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NONCAPITAL PROJECT PAPER (PROP)

Country: Korea Project No.: 489-11-230-634

Submission Date: December 5, 1967 Original X Revision No. _____

Project Title: Korea Institute of Science & Technology

U.S. Obligation Span: FY 66 through FY 70

Physical Implementation Span: FY 66 through FY 70

Gross life-of-project financial requirements:

U.S. Dollars 10,047,000

Cooperating country cash contribution \$12,082,000*
(in \$ equivalent, current exchange rate)

Other donor _____

Totals \$22,129,000

* ROKG also contributed land valued at \$1,750,000.

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I. Summary Description

A. Purpose

The basic purpose of this project is to contribute to the acceleration of industrial development by channeling science and technology into industrial action in Korea through the establishment of an institute for industrial technology and applied science. Korean industry has had only very limited opportunities to improve its technology through inputs normally available from applied scientific institutions in other countries. While Korea has borrowed much industrial technology from abroad, and while this has served an immediate purpose, the continuing reliance on this procedure would be costly, essentially uneconomic, and not likely to provide the technology most proximate to Korean needs.

*for MOP
copy*

AID strategy in Korea calls for assisting orderly industrial growth. An essential ingredient thereof is a competent source of practical assistance in industrial technology. Both the ROKG and the U.S. Government agree that one of the soundest long-range methods of accomplishing this purpose is to create an independent, non-profit institution of the highest standards, dedicated to bringing to bear on industrial problems the most pertinent and modern technology.

B. Historical Development

KIST came into being as a consequence of discussions between President Park of the Republic of Korea and President Johnson of the United States during May of 1965. In July of 1965, a team of science and research administrators headed by Dr. Donald F. Hornig, the President's Assistant for Science and Technology, examined the technological needs of Korea.

The Hornig Team report recommended that A.I.D. contract with a competent U.S. research organization to make a more detailed study. Battelle Memorial Institute conducted this study in late 1965, and in early 1966 - following receipt of their report and a proposal to serve as a "sister" institute to KIST through its formative years - A.I.D. developed a bifurcated contract (April and June 1966) involving KIST, Battelle and A.I.D., which set forth the services to be performed.

Following the arrival in Korea of a resident representative in April 1966, Battelle has provided services to KIST in these areas: staffing, planning, management, training, research, liaison functions, A&E services, procurement, recruitment and collection and dissemination of information.

Initial organization, construction and institutional development will extend through CY 68 - with completion of the first phase of development targeted for late 1970. For detailed discussion, see Annex I.

II. ROKG Financing

The ROKG inputs in terms of outright contributions of won for construction as well as for an endowment fund to generate income for KIST operating expenses have been provided in needed amounts and on schedule.

KIST WON FUND CONTRIBUTIONS
(Millions of Won)

I. ROKG Funding Through CY 1967

	<u>Won</u>	
Founder's contribution (CY 66)	1.0	
Operating subsidy (CY 66)	150.0	
Endowment (CY 67)	600.0 ^{1/}	
Construction Fund (CY 67)	620.0 ^{1/}	
Site Land Value	<u>472.5</u>	
TOTAL:	1,843.5	(Equiv. \$6,830,000)

II. Additional Funds to be Made Available in CY 68
(In pending ROKG budget)

Construction funds	900.0	
Endowment fund	<u>500.0</u>	
TOTAL:	1,400.0	(Equiv. \$5,150,000)

III. Won Funding After CY 1968

A review of KIST's long-term financial situation, taking into account estimated income from research, (from the \$1 billion endowment fund) reveals that the annual levels of expenditure may indicate the need for an addition to the endowment fund. (Or alternatively, a requirement in the next few years for additional annual ROKG operational subsidies). Construction costs in CY 69 and beyond are expected to be small and will be provided for in the appropriate ROKG CY budget.

1/ Counterpart source

U.S. Financing

On the U.S. side, dollar costs include construction commodities and research equipment not available in Korea, and contract costs for the BMI-AID contract.

U.S. INPUTS
(Thousands \$)

	<u>FY'66</u>	<u>FY'67</u>	<u>FY'68</u>	<u>FY'69</u>	<u>FY'70</u>	<u>TOTAL</u>
<u>A. Construction Items</u>						
Research Structures		1,638				
Support Facilities						
Equipment		190				
Service		393				
Site Preparation		288				
Laboratory Furniture		251				
		<u>2,761</u>				
<u>B. Research Equipment</u>						
1. Laboratories		318	403	605	300	
2. Library		185		172	100	
3. Fabrication Services		120		407	140	
4. Report Processing		31	31	38		
5. Gen. Stores Equipment		46	46	58		
		<u>700</u>	<u>480</u>	<u>1,280</u>	<u>540</u>	<u>3,000</u>
Sub-Total (Construction items & Res.Equip.)		3,461	480	1,280	540	5,761
<u>C. Sister Institute Services (see Table III)</u>	717	326	1,205	1,026	1,012	4,286
<u>D. GRAND TOTAL</u>	<u>717</u>	<u>3,787</u>	<u>1,685</u>	<u>2,306</u>	<u>1,552</u>	<u>10,047</u>

TABLE III

December 5, 1967

BNI CONTRACT SERVICES (USOM)
(thousand \$)

	<u>1966-67</u>	<u>1968^{1/}</u>	<u>1969</u>	<u>1970</u>	<u>Total</u>
I Coordinating Functions					
Resident Staff - Seoul	168	94	110	152	524
U.S. Staff - Columbus		81	101	114	296
II Recruitment (U.S. and Europe)	62	75	114	219	470
III Training and Orientation	176	195	89	56	516
IV Research Advisory Services	-	140	210	170	520
V Technical and Administrative Services	310 ^{4/}	132	156	134	732
VI Technical Information Center Program	46	125	55	69	295
VII Procurement Program	106	252	140	98	596
VIII Architectural and Engineering Services	175	111	51	-	337
TOTALS	1,043	1,205	1,026 ^{2/}	1,012 ^{3/}	4,286

- ^{1/} Adjusted figures based upon three quarters
^{2/} Adjusted to reflect three quarters
^{3/} Including last quarter from 1969
^{4/} Includes Energy Survey

Note: This table based upon October 30, 1967 submission of quarterly breakdown 1968-69, plus October 28, 1967 estimate through 1970. (BNI)

III. Setting or Environment

The extent to which Korean industry will contribute to expected development of Korea's economy will depend in large part upon its immediate access to locally adapted technologies, even though based on basic foreign developments. Other USOM projects already take into account the need for routine but necessary inputs of technical know-how as it applies to management in operations; but in this project we are concerned with the best methods to be employed in achieving the maximum benefits from costly borrowed industrial technology through not only adaptation, but fresh Korean technological innovations related directly to the existing industrial state of the art in Korea. Not only is the importation of technology costly per se, but it frequently has long-range uneconomic results because of the built-in difficulties of applying this technology within the Korean industrial environment, for example the particular or special nature of Korea's market, the level and mix of its industrial competence, the type and availability of natural resources, the degree of skills, etc. Korea's development has produced its own peculiar problems, most of which could be solved by its own talents, given the existence of a competent source of indigenous supporting technological knowledge and the borrowing (as needed) of foreign technology.

Korea is confronted by a wide range of technical problems. For example, its chemical industry is expanding, but it does not have the technical competence to make decisions on new processes or to facilitate the interaction of existing chemical engineering programs. Design and manufacturing technology are under-developed, with a related deterrent effect upon exports and the need to import fabricated products. The foundry industry, which is basic to any form of industrial development, needs substantial technical improvement, and the entire metal production and fabricating industry is sadly in need of new technology. It is conceivable that if Korean industry were directed solely toward fulfilling domestic needs, it could possibly remain comparatively unadvanced technically; but in an economy which is literally forced into an involvement with world trade, there is little choice but to develop an industry based on modern technology. Use of modern technology can have several signal benefits to Korea. First, it is possible that in certain industries, entire generations of technology can be skipped, thus realizing big investment "savings" over time. Second, improved technology can provide the basis for higher worker productivity and more efficient use of scarce domestic or imported raw materials. Third, if Korea is to be a "workshop" for the world, then Korean industry must adopt a leadership attitude. In order to be able to fill such orders as may come to Korea, Korean industry must be technologically able to meet such demands. This means technological adaptation and innovations as the rule.

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It should be stressed that the mere creation of KIST is, in itself, no insurance that industry's problems will be solved, for certainly the availability of capital, operating know-how, raw materials, and marketing skills are primary factors for consideration. Furthermore, the existing attitudes of Korean management toward the potential of KIST must be modified, and the modus operandi of existing researchers in Korea's universities must be gradually changed so that they may supplement or support KIST's activities.

The achievement of KIST's objectives calls for overcoming or materially changing certain attitudes about research. KIST researchers have no experience in performance for a fee, nor have they yet been exposed to a test of success which would justify the continuance of their research. Korean managers have looked upon research - and properly so within the Korean environment - as an ivory tower proposition, and they have generally looked upon the introduction of foreign technology as a simple answer to their problems. Industrial customers hold a view of research largely based upon a non-payout operation. So researchers employed by KIST have to be re-oriented. And as far as the business community is concerned, it has been largely free of the need for product development, increased productivity and better design because of the sellers' market. There have been no special pressures that would require innovations of methods improvement. The situation today, however, is ripe for a changing attitude among industrial managers, for Korea is being forced into a world market and is faced with a consumer purchasing selectivity heretofore unknown. The development of this project, therefore, will provide the type of applied technology needed by Korean industrialists to achieve competitive standards on world markets and to show the way for expanding the utilization of newly developed technologies in the manufacture of new products. The project is also oriented with a recognition by the USOM as well as the ROKG that KIST cannot operate in a vacuum solely as a research institute, but that it must take on an aggressive posture in selling its services within an economy which has heretofore had little or no understanding of the benefits of applied research.

It should be stressed again that the ROKG has displayed a penetrating understanding of the basic need for the autonomous operation of KIST. The Articles of Incorporation, and the KIST Assistance Act and the subsequent decree represent the distillation of what were originally fundamental differences of opinion between the USOM and the ROKG. During the first few months of KIST's development in 1965, it became apparent that the need to reach an understanding on the subject of autonomy was a most pressing one. The ROKG could not conceive of an institute such as KIST operating without government direction. The creation of an autonomous

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research organization confronted the ROKG with an absolutely unique situation. It was asked to capitalize an endowment fund (which had no precedent in Korea), make available large funds and place their control in the hands of a mixed board of trustees, the majority of whom were not within the government establishment. In view of the ROKG's contribution to this project, it was understandable that it took a proprietary interest and that it assumed it had an administrative and directional responsibility for the institution. While it took time for the idea of autonomy to be understood, it was finally accepted; and when the first assistance act passed by the National Assembly did infringe upon this autonomy, the ROKG passed a revision which insured autonomy.

The importance of autonomy, as reflected in this legislation, was shown at the time of the President of KIST's initial visit to the United States for recruitment purposes. For several years, Korea had seen steadily losing her promising young scientists to the United States; and at the inception of this project, everyone had grave doubts about the possibility of recruiting any of these scientists for the KIST staff. Dr. Choi, President of KIST, was delighted to be able to confirm that a significant number of Korean ex-patriate scientists were willing to return to Korea, and one of the major reasons for this attitude was the conviction on the part of those interviewed that they would be able to carry out their research in an atmosphere which would be insured by the autonomy of the institute. It should be recognized that, given the source of financial support at this time (ROKG and U.S.) KIST's development is obviously heavily dependent upon the attitudes and decisions made by the two governments. The USOM has been successful in every material respect in getting the ROKG to adopt a policy of (a) supporting KIST, (b) refraining from using the fact of KIST's dependence upon its support as a basis for interfering in KIST's development, (c) relying for protection of its interests on

1. The opportunity afforded to it through annual budget process for as long as KIST receives ROKG funds, and
2. Its participation on the Board of Trustees.

The USOM has followed the same policy -- support, restraint, and influence.

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Market for KIST Products

It has been previously mentioned that the ultimate criterion for measuring the degree of success attained by the institute - aside from the intrinsic excellence of the work done - will be the extent to which Korean industry approaches KIST for services. At the time of the first visit of Dr. Hornig in 1965, this was the subject of conversation with leading Korean industrialists. Although it was recognized at the time that these men had only a limited understanding of what contract research could do for them, they did, nevertheless, express optimism about industry's participation. They felt that they would be willing to pay for services rendered if they could be assured of the competence of the institute's staff. This attitude of theirs, two years later, is reflected by the fact that KIST already has several specific research projects sponsored by industry. These are:

Lubrication Oil Performance Study	₩ 1,980,000
Study of Metal Corrosion in a Refinery	2,205,000
Development of Zirconium Compounds for use in improvement of Soil Resistance of textiles	3,200,000

The total amount of won represented by these contracts is far in excess of what had been expected for 1967, and every indication now points to greater proportionate increases for 1968. The KIST staff already numbers several outstanding scientists whose competence needs no verification either in the academic community or in the industrial sector. The support of both the U.S. Government and the ROK Government, together with the rapid progress being made in construction and staffing has doubtless had a deep effect upon industrial managers; and once KIST has completed several surveys, studies or research efforts, there is little question but that the word will spread rapidly within the tightly knit Korean industrial area and thus provide the basis for generating further requests for contract research. At the same time, it is important to bear in mind that the local environment may not provide enough income during the first five years of KIST's growth to make it self-supporting. Even in the United States, at the time of EMI's beginning, its acceptance by U.S. industry was slow, and it was several years before EMI was able to balance its expenses against industrial contract income. This pattern was repeated in Germany and Switzerland in the middle fifties when Battelle established laboratories in those countries.

IV. Strategy

As previously touched upon, the USOM - within the broader objective of helping Korea to strengthen its economy through an accelerated and orderly industrial growth - has developed the subject project as a specific device for providing a competent source of practical assistance in industrial technology. The need for in-plant technical assistance still continues and will be implemented on an institutional basis through cooperation between the USOM and Korean industries. This activity alone, however, cannot provide the full measure of support needed for rapid industrial growth. The more basic and fundamental approach which supplements the technical assistance is the organization of the scientific community skills into an institution for strengthening industrial technology. The combination of this activity with the technical assistance program to industry clearly offers the best opportunity to provide industry with the techniques and knowledge so urgently needed if it is to meet the stress of expanding economy.

KIST can be expected to contribute to AID objectives in the field of private enterprise and particularly in foreign investment encouragement by the simple fact that the nature of KIST is a strong "plus" in any investment decision. In terms of AID's objectives in agriculture, KIST can be expected to make contributions in research in inputs for agricultural production, and in food technology and processing.

No estimates can be offered to indicate the quantitative effects of KIST upon industrial production, infra-structure, social, economic, and political institutions, etc.; but its direct working relationship with industry, as well as indirect (through governmental agencies and various elements of the infra-structure) will certainly result in wide-spread benefits across the entire economic fabric of the country. It is apparent that such important end-products and collateral effects as the following will profoundly modify the daily activities of the scientific, governmental, and commercial institutions throughout the country:

- a. The development of new products for domestic consumption and overseas markets;
- b. The bringing back to Korea of a significant group of Korean-born scientists presently located in the United States and elsewhere;
- c. The successful example of a research institution insulated from daily political influence;

- d. The mechanism for technological leap-frogging;
- e. The opportunity for training of Korean university scientists in special disciplines;
- f. The mutually beneficial exchange of ideas, methods, technicians, etc., between KIST and Korean universities;
- g. The sound example of competently produced technical surveys and studies;
- h. The ultimate increase in both employment and productivity in industry;
- i. The improvement of services rendered within infra-structure, i.e., power, transportation;
- j. The increase in general purchasing power;
- k. The creation of a new industry based upon KIST research developments;
- l. The follow-on potential attributed to the mix of U.S.-trained Korean scientists in local research projects;
- m. The identification of limiting factors to industrial expansion;
- n. The demonstration of benefits of techno-economic research.

We must consider the relationship of KIST to the professional associations and entities such as Korea Productivity Center, NIRA, KORSTIC, Bureau of Standards, Bureau of Weights and Measures, etc. These are service institutions dealing with current problems, while KIST deals with those that are imminent. In other words, KIST develops things for tomorrow. In effect, KIST is astride (in present and future) industry and its development, and in this position is about to play a vital role within the spectrum of economic progress in Korea.

Given the present ~~stage~~ stage of Korean industrial development, together with the strong ROKG role in industry and mining, much of KIST's work will likely be on ROKG contracts. At the same time, this pattern is not inconsistent with the maintenance of autonomy.

KIST will face a problem in the development of an effective interaction with other research-based Korean institutions. There are over 80 research organization in Korea, each of which may lose staff members to KIST. However, 58 are National and Provincial operations, with the balance attached to universities or Government-owned enterprises. For all practical purposes private research is virtually non-existent, and the major proportion of all research is actually routine analysis, testing and inspection - with applied research relatively unheard of.

In spite of their lack of applied research capability, these research organizations will feel that KIST has a preferential position for support from industry and the government. This natural reaction, coupled with some loss of personnel will no doubt tend to have a negative effect upon the development of good working relationship with KIST. However, given time and the already proven high-quality leadership within KIST there appears to be an excellent chance that cooperation can be achieved and that the competence of these organizations can actually be enhanced as a result of KIST's presence in Korea. We see KIST as both a catalytic agent in stimulating reactions within the research institutions mentioned above and an active source of project activity. There is every indication that, during the interval of time until the completion of its own facilities, KIST will in fact search out the best research laboratories and establish mutually beneficial working arrangements. Hopefully, such relationships would expand in the long run, with the research organizations providing an important supplementary function.

Dr. Choi, Hyung Sup, President of KIST is doubtless one of the most respected men of science in Korea. His selection by President Park, Chung Hee as the man to direct KIST's operations was a most fortunate one, for not only did it immeasurably enhance the prestige of KIST among scientists in Korea as well as abroad, but it also brought to KIST a personality gifted in those leadership qualities particularly needed by KIST in its confrontation with Korea's total economy.

As a further insurance of sustained leadership there is the KIST Board of Trustees. Its composition, as listed below, provides the depth and variety of experience so essential to policy development. Performance to date has well justified its functional mix and the confidence invested in its collective leadership.

KIST Board of Trustees

Chung, Rak Eun -
Chairman
Electrical Engineer, Tokyo Eng. College
Former Minister of Construction -ROK
Pres. Han Kuk Machine Industries

Chung, In Wook -
Vice-chairman
Metallurgical Engineer, Waseda University
Pres. Kang Won Coal Co.

Choi, Hyung Sup -
President of KIST
Metallurgical Engineer, Waseda Univ. Japan
M.S. University of Notre Dame - Ph.D Univ. of Minnesota
Former Director Atomic Energy Research Institute

* Kim, Tae Dong -
Lawyer, Meiji College, Japan
Former Vice Minister, Ministry of Transportation
Vice Minister, Economic Planning Board, ROKG

Choi, Sang Up -
Ph.D. in Chemistry, Purdue University
Professor - SNU, Yonsei University
Professor - Sogang College

Lim, Suk Choon -
Lawyer, Seoul National University
Pres. Korean Productivity Center
Pres. Bank of Seoul

* Lee, Chung Seung -
Lawyer, Seoul National University - Wharton Business School
Chief, Korean Trade Mission to Burma & India 1964
Vice-Minister, Ministry of Commerce & Industry

Lee, Ryang -
Mech. Engineer, Tokyo ~~Institute~~ Institute of Technology
Pres. Korean Society of Mechanical Engineers
Dean, College of Engineering, SNU

* Lee, Jae Chul -
B.S. Seoul National University
Lecturer, Dong Kuk University
Member, Board of Audit
Vice-Minister, Ministry of Science & Technology

* Natural Post Trustee

Note: Two other natural post trustees are:

1. Mr. Roger Ernst, Deputy Director, USOM
2. President of Battelle Memorial Institute

Another positive element is the continuing and enthusiastic support of the President of Korea for the KIST project. Not only has President Park, Chung Hee retained the type of interest that would normally be expected to flow from his original meeting with President Johnson, but he has taken a series of direct actions. He has personally assured himself that the ROKG budgets have contained adequate funding for KIST. He has made his personal support for this project known during the consideration and passage of the KIST Assistance Act by the National Assembly. He personally assisted in the selection of the KIST site and later provided the services of governmental engineers to assist in the actual construction of the KIST facilities and in the improvement of the KIST site. His constant concern for KIST's progress, in terms of both physical facilities and staff, is indeed one of the most encouraging and enduring evidences that the high type of leadership so vitally needed for the success of this project will be available.

V. Planned Targets - Results and Outputs

A. General

By the end of 1970 KIST will be a "being" with a professional staff of about 200 utilizing two research buildings, a fabrication services building, and a main building which will have administrative offices, a library, a technical information center, and a computer center. Actual research, as mentioned elsewhere, will be under way by the end of CY 67.

By 1970 KIST will have had substantially two years experience in the actual performance of research contracts. During that time, continued and heavy BMI inputs on research development will be needed. Up until 1970 AID must maintain a strong input and should not slack off at this critical or take-off period, i.e., '68 to '70.

B. Staff

It is expected that KIST staff will develop as follows:

<u>End of Year</u>	<u>No. of Staff</u>	<u>Professionals</u>
1966	48	6
1967	140	32
1968	264*	80
1969	392**	157
1970	500**	200

These staffing levels, of historic interest to note, run ahead of original BMI projections (due to a combination of factors:

- a. The desire of Korean sponsors to more fully use KIST at an early date;
- b. A higher ratio of support personnel to professional than in the United States.

In addition, as of November 1, 1967, it remains to be seen whether the actual recruitment of professionals will follow the patterns shown in the table above, for it may well be that the professional complement at the end of 1970 will be somewhat lower than 200.

* Maximum number provided for in CY 67 budget

** KIST estimates.

C. Facilities

The following buildings or major facilities will be essentially completed, equipped, and staffed:

By June 1, 1968

Research Building No. 1 (beneficial occupancy)

Central Plant or Utilities Building

Guest House

30 Apartment Units

6 Housing units for BMI staff

1 Presidential residence

1 Double residence for two vice-presidents

Community Center

Motor Pool Building

Gate House

By January 1, 1968

Main Building:

Administrative offices

Library

Technical Information Center

Computer Center

Auditorium

Cafeteria

Technical-Economic Research Center

Fabrication Services Building:

Research Building No. 2

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Pilot Plant Building (minerals dressing equipment, no dollar component).

D. Contract Research Capability

By the end of 1970, there will also be a select staff of senior professional researchers in residence and thoroughly trained in the complexities of contract research as they apply to the fields of mechanical engineering, materials science, electronics, and electrical engineering, chemistry and chemical engineering and food technology. With three years of operational experience KIST will have all the ingredients required and capability to perform concurrently a very considerable number of projects in a fairly wide range of subject areas.

As noted on page 10 and on page 5 of Part II, PIP, there is growing evidence of increased income from industry and government. Not only does it appear likely that the initiative thus displayed by industry will continue at a heightened pace, but it is also probable that the many areas of need and potential sponsorship uncovered by the series of techno-economic surveys listed below ^{1/} will generate other project requests.

- | | |
|------------------------------|--|
| Food Technology | Electronics |
| Petroleum and Petrochemicals | Plastics and Textiles |
| Mining and Metallurgy | Mechanical Engineering |
| Computer-based Technology | Analytical Chemistry |
| Ceramics | Scientific and Technological Information |
| Electrical Equipment | Pulp and Paper |
| Packaging | Foundry |
| Transportation | Construction Economics and Technology |

^{1/} Also see page 9-14 of summary report of KIST project to date. RESEARCH REPORT - Technical and Administrative Assistance to KIST, Oct. 31, 1967.

One of the most important areas of effort in KIST is that of Project Development, which is essentially a sophisticated sales approach by trained KIST personnel. This activity is already productive, and when applied upon the base already established by the surveys will doubtless result in an increasing number of income-producing projects. Another source of income that may well develop as KIST becomes more seasoned and competent is that from Far Eastern countries that have no applied research capabilities.

E. Achievement of Financial Self-sufficiency

If everything goes well KIST will no longer require ROKG subsidies and will maintain (in line with Board of Trustees policies) current value of its endowment by about 1970. (The endowment fund may require augmentation in 1969). While it is hoped that KIST can pay its way by the end of 1970, it is not altogether clear that this will happen. If so, it will be a unique experience for any institution in any developing country, and particularly a research institute.

The facts presented immediately above represent "establishment" as interpreted within the ~~frame~~ framework of the original U.S. Government commitment. The end of 1970 would appear to be a logical cut-off point for major dollar inputs, since by that date the institute will have been operating for a three-year period and will have attained sufficient status to go it alone.

While any quantitative evaluation of KIST's progress will lack those finite elements so conveniently identified with infrastructure projects, it is important to note those factors that will collectively effect its growth. These would include the following:

- a. Industry's attitude toward contract research;
- b. The degree of political stability;
- c. The standard economic indices;
- d. The development of new institutions and the modifications of existing ones;
- e. The demands of an aggressive and increasingly selective consumer group;
- f. The evolution of distribution channels, etc.

At this point of writing the indicators are pretty positive (reasonably bullish) for KIST's institutional objectives being achieved (there is little doubt about the physical and staff elements) provided we stay on course.

Because of this project's institutional nature, it is difficult to assess progress or project its accomplishments in quantitative terms. The original goal was a creation of an institute of sufficient viability to service the multiple demands of an expanding economy and do the job with a level of skill comparable to that which characterizes similar institutions in other parts of the world. Within this goal it is implicit that the job also would be done on a self-sustaining basis. Even with our present knowledge of Korea's rate of growth and the other positive elements that definitely appear to support an optimistic viewpoint of KIST's future, it is impossible to categorically single out any future year as the one in which KIST's operating expenses would be balanced by its income from industry.

The Board has taken upon itself the responsibility to prevent KIST from incurring a deficit. In fact, KIST cannot incur a deficit. The USOM considers the financial base of an endowment fund, even in ~~xxx~~ expected lowering of interest rates, to be soundly conceived and effectively implemented. Carefully prepared budgets by KIST point up a defensible battery of operating costs that can be adequately matched by interest generated from the endowment fund. The Board of Trustees has at the same time pointed out the long-range importance of building into the income items a significant and increasing return from research projects performed in 1967 and subsequent years. This projected income from contract research shows a steady and reasonable growth rate ^{1/} which should offset anticipated losses of endowment income due to reduced interest rates. The successful efforts of KIST to date in attracting requests for contract services and the planning already set up for increasing the intensity of project development are symptomatic of substantial achievements toward the goal of self-sufficiency.

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1/ See page 47 of Oct. 31, 1967 report "Technical and Administrative Assistance to KIST."

By the end of CY 1970 major institutional development objectives will have been carried out - staff as described will be on hand, buildings constructed and equipped - and with BMI technical assistance in the conduct of research in increasing volume between now and 1970, there will exist an on-going, viable, effective applied research institution.

The time period of CY 1968-70 can roughly be divided into two sub-periods: 1968 and the first half of CY 1969, which will show heavy input in physical building, as opposed to operations; and last half of CY 69-70, where inputs are essentially in research and staff.

The gradual development of more and varied disciplines in other areas as demand arises from within Korean ~~manufacturing~~ industry, will doubtless call for more dollar expenditures for equipment; however, local acceptance of KIST should be sufficient to influence the ROKG to make foreign exchange available for commodities and equipment that can only be purchased from abroad. It appears reasonable to assume that by 1970 KIST will have made enough impact to clearly indicate its potential to Koreans. The United States Government, having fulfilled its commitment to "establish" KIST could withdraw from active participation.

These assumptions or projections are based upon the following:

- a. Original agreement in 1965 between the United States Government and the ROK Government that operating costs, as well as construction costs (exclusive of U.S.-~~source~~ source commodities) would be derived from local sources;
- b. The experience to date in project development activities; the encouraging progress in overseas recruitment; the excellent progress in construction; the seasoned approach of KIST's management; the understanding support of the ROKG; and a generally favorable economic trend.

If KIST's success in developing contract research out-distances our present projections (which is entirely possible) then there will arise further requirements to take on additional business - not only in fields where they are already equipped but in new ones as well. In this event, requirements will be generated that call for FX expenditures.

We should recall the reference on page ^{A-4} which talks about first five years and second five years obligations, and the end of CY 1970 could be said to be the end of the first five years. The PROP deals

with the first five years and makes no attempt to define in detail the nature of the second five year requirements, beyond indicating that there will be a continuing (next five years) need for a sustained sister relationship, for foreign exchange to add or replace items, 1/ and financing of further training overseas. There is the question, wholly withdrawn from consideration at this time, of the creation of additional research facilities.

With regard to foreign exchange requirements after CY 1970 it may be possible to meet these with KFX alone, or in combination with possible additional source of foreign assistance.

1/ Even without the addition of new building units there will be requirements for supplies, spare parts, replacement of expendables, new equipment for new research requests and equipment replacement due to obsolescence.

VI. Course of Action

The main elements of AID course of action have been, and are:

- (a) To bring this Institute into being
- (b) To take all possible steps to insure its autonomy
- (c) To repose in EMI, the sister institute, the most comprehensive authority and responsibility for institutional development, and also for physical creation of facilities - thus insuring integration of manpower and equipment.

A. FY 1965 - FY 1967

FY 66 saw the actual creation of the Institute and the designation of Battelle Memorial Institute as the "Sister" Institute.

In FY 67 a series of major steps has been taken: completion of master site plan; completion of plans for the first laboratory, recruitment, orientation and training of KIST staff; initiation of research projects at both Battelle and KIST and selection of major research projects to determine overall technical scope.

The major portion of the commodity requirements was funded in FY 1967. Specific equipment needs, costs and timing thereof have evolved from the A&E work and the studies of the BMI library and machine tool short-term consultants.

B. FY 1968

In FY 68 the essential courses of action are to:

- (1) Complete procurement of all construction commodities
- (2) Procure major portion of research equipment - using FY 67 and 68 funds
- (3) Train (in 1969 and 1970 also) a significant number of Korean ~~engineers~~ to be employed by the Institute engineers
- (4) Encourage KIST to maximize its current contract research load.

The program has been under additional stresses from the ROKG to accelerate the building schedule together with USG restraints on commodity procurement procedures and the FY68 dollar budget. These problems are being forthrightly addressed by all parties to the bifurcated agreement.

Progress in FY68 is essentially a matter of extending or continuing previous activities outlined above - with the actual completion of the first facilities increment coming in late FY68. However, applied research projects in Korea will be ~~started~~ started during FY 68, utilizing the talents of a staff which, by that time, will be qualified to embark upon this major task. Much of the short-lead equipment will be ordered during early FY 69, so that by January 1, 1969, 80 per cent of all dollar equipment will have been ordered. Some of this equipment, i.e., both long-lead and short-lead, will arrive in FY 68, while most of the balance will be actually available for use by the end of FY 69. That portion of research which will require use of laboratory equipment will be conducted at facilities owned by local universities, government laboratories, etc., as well as at Battelle.

Therefore, FY 1968 should see the first research building completed and possibly a 200-man staff on board. Less than one-half of this staff will be professionals - all of whom will either be in a training status or actually engaged in research projects at Battelle or at Korean institutions other than KIST. Adequate housing will be available for the professional staff.

C. FY 1969-1970

One element of accomplishment that should emerge in FY 69 will be acceptance of KIST by the Korean community, i.e., the extent to which KIST has been successful in (a) obtaining basic acceptance; (b) establishing its role; (c) broadening its scope; (d) securing and holding outstanding technical staff. All of these are obviously long-range goals, but FY 69 should see the initial increments.

On the assumption that FY 68 and 69 will constitute the first operational phase of BMI, i.e., input of trained senior staff, conducting of early research, and education of the Korean community in utilization of KIST; and in view of the fact that the first truly KIST-based research will not commence until early FY 1969, it is

apparent that phase-out of this activity cannot be discussed in absolute terms. FY 69 and 70 will call for assistance from Battelle in (a) specific engineering, economic and technological tasks, (b) further staff training, and (c) advisory services, particularly with respect to the development and management of contract research. With the assimilation of this Battelle input, the completion of physical facilities, and the development of a capable staff, it is reasonable to assume that FY 70 would mark the last year of sustained dollar assistance.

The updated PERT chart (attached) ~~XXXXXXXXXXXXXXXXXXXX~~ reflects a series of actions that are self-explanatory, but it is not designed to explain the meshing of all inputs.

In its simplified form, the project calls for the construction, equipping and staffing of an applied research institute which is geared in size and quality to meet Korea's foreseeable needs. The USOM believes that all of the elements required for achieving this goal by the end of FY 70 are in proper phase, adequate amounts and of the desired quality. Recruitment, staffing, training, project development, liaison functions, organization development and construction are proceeding according to schedule. On the Korean side, all obligations for financial support (page 4) have been met or are being met. All dollar cost construction items are planned to arrive by the end of CY 1968.

The development of equipment lists for research laboratories has been done by BMI on the basis of the most essential research disciplines vis-a-vis Korea's anticipated industrial development. The funding, as shown on page 5, together with ~~xxx~~ projected procurement schedules, will help insure arrival in April 1968 for initial research activity - with the balance by April 1969. This research equipment represents an optimum selection needed to carry out research in the basic disciplines referred to earlier in this paper.

On the staffing side, a growth schedule has been developed (see chart page 16) which takes into account the fiscal realities of life as well as the necessity for orderly increases in personnel based on demonstrated need or ability of KIST to assimilate new staff members. In addition, accounting has been made for the period of time required both in KIST and at BMI for the specialized training so urgently needed in contract research. Korean scientists

are being recruited in the U.S. on a phased schedule that permits six-month periods of training at BMI - with subsequent injection into the KIST environment. By the end of CY 68 most of this training will be completed, so that the ~~rapid~~ completion of construction and installation of research equipment will be in functional harmony with staff competence.

VII. Conclusion

The end of FY 69 will be the time for a good fix on the future, for by that time KIST will have been in operation for two years. KIST must attain a high level of utilization of facilities on research and have an opportunity to assimilate working experience. Each laboratory subsection must achieve maximum involvement before planning any further expansion. We're not backing off from the second five years, but the above is the approach as far as new buildings are concerned. Our present view is that it is highly unlikely that additional research space will be required at that time. Reallocation of space on the basis of modified avenues of research may take care of it.

In the final analysis, despite the obstacles already encountered, we can conclude that the components that go into the creation of KIST are not, of themselves, particularly complex or worrisome. Recruitment of people has been relatively easy. Construction is proceeding on schedule. The welding of people, buildings and equipment into a viable institution, however, is a critical consideration, involving a host of important daily relationships. ~~Whereas~~ ~~some projects can't be done without technical assistance (sufficient~~ ~~at times to overcome the recipient) there is no danger of this~~ ~~sort of thing in fact.~~ A failure on our part to provide the technical assistance needed will still result in buildings, equipment, etc. -- but not a staff of business-manager scientists operating profit centers within an institute of industrial technology.

ANNEX IHISTORICAL DEVELOPMENT

Discussions held between President Park of the Republic of Korea and President Johnson of the United States in May 1965 initiated a move toward the achievement of an institute such as described above.

"The two Presidents, recalling their respective earlier careers as school teachers, discussed together the needs, challenges and opportunities of education at all levels in both countries. President Park welcomed President Johnson's offer to send his science advisor to Korea for the purpose of exploring with industrial scientific and education leaders possibilities for U.S. cooperation in establishing there an institute for industrial technology and applied science."

(Joint Communique, May 1965).

As a direct result, in July 1965 a team of American science administrators, headed by Dr. Donald F. Hornig, the President's special assistant for science and technology, visited Korea. After investigating the implications of the establishment of such an institute in Korea, the team recommended to President Johnson that

1. You go forward with your proposal to establish an institute for Industrial Technology and Applied Science in Korea, with U.S. Government cooperation and support;
2. You assign responsibility to A.I.D. in consultation with the Special Assistant to the President for Science and Technology, for assisting Korea in establishing as promptly as possible the Institute along the lines proposed in this report;
3. You request A.I.D. promptly to enter into a preliminary contract with an American technical organization, as identified in the report, for the purpose of assisting in the early organization of the Institute and proposing the terms and scope of U.S. and Korean support."

In September 1965 A.I.D. contracted with Battelle Memorial Institute for carrying out the purposes mentioned above. BMI sent a team to Korea from September to December 1965 and as a result of its study, affirmed the conclusions drawn earlier by Dr. Hornig and his group concerning the appropriateness and desirability of a research institution in Korea created to serve the technologic needs of the country's industry. BMI also drew up a blueprint for the organization of the institute.

Following the signing of the Articles of Incorporation of KIST by President Park, Chung Hee in February 1966, contracts were put into effect between BMI and A.I.D. and between BMI and KIST (April 1966), establishing the scope of services to be rendered by BMI. The chronology of major events to date is as follows:

	<u>1965</u>
Hornig Team Evaluation	July
Battelle Feasibility Study	Sept - Nov
	<u>1966</u>
U.S. - ROKG Signature on Project Agreement	Feb
KIST Founded, President Appointed	Feb
BMI Team Leader Arrived	Apr
Site Selected	May
Battelle/AID/KIST contract signed - Program Under Way	Jun
First Battelle TDY Experts Arrived Seoul	Jun
U.S. A&E Subcontractor Arrived	Jun
Korean Architect Retained - Construction Planning Began	Jul
First Regular Quarterly Board of Trustees Meeting	Jul
3 Trustees Visited U.S.	Sep
Ground Broken for Site Preparation	Oct
First Technical-Economic Survey Began	Nov
President Made Recruiting Trip to U.S. and Europe	Oct - Dec
Special Assistance Act Passed ROKG National Assembly	Dec
ROKG CY 67 Budget, Including ₩ 1 Billion for KIST, Passed by National Assembly	Dec

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	<u>1967</u>
Additional Trustees, Officers, Visit U.S.	Jan
Endowment Fund Established	Feb
First Professional Staff Member Completed Training at Battelle	Mar
Construction Started on First Research Building	Mar
KIST Assistance Act Revised	May
8 Professional Staff Members Began U.S. Training	Apr
PROAG and PIO/T Signed for \$3.1 Million	May
President Choi Visited U.S. on Second Recruiting trip	Jun
PROAG and PIO/T Signed for \$.7 Million	Jun
Final (7th) Technical-Economic Survey Completed	Jul
Vice-President Humphrey Visited KIST	Jul
First Sponsored Research Initiated	Aug
First Structure (Guest House) Completed	Aug
KIST Staff on Board	
3 Executive (Pres. VP, Auditor)	
35 Research Staff (Trained and in Training Status)	
32 Technical Support, 21 Administrative,	
<u>45</u> Clerical and Manual	Nov
136 -- Total	

One of the first responsibilities of BMI was to develop a PERT chart indicating the time phases for physical construction of facilities and the development of appropriate professional staff. The goals established in the spring of 1966 involved the completion of only the first research building and the utility building (R-1 and S-1) by the spring of 1968, and the completion by the end of 1968 of the main building, the fabrication services building, and the second research building (A-1, R-2, R-3). The staffing target then called for 100 by the end of 1967 and 210 by the end of 1970. The phasing of staff recruitment and completion of facilities would thus enable KIST to conduct applied research, utilizing laboratory facilities in late 1966. In

the meantime, however, plans were made for the utilization of existing staff in 1967 to conduct the specialized types of research that would not require the utilization of KIST facilities and related equipment. With the arrival and subsequent installation of scientific research equipment during 1968 and the completion of the facilities as scheduled, KIST would achieve its initial goal of conducting applied research within its own laboratories. Current appraisal indicates the probability that the major construction elements will be realized by the end of CY 1968, but that total completion of the buildings in terms of all equipment being installed, will not be an actuality until mid-1969.

The understanding between the U.S. Government and the ROKG as to financing, as agreed in the original PROAG of February 1966 is contained in the following sections:

"VII. U.S. and ROKG Contributions During First Five Years

From time to time, the two Governments will review the progress being made in the development of KIST and will together take appropriate actions in consonance with their joint commitments for insuring the continued growth of the Institute. In these consultations, the two Governments will make timely and appropriate decisions as to the amounts of funds to be provided to the Institute, to insure that funds made available are sufficient to cover KIST's needs for the first five years. The foundation for these decisions was set out in the attached letter of agreement between the U.S. and the ROKG."

"X. Requirements for KIST's Second Five Years

With respect to the second five years, prior to the end of Phase II of the development of the Institute, the two Governments agree that they will undertake a review of the Institute's progress and financial capabilities and consider ways and means to further the objectives agreed upon for such institute between President Chung Hee Park and President Lyndon B. Johnson in May of 1965."

The discussions held with the ROKG during the preliminary and formative stages of KIST development in 1965 were based upon an understanding that the U.S. Government would finance all dollar costs connected with the establishment of KIST and that the ROKG would assume responsibility for all won costs. Initially that was

conceived as being basically a 50-50 split, but recent studies reveal that it is more likely to be 40 per cent total dollar costs to 60 per cent won costs. The won-costed items include building site (land value), building site preparation, building construction, operating costs, the endowment fund, and interim operational subsidies. Although KIST is an autonomous institution, ROKG financing is to cover construction costs as well as initial operations. In view of the possibilities presented through such financing for ROKG interference in KIST's affairs and to maintain continuous autonomy, an independent source of funds for operations and maintenance expenses has been provided to KIST by means of the endowment fund. The endowment fund will generate income which, given the fact that the ROKG is to provide construction costs, will, hopefully, preclude KIST's having to apply annually to the ROKG for operational subsidies.

Although the most sanguine estimates of KIST income from industry did not include substantial income from industrial research projects in its early years, it was, nevertheless, expected that an increasing segment of operating expenses would be covered by fees paid by industrial firms for services rendered in applied research. This, together with government-sponsored and financed studies, was expected to become gradually larger during the early years of KIST's life; but figures were not available then - nor are there sufficiently valid ones now - to determine with any degree of accuracy the speed with which KIST is able to approach its ultimate goal of self-sufficiency. Requests from industry and government received during 1967 indicate an encouraging attitude on the part of industrial managers and point to solid progress by KIST in its attempt to translate project development efforts into operating income.