LORD, MELVIN S. — ARTICLES and speeches (1958-1965)

Folde

Talk to CEMLA, September 9, 1958 M. S. Lord

CORPORACION FINANCIERA INTERNACIONAL

1. Cuando se fundó la Corporación Financiera Internacional hace dos años, se hizo con la intención de ayudar a solucionar la gran necesidad que existe en muchos países de desarrollar la industria productiva privada. Así pues, nuestra Corporación es, en todos los sentidos, una institución internacional cuyo objetivo es esto, o sea, fomentar y ayudar a desarrollar la industria productiva privada en los países miembros de nuestra Corporación. Estamos muy estrechamente relacionados con el Banco Mundial, casi se podría decir que somos primos hermanos en muchos sentidos. Por ejemplo, para ser elegible a ser miembro de la Corporación Financiera Internacional un país tiene que ser miembro del Banco Mundial. También muchos de los servicios administrativos y profesionales del Banco Mundial son prestados a nuestra Corporación cuando sea necesario en nuestra tarea. La aportación del capital suscrito por nuestros miembros está fijado por cuotas por el mismo sistema que en el Banco, aunque en cantidades mucho menores. La CFI fué constituída con un capital autorizado de $100 millones y además con facultades para obtener fondos adicionales en préstamo mediante la venta de sus propios bonos u obligaciones. Tenemos hoy en día 55 países miembros y un capital suscrito de unos $93 millones. Se han hecho hasta la fecha inversiones en cinco países de algo más de $10 millones en once proyectos aprobados por nuestra Directiva. Nuestros países miembros comprenden en Europa todos los estados no comunistas, con excepción de España y Portugal, pero descontando Grecia, Finlandia y el Sur de Italia y quizás Austria, ninguno de los países europeos son elegibles por considerarse de bastante desarrollo industrial propio. Lo mismo puede decirse de los Estados Unidos, Canadá y el Japon. Queda pues definido que las actividades de la Corporación están esencialmente dirigidas a los países miembros de la

América Latina, el Sur y Sudeste de Asia, el Medio Oriente, Australia y Africa. Esto, pues, es la Corporación Financiera Internacional en cuanto a los países miembros y donde operamos nosotros.

2. Ahora con su permiso les quiero explicar en términos generales como tenemos que operar, y luego les daré algunos ejemplos específicos de lo que se ha hecho y experimentado hasta ahora.

3. Se fijarán que casi siempre usaré la palabra inversión, no la palabra préstamo, en cuanto a nuestras operaciones. La CFI por regla general solamente hace inversiones basadas en un interés fijo combinado con una participación en los beneficios de la empresa. Así, su función es semejante a la de cualquier otra institución de inversión de capital o un individuo capitalista, con la diferencia que la Corporación no puede tener acciones sino el derecho de conversión a acciones nada más, lo que se puede vender a un comprador de la inversión de la CFI. No puede tomar parte activa en la dirección de una empresa. Tampoco pretende competir con otras fuentes de capital privado.

4. Ya hemos sentado que el propósito de la Corporación es incrementar y fomentar la inversión de capital privado, sea del país miembro o de afuera, enel sector de la industria privada productiva. Así, y en contraposición al Banco Mundial, trata directamente con entidades particulares, sin intervención o garantía gubernamental. Hace sus inversiones en asociación con inversionistas privados con los mismos riesgos, y con beneficios relativamente proporcionales si la empresa tiene éxito. Pero para no competir con otras fuentes de capital privado, no acepta propuestas de patrocinadores cuando es evidente que pueden encontrar por sí mismos capital privado a un costo equitativo, o sea en términos que permite la posibilidad razonable del éxito del proyecto.

Para gobernar la manera de funcionar y cuáles serían las propuestas atendibles, fué constituída la política siguiente:

(A) En cuando al caracter privado de la empresa:

No invertirá en una empresa que es propiedad de y operada por algún gobierno, o en cuya dirección el gobierno participe. No obstante, una empresa en la que se han invertido fondos públicos no por eso queda necesariamente excluída de ser financiada por la Corporación si la empresa tiene un caracter esencialmente privado.

(B) En cuanto a la ubicación de la empresa:

La empresa debe estar situada en un país miembro, o bien en sus territorios dependientes.

(C) En cuanto al tipo y tamaño de la empresa:

Se considerará tanto la ampliación o el mejoramiento de una empresa existente, como también la creación de una nueva. El capital nuestro deberá ser utilizado siempre para crear facilidades productivas o bien para capital permanente de trabajo, y no para refinanciar una empresa. Y el proyecto o la empresa tiene que ser de importancia para el desarrollo industrial del país; así la Corporación toma muy en cuenta los programas de fomento industrial de los gobiernos. No invertimos capital en proyectos de communicaciones, de transportes, viviendas, escuelas o colegios, u operaciones puramente comerciales. En los primeros años son de interés las empresas o proyectos esencialmente industriales, como son fabricación o elaboración de productos y de explotación minera. De momento no estamos invertiendo capital in proyectos puramente agrícolas, pero estamos dispuestos a tomar intereses en proyectos mixtos, o sea como un central de azúcar con campos para producir su caña. En cuanto al tamaño de la empresa, por regla general se trata con empresas cuyo haber ascienda aproximadamente a $500,000 como mínimo, o su equivalente, una vez financiadas, y incluyendo el monto del capital de la CFI.

(D) En cuanto al monto de una inversión de la Corporación:

Una regla importante es la de no invertir más que la mitad del cost^{o} de una

empresa, y no se invierte jamás en un proyecto cuyo capital total esté representado por deudas en más de un 50% una vez totalmente financiado. El plan es hacer inversiones de entre aproximadamente $100,000 y aproximadamente $2,000,000 durante los primeros años.

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6. En cuanto a los propósitos y las formas de hacer inversiones, hay también unas reglas generales que sirven de guía para decidir si una propuesta es atendible. Importante entre ellas hay

(A) Primordialmente, la CFI es una institución inversionista, y no puramente prestamista y por lo tanto no puede contemplar préstamos simples, o sean préstamos con interés fijo y nada más.

(B) Se tratará siempre de hacer inversiones que estimulen la participación de inversionistas de capital privado, pudiendo ellos hacer sus inversiones al mismo tiempo con la CFI, o bien más tarde con la compra de nuestras inversiones. Un factor importante es que en cada caso la Corporación hará todo lo posible para formular su inversión de manera que contribuya a estructurar debidamente el financiamiento total de la empresa con capital privado.

En cuanto a la forma de la inversión de la Corporación en una empresa dada, no está permitido que ésta sea en forma de capital social, es decir en acciones. Se tomará una forma intermediaria entre capital convencional en préstamo y capital en inversión, o sea préstamos con derecho a participar en el crecimiento de la empresa. Esta participación en el crecimiento puede ejercerse con (a) derechos a convertir el capital prestado, o parte del mismo, en acciones, o (b) alguna remuneración adicional sujeto a utilidades o (c) una formula conteniendo las dos cosas. La CFI no puede ejercer este derecho de conversión a acciones, pero sí puede vender este derecho. El monto, el tipo de interés fijo, y la forma de la participación se determinan en cada caso según las circunstancias.

(C) La Corporación no se opone a que exista otras obligaciones, como bonos o hipotecas, que tengan prelación sobre su inversión, siempre que el monto de tales obligaciones sea razonable.

(D) El capital de la Corporación es en dólares, y durante sus primeros años hará inversiones por preferencia en dólares. Por lo tanto, normalmente las obligaciones correspondientes serán en dólares. No obstante hará inversiones también que en parte estén representadas en otras divisas, siempre que pueda justificarse la perspectiva de estabilidad de la divisa determinada, y cuando los derechos de participación en las utilidades son proporcionales.

(E) Los plazos que se dan se extienden en general de cinco a diez o posiblemente quince años aproximadamente. Los arreglos para la amortización de las inversiones son acordados en cada caso según sus características.

(F) La CFI intentará rotar su capital vendiendo sus inversiones tan pronto como ellas resulten suficientemente atractivas para interesar a inversionistas privados. No obstante estará siempre dispuesta a ofrecer a los patrocinadores de cada empresa el derecho preferencial de compra.

(G) Importante a notar también es que la Corporación no quiere entenderse con meros intermediarios o promotores. Una solicitud puede ser presentada por una empresa en existencia, por un inversionista en prospecto en una empresa nueva o ya existente, o por una firma o persona que desea establecer una empresa nueva.

7. Bueno, ya les he dado toda una serie de normas de la política de la Corporación. Creo que las que he tocado son de las más importantes. En el libreto de color marrón pueden Vds. ver en mucho más detalle todo esto. Creo que les puede ser de interés unos comentarios sobre lo que la Corporación ha hecho y ha experimentado en los dos años que ha operado.

Una de las primeras dificultades que se ha experimentado ha sido llegar a

hacerse conocida en los países miembros por el sector industrial y por la gente emprendedora para que conozcan lo que ofrecemos. A medida que la Corporación Financiera Internacional ha hecho por lo menos una inversión en un país, inmediatamente han venido otras propuestas del mismo país. Por ejemplo, la primera inversión hecha por la Corporación fué en el Brasil y la segunda en México. Desde aquellos países seguimos recibiendo propuestas muy interesantes y hemos hecho más inversiones en ellos. En otros países hemos hecho inversiones y tenemos bajo estudio propuestas, algunas de ellas a punto de ser negociadas, y se vé con bastante seguridad que ya hemos efectuado la tarea más difícil, el poner en marcha nuestra CFI.

9. Entre las dificultades que encontramos está el problema de hallar entre los solicitantes gente capacitada y con la experiencia necesaria para asegurar el éxito de sus proyectos. Vds. reconocerán que para cumplir con todos los requisitos de instalar una industria nueva se tiene que tener gente en los puestos de mando que saben lo que hacen y que prevean lo que se tendrá que hacer. En algunos casos hemos logrado unir solicitantes para un proyecto bueno con personas o empresas extranjeras que han podido aportar la experiencia técnica necesaria, y los dos se han asociado para llevar el proyecto a la práctica. En otros casos hemos logrado que el solicitante adquiera los servicios de ingenieros o consultores o de expertos de otra clase para cubrir la necesidad que había de completar el proyecto para asegurar su éxito en todo lo posible. En un caso intervenimos con casas extranjeras a fin de que ellas concediesen licencias técnicas para la entrega de informes técnicos completos para su aplicación en la empresa nueva donde luego invertimos capital.

10. ¿Cómo se puede determinar o asesorar cuáles son las faltas o los puntos débiles de un proyecto industrial que es básicamente sano? Esta es la tarea de varios de nosotros en la Corporación. Tenemos ahora veintiún miembros en el personal oficial de la CFI, cada uno de ellos de categoría de experto en algunos de los

terrenos que se tienen que asesorar en un proyecto. Tenemos también la muy valiosa ayuda de personal experto en el Banco Mundial, que colabora muy estrechamente con nosotros en asuntos de orientación general y asesoramiento económico. El personal que tiene la CFI ahora viene de siete países miembros (EE.UU., U.K., Cuba, Australia, Francia, y Alemania) A medida que crezcan nuestras operaciones iremos aumentando el personal, siempre con gente experimentada en operaciones internacionales del tipo nuestro.

11. Lo primero que se mira cuando una propuesta llega de un país miembro es si es un proyecto que está entre las categorias que son elegibles. Si lo es, luego se investiga si las personas que hacen la propuesta son gente seria con experiencia comercial e industrial y de la clase con quien la Corporación podría asociarse. Siendo positivos los informes estos, empezamos la tarea de asesorar el proyecto a fondo.

. No es preciso que los informes para solicitar una inversión estén presentados en una forma especial. Pero sí deben cubrir la mayor cantidad razonable de información preliminar sobre la empresa y los propósitos de la financiación. Los tipos de información preliminar que se necesitan para empezar a considerar seriamente una propuesta figuran en dos formularios anexos en el libreto marrón. Cualquier información adicional que haya de solicitarse, en cada caso se pedirá en el curso del asesoramiento.

13. Hacemos un estudio bien a fondo sobre los puntos técnicos-comerciales de cada proyecto. También de la organización y el personal disponible. En general se espera que las personas que se hayan asociado para el financiamiento, o la gerencia de la misma empresa efectúen la investigación técnica fundamental de la propuesta, inclusive los estudios del mercado, o bien que se hayan contratado consultores expertos para efectuarlos y organizar los estudios para que se pueda

valorar el proyecto. Desde luego, la Corporación decide en cada caso si es deseable suplementar todo esto con sus propios estudios.

14. Una vez terminada la valorización de la propuesta para determinar los riesgos comerciales, técnicos, y a veces de personal, si los resultados son prometedores de una empresa sana y predicen que una vez puesta en marcha producirá utilidades que puedan ser de interés al capital privado para inversión, la Corporación procede a negociar la inversión bajo las normas que les cité al principio.

15. A veces nos llegan los informes y los datos técnicos y comerciales tan completos y tan bien hechos que nos es posible proceder muy rápidamente a una inversión. Pero en la mayoría de los casos, debido a las largas distancias y el tener que tramitar y explicar todo por correo, se tarda bastante tiempo en recibir todo lo que nos hace falta. Muchas veces, también, un hombre emprendedor puede tener un proyecto fundamentalmente bueno pero le falta o el tiempo o la experiencia técnica o comercial para agregar todos los estudios y planos necesarios. En estos casos cuando el patrocinador es serio y lo quiere, muy gustosamente hacemos todo lo posible para ayudarle en la preparación de su proyecto. A veces le mandamos un consultor experto en la materia del proyecto, que nos sirve a nosotros también para asesorar el proyecto de cerca. En un proyecto que tenemos bajo estudio ahora hemos puesto al solicitante en contacto con un productor de lo que él propone hacer. Los dos se han puesto de acuerdo para estudiar el proyecto a fondo y unirse para su explotación si se comprueba que el proyecto es factible. El uno ha llevado la idea y el otro la experiencia para hacer una asociación que puede ser muy provechosa.

16. <u>Ejemplos de Inversiones</u>

1. Compañía fabricante de plásticos:

   (a) 10 años de experiencia

   (b) Productos nuevos que requerían datos y servicios técnicos asequibles

en el extranjero.

(c) Ya habían empezado el programa nuevo

(d) Faltaban capital para importar maquinaria necesaria

(e) Evaluación confirmó que era compañía sana, gente capaz y de clase para asociarnos

(f) Deficiencias:

(i) Subgerente o subdirector para ayudar al Director General

(ii) Ampliación departamento ventas - antes ventas a base de director o gerente a gerente - ahora entraban en campos de mucha competencia

(iii) Director Gerente intentaba llevar personalmente negocios corrientes de la compañía además cargarse de todo el detalle del programa nuevo, supervisar construcción, instalación de maquinaria y procedimientos nuevos. Sufría mucho los negocios establecidos. Recomendamos emplearan firma ingenieros para tomar responsabilidad de la supervisión de las construcciones, instalaciones, subcontractos, etc., librando al Director.

(iv) Contabilidad para controlar los costos, especialmente inventarios y material en proceso de fabricación.

(g) Informes de la compañía son muy prometedores a un porvenir fructuoso.

2. Ejemplo muy sencillo - compañía internacional que quería comprar y renovar planta de pasta de papel. Antiguos propietarios habían pedido dinero seguidamente durante los últimos años - a punto de quebrarse. No interesaba un simple transferencia de los propietarios de la compañía - interesaba que la compañía internacional iba a convertir la planta y ampliar producción en gran escala - ayudando a cubrir el déficit en pasta de papel que costaba al gobierno millones de dólares cada año en importaciones. Informes del plano de los patrocinadores eran completos

del todo, no obstante empleamos un consultor experto de fuera - ninguno de nosotros es experto en la fabricación de pasta de papel - a revisar todos los plantos y confirmar que era factible lo que proponían y que sus intenciones eran como decían. Confirmó el experto e hicimos la inversión, y el programa de conversión se está llevando a cabo en estos días, tal como habían proyectado.

3. Ejemplo de una inversión atractiva que fracasó -

Proyectaban una planta para un matadero y un frigorífico de productos de carne en escala grande para mercado doméstico y exportación. El proyecto en sí parecía completamente bueno y sano en su primera presentación. Un consultor nuestro, experto en esta industria confirmó que planos y proyectos eran buenos. Cuando empezamos a investigar el plano de financiamiento y lo que proponían hacer con sus utilidades, extrañaba que datos no coincidían - patrocinadores del proyecto proponían hacer instalación planta por una compañía suya en un segundo país. Cuando empezamos a averiguar e intentar confirmar los costos que proponían para instalación de planta, patrocinadores retiraban su colicitud sin más explicación. No sabemos base, pero seguro que no era proyecto de una clase buena con que tenemos que asociarnos.

4. Ejemplo de un fracaso con éxito:

Proyecto para poner una planta de viruda de madera prensada en plancha endurecida. Proyecto muy bueno en todos los sentidos, patrocinadores no podían levantar capital necesario por venta de acciones en el país - es un país donde nunca ha habido un mercado para acciones de ninguna clase. Por la muy buena fama del patrocinador y la investigación a fondo que hicimos, con los reportages y lo hablado del proyecto y la investigación e interés nuestro, al ofrecer las acciones al público, por sus compras aportaron todo el capital que hacía falta y aún querían comprar más. Por lo tanto no hacía falta ninguna acción nuestra.

17. Sin duda el trabajo más importante que tiene la Corporación Financiera Internacional es el de fomentar y servir de catalista entre la gente libre del mundo para que las empresas privadas y las industrias privadas, que son la base económica de nuestra libertad, se multipliquen en beneficio económico y social para todos. Tenemos en la Corporación relativamente poco capital para invertir si fuesemos nada más que inversionistas internacionales. Pero como catalista sí que podemos hacer mucho. Son 45 países elegibles para nuestras inversiones. Contando que tendremos $100,000,000 más lo que se puede levantar con venta de bonos y préstamos a la CFI, está claro que habría muy poco para repartir entre todos los elegibles. Así lo que se harán son operaciones piloto y de catalista para traer y canalizar capital privado hacia los fines que buscamos.

18. La meta de la CFI es demostrar en forma concreta que las inversiones particulares, eficazmente administradas, son lucrativas. No es un concepto nuevo, ni mucho menos. Tampoco quiero que Vds. llevan de aquí la impresión que creemos que los países de la América Latina no comprenden y practican esta meta y que no han hecho grandes progresos en todos los campos de desarrollo económico, social e industrial. Conozco algo de los países de la América Latina y sé muy bien los enormes progresos que han hecho en su vida industrial. Todos aquí en la CFI y a través de nuestros directores representando los países de Vds. sabemos sobradamente que Vds. son de los países del porvenir, socialmente, económicamente y en todos los sentidos.

19. Y aquí pongo punto final. Espero que Vds. se acordarán de la Corporación Financiera Internacional cuando vuelven a sus bellos países respectivos. Si entre sus amigos o conocidos hay quienes tengan proyectos industriales que puedan necesitar nuestra ayuda no dejen de ponerles en contacto con nosotros. Los libretos marrones explican en detalle lo que se requiere para ser atendibles. Cuando lleguen las propuestas aquí, les aseguro que les daremos toda nuestra atención. Para esto estamos.

Lower Limits

Every institution must for practical administrative reasons have some limits on the small size of the enterprises which it finances and the size of its own investments.

Particularly an international financial institution cannot investigate hundreds of very small businesses all over the world and also supervise hundreds of very small investments year by year.

Even local Development Banks or Fomentos have usually got some lower limits - in the Conference of Development Banks held at the World Bank in May 1958 (including Brazil, Chile, Mexico) it was clear that many of them had lower limits not much different from those of IFC - the financing of very small businesses must be handled locally.

For example, Nacional Financiera in Mexico has, in addition to its normal funds a special trust fund from the Government, with the aid of which it gives guarantees or discount facilities to commercial banks, so as to decentralize the work and reduce the expense of investigating projects and supervising loans.

IFC VISITS TO LATIN AMERICA

1. Chile - Mr. Garner, Carrillo, Evans in November 1956
   Carrillo in 1958
   Two firms of consultants
2. Paraguay - 1 IFC Engineer (Armstrong)
   Two consultants
3. Brazil - Von der Goltz (1958)
   Kauffmann (Brazilian lawyer) 3 or 4 visits
   Lamont - twice
   4 or 4 consultants
4. Colombia - Carrillo (1958)
5. Central America - Carrillo (1958)
   Dodd (Costa Rica and Guatemala)
   Mining consultants to Nicaragua (1957)
6. Mexico - Mr. Garner, September 1956
   Messrs. Haskell (3), Evans (2), Dodd, Blondeel (4 or 5)
   5 or 6 consultants

Talk by M. S. Lord to
Faculty and Students of
Technical Colleges of the
University of Sao Paulo
12 August, 1965

DEVELOPMENT ASSISTANCE THROUGH THE WORLD BANK GROUP

The World Bank group consists of three institutions which share the common purpose of providing and promoting a flow of capital into productive projects and programs, especially in the underdeveloped countries. The first of the three institutions, of course, is the Bank itself. Its 102 member governments have subscribed a total of more than $21 billion of capital, of which one-tenth has been paid in. It makes long-term loans at conventional interest rates; and while it lends for many kinds of projects, most of them have the common characteristic of being large in scale; the average Bank loan amounts to about $20 million.

The older of the Bank's two affiliates is the International Finance Corporation, which began operations in 1956. Its membership is composed of 78 governments that also are members of the Bank, and its subscribed capital is approximately $100 million. Whereas the Bank may lend to either public or private borrowers, IFC works exclusively in the private sector; and it concentrates its efforts on the development of industry.

The newest of the World Bank group is the International Development Association, better known for short as IDA. IDA has 94 members, drawn from the Bank's own membership. Its resources amount to over

$1,500 million. IDA lends for much the same kind of projects as the Bank, but deals with a rather different group of customers; its particular mission is to lend to countries not fully able to bear the burden of loans made on conventional terms, and its credits are made at very long term and free of interest.

All three of these organizations are cooperatives in the strict meaning of the word: that is to say, they derive their resources from their members, including borrowings from capital markets, and they operate for the benefit of their members.

The Bank itself is of course the largest and oldest of the three members of the World Bank group. It started work in mid-1946, and its first emphasis was on the urgent problems of reconstructing some of the war-damaged economies of Europe, for which it made loans totalling $500 million. It was from this beginning that it turned its attention by degrees to what has become the main area of activity -- the financing of economic development. Since 1948, the Bank has made loans totalling $8.2 billion for development projects and programs in 70 member countries or territories.

Most of this development lending has been for basic utilities which, in the underdeveloped world at least, generally do not attract private investors. More than a third of the total has financed the development of electric power. To give you an idea of the scope of this power lending, one can mention as an example that in 14 countries of Latin America, the projects financed by the Bank have on average amounted to a doubling of generating capacity as compared with 1948.

About a third of the Bank's lending has financed transportation -- especially railways, roads and ports. Most of the rest has gone into industry and agriculture. The industrial lending has been for heavy industry, such as steel, or has been channeled into private finance companies in the borrowing countries themselves, to be re-invested in establishing or expanding domestic industries. The agricultural loans have generally been for comparatively large schemes, and especially for flood control or irrigation projects that involve heavy capital spending.

Most of the loans have been made in the underdeveloped nations, although the Bank has also lent to others, such as Australia, New Zealand, Norway and Denmark, whose need for capital is bigger than they can meet through ordinary borrowing. The lending has been fairly evenly spread about the world: Asia, the most heavily populated region, has taken the largest share, followed by the Western Hemisphere, Europe and Africa. India is the largest individual borrower, with Japan in second place and Mexico in third.

The Bank is continuing to adapt and broaden its lending activities to meet the needs of its growing membership. Together with its affiliate, the International Development Association, the Bank intends to go on pursuing, as its main business, the building of basic economic foundations in the form of power and transportation projects. But in addition, both the Bank and IDA intend to increase their assistance to high priority projects in education, as a means of realizing

more fully the economic potential of our member countries. For instance, the Bank has made a loan of $6 million for higher agricultural education in the Philippines, while IDA has extended credits totaling $46 million for education projects in Afghanistan, Nigeria, Pakistan and Tanzania. The Bank has entered into an agreement with the United Nations Educational, Scientific and Cultural Organization, which provides for a cooperative program to identify, prepare and supervise educational projects to be financed by the Bank and IDA.

It is also intended to add substantially to the financing of directly productive projects in agriculture and industry. In agriculture, the Bank and IDA plan to give greater support to comprehensive agricultural schemes to increase productivity on individual land holdings. In Morocco, the Bank lent $17.5 million to assist a pilot undertaking to introduce modern intensive agriculture on 217,000 acres. In order to facilitate an increased flow of agricultural projects for Bank-IDA financing, the Bank has entered into an agreement with the Food and Agricultural Organization. This agreement is on the same lines as the one with Unesco. A flexible attitude has been adopted in the support of industrial development. For instance, financing will be extended not only for individual projects but, in a few appropriate cases, also for the import of raw materials and components where the shortage of exchange for such imports has prevented the full use of existing capacity. An IDA credit of $90 million has already been extended to India for this purpose. Development finance companies now obtain loans without having to specify each individual project in advance.

In exceptional cases, the Bank also will be willing to modify its loan terms -- now and then, to make a loan with an unusually long grace period or final maturity. But it does not intend to relax the standards which it applies to its business. The Bank intends to go on being careful and diligent in measuring a country's ability to use and repay capital, in working to improve the economic programs and policies of its member governments, and in helping to develop well-conceived and well-engineered projects for financing.

The association of Brazil and the World Bank is of 19 years standing. It is one of the founding members of the Bank and its two affiliates, the International Finance Corporation (IFC) and the International Development Association (IDA). Brazil is, along with Argentina, the Bank's largest shareholder among the Latin American countries, and occupies a corresponding position in the two affiliates.

So far, the Bank has lent $346 million for high priority projects in Brazil, in the sectors of electric power and transportation. The bulk of this lending has gone to assist Brazilian power companies, both public and private, to install (including units still under construction) nearly 3,000,000 kilowatts of new capacity. While some of this power involved thermal units that could be brought into production more rapidly to meet immediate demands, most of the increase is based on the country's hydroelectric potential. Of all the Bank's lending for power development in Brazil, nearly $300 million has been in the south-central region, the industrial heart of Brazil.

Besides assisting development projects, the Bank has been providing technical assistance of wide variety. In October 1964, the Bank sent a 20-man mission to review and appraise current economic conditions and future prospects and to study the Government's development program and policies. The mission's report was submitted to the Government in March 1965.

The Bank is acting as Executing Agency for a UN Special Fund Survey of the hydroelectric resources and power market of the south central region of Brazil. The scope of this study has been extended to include the use of coal for thermal power general and an evaluation of hydroelectric power sites.

IFC has undertaken six investment commitments totaling $11.3 million in Brazil. The Corporation is now examining several industrial projects, with a view to selecting those most suitable for financing by the World Bank or IFC.

It may be of interest to describe one specific case of how the World Bank goes about its business; the South American Republic of Colombia can be taken as an example. The story properly begins with a request to the Bank from the Colombian Government to send a mission of experts to examine the economy and to draw up recommendations which could serve as the basis for working out a detailed program of investment and other measures that would accelerate the economic growth of the country. This mission, the first such general survey team ever organized by the Bank, went

to Colombia in 1949, and submitted a 600-page report in the following year. It was not the business of the group to deal with loan proposals. Out of its report, however, came a series of far-reaching plans drawn up by the Colombian authorities themselves. These plans subsequently helped provide the basis for the very extensive lending program undertaken by the Bank in Colombia, a total of 25 loans amounting to about $390 million.

These loans have helped to renovate and extend Colombia's railways, to build and improve over 3,500 kilometers of highways, and nearly to quadruple the supply of electric power from public sources. One of the most interesting problems was to get better transportation in the upper valley of the Magdalena River, through which some of Colombia's coffee crop was shipped on its way to market in Europe and North America. The river itself could not carry cargoes in the months of the dry season, at time of low water; in those months, the river was, in fact, a barrier across the country, not crossed by any major highway and separating the country's two major railway systems. There were three possible ways to solve the problem of transportation through the valley. First, it would have been possible to dredge the Magdalena River deep enough to provide for year-round navigation. Second, it would have been possible to build a road from the shallows of the river to a down-stream point from which navigation would be insured throughout the year. The third possibility was to build a railway, running through the valley in such a way as to link the eastern and

western railway systems, and improving access to the port which was the valley's natural outlet to the Caribbean Sea and the Atlantic Ocean.

The Bank's general survey mission in 1950 had identified the problem of transportation in the valley as an urgent one, and had recommended that the Government retain consultants to study the problem and identify the best solution. The Colombian authorities accepted the recommendation and in 1951 engaged an engineering firm to make a comprehensive investigation; the Bank considered the project so vital that it agreed to pay part of the cost of the study.

In June 1952, the consultants reported that the prospective traffic would justify a railway, that construction, although difficult, would be feasible from an engineering point of view, and that of the three possible solutions, a railway would be the most complete and bring the highest economic return. In August 1952, the Bank made a loan of $25 million to finance construction of the new railway. In 1955, after a study of rising traffic, the Bank made another loan of $16 million to extend the new railway line 300 kilometers and provide quicker and more direct access to the Caribbean. This was followed by another loan of $5 million in 1960 for additional operating and shop equipment.

Severe difficulties of terrain as well as other factors delayed construction, but the Railway has now been open for three years. Running the length of the Magdalena Valley to the Caribbean it carries

freight from the coast to the inland cities in 12 hours, compared with ten days or more that used to be required for barge transport on the Magdalena River. It has opened for development a rich plain well suited to the growth of cotton and other crops. It has linked formerly separated parts of the country, has stimulated interregional trade, and has made it possible for Colombia, for the first time in its history, to have an efficient and nation-wide system of land transport.

While the Bank is a lending institution, its emphasis is not so much on what it can lend from its own funds as on what it can mobilize from other sources. Of the capital subscribed by our member governments, only one-tenth is paid in. For the rest, the Bank relies on what it can raise in the capital markets of the world.

The Bank raises funds, primarily by the sale of its bonds. The market for the Bank's bonds is international; altogether they have been sold in more than 40 countries. There is now the equivalent of over $2,700 million of bonds outstanding, in eight currencies -- Belgian francs, Canadian dollars, German marks, Italian lire, pounds sterling, Netherlands guilders, Swiss francs and United States dollars.

It has been possible for the Bank to raise this large sum, at interest rates little or no higher than are paid by governments themselves, for two basic reasons. One is the confidence in the Bank that has been engendered by its record of operations. The other reason is that investors know that the Bank has available still larger sums which it can call upon to repay its borrowing should ever difficulties arise. These amounts are, of course, the portions of the

member countries' subscriptions -- the nine-tenths -- that have not been paid in, but remain on call. The United States guarantee amounts to no less than close to $6,000 million, and the guarantees of the countries of Europe are still larger, amounting to about $6,500 million.

The Bank not only sells bonds; it is eager to draw investors still more directly into its operations. This it does by selling parts of its loans, either at the time they are made or out of its portfolio. About 500 financial institutions -- mostly commercial banks and insurance companies -- have bought parts of our loans; and in one recent case, investor interest was so high that out of a loan equivalent to about $7.5 million, all but $35,000 worth was sold. In all, the Bank has drawn $1,880 million of other capital into its operations by sales of loans. It loses money on these transactions, but it is an important part of the Bank's business to do all it can to establish the credit of its borrowers in the world markets.

Finally -- and especially in the case of its European clients -- the Bank has been able to introduce some of its borrowers directly to the market, by means of a combined operation in which a World Bank loan coincides with the raising of additional funds from private investors. One early case of this involved the Kingdom of Norway; at the same time as it borrowed $25 million at long term from the Bank, it was raising another $15 million by the sale of shorter-term securities in the American market. Altogether, the Bank has helped its borrowers raise approximately $560 million from private investors in this way.

In these various ways, the Bank has helped to raise from other investors a total of $6.5 billion -- a sum more than three times as great as its own paid-in capital. The Bank is proud of this achievement, and believes that it is a significant one; for if economic growth in the underdeveloped world is to be speeded up, a larger and constantly growing role must be played by private investors.

The Bank group's special instrument for promoting progress in the private industrial sector of member countries is the International Finance Corporation. Unlike the Bank, it invests in private enterprises without governmental guarantee, and again unlike the Bank, it is able to provide share as well as loan capital.

IFC aims to perform three main functions. First, it provides finance for private projects of high developmental priority. Second, it seeks to stimulate the international flow of private capital into productive undertakings; on occasion, it has helped to channel funds from investors in as many as eight or nine different countries into a single development project. Third, it seeks to promote the development of local capital markets; it may encourage local investors, for example, by underwriting the issue of securities by new or expanding enterprises, or by selling seasoned securities out of its portfolio.

In the past fiscal year, IFC was made the technical arm of the World Bank group in the appraisal, preparation and supervision of industrial projects. The Corporation now handles all proposals regarding financial and technical assistance to industry even if submitted for financing to the World Bank and the International Development Association.

Member governments of the World Bank and IFC are acting on a proposal to enable the Bank to make loans to IFC for re-lending for private industry. The proposal, if adopted, would create the possibility of still greater flow of capital from the World Bank group to industry.

IFC's investments and underwritings have now reached $137 million, for productive private enterprises in 32 different countries. Most of these companies are engaged in manufacturing or mining; but there is another class of enterprise in which IFC and the other members of the Bank group have played a major part. These are local development banks whose purpose it is to provide long-term capital and technical assistance to private industrial undertakings.

IFC and the other World Bank institutions have now helped to create or strengthen 19 of these industrial finance companies in Asia, Africa, Latin America and Europe; IFC is a shareholder in thirteen. Among the oldest are those in Turkey and India; and they demonstrate the dynamic role which such companies can play.

The Industrial Development Bank in Turkey is owned almost entirely by Turkish investors, and has been in existence since 1950. By the end of December 1964, its financial assistance to a wide range of industries totaled the equivalent of $80 million -- some $65 million in long-term loans, $8.5 million in equity participations and the balance in short-term credits. In its 14 years of activity, the Industrial Development Bank has performed a vital function in bringing additional private savings into Turkish industry, in supplementing those savings with investments of its own and borrowed funds, and in raising output and increasing employment.

The Industrial Credit and Investment Corporation of India has been operating since 1955. The majority of its capital is from Indian investors, but institutions in Germany, Japan, the United Kingdom and the United States also own its shares. This Indian Corporation has made over $215 million worth of investments in more than 374 different projects. It has been invaluable to the private sector as an agency for introducing new forms of term financing and underwritings, and as an intermediary for arranging participation by other Indian and foreign investors in the financing of Indian industrial enterprises.

A word now about the Bank's newest affiliate, the International Development Association. Like IFC, IDA was created by the Bank's member countries to deal with a problem that lies beyond the reach of the Bank itself. This is the problem of those countries among the underdeveloped nations who cannot -- or should not -- borrow on normal terms: their capacity to make use of capital is greater than their ability to assume and repay debt, on conventional terms like those offered by the Bank.

IDA's objective is to help keep development capital flowing into these countries on terms that place little strain on their balance of payments. IDA credits made up to now are repayable over 50 years, are free of interest, and carry only a 3/4 of 1 percent annual service charge. Soft as those terms are, the projects submitted for IDA financing are expected to meet the same technical, economic, financial and

administrative standards as if they were being financed by Bank loans on conventional terms. The projects financed by IDA are, generally speaking, of the same sort as those financed by the Bank. IDA so far has committed some $1,085 million for development projects in 29 of the poorer countries of the world.

The initial resources of IDA, amounting to $765 million in convertible currencies, had been lent by the end of the first half of 1964. It will be very many years before IDA can look for any replenishment of its resources from repayment of its credits. It is obviously in no position to borrow in the market. Continuation of its lending operations is therefore wholly dependent upon periodic contributions by the developed countries. In June 1964, the action to supplement IDA resources became effective: 18 capital exporting countries and the Bank itself are providing for lending in the next few years roughly $800 million.

Because of their international character, the Bank and IDA are able to conduct business with their borrowers in a way that is hard-headed and at the same time sympathetic. They must represent the long-range interest of all their members, lenders and borrowers alike. They are in an easier position, therefore, to withstand the pressures likely to weigh on national aid programs -- pressures from commercial interests to help finance the sale of particular goods abroad, whether the projects are justified or not, pressures from diplomatic quarters to make loans in order to win the favor of recipient countries, and the like.

This advantage of the multilateral approach to aid is widely understood. There is another advantage of multilateral aid, however, that is perhaps less generally appreciated, and it is simply that multilateral aid is likely to cost everyone less. This is a matter of no small importance to the countries bearing the burden of international development assistance, and it is a matter of vital importance to the countries receiving aid in the form of loans that must be repaid.

So far, the Bank has disbursed over $6 billion to enable its borrowers to import goods or sefvices needed for development projects. The Bank does not impose any conditions requiring the proceeds of its loans to be spent in the territories of any particular member or members; the charter specifically forbids it to do this. In fact, the Bank and IDA work just the other way around; they insist that the borrowers obtain their supplies on the basis of the widest feasible international competition among suppliers in the member countries (and also Switzerland). In this way, the borrowers get the best value available. It should be made clear that the orders are not placed by the Bank; that is left to the borrower. But the Bank gives careful supervision to the procurement methods used by the borrower and reserves the right to withhold disbursement for goods or services which it has reason to believe are excessive in price or not suited to the project.

The important consideration is that under a bilateral loan, tied to procurement in the lending country, the borrower in many cases has no choice but to pay a higher price. By contrast, when procurement is not tied, as under a Bank loan, the borrower can do his shopping in the least expensive market. In many cases, perhaps most, bilateral aid funds will continue to be tied to procurement in the country providing the funds. It is to be hoped that, where this is the case, a determined effort be made to give the borrower the maximum flexibility in the use of such funds, that he should be able to shop around within that country and not be limited to a single project or a single supplier.

On the supply side, no country whose exports are normally competitive should have any reason to fear that it will not receive a fair share of Bank-financed contracts.

The great advantage of the multilateral approach, as the Bank strives to practice it, is that it enables the participating nations, both lenders and borrowers, to concentrate on the fundamental and long-range goal of improving the lot of mankind, free from the distraction of side issues and secondary aims in commerce, diplomacy or military strategy. It provides a channel for private capital to move to poor countries and at the same time to stimulate the flow of trade in capital goods on the basis of free international competition. It enables the developing countries, if they have the will, to make the most of whatever resources they choose to devote to economic development.

This is an advantage of great worth to the developed and the developing nations alike, and it is an advantage that the World Bank institutions, in their own spheres of action, are ready to help them press to the utmost.

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ECONOMIC DEVELOPMENT INSTITUTE

Critical Path Method -- An Example of Application

by

Melvin S. Lord

CRITICAL PATH METHOD

Planning, Scheduling and Analyzing the CPM Network of the Formation of a Company

Let us assume that preliminary studies, estimates and decisions have already been made. Typical of some of the major steps to be carried out to form a company and provide financing for beginning of operations are:

	Step (or Event)	Estimated Time to Achieve (Activity) (Days)
1	Prepare and formalize the collaboration agreement between promoters	15
2.	Prepare article of incorporation for the new company	60
3.	Prepare preliminary information for underwriters and loan agencies	40
4.	Obtain government Development Ministry approval	30
5.	Select and name directors	60
6.	Finish presentation to loan agencies	15
7.	Finish presentation to underwriters	15
8.	Obtain government approval for stock issue	10
9.	Obtain government approval of foreign capital use	15
10.	Obtain state approval to register company	15
11.	Obtain government tax ruling	40
12.	Obtain proforma contracts from power and raw materials suppliers	40
13.	Review of information by loan agencies	100
14.	Review of information by underwriters	150
15.	Form company	15
16.	Negotiate and sign agreements with loan agency	20
17.	Negotiate and sign agreements with underwriters	30
18.	Promoters invest in company	15

Illustration A shows the manner in which the CPM network can be set up according to the sequence and interrelationship of events leading to the completion of the formation of the company. The sequence of events requiring the greatest length of time determines (a) the total estimate of time required to complete all activities and (b) the critical path (the sequence of activities requiring the greatest total time for completion) which identifies the activities which cannot be allowed to take more time than estimated without increasing the total time required to complete the project.

The following are definitions and symbols in current use in the Critical Path Method, and are used in analysis of the example:

Event	=	job to be done
Activity	=	time to complete an event
F	=	earliest finish time for a project or a part of a project being analyzed
T	=	target finish time for total of all jobs in a project or a part of a project being analyzed; must be $\geq$ F
S	=	starting time ("0", date or point in time)
ES	=	earliest start time for a given activity
t	=	time to complete a given job
ES + t	=	EF = earliest finish time
LS	=	latest start time = LF - t
LF	=	latest finish time for each job
FS	=	free slack (or free float) = time any given activity can expand without affecting subsequent activities = ES (of earliest successor event) - EF of the event being analyzed.
TS	=	total slack = LS - ES or LF - EF Represents maximum amount of time any given activity can be delayed beyond its ES without delaying project completion.

Illustration B shows a detailed analysis of the CPM network shown in Illustration A.

Using the corresponding numbers of the list of events and activities on page 1 and collecting the information developed through analysis of Illustration B, it is possible to set up a table that can be a very useful management tool for administration and control of the implementation of the project:

Event	Time to Complete Activity	Start time E	Start time L	Finish time E	Finish time L	Slack TS	Slack FS
1	15	0	45	15	60	45	45
2	60	0	0	60	60	0	0
3	40	0	20	40	60	20	20
4	30	60	140	90	170	80	0
5	60	60	150	120	210	90	10
6	15	60	120	75	135	60	0
7	15	60	60	75	75	0	0
8	10	90	200	100	210	110	30
9	15	90	195	105	210	105	25
10	15	90	195	105	210	105	25
11	40	90	170	130	210	80	0
12	40	60	185	100	225	125	45
13	100	75	135	175	235	60	0
14	150	75	75	225	225	0	0
15	15	130	210	145	225	80	0
16	20	175	235	195	255	60	60
17	30	225	225	255	255	0	0
18	15	145	240	160	255	95	95

MSLord
EDI
February 1966

CRITICAL PATH METHOD
COMPANY FORMATION SCHEDULE

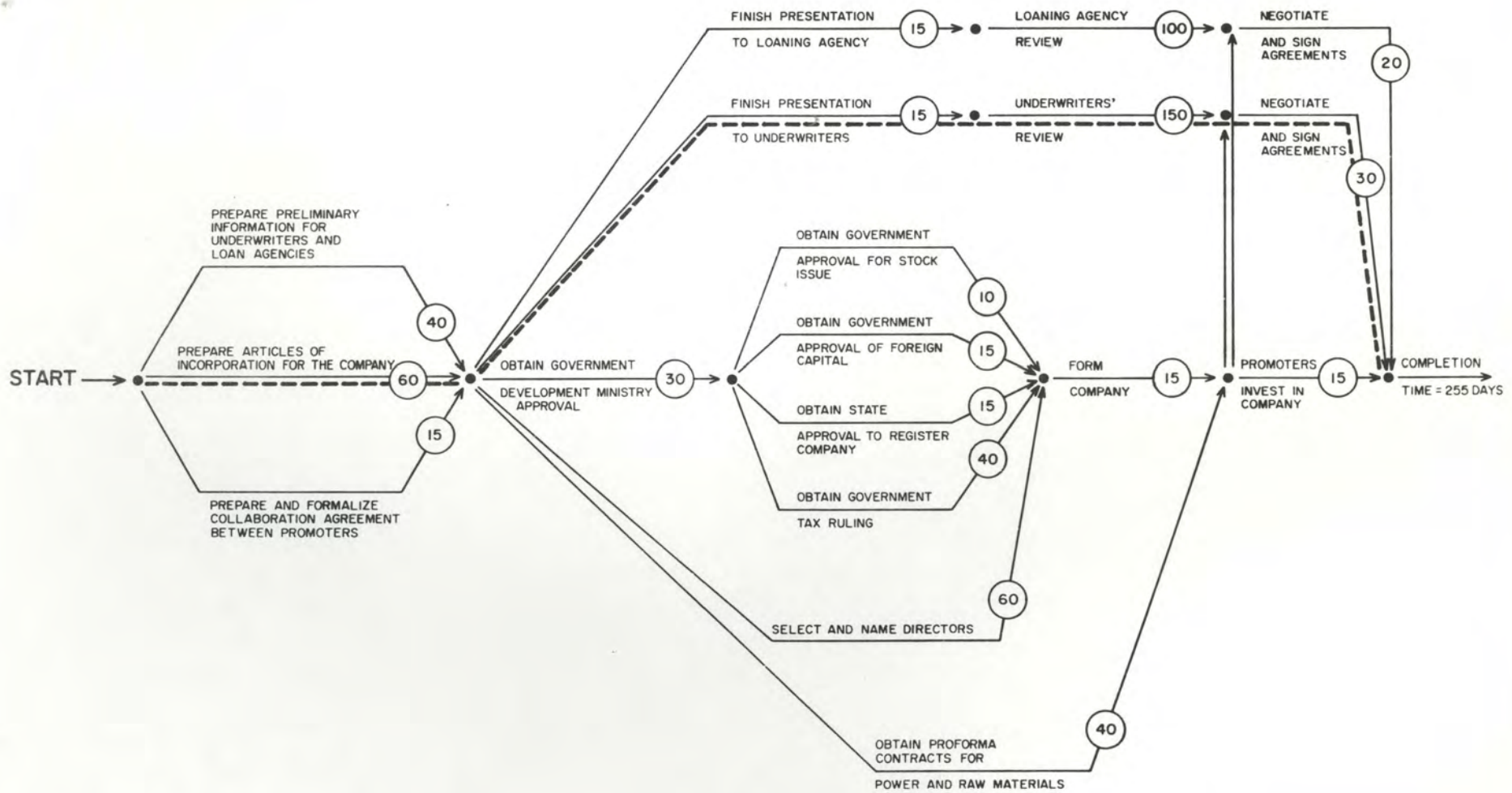

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ILLUSTRATION A

CRITICAL PATH METHOD
COMPANY FORMATION SCHEDULE ANALYSIS

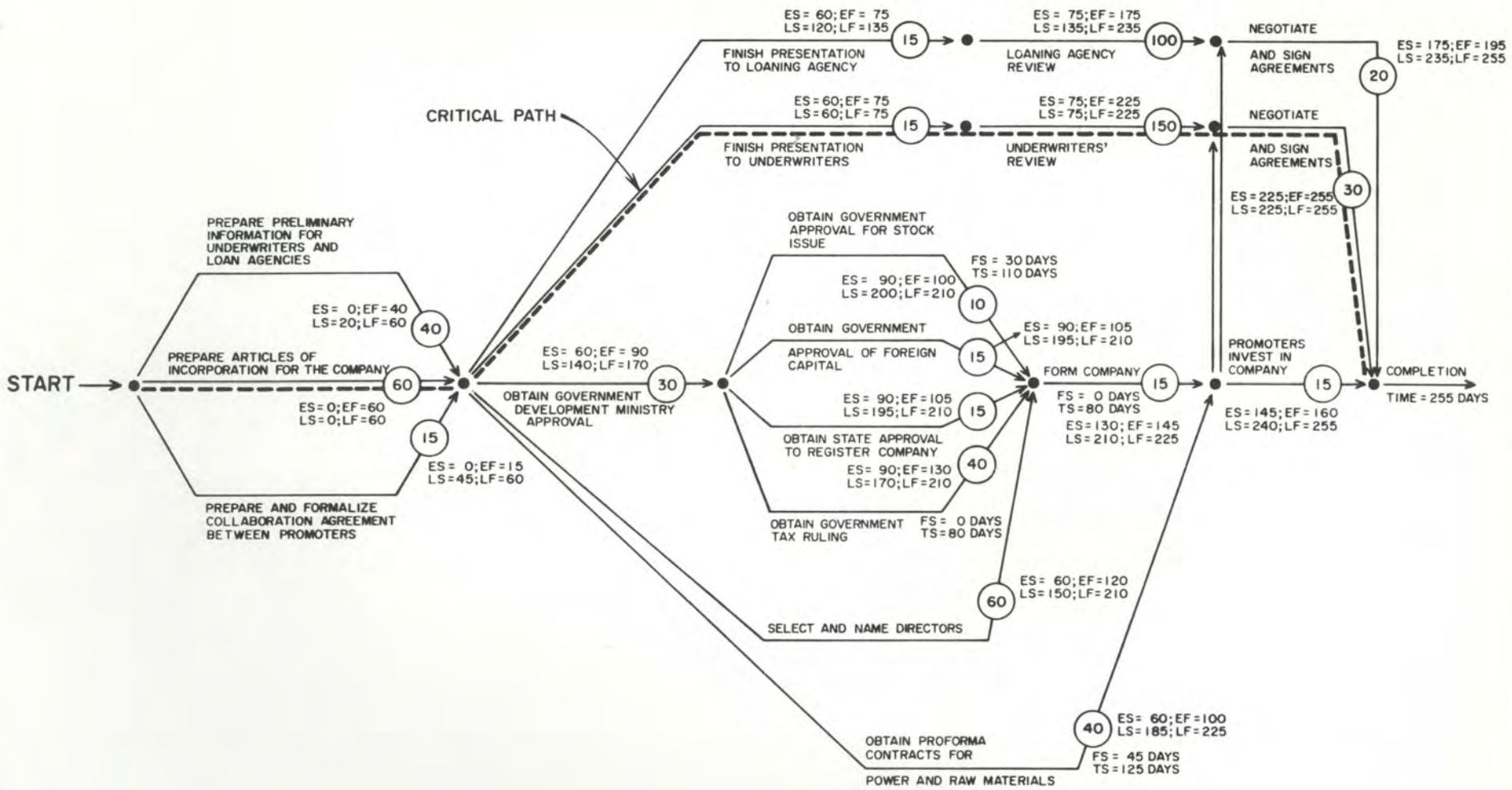

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ILLUSTRATION B

ECONOMIC DEVELOPMENT INSTITUTE

July, 1966

The Critical Path Method of Programming Applied to an Integrated Cane Sugar Project

Adapted by M. S. Lord from a study prepared in 1965
by Mr. E. P. C. Fernando in the Alfred P. Sloan School
of Management of the Massachusetts Institute of Technology.

The Project

A raw cane sugar mill is to be built with a capacity to produce 100,000 tons of raw sugar annually. The mill is to be built in a virtually undeveloped, unpopulated area called Nanum, a location some distance from the hypothetical town of Akara. To support the mill, about 45,000 acres of land are needed, 35,000 for cane growing and 10,000 for plant and service facilities, living areas for labor and staff, roads and other purposes. A primary main road has to be built from Akara to Nanum. The land for cane production must be cleared and prepared for cultivation, but this must be preceded by construction of the primary and secondary road systems servicing the location. A dam must be built on a nearby river and irrigation canals and facilities must be built and put into service before cane cultivation can begin. The entire labor force and supervisory staff must be recruited, trained as necessary, and brought to the site and cared for as needed for implementing the project and subsequent production operations. Building of the sugar mill and service and other industrial and social installations for the plant have to be planned and coordinated with development and putting into cultivation of the cane plantations so that the mill is ready to operate when the first cane crop is harvested. Fertilizers, pesticides, planting and harvesting implements, etc., have to be available as needed for cane production. Manufacturing supplies such as chemicals, packaging materials, maintenance materials, etc., have also to be available at the time of mill startup.

With this summary description of the project it is possible immediately to identify general areas of expertise needed for carrying out the physical aspects of the project:

(1) Experienced management for project implementation,

(2) Project engineering covering civil, mechanical, chemical and electrical aspects of cane sugar mill design, installation and operation,

(3) Land reclamation, dam construction, irrigation systems,

(4) Sugar cane agronomy,

(5) Planning and developing suitable housing centers and social services such as health, education and recreation,

(6) Equipment and materials purchasing and expediting,

(7) Financial control and administration of project implementation,

(8) Transportation and

(9) Marketing of sugar and mill by-products.

Effective management of a complex project such as this cannot be done even by the most experienced project managers and supervising engineers without detailed physical and financial planning and programming of each of the tasks to be performed. Nor can the technical and administrative skills, expertise and manpower be mobilized with proper effectiveness without such programming.

Preliminary Steps for Programming

Programming of a project requires that the individual tasks to be performed be identified, properly defined and described in terms of the task itself as well as its interrelationship with other tasks. Of special importance are:

(a) The determination of what other tasks must precede and be completed or in the process of being carried out before a given task can be started, and

(b) What tasks depend for their initiation on the completion or at least the initiation of another given task.

The first step toward achieving these two determinations is a relatively simple one, and consists of listing the main aggregate tasks, not necessarily in the order of their implementation, then grouping these as nearly as possible according to their direct interrelationship or interdependence and chronology.

To illustrate the preceding points in our cane sugar project example, let us assume that the corporation or entity to own or to be responsible for the project has been formed, financing has been assured, all preliminary or preparatory engineering and other studies and estimates have been completed and that the project is ready for implementation. From the description of the project, the following general list of aggregate tasks can be set up:

STEP I

Aggregate Task	Description of Aggregate Task	Estimated Time to Complete(Months)
A	Formal approval of budget items prepared from consultants' reports, feasibility studies, estimates, etc.	3
B	Finalize plans for road from Akara to Nanum, negotiate and contract for construction	4
C	Finalize plans for sugar factory, buildings, community facilities, transportation and place contracts for civil work and construction.	6

Aggregate Task	Description of Aggregate Task	Estimated Time to Complete (Months)
D	Finalize plans for sugar-cane plantation, survey, land-acquisition, land-preparation, dam construction, irrigation system and place contracts.	6
E	Recruit key personnel such as Administrators, project engineers, educators, medical personnel, mill supervisory staff, foremen, etc.	12
F	Select, relocate and train agricultural workers.	12
G	Order factory supplies such as fuel oil, lubricants, chemicals, packaging materials.	4
H	Order factory and plantation machinery and processing equipment abroad and arrange for delivery to Akara	12
I	Order plantation auxiliaries such as fertilizer, agricultural lime, pesticides.	4
J	Construct secondary plantation roads.	6
K	Construct main road from Akara to Nanum, the factory site.	6
L	Construct factory buildings and facilities at Nanum.	12
M	Complete installation of machinery and equipment in factory, provide power, water supply; make test runs.	9
N	Provide housing facilities, etc. for key personnel's community development.	12
O	Deliver and store factory supplies at site.	3
P	Deliver all factory machinery and equipment to site.	3
Q	Deliver all harvesting machinery and other agricultural equipment to plantation centers.	3

Aggregate Task	Description of Aggregate Task	Estimated Time to Complete (Months)
R	Clear land, build dam and irrigation systems, and prepare land for cultivation.	12
S	Deliver plantation auxiliaries to appropriate centers and store.	3
T	Provide self-help facilities to encourage construction of housing and community center for workers' families at suitable centers.	12
U	Plant cane fields, irrigate and fertilize land and cultivate cane.	6
V	Harvest first sugar-cane crop and deliver to factory for processing.	3
W	Startup mill and produce first sugar.	6

STEP II

The aggregate tasks listed in Step I can be expanded into a more extensive list, or, conversely, might be shortened, depending on the judgment or the objectives of the planner. Also, quite important is the fact that each aggregate task listed includes a considerable number of tasks which must be identified, described and estimated, all in full detail when the full scale program for the project is developed.

Although all are related in the overall project, the 23 (A through W) tasks listed in Step I can be broken down into quite closely related or interdependent tasks to be performed. For example, our cane sugar project can be divided into the following general groupings of activities:

Group I Install physical essentials of the sugar mill complex.

Group II Staff and man the sugar mill complex in preparation for industrial operations.

Group III Provide industrial operating supplies for the sugar mill.

Group IV Establish the physical aspects of the sugar cane plantation complex.

Group V Man and staff the plantation system for permanent agricultural operation.

Group VI Provide supplies for the agricultural operation.

After approval of budgets to initiate action, the aggregate tasks for accomplishment of each general group of activities can be set forth as follows:

Group I: Install sugar mill.

Task B: Finalize plans and contract for construction of Akara-Nanum road.

Task K: Construct Akara-Nanum road.

Task C: Finalize engineering for mill's industrial components and contract for civil construction.

Task H: Order mill machinery and equipment for delivery to Akara.

Task L: Construct mill buildings and all other industrial civil construction at mill site.

Task P: Deliver industrial machinery and equipment to mill site.

Task M: Install all industrial machinery, equipment and service facilities and make tests.

Task W: Startup mill and produce sugar for first time.

Group II: Staff and man the sugar mill complex.

Task E: Recruit key operating and management personnel and mill labor and train where necessary.

Task N: Provide housing and community living facilities for staff and labor.

Group III: Provide industrial operating supplies for the sugar mill complex.

Task G: Order factory supplies such as fuel oil, lubricants, chemicals, packaging materials, etc.

Task O: Deliver and store factory supplies at mill site.

Group IV: Establish the sugar cane plantation complex and produce cane.

Task D: Finalize plans for plantations, surveying and acquiring land, constructing dam and irrigation systems and contract for all civil and land reclamation work.

Task J: Construct plantation roads.

Task R: Clear land, build dam and irrigation systems and prepare land for cultivation.

Task U: Harvest first cane crop and deliver to mill.

Group V: Man and staff the plantation system for permanent operation.

Task F: Select, relocate at the plantation and train agricultural workers and supervisors.

Task T: Provide self-help facilities to encourage construction of plantation housing and community centers for workers and supervisors.

Group VI: Provide agricultural supplies for plantation operation.

Task I: Order plantation auxiliaries such as fertilizers, lime, pesticides, etc.

Task S: Transport auxiliaries to appropriate plantation centers and store.

The identification and division of the various tasks to be done, even in the general way illustrated here, is a major step toward giving management the tools for implementing a project. Possibly most important, it facilitates the specific identification of expertise needed for the various aggregate groups of activities and tasks. It is also a first step toward the proper identification and correlation of individual tasks and their interrelationship with others in the aggregate activity groupings.

Developing the Network for Identification of the Critical Path.

With practice, the technique of developing a network of a project's tasks is relatively simple if one adheres to the concept of designing the network so that the chronology of performing either specific or aggregate tasks is properly shown in relationship to tasks which must precede them or be carried out simultaneously.

While it is not absolutely necessary, experience has shown that it is often simpler to lay out a network by doing it backwards from the end or final objective of the project. In our cane sugar project, the final objective is aggregate Task W, "Startup mill and produce sugar". Several activities must immediately precede or be in process before this final task can be undertaken:

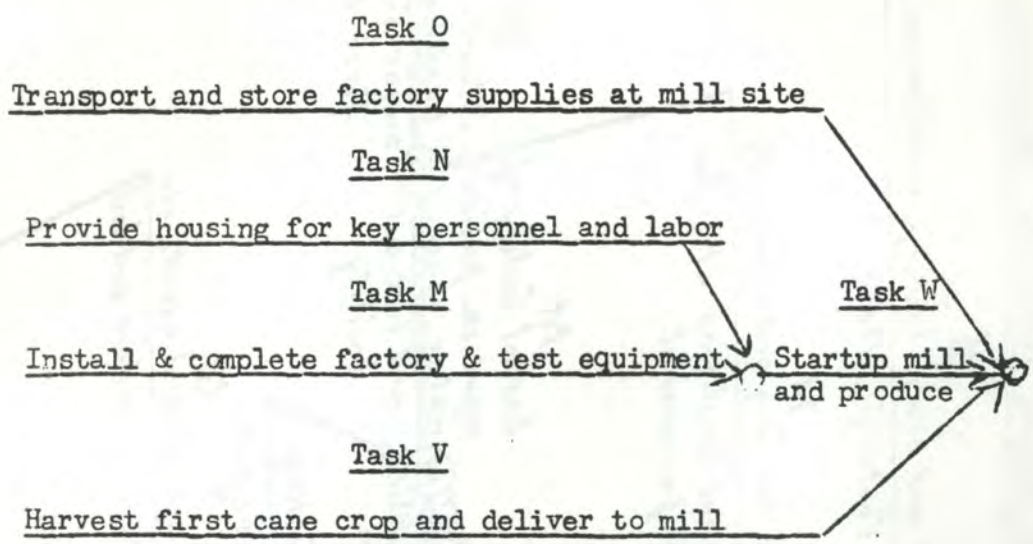
(a) Task M, installation of the factory providing power, water, etc., and making test runs;

(b) Task V, harvest first cane crop and transport to factory;

(c) Task O, deliver and store plant supplies at mill site;

(d) Task N, provide housing and facilities for key operating personnel and labor.

This can be shown graphically thus:



From this it is seen that Tasks N and M have to be completed before the mill can start up, but it is considered that Tasks O and V can proceed simultaneously with the startup of the mill so long as sufficient supplies and cane are on hand to support the startup of operations.

Proceeding backwards from this start, and locating in the network the tasks in each general group, I through VI, will result in the development of the network excerpted from Mr. Fernando's paper and shown as Fig. 2.

Shown in Fig. 2 are dotted lines from 5 to 7, 5 to 8 and 5 to 9. These dotted lines demonstrate that while for purposes of developing the CPM net, Task K, the construction of the road from Akara to Nanum, is part of the general task Group I, the construction of that road is also necessary for Tasks O, N and P. Therefore, completion of Task K is said to be a "constraint" upon initiation of O, N and P.

Also, Fig. 2 shows that it is considered that Tasks E and D can proceed simultaneously with A. This kind of netting or programming will depend on the specific circumstances of a project.

Determining the Critical Path of the Project

An essential part of programming a project is the estimation of time required to accomplish each task and aggregate of tasks. With the listing of aggregate tasks given in Step I (Preliminary Steps for Programming), the estimated time for completion of each task is given. These estimates of time are shown on the CPM programming net with their corresponding tasks as in Figure 3, which is identical to Figure 2 in the CPM net layout, omitting only the description of the tasks. For example, time required to carry out aggregate activity A (Finalize plans for road from Akara to Nanum) are shown to be three (3) months, directly below the letter A. Adding the times

FIGURE 2 - TENTATIVE NETWORK FOR IMPLEMENTATION OF SUGAR INDUSTRY PROJECT N S.E. NABROPHT

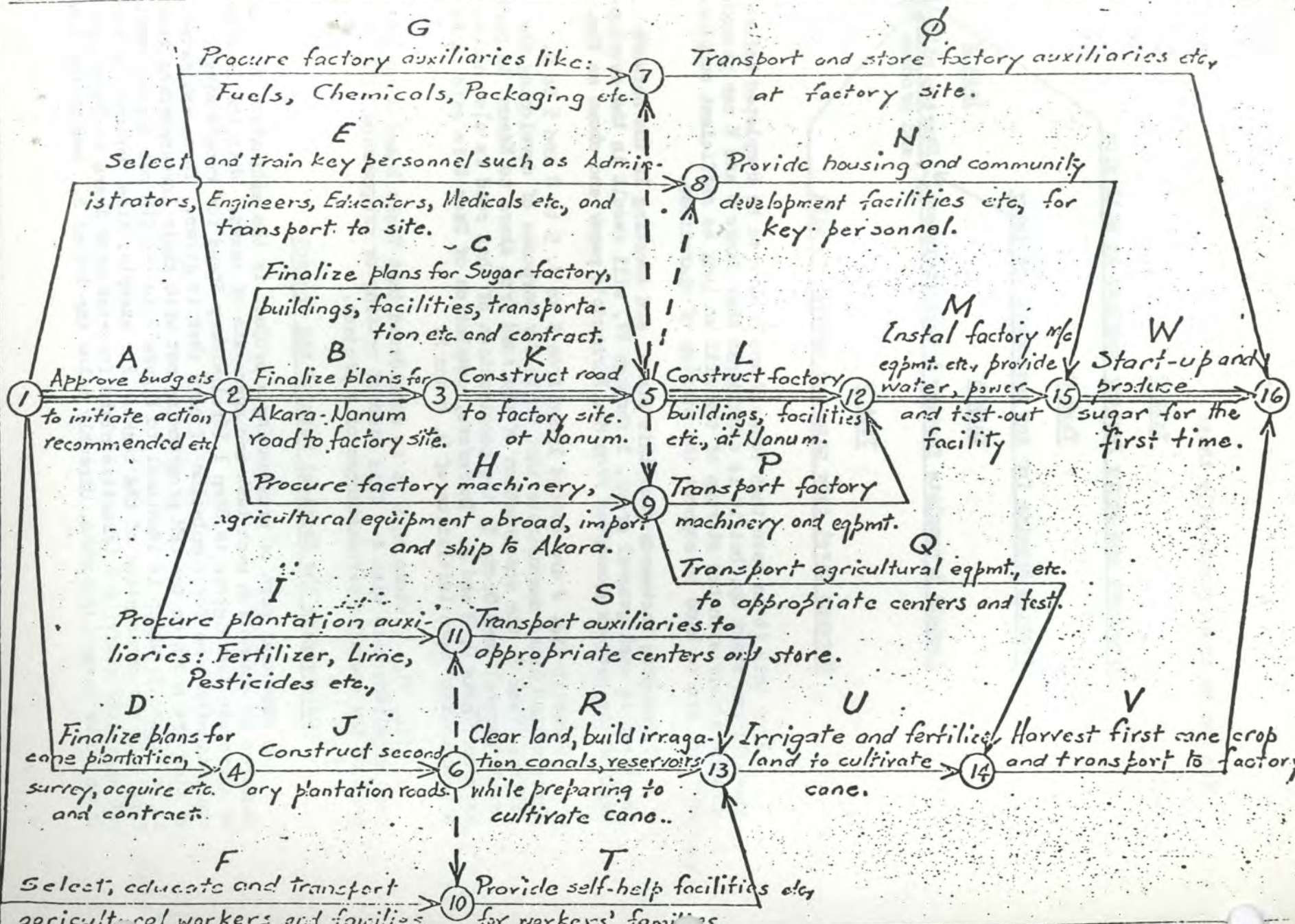
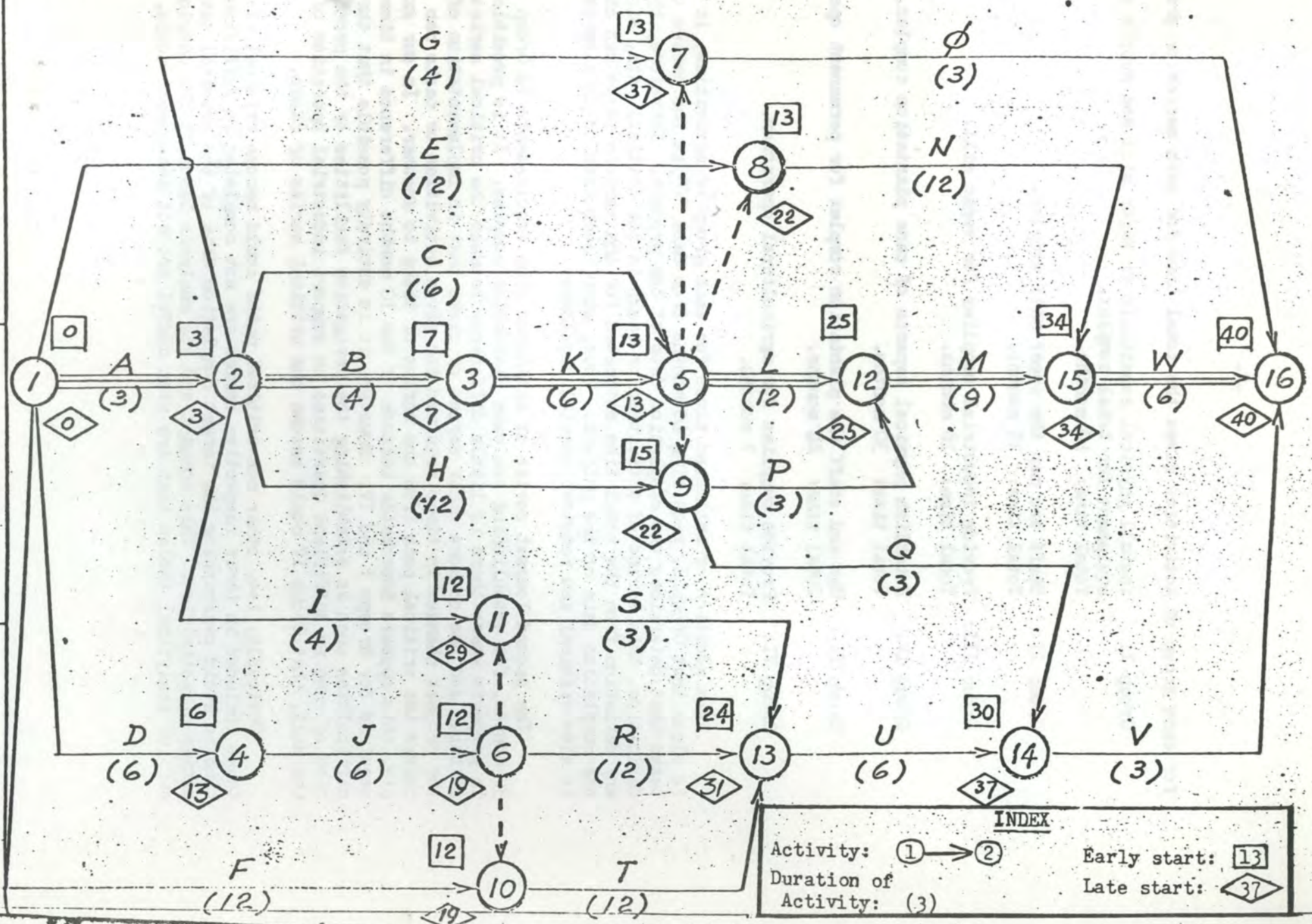


FIGURE 3 - DETERMINATION OF CRITICAL PATHS IN TENTATIVE IMPLEMENTATION NETWORK



for each group of activities gives the total time for each series or group:

Group I: Install physical essentials of sugar mill and supply all equipment for total complex.
Total time: 40 months.

Group II: Staff and man the sugar mill complex.
Total time: 25 months.

Group III: Provide industrial supplies for sugar mill.
Total time: 16 months.

Group IV: Establish physical aspects of cane plantation complex.
Total time: 30 months.

Group V: Man and staff the plantation complex for permanent operation.
Total time: 24 months.

Group VI: Provide supplies for agricultural operation.
Total time: 7 months.

From addition of estimated times for each group of activities, it is clear that Group I, requiring 40 months from date "0", is the series of tasks that determines the completion date of the project. Therefore, by definition, this series of activities or tasks is the critical path, since any deviation from the total time estimated for the various tasks can change the completion date of the project. Thus, also, each task in this series is also critical and requires special vigilance.

The second longest series of estimated time requirements is Group IV, 30 months, for establishing the cane plantation complex. It is possible in projects where there is little difference between the critical series of tasks and one or more other series of tasks that in implementation of the project changes in times required for given activities or tasks can change the critical path from one series of tasks to another. In our example, this appears improbable because of the 10 months difference in time required for Groups I and IV. However, it is entirely possible that through difficulties such as establishing the irrigation facilities or the production of cane in sufficient quantities to support industrial operation of the mill, that Group IV could become the critical series of tasks.

Obviously, too, other non-critical paths could become critical if the tasks included in their respective series are not completed in sufficient time to avoid overrunning the target completion date of the critical path series of activities. This concept and its analysis leads to the development of analytical tables that are most useful project management tools.

Analysis of Earliest and Latest Initiation and Completion Dates for Tasks

Symbols and their definitions commonly used for CPM analysis are:

Symbol		Definition
Task or Event	=	Job to be done
Activity	=	time estimated to complete a task
F	=	earliest finish time for a project or a part of a project being analysed.
T	=	target finish time for all tasks in a project or a part of a project being analysed; T must be $\geq$ F
S	=	starting time = "0" point in time or a specific date.
ES	=	earliest start time for a given activity on a a specific task.
t	=	estimated time to complete a specific task
ES + t	=	EF, earliest finish time for a specific task.
EF	=	earliest finish time for a task.
LS	=	latest allowable start time for a task = LF - t.
LF	=	latest allowable finish time.
FS	=	free slack (or free float) = time any given activity can expand without affecting adversely the activities that follow it; FS of a given task = ES of earliest successor event - EF of task being analysed.
TS	=	total slack = LS - ES or LF - EF; represents the maximum time the start of an activity can be delayed beyond its ES without changing the target completion date, T, of the project.

Using the letters designating the various aggregate tasks or events for our sugar project and the estimated times in months estimated for completing each of them, the following analysis can be made:

Aggregate Task or Event	"t" (months)	Starting Times (months from start) ES	LS	Finish Times (Months from Start) EF	LF	Slack TS	FS
A	3	0	0	3	3	0	0
B	4	3	3	7	7	0	0
C	6	3	3	9	10	0	3
D	6	0	7	6	13	7	0
E	12	0	10	12	22	10	1
F	12	0	7	12	19	7	0
G	4	3	33	7	37	30	6
H	12	3	19	15	22	16	0
I	4	3	24	7	28	21	5
J	6	6	13	12	19	7	0
K	6	7	7	13	13	0	0
L	12	13	13	25	25	13	0
M	9	25	25	34	34	25	0
N	12	13	22	25	34	9	9
O	3	13	37	15	40	24	25
P	3	15	22	18	25	7	9
Q	3	13	31	16	37	18	14
R	12	12	19	24	31	7	0
S	3	12	28	15	31	16	9
T	12	12	19	24	31	7	0
U	6	24	31	30	37	7	0
V	3	30	37	33	40	7	7
W	6	34	34	40	40	0	0

From an analysis such as this a project manager not only can identify clearly all of the aggregate tasks, but he can also determine how much he can manipulate the non-critical tasks without affecting subsequent tasks. There are a number of important reasons for having a clear idea of how this can be done among which are:

1. No task involving outlays of capital need be carried out or completed until necessary: thus capital outlays need not be made and the expenses of capital incurred until justified.

2. Consultants, contractors, company management and supervisory personnel and labor can be mobilized and allocated to specific tasks as needed for meeting CPM schedules, thus avoiding costly idle manpower and layoffs.

3. Tasks along the critical or near critical paths can be controlled and expedited so that avoidable delays are taken care of.

4. Procurement and allocation of funds for the project can be scheduled so that they are carried out most efficiently for minimum cost.

A necessary analysis for most projects is determining the manner in which it can be executed most advantageously at the least cost or for the best financial advantage to the owners. For example, spending more money to expedite tasks not on the critical path would be senseless. On the other hand, spending more money on tasks along the critical path might allow the sugar mill to be completed in 35 or 37 months rather than 40 months as scheduled, and might give the enterprise very attractive revenues which would more than offset added capital costs -- <u>if</u> sugar cane is to be available at an earlier date than shown in the schedules.