control point and using a single software and hardware.

Level of technology:	By the level of novelty and laid down basic scientific foundations, the proposed technology can only be referred to a conceptually new technology with limitations, since its individual functional elements are borrowed from other technologies of a similar purpose.. In this regard, it should be noted: 1. The proposed approach to the creation of an automated system for the operational monitoring of the characteristics of the input ore flows of mining and processing enterprises is based on the market's need for lowering the costs of ore processing. *2.* The proposed technical solutions complement the existing basic methods of controlling the characteristics of ores entering the processing, which makes it possible to improve the efficiency and accuracy of raw material estimates and the efficiency of its processing.
Technology development stage:	At the time of the commencement of the grant work, the development of the technology for the operational monitoring of the characteristics of the input ore flows for a multithreaded scheme for the reception of ore masses for the ore-processing complex was completed up to the stage of research and substantiation of the concept of an industrial system. Within the framework of the grant, it is expected to further deepen the stages of technology development, namely: Designing, creating an industrial prototype, pilot-industrial tests completed with the introduction (at the enterprise-customer technology) and commercial sales of commercialization products of technology.
Matters of state regulation/regulatory and other obstacles	Successful work on the Grant is hampered by the inconsistency of the laws of the Republic of Kazakhstan at the labor and tax codes, to the regulations of the World Bank. In particular, on the one hand, the source of grant funding, in fact, is the budget. On the other hand, in order to open Grant financing, according to the requirements of the science committee, it is necessary to create a new legal entity in the form of a Limited Liability Partnership (LLP). It is clear that the LLP is required to comply, for example, the following provisions of the said codes: 1. Provide paid annual leave to the employees of the LLP. 2. Maintain tax reporting in accordance with the accrual basis. (A cash method is required for the grant) and so on. Nevertheless, the Grant Agreement either does not allow these provisions in categorical form or does not provide for. In addition, the unprecedented number of requirements and rules of doing business for a legal entity in the form of a Limited Liability Partnership, as well as an exceptionally slow procedure for obtaining permits for deviations from them in a particular situation, are obstacles to successful implementation of the grant work and effective functioning in the market. The market of innovative products by definition is poorly predictable. In most cases, it needs to be formed and maintained, therefore the solution of the above problems is very relevant both for the success of the project "Stimulation of productive innovations" in general, and the subproject "Automated on-line monitoring system of incoming ore flows for mining and processing plants", in particular.

	For TST-16 LLP, the strategy for overcoming the above-mentioned problems is based on measures to optimize the procedures and schemes for technical and financial interaction with government agencies, business entities involved in the work, and investors (business partners) involved in co-financing the grant work.

3. Market overview, customers and competitors

Total market size	The products and services that to be created in the subproject are oriented to the market of systems and technologies for industrial automation and informatization of mining and processing and mining and metallurgical enterprises of the Republic of Kazakhstan and neighboring countries. In the RK, it is more than a dozen companies: KAZ Minerals PLC, ENRC, KazzincHoldings, ArcelorMittal, etc., including enterprises: Zhezkazgan and Balkhash concentrating plants; JSC SSGPO, JSC "Zhayremsky GOK"; Zyryanovsky GOK and others. Of interest from the neighboring countries is the market of mining and processing and mining and metallurgical enterprises of the Russian Federation. These are several dozen companies: OJSC Norilsk Nickel, EVRAZ, Mining and Metallurgical Holding Mechel, METALLOINVEST Company, and others. The experience of creating industrial automation systems at mining enterprises of the Republic of Kazakhstan, interaction with leading Russian scientists and specialists in this field show that the problems of prompt, reliable and timely assessment of the characteristics of processed ores entering the input of mining and processing enterprises and mining and metallurgical enterprises are still unresolved also For RF objects. When assessing the market for external potential consumers (RF), it is advisable to take into account the orientation of the Russian market to its own Russian producers of services for the creation of industrial automation systems and the need to connect Russian business partners to present our services on the Russian market. These reasons, in our opinion, will reduce the availability of the market to 50% and lead to a reduction in the cost of the team's services to create a system of operative monitoring of the characteristics of input ore-flows for external consumers by ~ 20%. The strategy of commercialization of the results of the subproject is aimed at fulfilling under contracts with potential buyers the products of the commercialization of the subproject services for the development and implementation of automated systems for the operational monitoring of the quality of incoming ore-bearing flows of mining and metallurgical production and the transfer of technology to the production of automated systems on the basis of a license agreement. Given the crisis processes in the economies of Kazakhstan and the CIS countries, in our opinion, it is advisable to expand the opportunities for commercialization of the results of the subproject, considering each of the above components as a product of possible commercialization for potential customers. In this case, each of the services included in the cost of the contract for the creation of an automated system for the operational monitoring of the characteristics of input ore flows of mining and

	processing enterprises will include: - Services for the development of techno-working documentation for an automated on-line monitoring system of incoming ore flows for mining and processing plants - 20,000.0 thousand tenge; - completion of the system hardware-software platform of the automated system for the operational monitoring of the characteristics of the input ore flows at mining processing enterprises. The price of this service is formed when developing the techno-working documentation in the budget documentation of the AU, depends on the technological structure of the automated facility and on average is about 70,000.0 thousand tenge; - Installation and commissioning works and the introduction of an automated system for the operational monitoring of the characteristics of input ore flows at mining processing enterprises into effect - 20,000.0 thousand tenge. When technology is transferred to the production of an automated system on the basis of a license agreement, the product of commercialization is the "License Agreement" for the use of intellectual property objects, which involves the transfer by the Licensor (patent holder of patents of the RK and the RF protecting intellectual property developed within the subproject technology) of the temporary non-exclusive right to use patents Licensee (potential buyer of the results of the subproject). The cost and terms of the license agreement will be determined individually for each potential buyer of the results of the subproject. The potential market for the results of subproject work amounts to KZT500,000,000, of which the expected target share for the implementation of the subproject is 25%, i.e. Sale is expected for the amount of 125000000 tenge.
Market growth dynamics:	3-4 years ago, the size of the automation equipment market for ore mining and processing enterprises was 5-10% less than today's, which is due to the economic condition of ore-processing enterprises and the influence of political processes on the formation of the metal market in Kazakhstan and neighboring countries. It is assumed that in the coming years the affordable market for automation equipment for ore mining and processing enterprises will stabilize.
Potential client profile:	Currently, in the current crisis situation, typical for the economies of the RK and the RF, and therefore for the distribution markets of the results of the subproject, the mining processing company that demonstrated interest in the product being created - "automated on-line monitoring system of incoming ore flows for mining and processing plants", The largest mining and processing company of the Republic of Kazakhstan is JSC SSGPO, a member of the Eurasian Group ERG. This company is a potential buyer of the results of work on the subproject.
Trends in the industry:	As noted above, the market for industrial automation of mining enterprises is affected by many factors, including political aspects. Over the past few years, political events in various parts of the world have adversely affected the market as a whole (Ukraine, Syria, the EU, the Crimea).

Competition environment:	According to our information, there is no analogue of the automated on-line monitoring system for the characteristics of the input ore flows in a multithreaded scheme for the receipt of ore for ore preparation among the operating facilities. The functions of controlling the characteristics of the input ore flows at the ore preparation and enrichment plants of functioning mining enterprises are realized through the use of ore control stations, conveyor analyzers within the framework of automated process control systems. These systems implement typical functions for monitoring technological parameters, including estimates of the weight of incoming ore at the input conveyor of the ore preparation department, what evaluated either with elemental analysis or on the basis of laboratory analysis of the content of useful components in the ore. Existing input control systems of quality of ores do not allow real-time, measurement of ore quality in a multi-flow scheme of ore receipt for enrichment.
Competitive advantage on the market:	1. The time for determining the quality of ores from mines is reduced: traditional two or three days are reduced to real time, i.e. up to the rate of the technological process. 2. Operational management of the mine - crushing - enrichment processing chain is ensured. 3. A real informational basis is created for objective self-supporting relationships between the mining and beneficiation
Availability of confirmed demand:	There is an agreement (memorandum) between the business partner of TST-16 LLP - Systemotechnika LLP and the customer of the technology of SSGPO JSC about the industrial approbation of the results of the subproject at the technological plant of the SSGPO's ore preparation complex and the possibility of industrial introduction of the System in the framework of the investment program of SSGPO. Based on the results of the industrial introduction of the automated system and the analysis of its functioning, high technical and economic characteristics of the results of the subproject will be confirmed and presented to potential buyers of the results of the work.
Other important information	In connection with the depletion of the ore base and a stable tendency to depletion of ore reserves, deterioration of mining and technical conditions at the operating mines of the RK and RF, the demand for the expected results of the subproject will only increase with time.

3.1 Potential partners and clients

- Business partner for the development and distribution of products created in the subproject is Systemotechnika LLP, which has many years of practice in the field of industrial automation of mining and processing enterprises. The business partner has transferred the right to use the results of earlier performed research, intellectual property products on the subject of the subproject to the executor of works on the grant subproject, owned by a business partner; Provides its co-financing and advertises the results of works to potential buyers of products created within the framework of the subproject.
- Discussions of the proposed technology with potential clients in the RK are con-

ducted jointly by the sub-project executors and the business partner. For potential customers, the results of industrial testing of the prototype of the automated system of operative monitoring of the input ore flows of the mining and processing enterprise and analysis of its functioning are of considerable interest.

Clients

Organization name	JSC "Sokolovsko-Sorbayskoe ore mining and processing enterprise" (JSC "SSGPO")
Email	http://ssgpo.chat.ru/, sergey.valov@erg.kz
Address	RK, 11500, Rudny, Lenin Street, 26
Phone/fax	8(71431)2-89-16
Description of activities	Enrichment of iron ore, obtaining of iron ore concentrate
Expected volume of marketed products	30 000,0 thousand tenge

Organization name	Kazakhmys Corporation LLP, Balkhashtsvetmet Production Association
Email	
Address	100300, Balkhash, Lenin Street, 1
Phone/fax	87103648576 87103648576
Description of activities	The entire cycle of processing copper ore up to the production of cathode copper
Expected volume of marketed products	10 000,0 thousand tenge

Organization name	Kazakhmys Corporation LLP, Enrichment Plant 1,2 in Zhezkazgan
Email	
Address	Kazakhstan, Karaganda region, Zhezkazgan (Dzhezkazgan), Metallurgov street, 1
Phone/fax	+7 (7102)74-11-85 +7 (7102)74-82-70
Description of activities	Mining and enrichment production
Expected volume of marketed products	It will be refined based on the results of industrial implementation and analysis of the functioning of the prototype system

Organization name	Stoilensky Ore Mining and Processing Plant
Email	http://www.sgok.ru/ info@sgok.ru
Address	South-western industrial area, playground Factory, travel-4, Stary Oskol, 309505
Phone/fax	+7 (4725) 449418 +7 (4725) 449562 — факс
Description of activities	Mining and enrichment production
Expected volume of marketed products	It will be refined based on the results of industrial implementation and analysis of the functioning of the prototype system

Organization name	Kachkanarsky ore mining and processing enterprise
Email	http://rus.evraz.com/ kgok@evraz.com
Address	Sverdlov Str., 2, Sverdlovsk Region, Kachkanar, Russia
Phone/fax	+7 (34341) 64664 +7 (34341) 64171
Description of activities	Mining industry → Mining and concentration plants in Kachkanar
Expected volume of marketed products	It will be refined based on the results of industrial implementation and analysis of the functioning of the prototype system

Organization name	LISAKOVSKI MINING AND CONCENTRATION MILL
Email	http://www.home.igok.kst.kz
Address	459300, Kazakhstan, Kostanay region, Lisakovsk, 1 microdistrict.,18
Phone/fax	(31433) 2-23-12, 2-23-13, 2-23-36, 2-23-64, 2-23-65
Description of activities	Metallurgical industry. Iron ore concentrate
Expected volume of marketed products	It will be refined based on the results of industrial implementation and analysis of the functioning of the prototype system

Partners

Organization name	Systemotechnika LLP
Email	www.syst.kzsyst215@gmail.com
Address	RK, 050000, Almaty, Amangeldy street, 40/112
Phone/fax	8(727)279-61-12
Description of activities	Information and automated systems
Essence of partnership	Commercialization of research results

Industry associations and public unions - will be clarified

Organization name	
Email	
Address	
Phone/fax	
Description of activities	
Essence of cooperation	

Industrial events - will be clarified

(pleasespecify sectoral exhibitions and other events for finding partners and customers; minimum 5 in tabular form)

Nameoftheevent	
Venue	
Description	

3.2 Competitors and comparative analysis

Competitors

Organization name	TECHNOROS LLC Full name: Limited Liability Company "RADIOMETRIC SORTING TECHNOLOGY"
Email	e-mail: technoros@kras.ru

Address	RUSSIA, Krasnoyarsk, ul. TV, 1, building 7. Address for correspondence: RUSSIA, 660041, Krasnoyarsk-41, PO Box 12151.
Phone/fax	(391) 243-44-33, 258-11-67. Факс (391) 290-00-15.
Description of activities	Development and introduction of Quality Control Systems for ores and X-Ray Radiometric Separation
Product cost per unit	It is determined individually for each object. 18 implementations at non-ferrous metallurgy and gold mining enterprises.
Estimated market share	

Organization name	OOO Uraludoavtomatika, Limited company "INNOVATIVE AND PRODUCTION ENTERPRISE" URALRUDOAVTOMATIKA "
Email	Not published
Address	620078, Sverdlovsk Region, Yekaterinburg, Comintern Street, 20/17, 54
Phone/fax	8 (343) 374-84-15 fax: 374-33-81
Description of activities	Tests and analysis of physical and mechanical properties of materials and substances. Installation of industrial machines and equipment Scientific researches and developments in the field of natural and technical sciences
Product cost per unit	It is determined individually for each object.
Estimated market share	

The main advantages of our technology with regard to competitors on a variety of factors, including the price in a tabular form:

№	Company name	Type of equipment	Purpose of the equipment	Installation location	Performance Indicators	Price
1	Uraludoavtomatika LLC	device	Determination of the content of one useful component in the ore on the conveyor without determining the source (mine)	On the conveyor conveyor of ore to the warehouse or loading into wagons or dump trucks	If there ore entering are several sources the factory, it is required to install several devices and create a data transmission network and develop a system for their processing and reporting	The price of each device for a specific customer is determined by the manufacturer individually
2	TECHNOROS LLC	device	Determination of the content of up to 5 use-	On the conveyor of ore delivery to	If there ore entering are several sources the facto-	The price of one device is 7500.00

			ful components in the ore from a single source (mine)	the warehouse or loading into wagons or dump trucks	ry, it is required to install several devices and create a data transmission network and develop a system for their processing and reporting	thousand rubles. (Over 41 million tenge at the exchange rate as of May 12, 2017)
3	Our company	system	Determination of the maintenance of a useful component in a mixture of ores from 2 mines, calculating the quantity for each mine	Instruments on the conveyor belt of ore after large crushing, computing equipment in a special room	Regardless of the number of sources of ore entering the factory, one system is required to determine the amount of ore that has arrived at the factory from each mine and the content of a useful component in that ore.	The price of each system component and technology components for a specific customer is determined individually

4. Analysis of intellectual property

4.1. Intellectual property protection status

Systemotechnika LLP, the business partner of the executor of the grant subproject LLP TST-16 is the patent owner of the patents of the Republic of Kazakhstan №30052, №30907 and №31642 on theme of sub-project.

During the implementation of the project, it is planned to create new Objects of intellectual property (OIP).

The new OIPs created during the implementation of the subproject are commercialization products that allow potential customers to use the developed technology of operative monitoring of input ore flows at mining and processing enterprises.

4.2. Results of patent search with excerpts from the text *(closest analogues)*

- These found analogues does not have features that might incorporate in-to our technology.
- There are no additional possible applications for our technology found in analogues .
- The patent holders of the analogues, similar to our area, no are potential licensees for our technology
- Advantages of our technology in comparison with existing analogues - higher monitoring efficiency and lower relative cost.
- We have no information what are there companies/inventors that have a significant advantage in this area.

4.3 Key search words and numbers of the international patent classification: *(specify keywords used in searching)*

Analogues	*Other settings*	*IPC*	*Words*	*Level*
US 5417106 A, 23.05.1996.	*-*	*G01N 35/0000*	*System*	*I*
				II
				III
				IV
				V
				VI

5.Project's business model and sales plan for three years

As noted earlier, the products of commercialization of the results of the planned subproject are:

- software and hardware complex (PTC) of AS OMKKR,
- services in the design, installation and commissioning of an automated system for the operational monitoring of the characteristics of the input ore flows of mining refineries;
- License agreement for the use of intellectual property (patents of the Republic of Kazakhstan for inventions).

The executor of the grant subproject, in the process of its implementation, develops the aforementioned commercialization products based on the results of previously performed R & D, implements the industrial prototype on the real object of the enterprise - the customer of the technology and performs the analysis of the functioning of the created automated system.

The scope of the equipment, the financial plan and the process of developing an automated system for the operational monitoring of the characteristics of the input ore flows of ore mining and processing enterprises with a sufficient degree of detail reflect the following documents included in the Grant Agreement: "Procurement Plan", "Financial Plan" and "Subproject Implementation Plan" (Are given in the annexes to the commercialization strategy under consideration).

How will you commercialize your technology?

The results of the subproject will be published in the Republican branch and scientific and technical journals, advertised and brought to the attention of potential customers in Kazakhstan and the Russian Federation. The business model of the commercialization of project results is shown in Figure 5.1.

BUSINESS MODEL

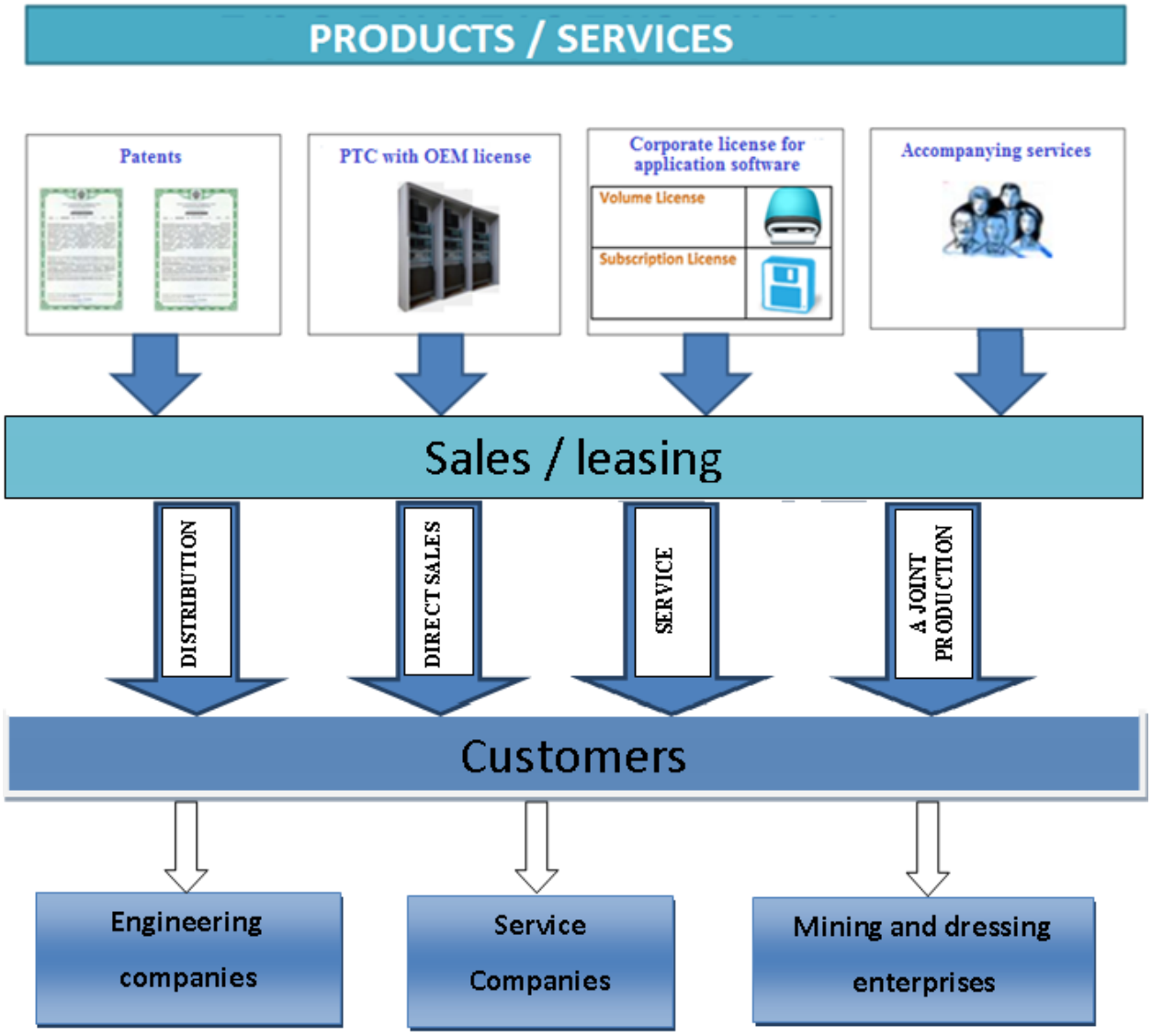


Figure 5.1 Business model of the project

Today the executor of the grant subproject and his business partner have agreements with our Russian colleagues on patenting the results of work in the RK and in the Russian Federation. The right to own of patents , created within the subproject, will be granted to the grantee of LLP "TST-16". Combining efforts and interests with well-known firms, scientists and specialists of the Russian Federation will reduce the problems of entering the Russian market and will simplify contacts with potential customers in the Russian Federation.

In the process of business development, the balance of development costs and revenue from sales of commercialization products will be observed. The volume of expected sales in the next two years after the completion of the grant project is presented in Table 5.1.

Table 5.1. Possible sales in the next 2 years after completion of the project

No	Year	Volume of anticipated sales	Comments
1	2018		
2	2019	25 000,0 thousand tenge	
3	2020	25 000,0 thousand tenge	

6. Team and invited experts

6.1. The project team

The project team consists of 7 specialists. All specialists have considerable experience in the field of theory and practice of the creation of automated process control systems. Their qualification as the developers of the types of provision of industrial automation systems corresponds to the level of the expert.

- Tukeyev Ualsher Anuarbekovich
- Education: higher - Kazakh Polytechnic Institute, specialty - "Electronic computers".
- Year of birth: 1947
- Status in the project group: The head of the grant project,
- Experience and specialization: a well-known Kazakh scientist in the field of IT technologies and automated information systems, Doctor of Technical Sciences, professor, full member of the International Academy of Informatization, full member of the Academy of Sciences of the Higher School of Kazakhstan, honorary member of the National Academy of Sciences of the Republic of Kazakhstan. The author of more than 155 articles, one monograph, four teaching aids. Has extensive experience in managing and implementing projects of information and automated systems. Specializes in the field of DBMS and technologies for the design of industrial automation systems of real time.
- Work experience by profession: 45 years.
- Responsibilities of the project team: As part of the project team, Tukeyev U.A. Fulfills the duties of its head and determines the main scientific and engineering aspects of the works performed, manages the development and testing of algorithms and models included in the basic basic elements of the final commercial product - an Automated on-line monitoring system of incoming ore flows for mining and processing plants.

- Akselrod Valery Yurievich
- Education: higher - Gorky State University. N.I. Lobachevsky. Specialty "Radiophysics and Electronics"
- Status in the project team is a specialist in commercialization.
- Year of birth 1949.
- Experience and specialization: Specializes in marketing and project management in the field of industrial automation. Leader and participant of projects and scientific and engineering developments implemented in Systemotechnika LLP concerning automation of technological processes at ore mining and processing enterprises and metallurgical enterprises of Kazakhstan. The author of 2 monographs, 4 patents of the RK and 2 patents of the Russian Federation for inventions, more than 20 publications in scientific publications and 16 scientific reports and 2 author's certificates..
- Work experience in the specialty: 40 years.
- Responsibilities within the project team: Within the grant project, it plans the work of subproject team members and outside organizations, monitors their implementation, monitors implementation of the products, logistics of the project team, financial and economic indicators of its activities. Provides organizational support for advertising and information activities that form demand for results, the formation of a portfolio of orders and marketing of the created product, control and management of the budget of the project team, interaction with co-executors and potential buyers of the results of commercialization.

- Amirbaev Taufik Rasimovich
- Education: higher, graduated in 1970 KazPTI. Lenin Specialty Automation and Telemechanics.
- Status in the project group - Senior Research Fellow.
- Year of birth: 1943,
- Experience and specialization: He has extensive experience in mathematical modeling of technological processes, design and implementation of control systems for technological processes of mining and metallurgical enterprises with a continuous production pattern. He is the author of more than 20 publications in scientific publications and 9 scientific reports in the field of AS, the patent of the RK for invention.
- Responsibilities within the project team: Within the grant project, it is responsible for the development of technical requirements, tasks, formulation and formalization of applied tasks, development of functional specifications. Develops plans and methodical programs for research and development. Candidate of technical sciences, specialist in the field of automatics and telemechanics. Specializes in problems of system analysis.
- Work experience by profession: 45 years.

1. Petr Petrovich Korshunov
   - Education: higher, graduated from KazPTI, specialty automation and telemechanics, qualification - electrical engineer.
   - Status in the project team: engineer / technologist.
   - Year of birth 1943
   - Experience and specialization: Specialist in the development of technical support for industrial automation systems. He has extensive experience in the design of industrial automation systems for mining and processing enterprises. The head and direct participant in the design of technical support in more than ten major projects on the creation and commissioning of automated process control systems for mining and metallurgical enterprises.
   - Responsibilities within the project team: Within the grant project, it is responsible for the quality and completeness of the project documentation and the technical support of the AS.
   - Work experience by profession: 45 years.

   - Rassulov Timur Mansurovich
   - Education: two higher educations, graduated from the Kazakh National Technical University named after K.I. Satpayev, qualification engineer in the specialty of "electronic systems and technology." He graduated from the International Academy of Business, qualification of a bachelor in the specialty "Management".
   - Status in the project group: engineer / technologist.
   - Year of birth 1985
   - Experience and specialization: A software engineer specializes in the development, implementation and maintenance of software for automated and automatic process control systems.
   - Work experience in the specialty: more than 10 years
   - Responsibilities within the project team: Within the grant project, it specializes in the development of mathematical and software at the level of control equipment and controls the quality of the applied software application of the automated system for the operational monitoring of input ore flows of mining and processing enterprises.

- Zemlyansky Vladimir Petrovich
- Education: higher, graduated from KazPTI, specialty automation and telemechanics, qualification - electrical engineer.
- Status in the project group: engineer / technologist.
- Year of birth 1947
- Experience and specialization: Specialist in the development of technical support for industrial automation systems He has extensive experience in project management for the creation, implementation and maintenance of industrial automation systems in large industrial enterprises, considerable experience in the development of automation systems based on SIEMENS equipment. One of the authors of scientific research, the results of which formed the basis of technology on the subject of the grant project under consideration.
- Responsibilities within the project team: As part of the subproject being carried out, it is responsible for the technical and instrumental support of the work.
- Work experience: 40 years.

- Shchepina Maya Petrovna
- Education: Higher - Kazakh Polytechnic Institute, specialization - automated control systems, qualification engineer system engineer..
- Status in the project group: engineer / technologist
- Year of birth 1967
- Experience and specialization: Specialist in system analysis and tools for developing software for information systems and control systems for production and technological processes. Has 26 years of experience in the field of information technology and industrial automation.
- Responsibilities within the project team: Within the subproject being executed, it is responsible for the quality and convenience of the "human-machine" interface of the system being created.
- Work experience in the specialty: 26 years.

6.2 Attracted experts and consultants

In the process of performing the work of the grant subproject, it is planned to engage consulting firms at the design stages of the automated system for the operational monitoring of the characteristics of the ore flows of mining and processing enterprises and its implementation in operation on a real object. These responsible stages will involve highly qualified specialists who have experience in designing and putting into commercial operation large automated systems at mining refineries.

The team of project executors, with the assistance of qualified and experienced consulting firms, develops project documentation, an industrial prototype of a highly efficient automated system and puts it into operation at technological workshops of one of the largest mining and processing complexes in Kazakhstan.

6.3 Competitive advantages of the team for the project

The team that performs the grant sub-project includes highly qualified specialists, covering the entire spectrum of activities necessary to obtain the planned results.

7. Project implementation plan (in accordance with financial plan)

No	Activity	Period	Budget	Outcome	Risks for deviating from the schedule
1	Marketing studies completion	Q1 2018	1500000	Research report	no
2	Meeting swith potential clients	Q1 2017 - Q4 2018	2000000	Programs and minutes of meetings	no
3	Procurement of equipment	Q3 2017– Q2 2018	74863000	Purchase agreements, payment documents, invoices	Failure to meet supplier delivery deadlines
4	Conducting industrial tests	Q3 2018– Q4 2018	20000000	Test report	Not readiness for implementation of the system
5	Applying for patent granting	Q4 2017– Q3 2018	400000	Patents and certificates	no
6	Productcertification	Q1 2018	300000	Author's testimony to the software package	no
7	Testsale	Q2 2018	300000	Contract of supply. Acts of acceptance / transfer of products / services commercialization	Reducing the source of financing for the buyer
8	Search and licensee acquisition	Q4 2017– Q3 2018	1200000	License agreements	Reducing the source of financing for the buyer
9	Searching for and attracting investors	Q1 2017– Q4 2018	500000	Joint Financing Agreements	Absence of investors
10	Media coverage	Q1 2017– Q4 2018	1200000	Publications in the media	no

8. Strengths and weaknesses analysis (SWOT analysis)

(prepare a SWOT analysis of technology)

Figure 8.1. SWOT Analysis Scheme

The generalized SWOT analysis is shown in Figure 8.1. Specification of SWOT analysis factors for the business model of the project corresponds to the following:

1. **Opportunities**

Opportunities (favorable environmental factors)

Demand in technology and system of operative monitoring of characteristics of input ore flows at mining and processing enterprises

Optimistic forecast of the dynamics of ferrous and non-ferrous metals markets and means of industrial automation for ore mining and processing enterprises.

In connection with the depletion of the ore base and a stable tendency to depletion of ore reserves, deterioration of mining and technical conditions at the operating mines of the RK and RF, the demand for the expected results of the subproject will only increase with time.

External factors

2. **Strength**

Strength (subproject advantages)

Competence and experience of team members and business partners.

Recognized professionalism and good reputation of the team and business partner among potential customers in Kazakhstan.

Results of research performed at an industrial enterprise.

Patents of the Republic of Kazakhstan from a business partner.

The presence of interested scientists, professionals and firms of the Russian Federation in the positive results of the project in the Republic of Kazakhstan.

Presence of advantages in the developed technology over existing ones at operating enterprises.

Internal factors

3. **Threats**

Threats (counteraction of the external environment)

Slow dynamics of the growth of the market for industrial automation equipment for ore mining and processing enterprises.

Problems of information and practical accessibility to the means of automation of the countries of near and far abroad (political factors)

External factors

4. **Weakness**

Weakness (disadvantages of the subproject)

Insufficient awareness of the newly created (according to the requirements of the grantors) firm-recipient (LLP "TST-16") for potential buyers and foreign partners

The executor of sub-project lacks its own working capital to make operative decisions

Inadequate marketing skills of the subproject team members.

Internal factors

9. Conclusions

(in this section you should summarize the technology, intellectual property, market, business model, team and external factor that affects business)

Within the framework of the grant subproject: "Automated on-line monitoring system of incoming ore flows for mining and processing plants", demanded technology and innovative products are created, the use of which will improve the efficiency of mining processing complexes.

The intellectual property (IP) products on the subproject subject received prior to the start of the grant work belong to the business partner of the grantee - Systemotechnika LLP, the rights to use which it transfers to the subproject executor - TST-16 LLP. In the framework of the subproject, applications for IP products are developed, owned by LLP "TST-16".

At present, despite the difficult financial condition of potential buyers of products developed in the subproject - ore mining and processing enterprises of the Republic of Kazakhstan and weak dynamics of the automation market for GOKs, one the largest mining-processing enterprise of the Republic of Kazakhstan - JSC SSGPO, expressed considerable interest in the automated system being created, Taking over the functions of the customer of technology, on the technological redistribution of which the industrial prototype of the created system will be tested.

The products of commercialization of the results of the planned subproject are:

- services for the design, installation, commissioning of an automated on-line monitoring system of incoming ore flows for mining and processing plants;
- licensing agreements for the use of intellectual property (patents of the Republic of Kazakhstan for inventions).

The executor of the grant subproject, in the process of its implementation, develops the aforementioned commercialization products based on the results of previously performed R & D, implements the industrial prototype on the real object of the enterprise - the customer of the technology and performs the analysis of the functioning of the created automated system.

The professionalism of the team members and adequate analysis of the influence of internal and external factors on the results of the subproject will allow the effective implementation of the planned work.

10.Annexes

1.FinancialPlan;
2. Procurement Plan ;
3. Implementation Plan;
5. Staff List.