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CENTRE FOR TECHNOLOGY DEVELOPMENT (CTD) IN SYRIA

SYRIA

Technical report : introduction of strategic, structural
technology transfer and marketing concepts*

Prepared for the Government of the Syrian Arab Republic
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Steven M. Sweid → Consultant
consultant in commercialization of the results
of R + D activities

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United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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EXPLANATORY NOTES

CURRENCY

The Syrian Pound has the official value of approx 45 Syrian Pounds to the US dollar.

TECHNICAL TERMS

CTD: Centre for Technology Development.

SSRC: Scientific Studies and Research Center

Incubation center: Consists of a physical and organisational structure that provides the appropriate support and environment to a given technology and the manpower involved in this technology to help it develop a commercially viable product. Science parks, or technology parks represent some of the various types of incubation centers. Moreover, every company has some form of incubation facility to enable it to develop and launch new products.

Commercialisation: Is the process of transforming R&D know how into commercially viable products, including also the transfer of technology to the commercial sector, ie industry.

Technology transfer: Is the process of transferring a given technology along the different development phases, ie research, development, design, manufacturing ,marketing etc... It also refers to the transfer of a given know how (license) from a given source to a recipient. There are many ways to transfer technology, eg through people movement, licenses, products, equipment, training , subcontract manufacture, etc.

Innovation: Is the process of creating new products, usually referring to commercially successful products.

Module (In the framework of the CTD project): Can be characterised as a self supporting, comparatively small group of well educated and experienced staff comprising specialists in a given field of science/technology (Project of the module) and necessary supporting team specialised in information services, marketing, technology transfer, prognostics and industrial relations.

ABSTRACT

This two weeks long assignment in Syria, and which is described in this report, makes part of a joint program aimed at developing the Centre for Technology Development (CTD) in Syria, whereby this centre will serve as a vehicle providing assessment, transfer, adaptation and commercialisation of various novel technologies relevant to the country. In view of the achievements of the Scientific Studies and Research Centre (SSRC) in the field of optical instrumentation, ie project DP/SYR/86/011, it was deemed reasonable to base the activities of CTD, at least partially, on such achievements. Initially, the focus will be placed on simple optical microscopes and other devices for medical and educational purposes, which represent the stage 1 of the optical project module.

Furthermore, it is stipulated that the commercialisation of technology should proceed gradually, ie subcontract manufacture of mechanical parts in the initial phase, followed possibly by the same for the optical parts (lenses), and ultimately the set up of an assembly operation in the private sector.

The objective of this assignment was to introduce to the specialists of SSRC the basics of technology transfer, marketing and management relevant to the fast and efficient start-up of manufacturing of designed devices.

Preparation for the visit was in the form of research and interviews covering a number of industrialised and developing countries. This up to date and relevant backup data was used to produce the presentation material for the above topics.

In Syria, presentation and discussion sessions were organised with SSRC, in addition to visits to the different workshops at SSRC, and to a few private sector companies. These sessions were used to work out details, models, and guidelines pertaining to the specific product range and the local market.

In consideration of the overall situation at SSRC and the local market, it was found that with the integration of the proper market oriented attitude and organisation at SSRC the above endeavour for commercialisation of technology has a very good chance for success, even in the foreseeable future. The clear commitment of SSRC to technology development and manufacturing, and their strong willingness to implement the commercialisation process, need to be coupled with the proper business mentality throughout their organisation and activities.

A set of practical recommendations has been produced in collaboration with the SSRC team. This should help in the buildup of the initial momentum of the commercialisation process. Emphasis was placed on guidelines in the form of success criteria, and the need to introduce even at this early stage a marketing activity within SSRC. Eventually, these activities which relate to commercialisation, could be shifted over to CTD.

INTRODUCTION

The assignment described in this report is part of a joint program aimed at developing the Centre for Technology Development (CTD) in Syria, whereby this centre will serve as a vehicle providing assessment, transfer, adaptation and commercialisation of various novel technologies relevant to the country. These technologies may be indigenous, foreign or jointly elaborated.

For a realistic and successful launch of the CTD project, it was earlier deemed reasonable to base the activities of CTD, at least partially, on the achievements of the Scientific Studies and Research Centre (SSRC) in the field of optical instrumentation; this in view of the successful performance of the project DP/SYR/86/011.

A modular approach to the implementation of this commercialisation project is being undertaken, whereby the optical instrumentation would represent the first module (with simple optical microscopes and other devices for medical and educational purposes representing the stage 1), and with subsequent modules being introduced one at a time.

The objective of this assignment is to introduce to the specialists of SSRC the basics of technology transfer, marketing and management relevant to the fast and efficient start-up of manufacturing of designed devices. The main purpose is seen in breaking the psychological barrier linked with commercialisation, by presenting different case studies, guidelines and success criteria.

Preparation for the project included extensive research and interviewing in different industrialised and developing countries, with the aim to extract up to date, relevant and essential information. This feedback was used to prepare the presentation material, which was then delivered in a sequence of workshop type lectures at SSRC (in the form of transparencies).

Apart from the presentation sessions, a number of separate discussions took place with the SSRC team to assess their specific situation, and to work out targeted recommendations and solutions, certainly in relation to the stage 1 products, ie microscopes, educational and medical optical devices. This activity was supported by a series of visits to the SSRC departments and some local manufacturers.

It is worthwhile pointing out that the consultant appointed for this job is also familiar with the local market in Syria. Therefore, despite the short length of the assignment (2 weeks in Syria), it was possible to work out quite detailed and concrete suggestions in collaboration with with the SSRC team.

In this report only extracts from the presentation material are included (in the Annex). Full copies of the transparencies have been supplied to SSRC, UNDP, and UNIDO.

MAIN RECOMMENDATIONS

(Detailed justifications are included in the annex.)

- * SSRC (CID) ought to involve also in the market introduction and entry phases of the developed new products prior to transferring the full technology package to the private sector: This will speed up the process of commercialising the technology.
- * Project manager should involve also in strategic activities(ie overall pathfinding) which relate to product/market interface and commercialisation considerations, and should overview regularly marketing issues. He should gradually allocate more time (approx 50%) to such activities, which are as important as the technological aspects.
- * Appointment even at this early stage of a suitable marketing man, on a fulltime basis, to support different commercialisation aspects. Ideally, this man will report to project manager (Mr Moussoulli). Marketing man will also involve in marketing the idea of tech-transfer to the private sector, including the screening and selecting of suitable companies. Eventually, this department could be transferred to CID.
- * Production know-how should be fully established at SSRC before embarking on transferring the technology to the private sector: avoid transferring semi-finished licenses.
- * Production: Internal and external support should be provided to SSRC in assessing the different production techniques: eg for volume production, ie what is the suitable technique for a given output capacity ? This should include costing aspects and testing methods for volume production. Feedback from marketing on expected quantities will be essential. A member of the team should evolve gradually into a production manager.
- * To widen the range and categories of companies to be screened in the private sector as technology receivers: To include agents (importers) of scientific equipment for instance, manufacturers of multicomponent products, known top businessmen.... ie not to limit range to producers of parts only. The main purpose is to find the suitable and most promising customer for the technology.
- * To choose the right people: One can never overstress the importance of choosing the right people. This also applies to the choice of the private sector partner or subcontract manufacturer: People are the key to success: Choose carefully.
- * CID office downtown: CID office for public relation, promotion and marketing of the SSRC projects should be ideally located downtown, among the private sector businesses, and not at SSRC present location.
- * To use a soft approach with the private sector: Let them come forward to SSRC or CID, rather than the other way around. This should make them more comfortable with the idea of cooperation, at least initially

- * To involve trade or industry associations such as the chambers of commerce or industry in Damascus, as a third party in the mediation with the private sector, and the promotion of CTD activities: eg, initial meetings between SSRC (or CTD) and the private sector could take place on the neutral grounds of such organisations.
- * SSRC (or CTD) as magnets for foreign companies: SSRC (or CTD) is very well placed to attract foreign companies to produce in the private sector in Syria. Exploit this aspect soon.
- * To use the parallel approach in the general operation, ie different activities and considerations simultaneously, throughout the project, rather than a serial approach. For instance R&D, manufacturing and marketing should be coupled all the way through right from the start. Individual weights should be adjusted at each step.
- * To apply the discussed success criteria as much as possible to secure success of the commercialisation process, or at least to reduce the risk of failure, and to avoid wastage in time, effort and money.
- * Selfreliance: SSRC should attempt to push ahead with the commercialisation process with the present conditions and the tools at its disposal now; SSRC should not wait for the ideal global situation to emerge, and the comprehensive government support program. Initially, all difficulties and obstacles could be overcome with practical thinking and common sense. However, while learning from experience, SSRC should propose to suitable government departments the type of supportive measures which will make things easier and quicker, or even feasible when the scale of the program becomes wider.
- * To prepare a timetable for the commercialisation process, together with breakdown of tasks or project phases: This would be extremely useful as a guide and a tool to assess progress. Producing such a timetable is a very enlightening exercise in itself. A preliminary timetable could be produced now.

Since the CTD project has not yet taken off, the continuous support and frequent coaching of UNIDO, UNDP, remain crucial, until a given critical momentum is reached by the project.

I.

REPORT

This report includes the main findings, recommendations, and activities related to the assignment in Syria. In addition, an annex section has been incorporated to elaborate on specific items and to attach copies of specific documents, eg job description... The full content of the material presented during the workshop sessions is not included, but copies thereof have been supplied separately to SSRC, UNIDO, and UNDP. Some extracts could be found in the annex.

II.

MAIN FINDINGS

A. DURING THE RESEARCH PHASE (Interviews and research prior to the trip to Syria)

In the developed countries, successful companies or R&D institutions involving in innovative high tech products generate their product ideas from the market, eg customer. Their products are market oriented, and their operation is business oriented rather than technology oriented. Even academic or government research bodies are gradually having their R&D projects generated by the industry, ie industrial partner. The notion that R&D generates the product ideas, which then have to be matched to the market, has been proven a failure in the majority of cases (Unless one is talking of a revolutionary idea). In brief, the trend worldwide is for R&D to serve the needs of the community and the industry, and the goal is originally set by the market.

The trend worldwide is now towards more applied research and less basic research. Basic research is seen as a luxury, which only rich countries can afford. Applied research results also in many spinoff ideas.

There are many incubation centres in the developed countries, ie science parks, technology parks, etc. Some are more successful than others. In the UK for instance, the Cambridge park has been going on for about ten years. It is found that science parks do encourage more academics to start their own business. On the other hand, the experience shows that businesses run by scientists in the parks perform less successfully than others.

It is now clear that to maximise the benefits from incubation centres different criteria have to be fulfilled. In brief, by establishing an incubation centre around an R&D house does not automatically lead to success. Each company has also its incubation structure, geared towards introducing new products regularly. Basically, if the product idea is market generated, and the management is also business oriented, then the chances for success are much greater.

In the majority of advanced countries governments are now insisting on the collaboration between government R&D institutions and the industry. Furthermore, governments fund R&D programs in consortia of companies mainly, and they encourage pre-competitive research for strategic technologies. Many supportive schemes relate also to start up of companies, together with special networks to facilitate technology transfer and use of R&D results.

In all the developed countries, including those which grew very quickly, eg Korea and other S E Asian countries, the government supportive and financing role is essential.

There are some recommendations for R&D in small countries (The issues appear in the presentation material.)

B. At SSRC (In Syria)

Assessment of manufacturing capability at SSRC:

It is understood that the centre is committed to the manufacturing phase, ie to produce lenses and other optical products. This commitment would be essential for the success of the technology transfer to the local industries . It is also found that SSRC shows a strong interest and willingness to commercialise. This is an important ingredient for success.

Junior microscope (100X max)

Following a discussion with Mr Moussoulli at SSRC it is understood that the prototype for this device will be completed most likely by the end of 1991. Documentation for the specs of all parts could be ready by that time too. However this does not imply that they will be ready to manufacture by then. They will try hard to work on the pilote production and production know how. The main thrust now is on the large microscope.

The optics for the junior microscope are already available. They are working on the mechanics mainly. Actually the whole design is geared towards production, ease of use and low cost. Probably, the main body part would have to be cast (Aluminum) to make it more economic, with the possibility of coating, for protection and appeal.

Large microscope (1000X max)

The main thrust now is on developing the know how and prototype for this device. The reason for this priority is the importance of this device from a technological point of view, providing strong know how in optics and the mechanics involved. SSRC hopes to finish the prototype by the end of 1991, but this won't be the design for production. Different adjustments changes would have to be introduced to make the product marketable, eg they might have to include binoculars.

Production of lenses

In relation to the manufacturing step, consideration of different manufacturing techniques have still to be evaluated, in conjunction with different output capacities or types of lenses, eg should one use high speed polishing or standard abrasive method, or what are the trade-offs of molding the lenses first..etc. Practical experience is also required in the area of quality control (Testing) for volume production, when required. The aspect of production costing has to be treated for each part and process step; initial costing exercises have already been initiated at SSRC.

Other simple optical related products

The issue of simple optical products has been elaborated together with the SSRC team, including members of the Chinese support team. It was indicated by SSRC that the commercialisation support program could also incorporate consumer or educational products, which are simple to produce, similar magnifying glass, or light concentrators, simple plastic lenses etc. This would be very attractive to manufacturers of parts, who could combine the lense with other parts to have a simple finished product. A simple telescope is also possible.

Market considerations.

One of the objectives of this mission is to assist SSRC or CTD in formulating marketing policies and creating the adequate management structures. It is clear at this stage of the project that the acquisition and development of the optical technology at SSRC has top priority. Commercialisation will be implemented gradually. This activity will involve different marketing directions, one involving the marketing of products produced at SSRC to the local market, the other involves the promotion and marketing of the SSRC technology (License) to the private sector, and another the promotion and marketing of SSRC capability to foreign companies. Other indirectly related market activities would involve the selection of the appropriate partners in the private sector.

Furthermore, market analysis is essential in the selection of the appropriate new product ideas and estimating the potential market size and hence the required production capacity. In actual fact, successful product ideas originate from market considerations. One cannot overstress the important role of the market in a commercially oriented R&D operation.

If CTD is to operate successfully, it has to integrate marketing as an essential part into its system. Without rethinking in marketing terms, commercialisation will not work.

C. ABOUT THE LOCAL MARKET AND THE PRIVATE SECTOR

Different features make the private sector in Syria attractive as a technology recipient: the spirit of entrepreneurship is available, innovative thinking coupled with copying is present, competition thrives in all product types, and local production even of technical goods is now perceived as the sensible way to go. On the other hand quality remains a weak factor.

Through different discussions with the SSRC team, and through other expectations, it is found that access to the private sector is not straightforward: There could be a reluctance on the part of a private company to deal with a government sector, where SSRC or CTD could be perceived as such. No company would like to have big brother watching over their shoulders and books ! These findings are important in relation to commercialisation, and to defining the type of approach to be chosen.

Recent policies in Syria are encouraging investments in industry and collaboration with foreign firms in joint ventures. This and other new political factors could create a healthy environment and climate for the CTD project.

III.

ACTIVITIES

A. Overall about the activities during the project period:

Prior to the start of the project preparations included research into the areas of innovation management, commercialisation of P&D, incubation centres, technology transfer, present trends in R&D worldwide, type of government support in developed countries, and the local market in Syria. The research included the review of up to date articles on the subjects, as well as many interviews on a worldwide level. For instance, many known incubation centres were contacted in Europe, as well as many well known research, venture capital, and consulting firms.. This exercise was aimed at obtaining an up to date overview on the subject, at learning from experience of others, and at narrowing down the list of success criteria. The bulk of this information served the purpose of producing the presentation material.

Furthermore, an appreciable number of brochures and pamphlets were collected from different government R&D commercialisation departments, incubation centres, and R&D and tech transfer firms, to provide SSRC with concrete examples and actual guidelines.

The presentation material is divided into different topics, with the main part having been prepared prior to the trip .

During the briefing visit in Vienna, new items were included in the presentation material. Furthermore, the library at the UN building was used to elaborate on some issues. A preliminary agenda for the visit in Syria was also produced in Vienna.

In Syria, the activities included the preparation of a visit agenda. A sequence of lectures was presented during the first week of visit in the morning. Discussions with the team at SSRC have taken place usually following the presentation sessions, and during the second week. These included also the assessment of the manufacturing capability at SSRC, and one session for the selection of the second CTD module. Different new materials and organisational models resulted from such discussions. Conclusions and recommendations were also discussed with the SSRC team.

Visits were also organised within the different departments and workshops at SSRC, as well as of a few private sector companies. The latter served to assess some useful factors relating to cooperation with this sector.

Briefing meetings were also organised with the Director General of UNDP in Damascus, as well as with the Director General of SSRC.

Finally, activities included briefing with UNIDO in Vienna, and the preparation of the final report.

B.

OVERALL WORK PROGRAM

<u>DATES</u>	<u>ORGANISATION/ITEM</u>	<u>PEOPLE</u>
25.6.91	Arrival in Vienna	
26-28.6.91	UNIDO-Meeting and briefing for the trip to Syria	Mr M Boutoussov Mrs K Liedl
29.6.91	Dep. Vienna to Damascus	
30.6-13.7.91	SSRC, UNDP- Mission in Syria	See details
14.7.91	Return to Vienna	
15-17.7.91	Briefing on mission	M. Boutoussov
18.7.91	Return to London	

C.

DETAILED WORK PROGRAM IN SYRIA

<u>DATES</u>	<u>ORGANISATION/ITEM</u>	<u>PEOPLE</u>
Sun 30.6.91	Arr. 4.30 AM Damascus UNDP:Tel contact SSRC: Tel contact	Ms Nadia Kossak Mr Moussoulli
Mon 1.7.91	UNDP-8AM meeting: Official papers SSRC 9 AM meeting Introduction to SSRC Agenda for the visit	Ms Nadia Kallas Mr Alloush Mr F Moussoulli Dr Murayatti Ms M Kallas
Tue 2.7.91	SSRC: Presentation 9.30-12.30 Management of commercial Innovation SSRC: Visits of labs Optics, Environmental Solar energy SSRC : Discussions on tech- transfer	Many attendees incl: Mr Moussoulli Mr Armanazi Mr Fawwaz Mr Rafii Mr Haider Mr Moussoulli

<u>DATES</u>	<u>ORGANISATION/ITEM</u>	<u>PEOPLE</u>
Wed 3.7.91	SSRC: 2nd presentation session: Tech-transfer, incubation, start up 9.30-12.00	Same attendees as previously
	SSRC: Discussions	Mr Moussoulli & team
Thu 4.7.91	UNDP 12.00 Tlx to Vienna	Ms Kossak
Fri 5.7.91	Holiday	
Sat 6.7.91	SSRC: Presentation 3rd session Marketing, Role of gov in R&D	Same attendees
	Some discussions on selection of 2nd module	Mr Moussoulli
Sun 7.7.91	SSRC: Assessment of manufacturing and tech-transfer capability at SSRC 9.30-2.00 Detailed discussion	Mr Moussoulli & members of team
Mon 8.7.91	CTD, SSRC: Presentation 4th session: Recap incubation, R&D policies in diff countries, R&D commercialisation policies. in relation to CTD potential services	Mr Moussoulli Mr Armanazi Mr Rafii Ms Kallas
	CTD: Selection of 2nd module: Elaboration on the criteria proposed by Mr Boutousov, and use of the matrix to compare the different options	Same as above
Tue 9.7.91	SSRC: Recap of all issues preparation and discussion of recommendations: List	Mr Moussoulli
	Supply of a full copy of the presentation material and some sample brochures	
Wed 10.7.91	SSRC-private sector Visit of two workshops for injection moulds, and injection moulding service	Mr Moussoulli & colleagues
	Assessment of diff cooper. possibilities	

<u>DATES</u>	<u>ORGANISATION/ITEM</u>	<u>PEOPLE</u>
Thu 11.7.91	UNDP:Meeting and briefing	Mr Hla Mr Allouch Mr Hagona Ms Kossak
Sat 13.7.91	SSRC:Final discussion and recap, also CTD Discussion with other dept. on incubation	Mr Moussoulli Ms Kallas
	SSRC: 11.30 meeting and briefing with director gen. of SSRC	Dr W. Shahid Mr Moussoulli Mr Amarazi Ms Kallas
Sun. 14.7.91	Return to Vienna 12.30 AM	

IV. OUTPUT

A. Presentation material:

One of the objectives of the job was to introduce to SSRC the different marketing and commercialisation aspects related to the CTD project. The material was prepared on overhead transparencies, and was delivered in the form of a sequence of lectures at SSRC. Copies of the full package was then provided as a reference material to the SSRC team. This material consisted of a general coverage of the issues as well as items specifically relating to the optical project and CTD. The main thrust was on identifying the success criteria, experience and organisational and technology transfer models.

In broad terms, the presentation sessions were organised according to the following topics:

1. Innovation and management of innovation.
2. Role of marketing in innovation business, and marketing of innovation.
3. R&D worldwide, role of governments, and case studies
4. Aspects of business incubation and tech transfer
5. Commercialisation details relating to SSRC and optical project.

B. Commercialisation models and organisational structures:

In the course of discussion with the SSRC team, a set of models for commercialisation and management were proposed to SSRC. Such models were included in the presentation material, with different samples being included in the annex of this report.

C. Criteria for the selection of the next CTD module:

Based on information and guidelines supplied by UNIDO, and which related to selection criteria of technology project in Korea mainly, a matrix was proposed to SSRC, to be used as a tool to compare the different options for the selection next module. A weighting factor for each criteria was also suggested. A copy of this matrix is included in the annex.

V. GENERAL IMPRESSIONS AND CONCLUSIONS

- * CTD project and team are in a good position to succeed, providing that specific criteria are followed. There is no lack in the commitment to the technology, and the willingness to involve in the commercialisation process.
- * A very important factor for success is the need for strong market orientation by SSRC, ie R&D responding to market needs and conditions and not the other way around: Market knowledge and activities are as important as the technology. The market ingredient is crucial for the success of commercialisation.
- * Hurdles and problems linked with the commercialisation process could be overcome initially through practical, businesslike, and case by case considerations, without the need for a major government support scheme. Obviously, such support would be essential if the program has to be implemented on a wider scale in the future. Constant support from UNIDO, UNDP, and the top management at SSRC is indispensable for the implementation of the initial phases.

A N N E X E S

APPENDIX A1

JOB DESCRIPTION

TITLE: *Consultant in Commercialization of the Results of R&D Activities*

DURATION: 3 weeks

DUTY STATION: Damascus (Syria)

DUTIES:

1. To introduce to the specialists of the Scientific Studies and Research Centre (SSRC) which are responsible for the design and small-batch manufacturing of optical microscopes for medical and educational purposes, the basics of the marketing activities which should precede an introduction of the high-tech products to the internal and foreign markets. To outline the role of marketing as of a significant component of the commercialization process.

2. To perform, with an assistance of relevant local specialists, the study of the manufacturing capabilities of SSRC as well as potential capacities of local small industries concerning optical instrumentation.

3. To assess the optimal structure of the cooperation between SSRC and local industries having in mind manufacturing of optical instruments on the basis of subcontracting and technology incubators. To introduce the idea of technology business incubator to national counterparts and to discuss the ways of its implementation.

4. To advise upon the structure and operational modalities of the specialized module within the forthcoming Centre for Technology Development responsible for the commercialization of the R&D through local and international markets.

5. To prepare the final report including basic findings, suggestions and recommendations, not only providing the main results of the mission but also applicable as a separate draft chapter of the future project document "Centre for Technology Development".

QUALIFICATIONS: Substantial practical experience in advising for small companies in commercialization of the R&D results through proper management, marketing and technology transfer during start-up activities working in the field of high technologies.

LANGUAGE: English

BACKGROUND INFORMATION: The Scientific Studies and Research Centre (SSRC), Damascus was substantially strengthened in the course of the on-going project DP/SYR/86/011 and became the institution capable to lead in the design, technology transfer and manufacturing of optical instruments quite relevant for the country, such as:

- optical education kits,
- optical microscopes for educational purposes,
- medical optical microscopes and others.

At the same time, the qualified staff of SSRC and equipment delivered along with the project, cannot, by themselves, cover all the needs of the country in the devices mentioned above and spin-off of the relevant knowledge and skills is required.

That is why the incorporation of the local small and medium industries into the process of manufacturing, under the guidance of SSRC, of the above mentioned relevant devices is strongly recommended. This goal can be attained if the results of R&D activities performed by SSRC are effectively transferred to the local industries. In order to do this, the SSRC staff responsible for manufacturing of optical instruments, should also be trained in activities related to any efficient start-up activities in the manufacturing of high-tech products, such as marketing, management and relations with local contractors.

APPENDIX A2

* RECOMMENDATIONS: DETAILS AND JUSTIFICATIONS

- * SSRC (CID) ought to involve also in the market introduction and entry phases of the developed new products prior to transferring the full technology package to the private sector: This will speed up the process of commercialising the technology.

Justification: This measure will prove that the product has a demand in the market, with further indication of potential clients. For any potential receiver of the technology this aspect is crucial. Furthermore, this will help SSRC get some feedback from the market and adjust specs accordingly. This exercise is very important to SSRC, without which SSRC won't take the matter of market orientation seriously, and hence the product won't be developed satisfactorily. The introduction of products provides SSRC with the important experience it lacks in the market.

- * Project manager should involve also in strategic activities which relate to market considerations, and should overview marketing issues. He should gradually allocate more time to such activities, which are as important as the technological aspects.

Justification: As discussed during the presentations, the involvement of top management in such activities is indispensable for the success of the product innovation.

- * Appointment even at this early stage of a suitable marketing man, on a fulltime basis, to support different commercialisation aspects. Ideally, this man will report to project manager (Mr Moussoulli). Marketing man will also involve in marketing the idea of tech transfer to the private sector, including the screening and selecting of suitable companies.

Justification: As discussed during the presentations, the marketing parameter and input is as important to the success as the technology. The input from the market should be at an early stage. A lot of market data is still required on the optics. The marketing man will ensure that the market component in the overall operation is available.

- * Production know-how should be fully established at SSRC before embarking on transferring the technology to the private sector: avoid transferring semi-finished licenses.

Justification: As a developing country, the local industries do not have the R&D capability to develop a given unfinished know-how. The license should be well worked out and ready for production in order to be used in Syria. Even small details have to be dealt with, since any deficiencies will surface later at the private sector partner, resulting in technical problems or lower quality. This will mean even more involvement on the part of SSRC to remedy the situation. So it is preferable for SSRC to finish the whole thing first, rather than waste much more effort later. Also, developing the technology under one roof is much more efficient.

- * Production: Internal and external support should be provided to SSRC in assessing the different production techniques: eg for volume production, ie what is the suitable technique for a given output capacity ? This should include costing aspects and testing methods for volume. Feedback from marketing on expected quantities will be essential. A member of the team should evolve gradually into a production manager.

Justification: Since SSRC will involve in actual production, it will require the necessary support in this field. Actually, SSRC will be transferring production know how to the private sector.

- * To widen the range and categories of companies to be screened in the private sector as technology receivers: To include agents (importers) of scientific equipment for instance, manufacturers of multicomponent products, known top businessmen.... ie not to limit range to producers of parts only.

Justification: The choice of the right partner is vry important for the success of commercialisation. If the wrong partner takes the project, he will fail. It is the duty of SSRC to choose the type of partner who will succeed with the project. Good knowledge of the market (eg scientific equipment) by the partner in the private sector would be one of the strong choice criteria.

- * To choose the right people: One can never overstress the importance of choosing the right people. This also applies to the choice of the private sector partner or subcontract manufacturer: People are the key to success: Choose carefully.

Justification: This is to emphasise the importance of people. This is a combination of factors and skills. One deals with people and not with company blocks !

- * CID office downtown: CID office for public relation, promotion and marketing of the SSRC projects should be ideally located downtown, among the private sector businesses, and not at SSRC present location.

Justification: Though SSRC (or CID) are independent institutions, it is most likely that they are seen through the eye of the private sector as government research departments. A promotion office integrated physically with the industrial community makes interaction much easier.

- * To use a soft approach with the private sector: Let them come forward to SSRC or CID, rather than the other way around. This should make them more comfortable with the idea of cooperation.

Justification: This relates again to the previous point. At least in the initial phases, and until the community feels familiar with the program, a soft approach would be desirable. Companies should not feel obliged to take on the technology !

- * To involve trade or industry associations such as the chambers of commerce or industry in Damascus, as a third party in the mediation with the private sector, and the promotion of CTD activities: eg. initial meetings between SSRC (or CTD) and the private sector could take place on the neutral grounds of such organisations.

Justification: The private sector is familiar with above organisations since they deal with them on a regular basis. Their involvement could be required initially only.

- * SSRC (or CTD) as magnets for foreign companies: SSRC (or CTD) is very well placed to attract foreign companies to produce in the private sector in Syria.

Justification: Foreign companies would be very happy to have a partner who helps them in training the local staff, recruit management, and oversee quality (Guarantee), and who can help even on the technology side.

- * To use the parallel approach in the general operation, ie different activities and considerations simultaneously, throughout the project, rather than a serial approach. For instance R&D, manufacturing and marketing should be coupled all the way through. Individual weights should be adjusted at each step.

Justification: This emerges as a result of the management of change and innovation. Without a parallel approach there is no commercial success and no efficiency. SSRC will have to apply this structure in order for it to transfer this experience to the private sector.

- * To apply the discussed success criteria as much as possible to secure success of the commercialisation process, or at least to reduce the risk of failure, and to avoid wastage in time, effort and money.

Justifications: The criteria have been discussed in the presentation material (Some points appear in this annex). Strategic involvement of top management is one of them, and coupling between marketing and R&D is another etc.. It should be remembered that a combination of criteria have to be applied for success. If one main parameter is missing, there is very limited success or no success at all. SSRC should also transfer such criteria to the private sector.

- * Selfreliance: SSRC should attempt to push ahead with the commercialisation process with the present conditions and the tools at its disposition; SSRC should not wait for the ideal global situation to emerge, and the comprehensive government support program. Initially, all difficulties and obstacles could be overcome with practical thinking and common sense. However, while learning from experience, SSRC should in the meantime propose to suitable government departments the type of supportive measures which will make things easier and quicker, or even feasible.

Justification: The ideal situation will take long to materialise. Moreover, the whole thing is a learning process too and a dynamic thing. The main thing is to get started on a limited scale, test things and gain experience, and then try to expand on stable foundations.

- * To prepare a timetable for the commercialisation process, together with breakdown of tasks or project phases: This will be extremely useful as a guide and a tool to assess progress. Producing such a timetable is a very enlightening exercise in itself. A preliminary timetable could be produced now.

Justification: To break the overall goal into well defined and scheduled tasks is an indispensable step for the implementation of the project. Once a detailed and realistic plan of action is initiated, the whole thing becomes more visible, feasible and organized. Such a timetable should be discussed and reviewed regularly.

- * Since the CTD project has not yet taken off, the continuous support and coaching of UNIDO, UNDP, remain crucial, until a given momentum is reached by the project.

Justification: The presence of a sponsor role is very important for a project to take off. The least a sponsor can do is to encourage and motivate. The support of an advisor acts as a lubricant for start up.

APPENDIX A3

MATRIX OF CRITERIA FOR THE SELECTION OF THE SECOND MODULE.

CRITERIA	WEIGHTING (Example)	RATINGS		
		PRJCT 1	PRJCT 2	PRJCT 3
1- FITNESS TO NAT.R&D STRTG.	10			
High tech stratgic role				
Exstrice of core techncs				
Subtotal				
2- NATIONAL ECON ASPECTS	30			
Impact on GNP				
Export contribution				
Import substitution				
Capital intensiveness				
Addit. job creation				
Added values achieved				
Subtotal				
3- TECHNOLOGY ASPECTS	10			
Creativeness				
Comp. exist. technolgs				
Marketability				
Subtotal				
4- COMMERCIALISATION	30			
Devel. capability				
Marketin,				
Research resources				
Prdct commerc. infrast.				
Subtotal				
5- CONTINUITY WITH 1st MODULE	20			
TOTAL	100			

Remark: Project 1..... Non destructive testing
 Project 2..... Precision machining
 Project 3..... Precision casting

Each weighting factor appearing in the table should be divided among the underlying subcriteria, again according to judgement. The weighting factors appearing in this table are suggestions only. They could be modified, depending on the relative importance of each criteria.

The weighting factor represents the maximum value for the given criteria. The rating will be a given percentage of this value.

DETAILS

.CRITERIA FOR SELECTION OF THE OPTIMAL FIELD OF R&D ACTIVITIES.

1.Fitness to national R&D strategies.

- high tech role in strategic fields;
- existence of core industrial technologies capable to cover excessive risk.

2.National economical aspects.

- impact on GNP , if any;
- export contribution/import substitution;
- capital intensiveness;
- job creation;
- added values achieved as a result of commercialization;

3.Technology aspects.

- creativity;
- competition with existing technologies;
- marketability.

4.Commercialization.

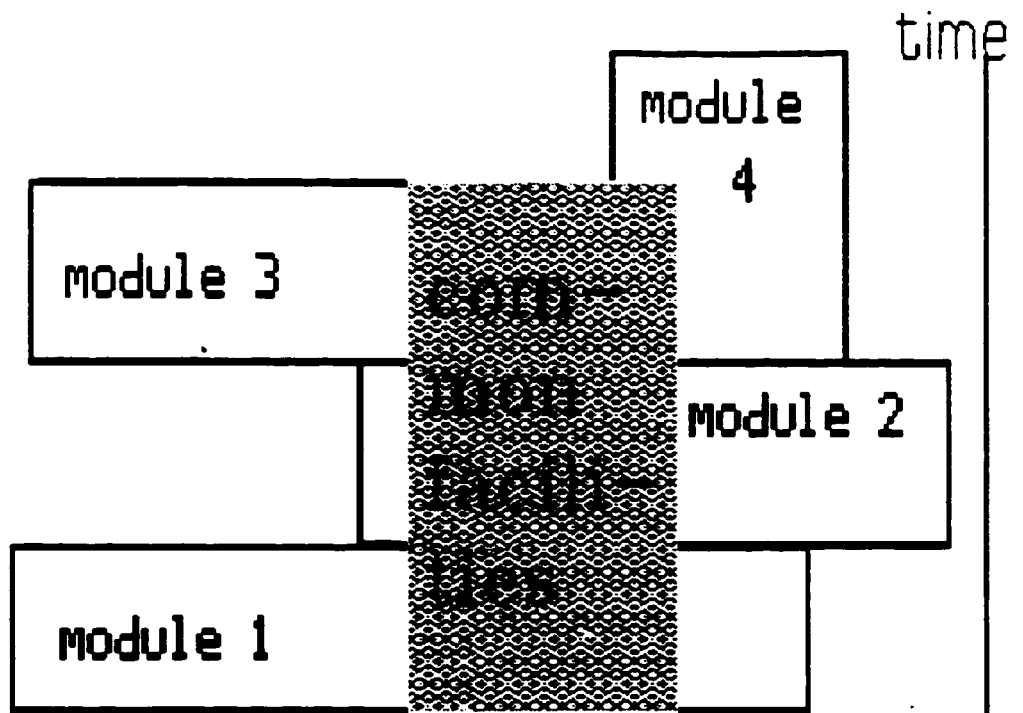
- development capability (manpower,willingness,managerial skills);
- marketing(world market demand, domestic demand, market share);
- research resources (easiness of equipment import, technology transfer- any problems?, funding);
- product commercialization (industrial environment, stability, growth rate).

5.CONCLUSION.

It is evident that the problem of optimal development of CTD and SSRC is MULTICRITERIAL OPTIMIZATION PROBLEM.

In order to solve it successfully, SYNERGETIC APPROACH is the best solution.

EXPERIENCED CONSULTANTS, UNDP AND UNIDO STAFFMEMBERS, NATIONAL SPECIALISTS AND INDUSTRIAL/GOVERNMENTAL AUTHORITIES should undertake a chain of extensive joint efforts during the short time span given.



modular concept of development of R&D centre

APPENDIX A4

LIST OF MAIN TOPICS COVERED DURING THE PRESENTATION AND DISCUSSION SESSIONS

A. GENERAL TOPICS

Successful management of innovation business
Keys to success of innovative products
Strategy setting in the innovation business
Role of generalists: Coupling of knowledge
Successful innovation structure
Parallel approach in innovation
Managing technology
Case studies in innovation

What is the market
Type of products and marketplaces
The importance of the local market
Marketing of licenses
Objectives of marketing research
Tools used for market assessment
Objectives of the business plan and format
Cutting cost and marketing
The marketing man

Role of SSRC as business incubator

Aim of business incubators
Facts about business incubators
Recommendations for business incubators
Success criteria of technology transfer
Models for the interaction of system houses and component houses

Role of governments in successful economies
Trends in R&D worldwide
R&D expenditures in different countries
Role of governments in promoting R&D
Actions by governments to improve tech transfer
Recommendations for new technologies in small countries

Case studies of government role and R&D models:
Korea, Japan, China, Germany, UK, France

B. SPECIFIC TOPICS:

Market related:

Important aspects of the local market
Marketing of technology in the local market
Marketing of SSRC capability to foreign firms
How to cut cost of product and production
How to market the product in the local market
How to conduct market research
Factors to improve introduction of technical products
Characteristics of the marketing man.
Duties and tasks breakdown of the marketing man at SSRC

Tech transfer, commercialisation, and organisation:

Effective subcontract project
Criteria for success of technology transfer through subcontract
manufacture in Syria, and terms of contract.
Important points on subcontract manufacturers
Organisation: Departments at SSRC
Important departments at CID
Duties of managers
Different models for cooperation with the private sector
Advantages of the local market in Syria
Special role of SSRC: The third party
SSRC as magnet for foreign technology

External and internal support required by SSRC in manufacturing and
marketing

Government support that might be required for the project
Government role in R&D in many countries: case studies
Recommendations for R&D and new technologies in small countries
Models for technology transfer services
How to approach potential companies in the private sector
Relationship between innovation and free enterprise

APPENDIX A5

ELABORATION ON SOME DISCUSSION TOPICS: TECH TRANSFER, MARKETING

Strategy first, and then structure.

Strategic inputs are more important than cash injection alone.

The duty of the top management is to couple the different functions together, ie marketing and R&D. Otherwise, such functions tend to fight with each other.

The duty of top management is to set a common and clear overall objective for the operation, and not to leave this task to any given department. Otherwise, each department will set a different objective, and which will be conflicting.

A successful commercial innovative operation is an open system, ie in constant interaction with the world outside (Markets, technologies)

For maximum interaction, it is better to have all innovation development activities under one roof, and to encourage informal open communications in all directions, to collaborate rather than compete, and to get rid of the fear of mistakes, all with the goal of fostering synergy, of encouraging new ideas, and bringing problem to the open at an early stage.

The R&D man should also interact with the customer.

The customer and his needs should be seen as an integral part of the R&D.

Divide the overall plan in clear assignment, and review such on a regular basis.

Produce a plan of action on a weekly basis for each member of the staff, and review performance on a weekly basis, ideally at the end of the week. every member should also spend 10 minutes at the end of every day putting an action plan (list) for the next day, in a priority order, and not to delay this task to the next morning. When implementing the action plan, finish the important task first, and then go to the next one.

Without innovation, including the innovation in improving quality and reducing cost, private enterprise has no meaning.

Innovation capability is a skill that could be taught and reinforced similar to other skills.

For any given product, project, or activity, select the people who are in a position to innovate. It is useless to give people a product which is too advanced for them to innovate in. If this does not apply, select a lower level product where innovation will be possible.

Market consideration should start prior to the innovation process.

Knowledge of the market is essential for success. Even the most sophisticated product fails without this knowledge. This includes the knowledge of the customer. One should know the customer even better than the product.

One sells benefits and not technology. Also, one sells to people and not to companies.

The worst thing is to make the wrong assumptions about a given market. Test the assumptions constantly.

The worst thing is to address the wrong customer for a given product. One should spend ample time and effort in pinpointing the most suitable type of customer. This will speed up success and will save much time and effort later.

Producing a good promotional package is most important. Benefits of the product should be highlighted in this package.

The business plan is the backbone of a commercial operation.

Cutting cost, adding value, and improving quality are crucial objectives in a commercial activity

Quality assurance should serve as an important promotional marketing tool for SSRC. This is especially important when approaching foreign companies, for local assembly in Syria.

For technology transfer through subcontract manufacture, the following is recommended:

Gradual release of types of parts to be manufactured: Not in one go
SSRC to prove production viability first before release of know how
SSRC to keep over 50% of production capacity inhouse
Start with one subcontract manufacturer first
Quality control (Final) always at SSRC
SSRC to supply input material initially
Collaboration basis with subcontract manufacturer
Open communication plus detailed documentation
Initially samples should be supplied prior to delivery of quantities

No contract, and no equipment transfer until subcontractor can prove capability at production plants of SSRC: Following training at SSRC.

Every contractor gets a specific production quota

Guidelines and documentations of tech transfer and procedures, etc., should be clear, detailed, simple to follow, and well organised: Use many graphs for illustration.

Production manager at SSRC is best suited to deal technically with subcontract manufacturers. He acts as the liaison man.

Apply different criteria for the selection of the subcontract manufacturer.

Help manufacturers also to produce simple finished optical products.

There is a possibility for SSRC to cooperate with known businessmen in the transfer of the whole assembly package, since those have int'l experience, as well as manufacturing capability, and most importantly, they have experience in dealing with governmental bodies. Briefly, they could provide the full business ingredient required.

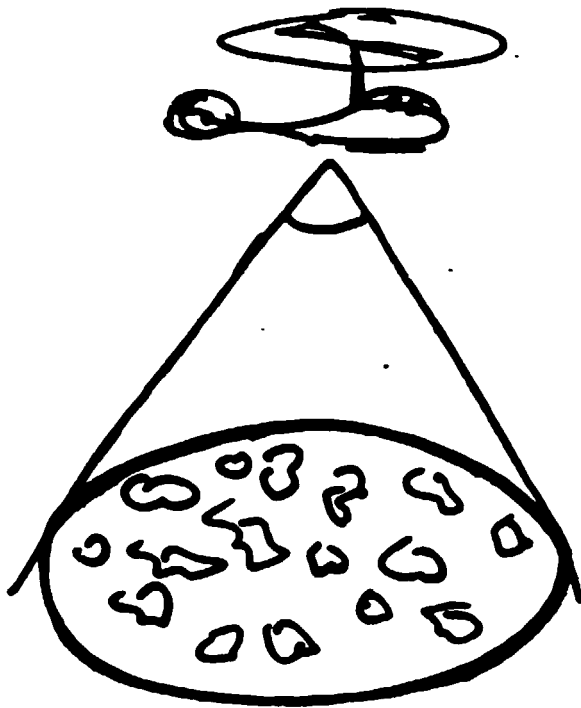
Government support is crucial for the longterm success of commercialisation. Only government support can widen the scope of activities of CID on a national level. The support is in the form of logistical, promotional, mediation, protection, removing bureaucratic barriers, financial, incentive buying, organisational, and int'l aspects.

However, in the initial shortterm phase, only limited support would be required, eg involvement of chambers of commerce in promotion, logistical data, and encouragement by buying the products for government departments. In the initial phase it is worthwhile for SSRC to depend on its own efforts in the commercialisation attempt. Once the intricacies are known and some experience is gathered, then a more effective and wide scale government support program can be proposed.

SAMPLE COPIES FROM THE PRESENTATION MATERIAL^{*}

- * Since the copies are made directly from the transparencies, the quality of the copies has suffered.

ROLE OF GOVERNMENT IN SUCCESSFUL ECONOMIES



TOP VIEW

STRATEGIC VIEW

SHORT-TERM, LONG-TERM Policies.

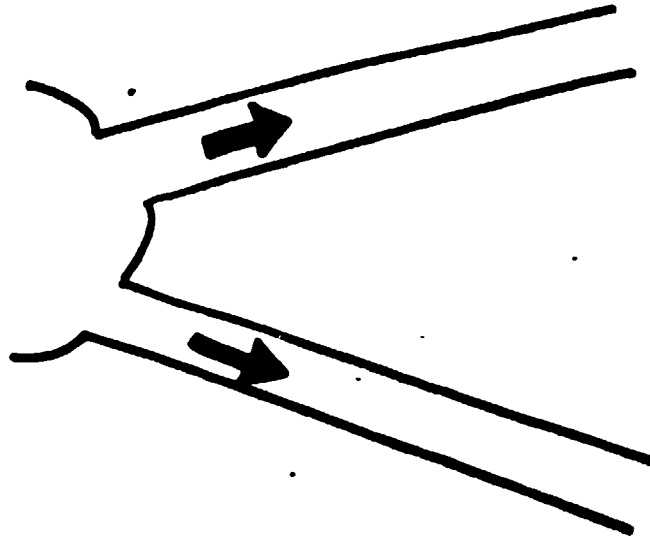


ROLE OF THE GOVERNMENT IN COUNTRIES WITH SUCCESSFUL INDUSTRIES & ECONOMIES

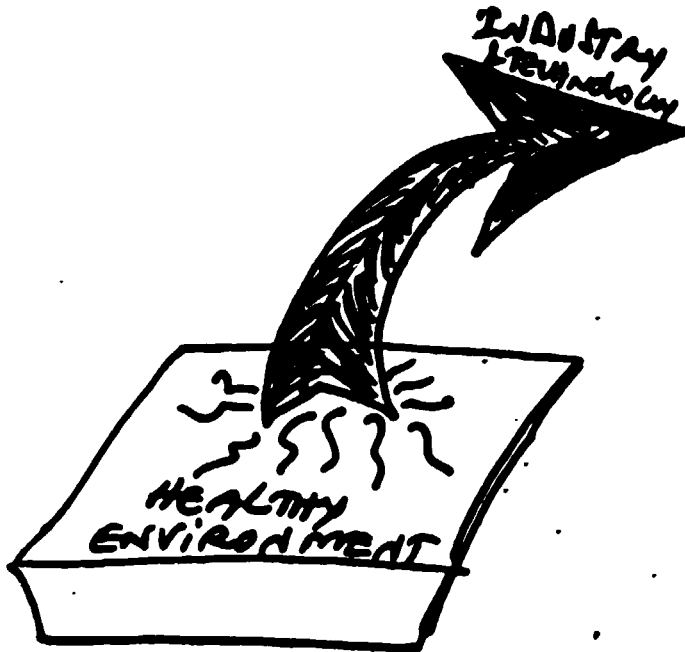
THE ROLE OF THE GOVERNMENT IS ESSENTIAL

- 1 TO PROVIDE SENSE OF DIRECTION, GUIDANCE & UNITY OF PURPOSE
CLEAR OBJECTIVES, PLANS, POLICIES.
 - NOT SHOWING THE GOALS, BUT ALSO THE ROUTE: HOW TO GET THERE.
 - TO PROVIDE STRATEGY & SUPPORT MEASURES FOR MANUFACTURE, FINANCE, EXPORT & EDUCATION
 - TO OVERVIEW PROGRESS: TOP VIEW: NECESSARY FOR GUIDANCE.
- 2 TO ENCOURAGE, TO PROMOTE, TO SUPPORT
 - TO ACT AS COACH, BUT NOT CAPTAIN
 - TO ACT AS MENTOR
 - NEEDS-BASED ALLOWANCES - INDIRECT GOVERNMENT ASSISTANCE
 - INDICATIVE-PLANNING LIKE JAPAN:
DIRECT industry's aid to most promising fields
- 3 NOT TO INVOLVE DIRECTLY IN PRODUCING OR MARKETING COMMERCIAL PRODUCTS (EXCEPT BASIC MATERIALS)
- 4 TO BASE THE INDUSTRY ON THE PRIVATE SECTOR RIGHT FROM THE START. (EXCEPT MILITARY & SPACE)
 - STIMULATE PRIVATE ENTERPRISE & COMPETITION
- 5 TO PROVIDE THE MEANS FOR FINANCIAL SUPPORT:
FINANCIAL INCENTIVES: LOW INTEREST LOANS, GRANTS, SUBSIDIES, TAX REBATES...
TO GEAR GIVEN INDUSTRIAL SECTOR WITHIN A DIRECTION.

ROLE OF GOVERNMENTS IN SUCCESSFUL ECONOMIES.



TO PROVIDE DIRECTIONS
& GUIDANCE
GENERAL DIRECTION & FRAMEWORK



TO CREATE A HEALTHY ENVIRONMENT, A
STRONG FOUNDATION FOR A SUCCESSFUL ECONOMY
TO FLOURISH

- 6 ■ TO CREATE A HEALTHY ENVIRONMENT FOR GROWTH OF INDUSTRY & TECHNOLOGY.
- 7 ■ TO ACT AS TEMPORARY FOLLOWER OF A GIVEN INDUSTRY, UNTIL IT IS COMPETITIVE.
 - TO USE TEMPORARY MEANS TO PROTECT INFANT INDUSTRIES: IMPORT DUTIES, SUBSIDIES, EXCHANGE RATE.
- 8 ■ BUT TO KNOW WHEN TO SUPPORT A GIVEN INDUSTRY AND WHEN TO LEAVE TO STRONGER THROUGH COMPETITION & FREE MARKET.
PULL-RELEASE POLICY.
- 9 ■ TO WATCH WORLD MARKET VERY CLOSELY
- 10 ■ TO BE FLEXIBLE ENOUGH TO ADJUST QUICKLY:
TO WORLD SITUATIONS, TO CHANGE POLICIES,
TO PROTECT DOMESTIC MARKET ...
- 11 ■ TO PROVIDE ESSENTIAL SUPPORT IN INT'L BUSINESS AND COOPERATION: TRADE, JOINT VENTURES ...
- 12 ■ TO PLAY AN ESSENTIAL ROLE IN SUPPORTING STRATEGIC INDUSTRIAL AND TECHNOLOGIES: GOAL: SELF RELIANCE AND COMPETITIVENESS.
- 13 ■ ENCOURAGE STUDENTS TO GO ABROAD.
- 14 ■ REDUCE BUREAUCRATIC PROCEDURES: MEETINGS OR QUINETS.

ACTIONS BY GOVERNMENT TO IMPROVE TECH-TRANSFER (EVALE)

- TECHNOLOGY BROKERS: TIMELY LINK BETWEEN RESEARCH & EXPLOITER.
- SCREENING OF RESEARCH PROJECTS TO IDENTIFY COMMERCIAL OPPORTUNITIES
- SPECIAL SERVICE TO SMALL BUSINESSES, TO TAKE ADVANTAGE OF THE PUBLIC FUNDS & ...
- TRANSFER AGENCIES IN THE UNIVERSITIES & RESEARCH INSTITUTIONS TO SEEK OUT COMMERCIAL PARTNERS.
- CURSES FOR TRADE FAIRS & EXHIBITIONS
- TRAINING TO IMPROVE TECHNICAL SKILLS OF INDUSTRIAL MANUFACT.
- INCREASE MOBILITY OF RESEARCHERS BETWEEN ACADEMIA & INDUSTRY.
- CUT DOWN ON BUREAUCRATIC PAPER WORK.

RECOMMENDATION FOR R&D IN SMALL COUNTRIES

(e.g. Finland, Austria, Spain)

- TO COUPLE TO DOMESTIC MAINSTREAM INDUSTRIES
- TO COUPLE TO DOMESTIC RESOURCES
- TO SPECIALIZE IN GIVEN TECHNOLOGIES.
- TO SEEK NICHE MARKETS TO FOCUS ON
- TO INVOLVE WITH TECHNOLOGY IMPORTS = LICENCES.
- TO FOCUS ON MAINSTREAM TECHNOLOGIES: NOT LEADING TECH.
- TO BE A FOLLOWER AND USE AVAILABLE TECH & KNOWLEDGE
- TO INVOLVE ALSO IN THE CONSUMER SECTOR.
- GRADUAL PRODUCTION PATH TO HIGH-TECHNOLOGIES
- TO STRENGTHEN INNOVATION CAPABILITY: TRAINING, KNOWLEDGE
- TO MAXIMIZE COOPERATION: DEVELOPER & USER, SYNERGY, ALL OTHER
- GOVERNMENT SHOULD PROVIDE GUIDANCE: WHAT R&D?
- PRODUCE SYSTEMS FIRST, THEN SUBSYSTEMS, THEN COMPONENTS,
THEN MAXIMIZE LEFT & RIGHT IMPORTS
IMPORT SUBSTITUTION.
- COPY & IMPROVE ON AVAILABLE PRODUCTS
- GOVERNMENT SUBSIDIES FOR SHORT PERIODS.

SOME RECOMMENDATIONS FOR NEW TECHNOLOGY INDUSTRIES IN SMALL COUNTRIES:

- GOVERNMENT GUIDANCE: PROMOTING TECHNOLOGIES
- SUPPORT PRIVATE ENTERPRISE IN CONNECTION WITH FOREIGN COOPERATION: TECHNOLOGY TRANSFER: JOINT VENTURES, ALIENRY, SUBSIDIARIES.
▶ MAKE SURE TECHNOLOGY IS BEING TRANSFERRED.
INTERNATIONAL TECHNOLOGY IS ESSENTIAL.
- INVOLVES GOVERNMENT AID IN COMPLEMENTING TECHNOLOGY IMPORTS; TECH-IMPORT IS NECESSARY FOR INDUSTRY.
- ▶ SUPPORT THE GROWTH OF A FEW LARGE DOMESTIC PRIVATE ENTERPRISES:
CRITICAL MASS: FUTURE MULTINATIONALS
- GOVERNMENT SHOULD STRIKE A HEALTHY BALANCE BETWEEN:
SELF-INITIATED AND
DOMESTIC INNOVATIVE ENTERPRISES
DIRECT IMPORT OF LICENSES
FOREIGN ALIENRY & SUBSIDIARIES.

TECH-TRANSFER : EXAMPLE GERMANY.

- PUBLIC R&D ≈ 40% OF TOTAL R&D EXPENDITURES.
 - 2/3 TO UNIVERSITIES
 - 1/3 TO COMPANIES.
- TO EXPLOIT R&D:
 - APPLICATION ORIENTED TRANSFORMATION OF R&D RESULTS (TO MAKE THEM MORE ACCESSIONABLE)
- RECIPIENTS OF SUBSIDIES ARE OBLIGED TO EXPLOIT THE RESULTS. (FOR THE BENEFIT OF THE BEST)
- TECHNOLOGY TRANSFER UNITS AT RESEARCH INSTITUTIONS & OUTSIDE THE UNIVERSITIES.
- MOBILITY OF RESEARCH STAFF IS STRONG.
- ENCOURAGEMENT OF INDUSTRIAL PARTNER IN R&D.
- SUPPORT FOR PILOTS & DEMONSTRATION PLANTS.

EXAMPLE UK

- MANY PROGRAMS TO ENCOURAGE COMMERCIAL R&D & COLLABORATION OF INDUSTRY WITH R&D INSTITUTIONS. ORGANISED BY DTI (DEPARTMENT OF TRADE & INDUSTRY)
- TO HELP INDUSTRY EXPLOIT SCIENTIFIC DEVELOPMENT.
- TO MAKE SCIENTIST MORE AWARE OF INDUSTRY'S NEEDS.
- TO BRIDGE THE GAP BETWEEN INDUSTRY & SCIENCE BASE: COLLABORATIVE RESEARCH.
- FINANCIAL INCENTIVES & GRANTS FOR R&D & STARTUP.
- GOVERNMENT USUALLY FUNDS 50%.
- SEED FINANCES.
- HOWEVER, BECAUSE OF STRONG PRIVATISATION DRIVE & SHORT TERM PROFIT DRIVE, & SURVIVAL & LACK OF LONG TERM GOVERNMENT POLICIES, A LOT OF THE INDUSTRY & R&D IS IN DISARRAY AND NOT CATCHING UP WITH COMPETITION.
 IN THE UK NO TOTAL LEADERSHIP OR POLICIES JUST AS IN JAPAN. ~~STAY~~
 NO UNITY OF PURPOSE, NO DIRECTION:
 EACH COMPANY IN A DIFFERENT DIRECTION:
TOO MUCH MARKET FORCES RESULT IN CHAOS.

SUCCESSFUL MANAGEMENT OF INNOVATION

AND INNOVATION BUSINESSKEE

MARKETING PEOPLE

- OVERALL PRODUCT/MARKET STRATEGY IS SET BY TOP MANAGEMENT:

NOT R&D PEOPLE AND NOT MARKETING PEOPLE
(DEFINED & COHERENT PRODUCT/MARKET STRATEGY)

- TOP MANAGEMENT SPENDS MOST OF ITS TIME IN STRATEGIC WORK: ~50%:

ANALYSIS & PLANNING: REFINING
MARKET SITUATION & NEW PRODUCT LINES

- TOP MANAGEMENT PRIORITY IS TO KEEP BRINGING R&D AND MARKETING PEOPLE TOGETHER: STRONG COUPLING.

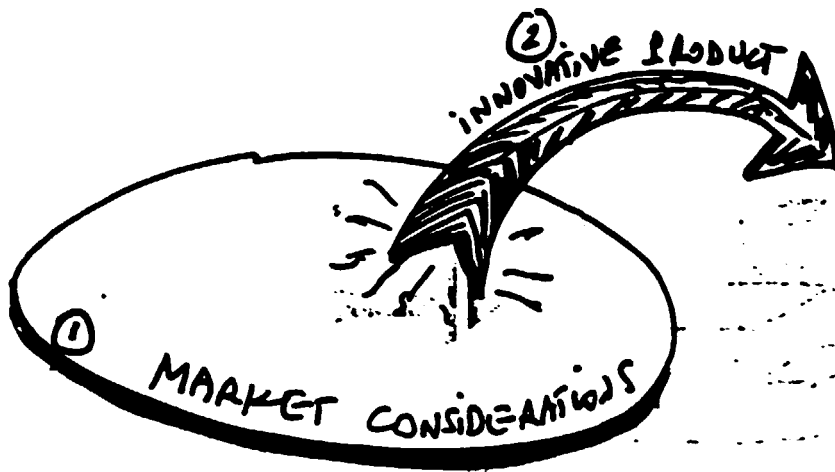
AND: COLLABORATION:
HARMONISATION OF DIFFERENT FUNCTIONS.

- ONCE THE MAIN STRATEGY (OBJECTIVE) IS FOUND, TOP MANAGEMENT PUTS

TOGETHER A SUITABLE STRUCTURE:
STRATEGY FIRST, THEN STRUCTURE..

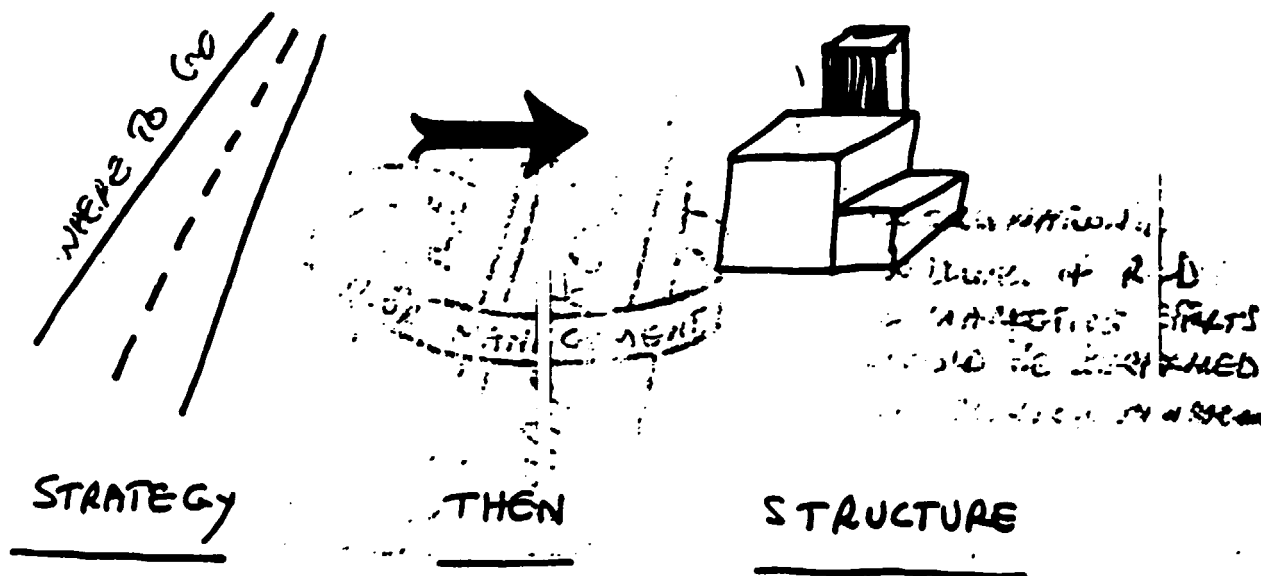
- TOP MANAGEMENT LOOKS AT THE INNOVATION FROM A BENEFIT-POINT OF VIEW:
COMMERCIAL SUCCESS
MARKET DRIVEN.
- IN SUCCESSFUL COMPANIES COMMUNICATION AND COLLABORATION ON ALL LEVELS IS VERY STRONG: STRONG COUPLING
HORIZONTAL
FLEXIBLE.
HIGH MOBILITY BETWEEN FUNCTIONS
- AWARENESS OF BOTH MARKETS AND TECHNOLOGY EXISTS ON THE DIRECTOR LEVEL.
- TOP MANAGEMENT HAVE HIGH INTELLIGUAL CAPABILITY: BECAUSE SYNTHESIS IS DIFFICULT!
HARD WORK!

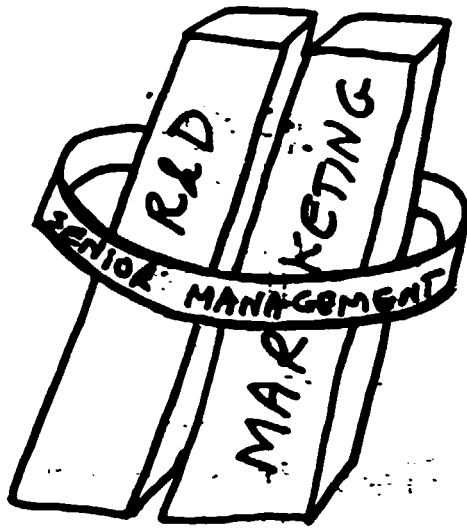
KEYS TO SUCCESS OF INNOVATIVE PRODUCTS



IDEAL R&D IS TRIGGERED BY THE MARKET AND NOT THE OTHER WAY AROUND.

BUSINESS DIVISION SHOULD HAVE A GREATER SAY ABOUT R&D

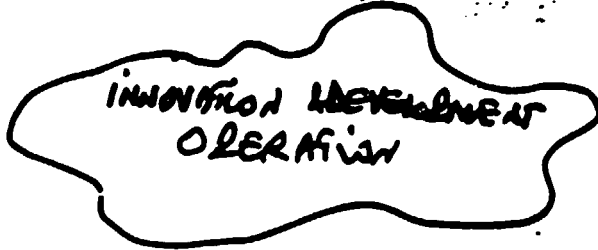




COORDINATION & COUPLING OF R&D & MANUFACTURING SHOULD BE PROVIDED BY SENIOR MANAGEMENT

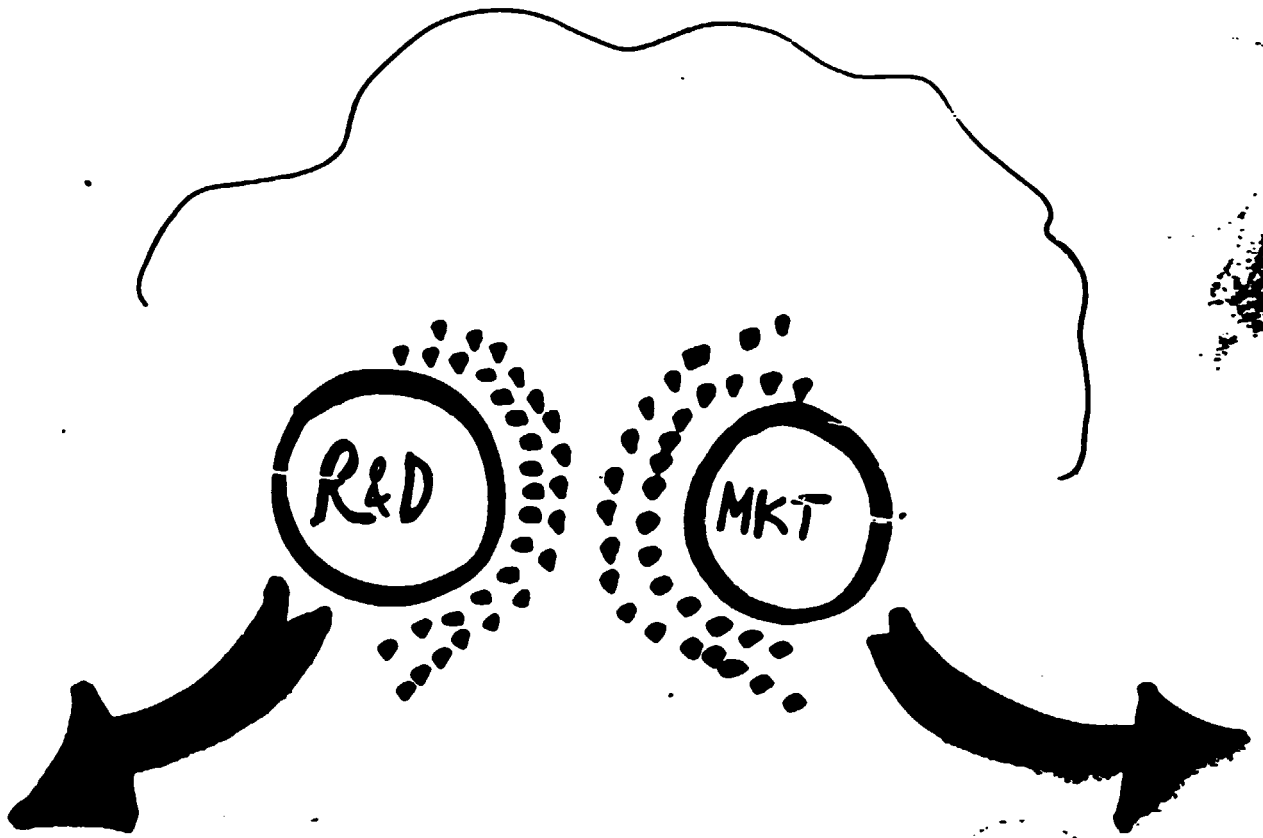
COORDINATION, & COUPLING

STRATEGY



STRATEGY & DIRECTION SHOULD COME FROM THE TOP

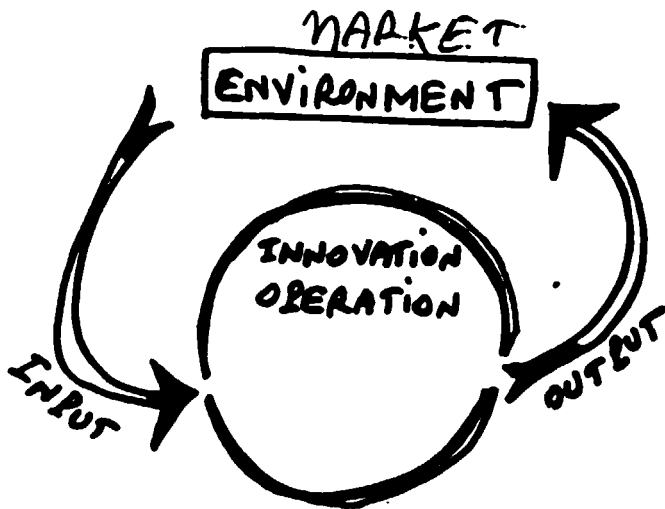
17
WITHOUT PROPER
LEADERSHIP,
R&D AND MARKETING
PEOPLE USUALLY
DRIFT APART



EACH ONE WILL SET HIS OWN
OBJECTIVES, AND WHICH COULD
CLASH

12.

SUCCESSFUL INNOVATION SYSTEM:

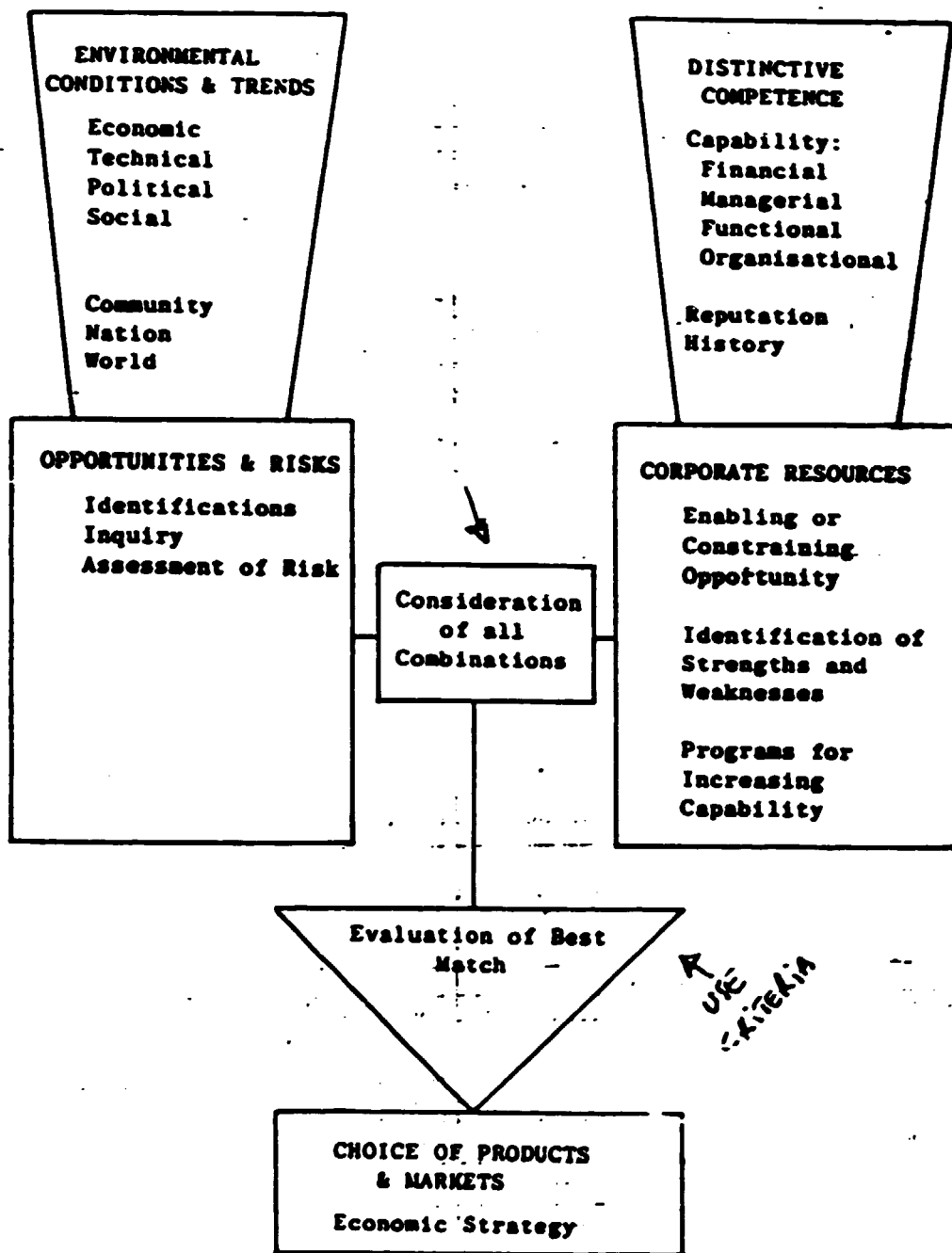


OPEN SYSTEM

INTERACTION WITH OUTSIDE
CONSTANTLY

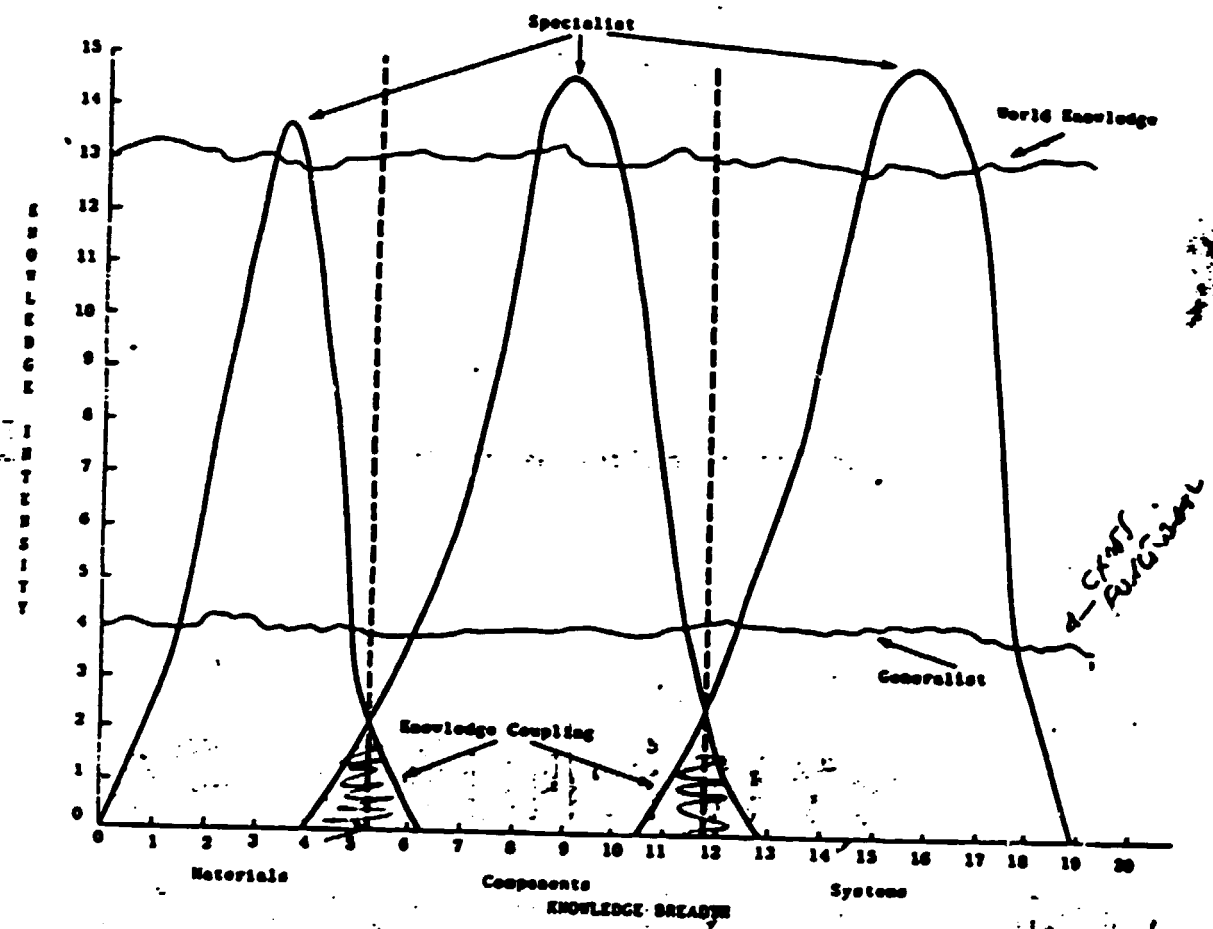
SYSTEM SHOULD ADAPT IDEALLY
TO THE ENVIRONMENT.

DEVELOPMENT OF STRATEGY



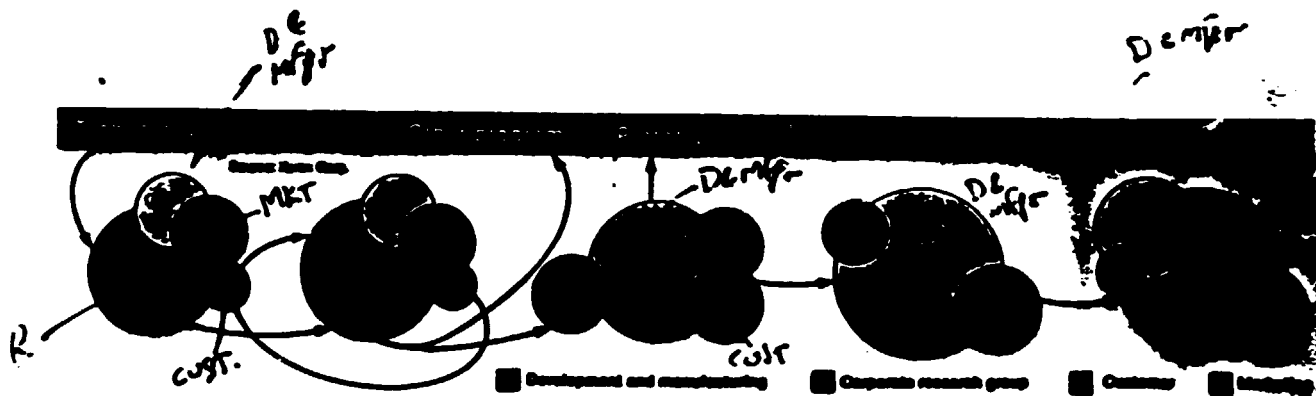
ROLE OF THE GENERALIST: COUPLING OF KNOWLEDGE

SPECIALIZATION AND COUPLING OF KNOWLEDGE



Source: J A Morton "Organizing for Innovation", McGraw-Hill (1971) p16

COUPLING AT AN EARLY STAGE



[1] The Xerox Corporate Research Group has been trying out ways of speeding the transfer of technology from research to commercial application. In this approach, called the Express Project, representatives of research, development, manufacturing, mar-

keting, and the customer all get involved every step of the way. The relative sizes of their roles change at each stage. For example, development and manufacturing (yellow) plays a minor part at first but a dominant one toward the end.

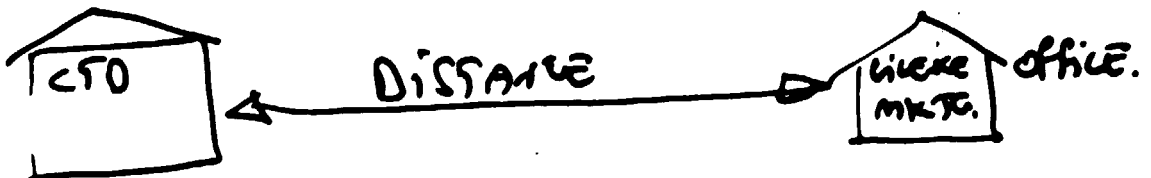
MARKETING OF CONTRACT DEVELOPMENT & PRODUCTION

TO FOREIGN-FIRMS

- STRESS TECHNICAL LEVEL OF SSRC
- SULLY OF MANAGERIAL AND ENGINEERING LEVEL
- GOVERNMENT SUPPORT THROUGH SSRC
- LINK WITH BUSINESS COMMUNITY
- TRAINING SUPPORT BY SSRC: ALL LEVELS
- STANDARDS & QUALITY CONTROL SECURED BY SSRC (QUALITY ASSURANCE)

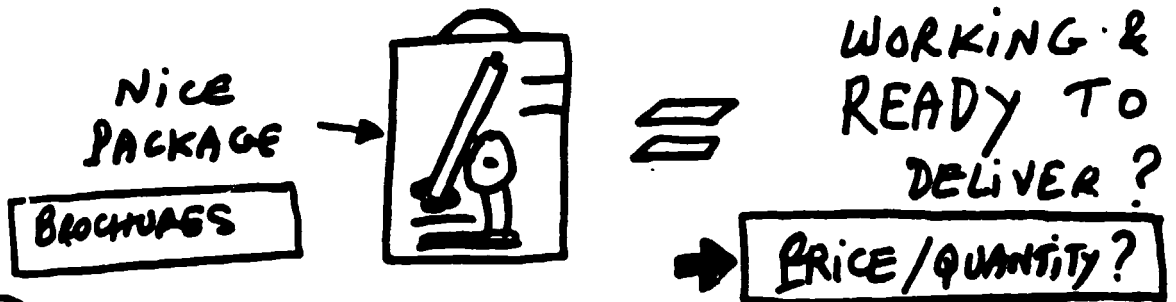
MARKETING LICENSES TO LOCAL MARKET:

- PRODUCT, PRODUCTION, & INITIAL MARKETING SHOULD BE LAYED AT SSRC
- A MARKETING DESK AT SSRC SHOULD SPECIALISE IN MARKETING THE TECHNOLOGIES: & REFERRED LOCATED IN TOWN. CTD??
- SHOULD LABOUR A COMPREHENSIVE BUT SIMPLY DETAILED OF THE PROJECT, IN AN ATTRACTIVE DOCUMENTATION
- SHOULD BE ABLE TO SCREEN POTENTIAL BUYERS, INITIALLY TO FIND SUCH LOCAL MANUFACTURERS.
- TO WRITE WITH SSRC FOR CONTRACT DETAIL ... TRAINING...

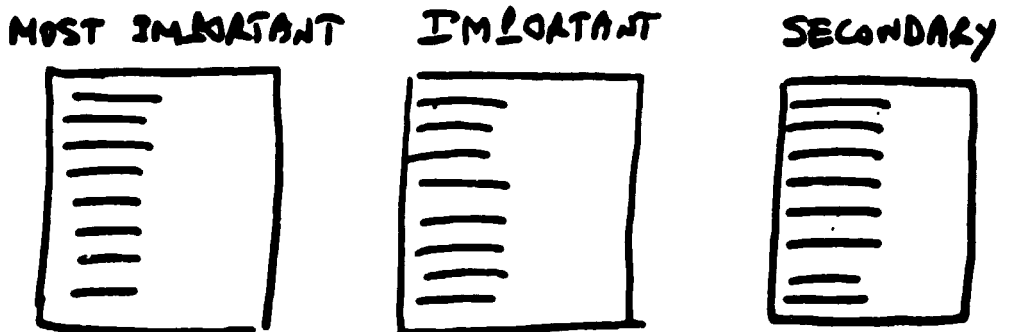


SUGGESTED STEPS TO MARKET AND SELL THE MICROSCOPE AND OTHER SIMILAR PRODUCTS IN THE LOCAL MARKET.

- ① MAKE SURE THE MICROSCOPE AS A PRODUCT AND PACKAGE IS READY: + ACCESSORIES.

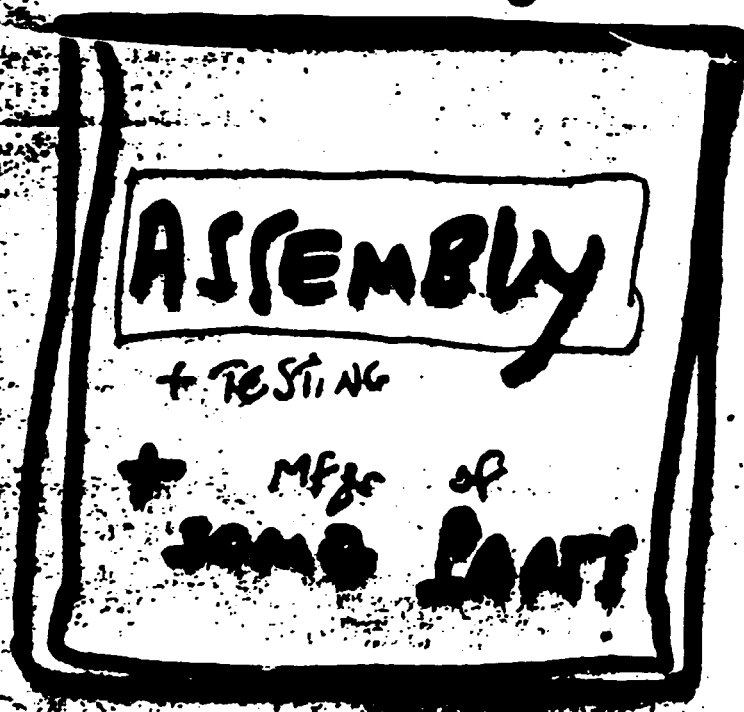
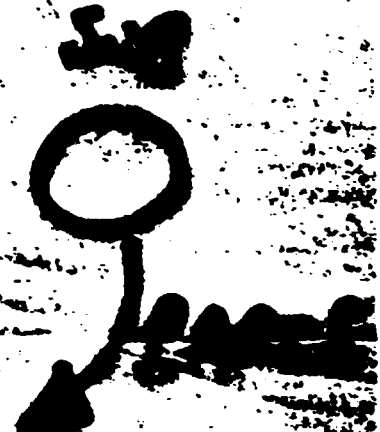


- ② HAVE A WORKING PROTOTYPE FOR DEMONSTRATION.
- ③ FIND THE ADDRESSES OF ALL POSSIBLE CUSTOMERS:
 SCHOOL - FACTORIES - LABS - HOSPITALS ...
 DAMASCUS AND REGIONAL
- ④ FIND OUT NAMES OF TOP MAN IN EACH ONE OF THE CUSTOMER ORGANISATION.
- ⑤ DIVIDE THE LISTING IN CATEGORIES OF WORK, AND SIZE AND PRIORITY. PRIVATE + GOVERNMENT.



HAVE SOME INITIAL IDEA ABOUT EACH COMPANY: WHAT THEY DO.....

MEASURE: PATENT



INFO -
SCHEDULE
FOR
PART
WORK

MAIN LICENSEE



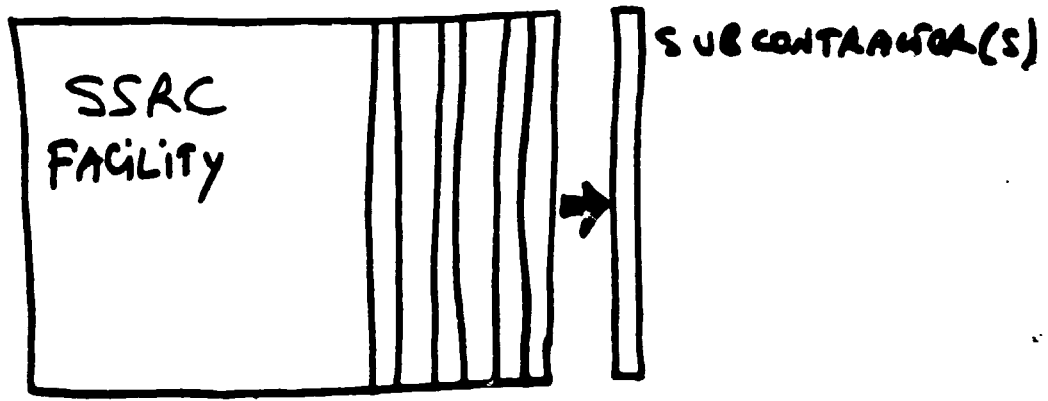
RELEASE OF
PRODUCT
LICENSE

51

SUBCONTRACT MANUFACTURE
(INCUBATION)

CRITERIA FOR SUCCESS

I ● GRADUAL APPROACH : GRADUAL RELEASE

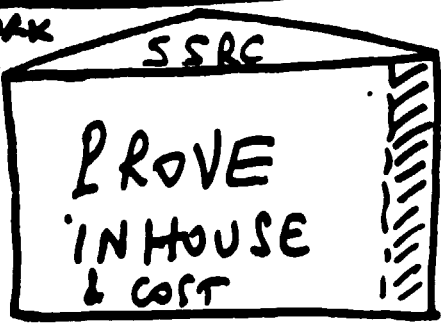


SIMPLE TO MORE DIFFICULT PARTS

→ II ● PROVE PRODUCTION VIABILITY AT SSRC FIRST

MAKE IT WORK
AND SEE ALL
STEPS IN
DETAILS

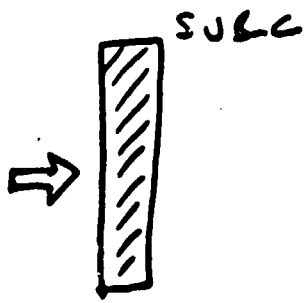
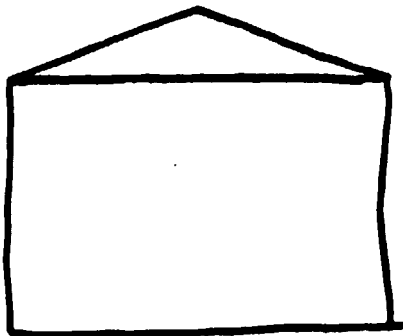
①



THEN TRANSFER

OTHERWISE WASTE
OF TIME, MONEY,
AND WHO KNOWS

②



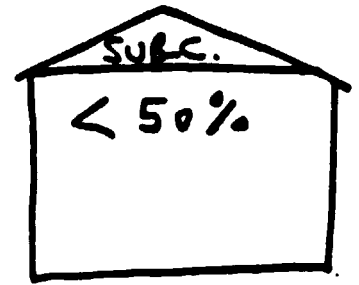
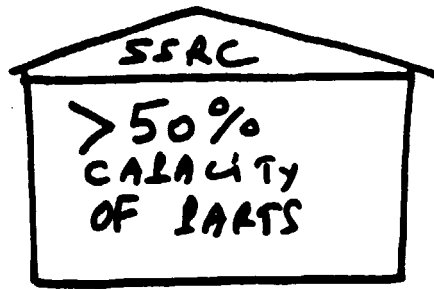
THEN RELEASE

Initially - 2-3 yrs - SSRC will produce PARTS INHOUSE ALSO. SV

III

KEEP ALWAYS > 50% CAPACITY AT SSRC

LESS RISK WITH INHOUSE PRODUCTION - AT LEAST WITHIN

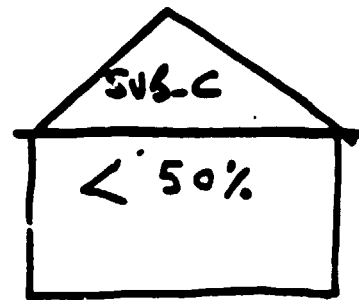
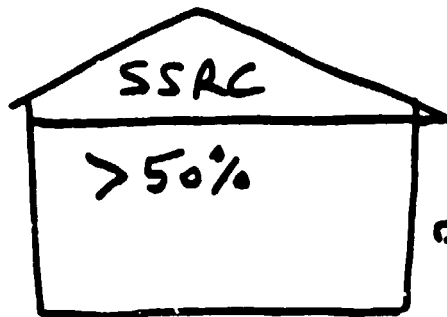


WHEN MORE DEMAND, SSRC
ADD MORE EQUIPMENT TO
ITS PLANT, & SUBCONTRACT
OTHER

IV

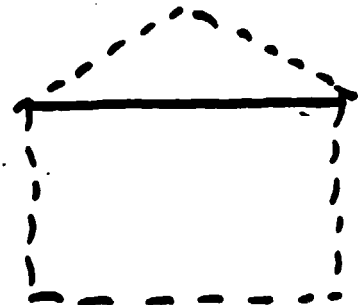
START WITH ONE SUBCONTRACT MFG FIRST

TO GAIN EXPERIENCE IN PRODUCTION &



COMPLETION.

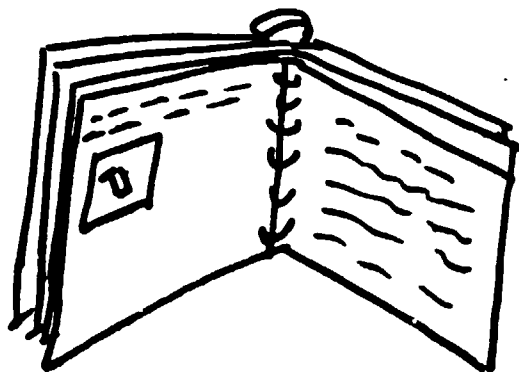
MORE CAPACITY



FUTURE, ADDITIONAL
SUB-C

XIV

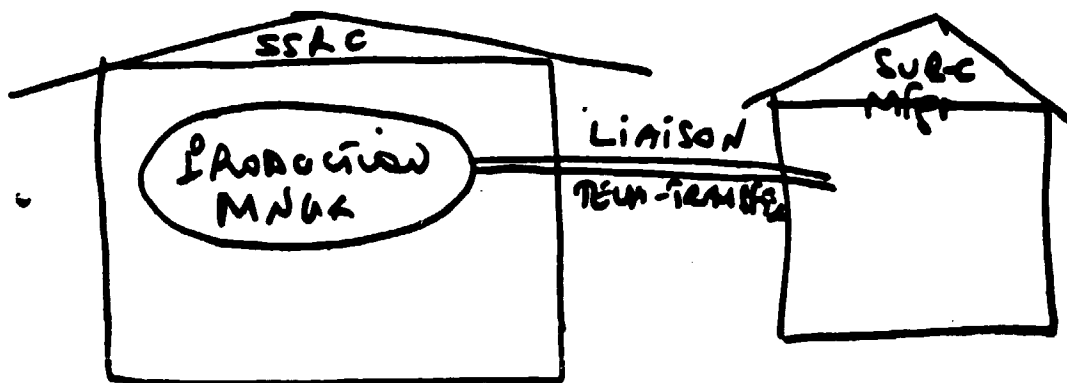
GUIDELINES & DOCUMENTATION OF TEST-TRANSFER PROCEDURES ... SHOULD BE CLEAR, DETAILED, SIMPLE TO FOLLOW, & WELL ORGANIZED:
USE GRAPHS WHEN USEFUL



CLEAR &
DETAILED

XV

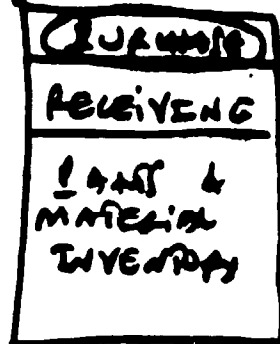
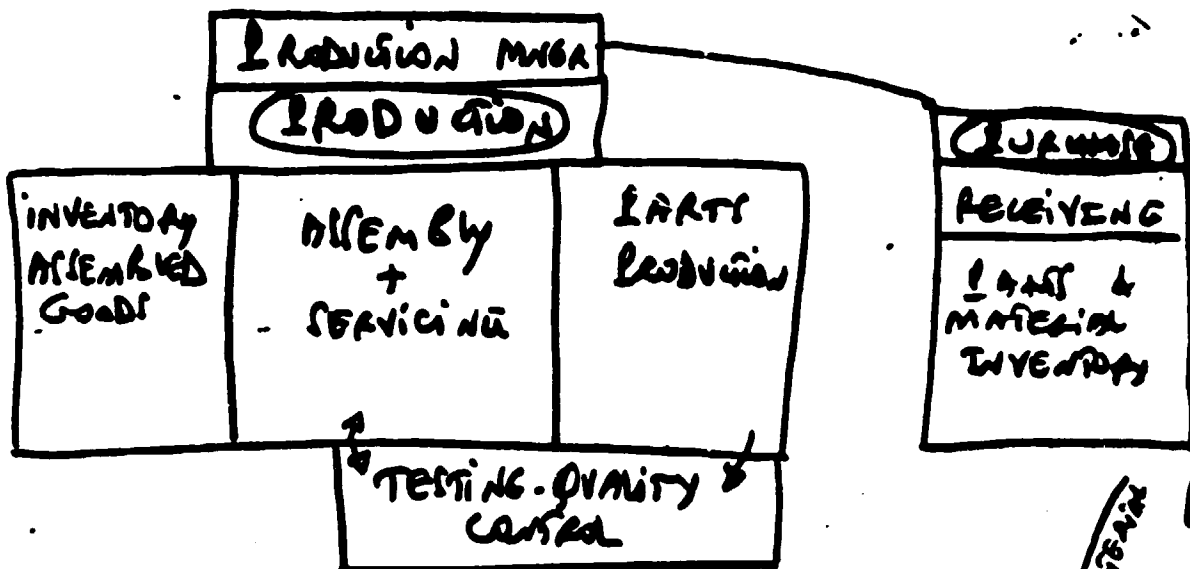
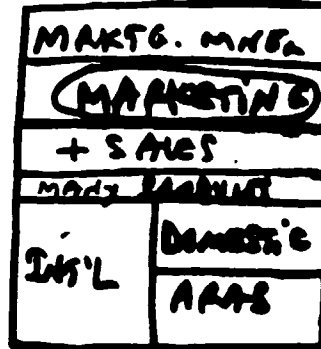
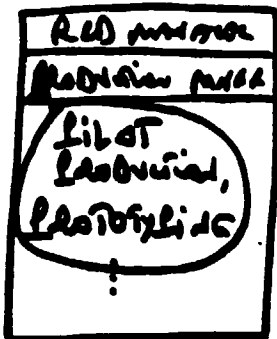
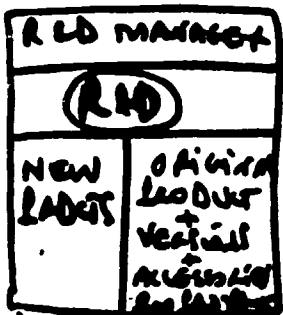
PRODUCTION MANAGER AT SSCC IS BEST SUITED TO DEAL TECHNICALLY WITH SUB-MFGS. HE IS THE LIAISON MAN



DEPARTMENTS AT SSAC.

GENERAL MANAGEMENT

ACCOUNTS RECEIVABLE



MEETING CONFERENCE ROOM

TRAINING ROOM

LIBRARY: TECH + MATH.



DUTIES

R & D MANAGER

- IMPROVE ON ORIGINAL DEVICE + VERSIONS, REDUCE COST
- WORK ON NEW PRODUCTS: DEVELOPERS
- CONCENTRATE ON NOVELTY ASPECTS INNOVATION IN FUNCTION + INNOVATION IN CONSTRUCTION
- SEE COMPETITION PRODUCT & COPY!
- CAN BE REDESIGNED FROM WITHIN

PRODUCTION MANAGER

- ASSEMBLY OF PART INTO DEVICES
- PRODUCTION OF PART AT SCALE
- LIAISON FOR PRODUCTION OF PART AT SUBCONTRACTORS, INCLUDING TRAINING, DOCUMENTATION
- QUALITY CONTROL (PICKING)
- ENGINEERING TO IMPROVE QUALITY & REDUCE COST

MARKETING MANAGER

- MARKETING OF PRODUCTS: + LIAISON
- FINDING NEW CUSTOMERS, AGENTS,
- INTERFACING WITH USER: REPUTATION
- LIAISING WITH PRODUCTION FOR DELIVERIES
- CONSTANT MONITORING OF MARKET, & NEW PRODUCTS, BUY
- COMPETITION PRODUCT
- LIAISE WITH R&D WITH NEW IDEAS, PROBLEMS & SOLUTIONS
- MARKET ORIENTED
- OBVIOUSLY SALES
- SHOULD CONSIDER TO BUDGET

GENERAL MANAGER

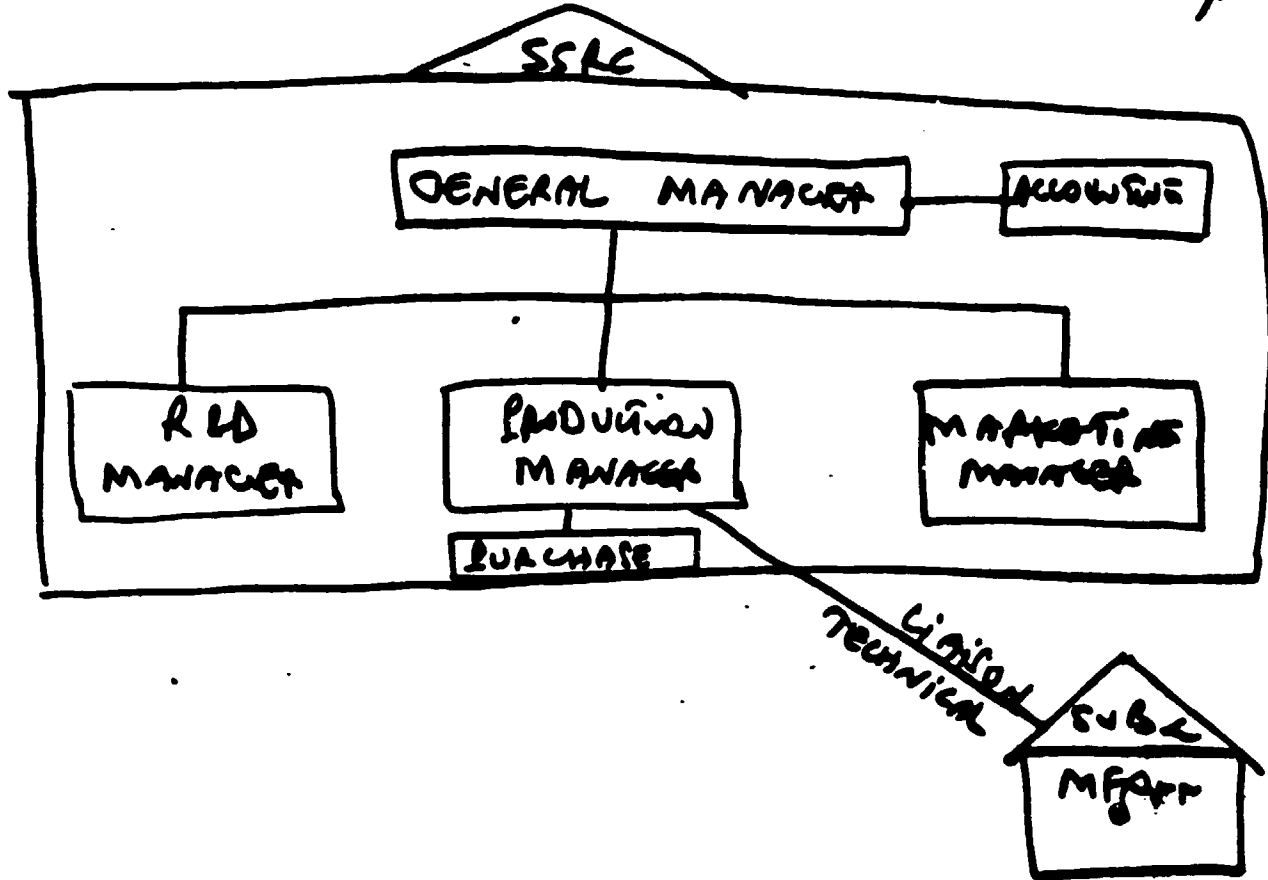
- STRATEGIC; LONG TERM
- PLANNING, CONTROL, INFLUENCE BUSINESS PLAN
- BOTH TECHNICAL & MANAGER CONSTANTLY MONITORING APT. TIME
- SHOULD SEE TO IT THAT BUSINESS IS DOING WELL.
- CONSTANTLY MONITORING MARKET ON A DAILY BASIS, & HOW IT RELATES
- SHOULD SEE TO IT THAT COMMUNICATION IS TAKING PLACE BETWEEN THE DIFFERENT FUNCTIONS
- IS RESPONSIBLE FOR SETTING UP SUBCONTRACTOR BASE AND OVERALL
- HE IS RESPONSIBLE FOR OVERALL SUCCESS OF PROJECT, INC.
- HE COULD BE MARKETING MANAGER INITIALLY.

- HE SHOULD SEE ALL MANAGERS TOGETHER AT LEAST ONCE A WEEK

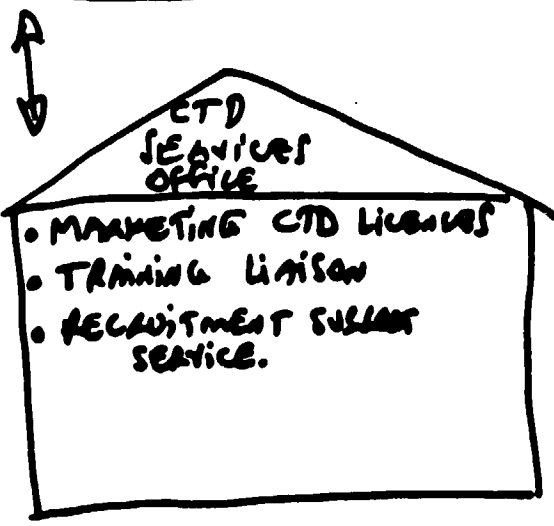
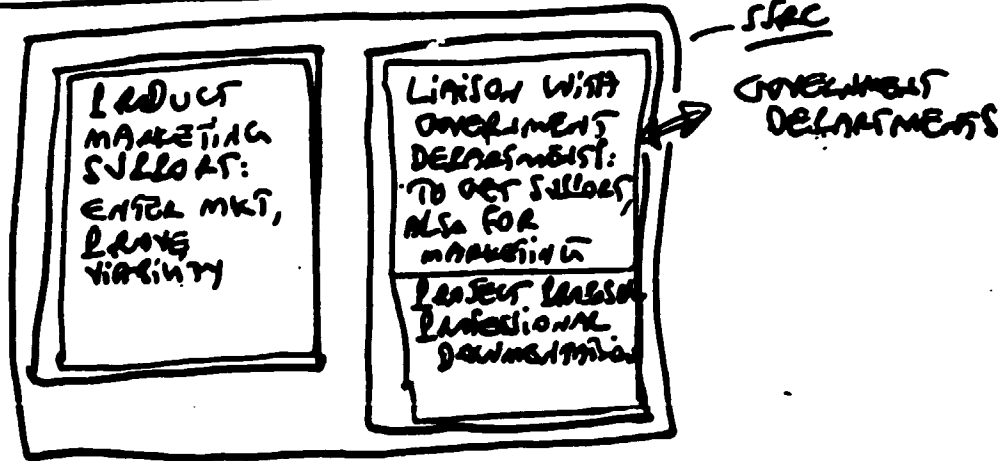
IMPORTANT POINTS ON SUBCONTRACT-MANUFACTURE:

- RUN BY A COMPETENT ENGINEER: WHO CAN TRAIN
- SOMEONE WITH EXPERIENCE IN PRODUCTION (ALSO BUSINESS)
- WHO CAN ASK FOR FUTURE MORE DIFFICULT DESIGNS
- QUALITY AND STANDARD AWARENESS
- PERSONALLY FINANCIALLY COMMITTED: PREFERABLY
- DETAILED COMMUNICATION PROLEGUES
- PERSONAL & FREQUENT COMMUNICATIONS: PROXIMITY.
- EACH TASK VERY WELL UNDERSTOOD
- QUALITY CONTROL SHOULD REMAIN WITH SSRC (+ INSPECTION)
- CAN BUY-BACK EQUIPMENT? LOGICITY
- PARTS COULD ALSO BE SOLD ELSEWHERE
- LIAISON MAN AT SSRC: FOR SLOW
- SET UP MORE THAN ONE SUBCONTRACT MFGA: COMPLETION, OR 1/2 AT SSRC
- GRADUAL TRANSFER OF TECHNOLOGY TO MFGA.
- A SPECIFIC QUANTITY COMMITTED BY SSRC.
- CONTINUOUS TRAINING

MANAGEMENT STANDARDS UNDER ONE ROOF



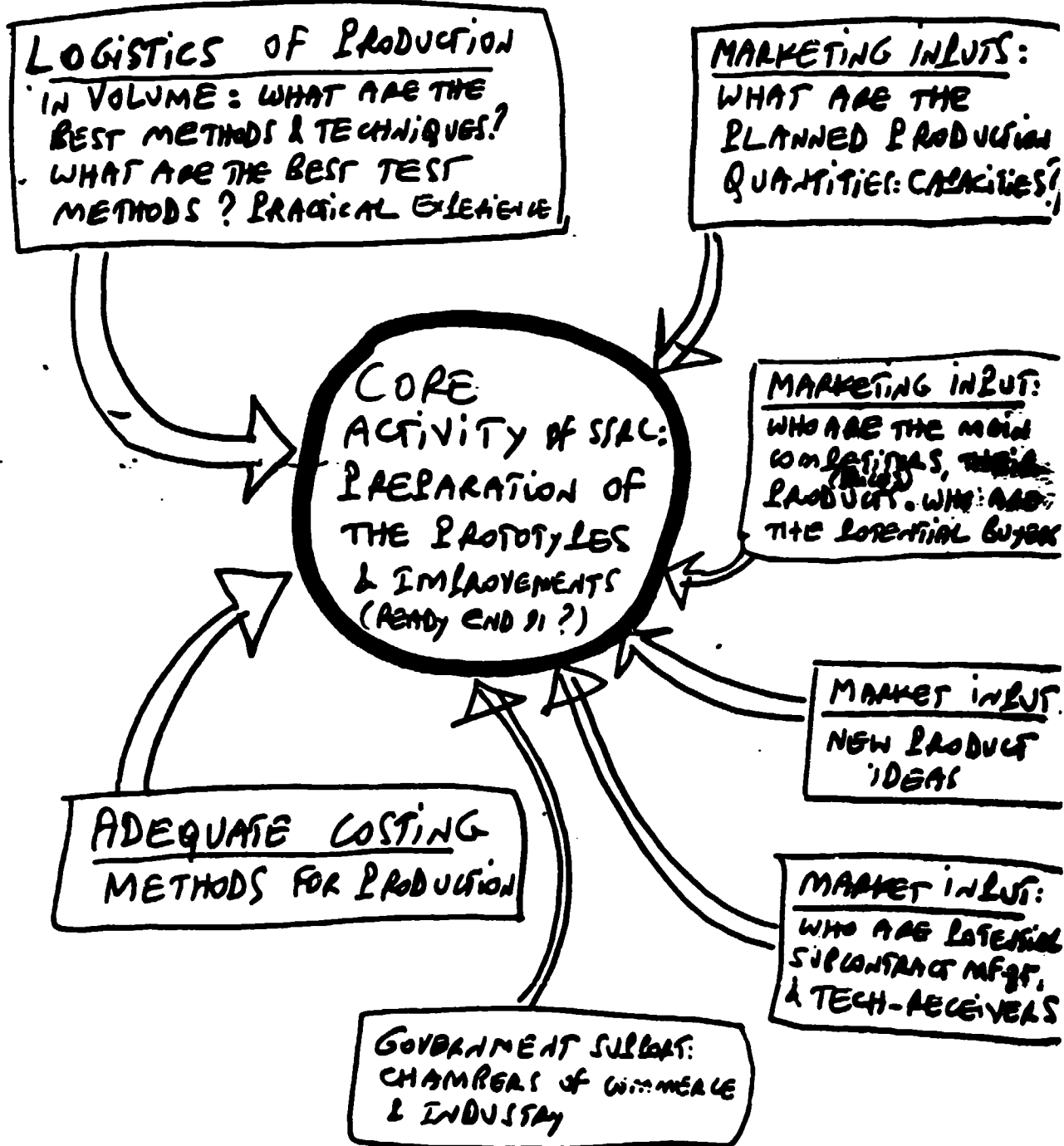
IMPORTANT DEPARTMENTS of CTD: (GENERAL)



CTD office.
In town
office.

EXTERNAL OR INTERNAL SUPPORT REQUIRED FOR
THE OPTICAL PROJECT TILL THE END OF 1991:

(TO SUPPORT MANUFACTURING & COMMERCIALISATION)



PARALLEL APPROACH.

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GOVERNMENT SUPPORT THAT MIGHT BE REQUIRED
FOR THE COMMERCIALIZATION OF THE OPTICAL PROCESS:
AT SSRC

- MARKETING INTELLIGENCE ABOUT THE LOCAL MARKET:
MARKET DATA, IMPORTS, CONSUMPTIONS, SUPPLIERS, POTENTIAL BUYERS...
- ROLE OF MEDIATION (THIRD PARTY) OF CHAMBERS OF COMMERCE & INDUSTRY IN PINPOINTING AND CONTACTING POTENTIAL SUBCONTRACT MANUFACTURERS & RECEIVERS OF FULL PACKAGE OF TECHNOLOGY.
- PROMOTIONAL ROLE OF COMMERCIALIZATION OF R&D THROUGH CHAMBERS OF COMMERCE & INDUSTRY.
- REDUCING BUREAUCRATIC PROCEDURES FOR ALL STEPS OF THE PROCESS.
- PROVIDING SOME FINANCIAL INCENTIVES TO RECEIVER OF TECHNOLOGY.
- IMPORT BARRIER FOR DEVICES PRODUCED LOCALLY:
HIGHER TARIFFS TO ENCOURAGE LOCAL PRODUCTION:
AT LEAST FOR A SHORT PERIOD
- GOVERNMENT DEPARTMENTS AS CLIENTS:
TO ENCOURAGE IN THE INITIAL PHASE OF PRODUCTION
- SUBSIDY FOR EXPORTS:
INITIALLY, TO ENCOURAGE EXPORTS.

* RECOMMENDATIONS ON START UP:

START UP IS A HIGH RISK BUSINESS.
TO COMPENSATE FOR THE RISK THEY SEEK:

1- * HIGH QUALITY MANAGEMENT TEAM

2- * WITH PROVEN TRACK-RECORD IN
BUSINESS START UP ESPECIALLY.

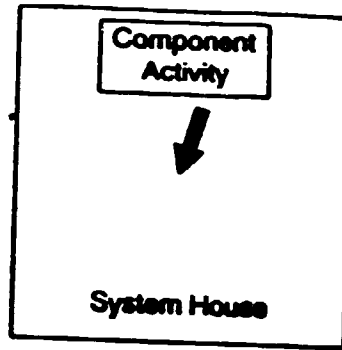
3- * HAS TO BE A TEAM

MODELS FOR THE INTERACTION OF SYSTEM HOUSES AND COMPONENT HOUSES

CASE 1 Full Integration

Interaction Details

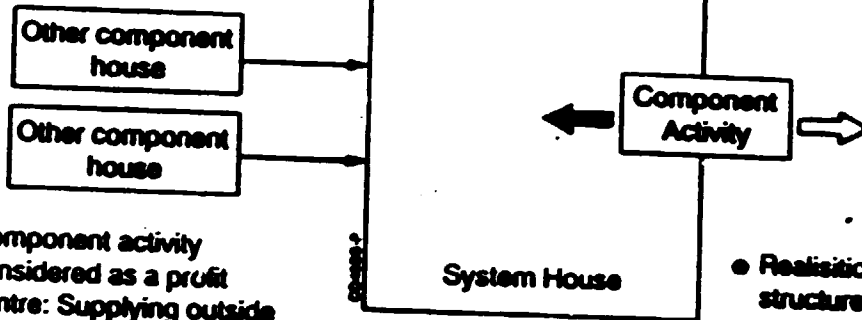
- Vertical Structure
- Component activity not a profit centre: system house pays all
- Open communication channels
- Component activity supplying in house only



Pros and Cons

- Full trust
- Ideal for component innovation: clear objectives, technology driven
- Ideal for setting component standards: set by system need, volume oriented
- This situation is not always possible

CASE 2 Partial Integration (Attachment)



- Component activity considered as a profit centre: Supplying outside market also: sensitivity to profits
- System house buying some components outside

- Realistic compromise structure
- Innovation level depends on financial support of system house
- Innovation level depends on type of communication
- If system house has its say, this case is effective for setting component standards