

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

To be successful, transfer of technology requires more than just the moving of high-tech equipment from the developed to the developing world, or within the developing world. It also requires enhanced knowledge, management skills and technical and maintenance capabilities of those receiving the technology. This is also true for USL business regarding Transferring Technology. Integrating human skills, organizational development and information networks are also essential for effective TT. Thus TT is a broad and complex process. At the end of TT, the recipient must have the ability to use, replicate, improve and if possible, re-sell the technology. There is no single strategy for successful transfer that is appropriate to all situations. Selecting the correct strategy for the situation is the most important aspect of TT. If the transfer of technology is inadequate, unsustainable or unsafe, technology recipients should be able to identify and select technologies that are appropriate to their actual needs, circumstances and capacities. In these regards, USL have very strict regulations and practices. One important control is the SIMAS. A major disadvantage of this system is that it only addresses the quality and safety aspect. This system does not provide guidance on how to select a proper technology and how it should be properly transferred to the intended recipient. One of the main expectations of this research was to further strengthen the above process by proposing a suitable model and guidelines in selecting technologies in the future. It is also designed to give an understanding on how to select suitable technology while doing a proper evaluation.

This research analyzed the problems faced by USL when new Technology is transferred and identified the factors affecting the TT. In the meantime, a suitable simplified model for Technology Selection & Transfer has been proposed by considering the combined model which was used in this study.

The difficulties that many third world nations have experienced with transfers of technology and technological development have not gone unrecognized. They have produced a wealth of literature detailing ways to improve these transactions effectively. These developments outline a number of methods to improve third world's technological development experience. The precise methods used by an individual country or a company will differ depending on its

unique characteristics. Therefore before selecting any specific method, a country or a company intending to implement technological development is encouraged to consider a comprehensive technological developmental scheme similar to that of Unilever's system SIMAS.

While doing this research, the researcher found that all the technologies used in USL were brought from other countries. This leads to a conclusion that the only suitable option of acquiring technology to USL is by importing technologies from developed countries with the help of local decision makers and the regional technology teams. It should however be noted that transferring the technology alone is not sufficient to improve the local business. The transferred technology should be extended beyond the specific project and be utilized in subsequent projects, such as capacity enhancement projects that will allow USL to become a regional supplier to other Unilever companies. Therefore a proper transfer process or mechanism is extremely important for continuous improvement. This research discusses about proper TT mechanism, how this process can be initiated and followed until the implementation, giving solutions to the problems and going beyond acquiring technological transfer.



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In conclusion of this research project, the objectives set out in the Chapter 1 were achieved.

The objectives of the research were,

1. To analyze the problems faced by Unilever Sri Lanka when transferring new Technologies and identify the factors affecting the Technology Transfer.
2. To propose a suitable Model for better Technology Selection and more effective Technology Transfer.
3. To highlight the importance of Technology Choice concept a National award winning project.

Objective 1: To analyze the problems faced by Unilever Sri Lanka when transferring new technologies and identified the factors affecting the technology transfer.

To evaluate this objective TT was analyzed by using the combined conceptual model developed by using the seven factor model which was described in Chapter 2.

In Chapter 2, the researcher examined the necessary facts and key words related to this research on TT. It further reviewed in depth the concepts, theories, various models and examples developed by experts. Different definitions related to technology transfer have also been discussed. This chapter interpreted the importance of the technological components, capabilities and barriers which were analyzed in depth to fulfill the aim and objective of this study.

The research findings were analyzed in detail in Chapter 4. In this chapter, several insights of USL were explored. USL has the experience of many technology transfer projects which can be categorized under small to major projects during the past 70 years of its existence. The survey results were useful and effective in analyzing the problems faced by USL when transferring new Technology together with identifying the factors affecting the TT.



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Technological Capabilities

According to the findings from the survey, the Acquiring, Vending and Modifying capabilities at USL are in High level. However there is always room for these capabilities to improve to Advance level. Also for effective technology transfer to take place, development of these three capabilities will be critical. The other two capabilities, namely Converting/Transforming and Generating/Innovating capabilities, are in the Medium category. Results indicate that the required technological capabilities of USL business are available with the company. For this reason, is very important for USL to build, develop, strengthen, enhance and improve the existing scientific and technological skills and capabilities to a world class status,

Technology Components

The technological components in USL for process technology were analyzed. The research findings are as follows,

Technoware: The result of RII and mean value show that the transfer Technoware component has been developed to a satisfactory level at USL. However in order to have effective TT, Technoware must be improved further for an industry like USL. Although the results give favorable findings, practically USL experienced issues in this system.

Humanware: The results show that Humanware component in USL is not at a satisfactory level. In the technology component assessment section, it received the lowest marks. Therefore the Humanware component in USL needs more attention and further detailed study must be done to find out the root causes. The periodical analysis of the training requirement for each department (work force) is not adequate and it can be improved through the Human Resource department. USL needs to consider continuous training for technical staff. Identifying training needs to each individual is very crucial. This however must be handled with extra care since USL has a highly unionized workforce organization.

Orgaware: Orgaware results are unexpectedly at an unsatisfactory level. It is necessary that the organizational practices, linkages and related arrangements need to be more effective in order to make the best use of technology and human resources. If immediate actions are taken in this regard, USL can score favorably in the new project at Horana (Project MORPH).

Infoware: Compared to Orgaware, Infoware is at a better level. Technoware Specific Infoware (TSI), Humanware Specific Infoware (HIS) and Orgaware Specific Infoware (OSI) were measured together in the analysis. This is all about transferring, controlling and managing the information needed for TT, technology utilization and for internal & external business studies. The information pertaining to the technical specification of Technoware is available with USL for almost all the systems including standard operating procedures and software needed to activate Technoware. Also the information needed to provide functional requirement such as engineering data, standards, international standards, engineering measurement and information about operating frequencies is available at USL.

Enabling Environment for Technology Transfer

This research has identified the barriers to successful and effective TT, and provides a roadmap for successful TT. Emphasis will be on TT, within Unilever inter companies, and also between Unilever and vendors, covering broad range of comprehensive national and regional policies. These research findings may help to ensure that local technology investment decisions are made and to operate environmentally sound, socially acceptable and economically viable solutions.

Transferee Environment

Transferee environment of USL has been assessed based on the questionnaire circulated. According to the analysis, Transferee environment at USL is in Medium level. However there is always room for improvement. Also for effective TT to take place, development of this environment also will be critical.

Transferor and Greater Environment

Transferor and Greater environment of USL has been assessed based on the questionnaire circulated. According to the analysis, USL is at a High level.



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Barriers

Next step is to evaluate the barriers to effective technology transfer and how it can be reduced or eliminated.

In general, technology transfer practice in USL has not always been proactive to absorb the best technologies. The senior management lack of willingness and speed to find opportunity to improve the technical know-how. USL is a multinational company and its business is controlled by India, and speed to making decisions for change is slow. The local competitors who have their own control could bring any available technologies without barriers and therefore a loss of opportunity for USL for market share growth is identified. Although developing a mechanism for the latest technical information flow and to be the first in the market by bringing new technology is the best approach for strategic growth, it should be

carefully studied and proactively the right type of technology at the correct time should be selected.

Barriers to the Transfer Process

Both internal and external barriers affect in different level, technology transfer and also the barriers to technology transfer exist for all innovations at varying degrees. Technology does not stand alone, but encompasses political, social, economic, and cultural values that can serve as barriers and impede the diffusion or transfer of technology.

Social barriers. It is important to recognize that transfer occurs within a social system. The social system defines the boundary or limits within which the innovation will be transferred and diffused. USL has many issues in bringing high technology machines to Sri Lanka since it affects the labour redundancy.

Political barriers. The influence of political barriers on transfer is evident in Sri Lanka as well. Heavy tax structure and tariff policies some times give a negative impact in selecting new technologies to USL. This was highlighted when discussing with experts on this matter. One positive step regarding this issue is the approval USL obtained from the government institutions for the Project MORPH. This decision will greatly contribute to the Sri Lankan economy in a very positive manner in the near future.



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Economic barriers. The economic barriers have an obvious impact on technology transfer. Obtaining regional or global approval is at times a negative impact on the decision making process.

Personal barriers. In the people front, a very small percentage of the population, called *innovators*, constantly seek out new innovations. This group is followed by a larger group called *early adopters* who are generally eager to test new technologies. This group influences those around them and is often sought out for advice. This is a key group for change agents working to transfer a technology to identify because they can have a strong impact on their peers.

Objective 2: To propose a suitable Model for better Technology Selection and more effective Technology Transfer.

This was discussed in detail in Chapter 3 and the analysis was done in Chapter 4 which helped to identify and highlight the important factors which affect effective TT. This is very important since USL is currently in the initial design stage of project “MORPH”. Here the researcher proposed the simplified model developed during the model development stage in Chapter 3. The developed combined conceptual model can be use as a guide line when assessing technologies which USL intends to acquire in future projects.

Objective 3: To highlight the importance of Technology Choice concept with a National award wining project.

This was discussed in detail in the Chapter 4 with the award wining Energy Efficient project done in USL as a case study. Technology Choice concept highlights the importance of using a structured system in analyzing how to select a proper technology while addressing various routes. Analysis was done under three different categories: techno economic compatible criteria (TECC); organizational compatibility criteria (OCCC); and operating domain compatible criteria (ODCC). This analysis can be use as guide document for USL in future technology evaluations for acquisitions. This will help USL to acquire *Appropriate Technology* in its future acquisitions, specially in the MORPH project.

5.2 Recommendations

Recommendations given here are based on the research findings in TT process at USL. This gives an idea to overcome the barriers for successful TT, ways and means to improve the Technological Capabilities, and the Technological Components of USL. Finally it gives an indication of actions that should be taken by USL for effective and successful technology transfer.

Technological Capabilities

Acquiring, Vending and Modifying capabilities at USL are in High level. However there is always room for these capabilities to improve to Advance level ($RII > 90$). Also for effective technology transfer to take place, developing of these three capabilities will be critical. Converting/Transforming and Generating/Innovating capabilities, they are in Medium category. Capability building at USL is very important. The following should be focused in this regard.

- Proper identification of technology
- Strengthen the USL team, i.e. managers, engineers and workforce
- Scientific Technology information assessment
- Address financial and regional barriers
- Address major barriers for TT
- Handle the regional pressure

In order to improve the capabilities the following points must be addressed in a methodical way,

- Introduce human resources development programs
- Introduce advance management techniques and improve skills
- Identifying and selecting the most suitable technology
- Identifying and selecting the most suitable mechanism in acquiring
- Identifying the right technology suppliers
- Effectively utilize plant and machineries
- Proper planning and controlling of new projects
- Carry out troubleshooting and in house maintenance activities

Technology Components

The findings of the study indicate that Humanware and Orgaware components are not at a satisfactory level at USL.

Humanware: USL needs to consider continuous training for technical staff. Identifying training needs for each individual is very crucial. In order to improve the Humanware, the following are recommended.

- Must organize more systematic training programs to enhance skills and competencies of its workforce as well as for managers
- Recruit trained or educated people for production department as well as for the maintenance department
- Should have a clear policy to train its staff for new technology

Orgaware: In order to improve the Orgaware component of USL as well as to improve the effectiveness of the organizational practices, linkages and related arrangements which need to make the best use of technology and human resources, the following are recommended.

- USL must be re-organized / re-structured in a very systematic manner when deciding the MORPH structure for the new factory at Horana
- Must take firm actions to overcome the regional pressure
- Should create a very good conducive environment for both the managers and workforce members

5.3 Summary and Key Learning Points for Managers

- Identification of the technologies to be acquired through ITT gives rise to a good understanding of the needs of the different market segments being catered by the firm and the strategies being used by competitors. In this regard USL managers must play a key role in project MORPH when selecting new technologies. This will be a tough task when dealing with the regional teams.
- Often, firms do not draw a baseline to their own processes and technological capabilities. Before attempting to evaluate the transferor's technology and technological capabilities it is imperative that a transferee firm undertakes a baseline exercise for better understanding of its own technology and technological capabilities. This is one of the most important factors to consider today for USL managers due to the selection of new technologies for the new project (MORPH).
- Determining the state-of-the-art attributes of the technologies require good skills and technological forecasting. Along with these out comes the need to have access to a good database of technology sellers. Value engineering concepts must be used for this purpose as well.  University of Moratuwa, Sri Lanka.
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- It is quite possible that a transferee firm may not have necessary skills in-house to carry out the necessary analysis with regard to the external setting, internal operations and technological forecasting. Considering the strategic significance of an ITT project it may be advisable, in such instances, for the firm to seek the assistance of outside consultants. This is why the project MORPH has taken the regional technological unit support.
- Selecting good suppliers requires the capacity to carry out comprehensive and in-depth searches of trade catalogues, databases (commercial, government, and international agency), trade journals, business magazines, etc. Such skills are developed only over time. Industry scanning skills development needs to be considered as a strategic issue by the top management. In this regard USL has taken all the recent Unilever project details which are relevant to our business.

- Technology component specification and technology assessment require individuals who have the ability to link theory with practice. These individuals must have the capacity to carry out the analysis and translate the results into concepts and words that can be easily understood. Graduates with postgraduate training in engineering management or technology management are well suited for this task.

5.4 Future Research Interest

This study however, can be carried out further on the selected objectives in a different approach or model by another colleague at USL, and enhance these findings which can be used by all the south Asian members in Unilever. K. Ramanathan's (2003) new "Technology Life Cycle Model" can be used as one example. At the same time new research results will be useful for this sector as well as to the country as a whole, because after the war, the country is aiming for fast track growth. These findings are very important for the nation.



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