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ROLE OF TECHNOLOGY MANAGER IN END-TO-END COMMERCIALIZATION, FROM A CASE OF TELE-ECG SYSTEM

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ABSTRACT

An R&D organization that develops a commercially usable product can draw its benefit by either manufacturing &selling the new product directly to customers, or by licensing out the technology to a firm that manufactures& sells. Many a time the research organization is not mandated to manufacture & sell directly to end-users. Then licensing would be the best path available for commercialization of developed product. The main actors in this process (also called technology value chain) are developer, technology-transfer office,transferee-firm, suppliers of components / accessories, and market-researchers.It is desirable to have a central actor to coordinate all the activities to ensure the effectiveness of end-to-end technology value chain. Such a central actor may be called *technology manager*.

A case of Tele-ECG system developed by Bhabha Atomic Research Centre (BARC) of India is taken as an example. The objective of the paper is to elucidate the role of a perceived '*technology manager'* in the process of commercialization.

Semi-structured interviews were conducted with individual actors such as developer, technology-transfer expert, a few technology-transferees and a few end-users. Perceptive analysis was carried out to figure out the importance of a central functionary called technology-manager.

Key-words: Technology Manager, Commercialization, End-to-End Technology Transfer

INTRODUCTION

Technology commercialization is the process of applying technical ideas into businesses. It plays a critical role in economic development. Primary sources of new technology are universities, laboratories or R&Ddivisions within private-sector companies. However, to have social and economic impact, additional value must be created through commercialization.

According to Harvard Business Review (May–June 1990), in the coming decade, businesses will rise and fall depending on the effectiveness of their commercialization efforts. Most companies are compelled to develop this capability of commercialization of their knowledge. This capability is by and large centered around 'technology manager'. He gives a proper trajectory for the process of development and commercialization of technologies. This paper throws light on the role of technology manager, by means of a case study on Tele-ECG system developed by a government funded research institute.

LITERATURE REVIEW

According to Fredrick Ferre (1988) technology can be defined aspractical implementation of intelligence.
Schilling (2012) wrote about innovation as: 'Technological innovation is an importantcompetitive driver in many industries. Many firms receive more than one-third of their sales and profit from products developed within the past five years. The increasing importance of innovation has been driven largely by globalization of market and advent of advanced technologies that enable more rapid product design and allow shorter production runs to be economically feasible.

Literature indicates that, even the most effective, technology needs to be 'managed' well in order to fetch profit. As one of the tools technology management, National Aeronautics and Space Administration (NASA) introduced the concept of Technology Readiness Levels (TRLs) in the mid 1970's to allow more effective assessment of, and communication regarding the maturity of new technologies (Mankins, 2009). Heslop et al. (2001) also gave a good number of tools such as Technology Readiness Level (TRL), Technology Manufacturability Level, Technology Marketability Level, etc. Maria et al. (2011) gave a metric for Technology-Absorption Level, indicating to what extent a firm can absorb the technological knowledge from external sources, for the purpose of reaping commercial benefits.

METHODOLOGY

Qualitativestudy was taken up. Semi-structured interviews were taken with

- developer of Tele-ECG system
- tech-transfer expert,
- several of technology transferees and
- several end-users of Tele-ECG systems.

The findings were tabulated, and perceptive analysis was carried out. The taskssupporting the technology-transfer &commercialization were abstracted to formulate the functions of a technology manager.

DATA COLLECTED

4.1 Information from System Developer:

Findings	Insights
Proactively identified the need and also suggestion came from top management	Drive from top management is a stronger motivator
Identified the utility of this low cost user-friendly system for ground level users	Make technology comfortable to end users
Use of Standard accessories and an arrangement that the product design shall be made by transferee	Minimization of effort for adoption of new technology
Level of development	The developer decided to develop till design and optimization of core hardware and software. The final manufacturing design

Findings	Insights
	including casing shall be made by the tech-transferee, to suit the tastes of the end-users.
Proactive, periodical upgradation of technology by developer	Countering obsolescence

[Table 1 – Information form system developers]

Interaction of TTO with technology-developers: TTO helps the developers in assessing readiness of the technology for transfer. Also TTO helps in drafting the Technology Transfer Document (TTD), drafting & executing Technology Transfer Agreement.

Information collected from Technology-transfer Officer (TTO):

This is the central office commonly all the technological groups in the organization, for executing the technology transfer activity. The following are the points gathered by interviewing a tech-transfer officer.

Steps taken by TTO for transfer of technology from lab to industry:

a. Evaluation of Technology: TTO evaluates the technology for its functioning, performance, ease of use, etc. and might offer any suggestions for improvement of technology from user-angle, on the basis of their wider experience.
b. Evaluation of Part used in system:Some important parts like LED display, push buttons, etc. are evaluated and checked for proper functioning.
c. Patenting of the technology: TTOfacilitatespatenting if felt appropriate.
d. Notification of availability of technologies is done by various means. The prospective transferee proposes to buy the technology by filling a prescribed form and paying an administrative fee.
e. Selection of prospective firms for tech-transfer is done by considering various factors such as financial, technical and marketing strengths
f. TTO executes the license-agreement with the tech-transferee firm at a nominal transfer-fee.
g. The system developer (scientist) provides initial training and further hand-holding (technical support) for one year.

Above points depict the centrality of TTO in the whole process of tech-transfer.

Information collected from tech-transferee firms

Transferee firms A, B, C and D were contacted to find about not only their progress with the technology received by them, but also about their interaction with TTO. Findings:

In transferee-firm A, the proprietor is an expert in the field and has a strong R&D team. They innovated further on the technology they received and brought out a differentiated product for high-end users.

In transferee-firm B, the proprietor is a moderate expert in the field and had outsourced a moderate level of R&D, came out with optimal product and was good at marketing.

In transferee-firmC, the proprietor is of a different field has taken the technology for the purpose of expanding the business into new ventures; made a progress at a lesser pace since they were busy with their regular business.

In transferee-firm D, the proprietor not much familiar with the field, but employed an engineer capable of redesigning for producing low-cost product. Since they were busy with other regular products, and due to apprehension about market for the tele-ECG system, they did not venture ahead with the technology.

A good technology manager would have gathered insight from all the transferee-firms and would prove to be a supporting member to all the stakeholders.

Information collected from the end-user (doctors):

(Sampled interviews are written verbatim or retaining the richness of information)

A. On scale of 5 how much will you rate the system?

The system developed by developer, is very efficient and user friendly. Hence, I will rate it 4.5

B. How often do you use the system?

As a physician, I get opportunity to use tele-ECG system for around 4-5 patients per day. This system makes it easy for me to send the report to a cardiologist immediately by my android mobile. *C. Is the system user friendly? If no what all things according to you should be added or removed?*

Yes! The system is very user friendly and the operation is quite simple. The segment intervals are up to the mark and the baseline wander is quite minimal.

D. Survey from customers and users

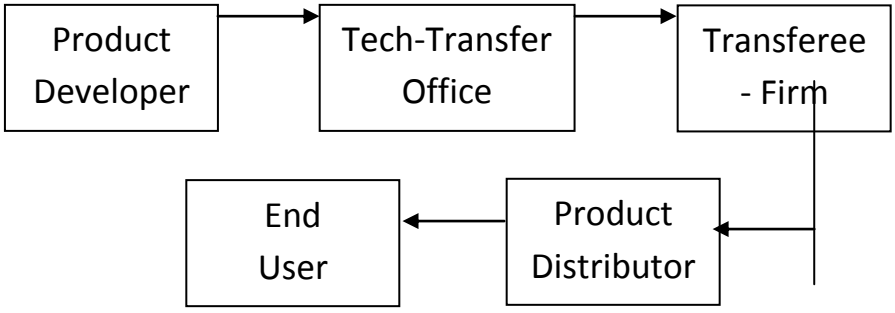
We also made surveys by visiting hospitals and nursing homes and found that use of tele-ECG system is meagre since they already use conventional table-top ECG machine. We interviewed physicians from rural areas on telephone. They were happy with the system since they can send ECG data to a specialist residing far away, for suitable advice.

A technology-manager would be in a position to draw useful insights from the users and benefitted the technology developers and transferees.

DISCUSSION

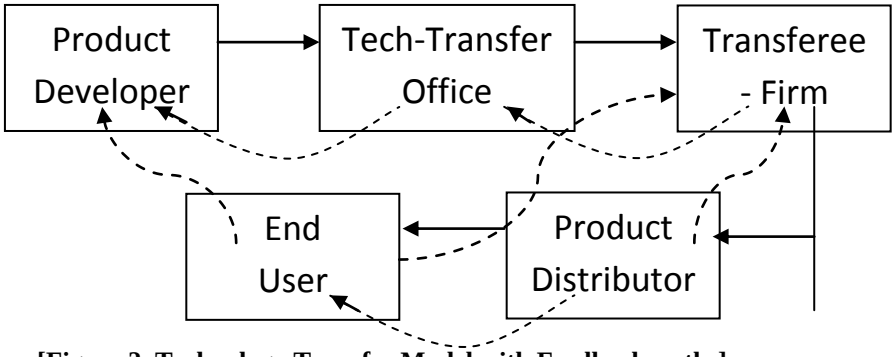
From the information gathered, it became clear that Technology Transfer Office plays a central role, as proved empirically by several researchers such as Siegel (2004).

Based on all the feedback from technology developers, technology transferee-firms and end users, we made a perceptual model of the process of technology transfer. At a grosser level, a simple, linear model as shown in figure 1 is emerged.



[Figure 1. Linear model of technology-transfer process]

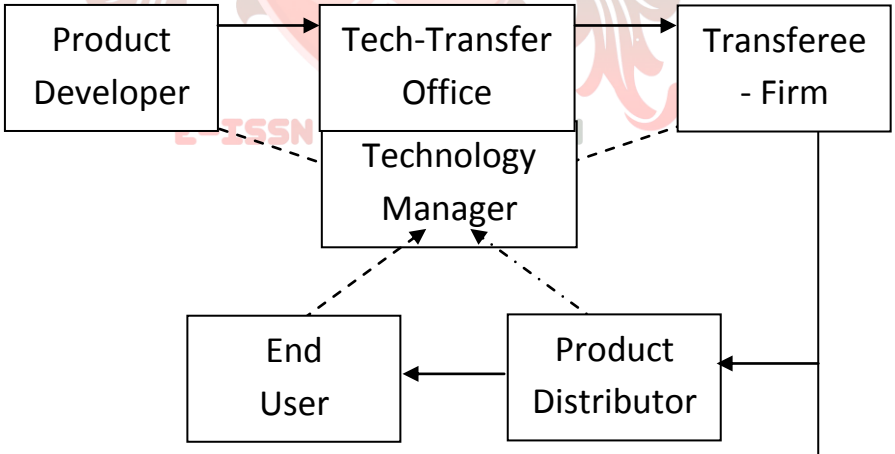
However, good to and fro communication across the functionaries raises the effectiveness. The enhanced model, showing feedback paths in the dashed lines is given in figure 2.



[Figure 2. Technology Transfer Model with Feedback-paths]

A formal functionary to centrally coordinate all the communication across other members would greatly enhance the whole process. Such a functionary may be called as technology manager. He can play many more useful functions. As per Conor O' Kane et al. (2015) and others, TTO-officers can play many more useful roles in enhancing technology transfer effectiveness. Due to their wide exposure in the industry, they are in a good position to identify the broader use value of the technologies that are developed not necessarily for licensing out. They can identify the market requirements and suggest the developers to tweak the system to impart wider usability. They can help the developers in making a better case for funding, vide Conor O'Kane (2018). They can help in drafting and following up with patents and bring in useful contacts, as depicted by Chang Li et al. (2015).

The model that support all such activities are shown in figure 3



[Figure 3. Tech-transfer Model with Centrality of Technology-Manager]

Other functions of technology manager:

TECHNOLOGY SCANNING

Strategic technology scanning is needed to strengthen the link between technology and corporate strategy Technology scanning can be defined as learning about any technological development which could have an impact in the future (Mortara et al., 2008). Now speaking of the role of technology manager in this aspect – a technology manager should be abreast with the technologies available and the market requirement and

also keep the products at par with those of competitors. This needs technology-scanning and further evaluation by cost/benefit analysis.

TECHNOLOGY FORECASTING

Technology-manager has to predict the trends of technology-life cycles of products being handled. Study on this is based on past experience and more on technological developments. By analyzing future opportunities and threats, a technology manager can make propose a plan in order to ensure long term sustenance of the firm.

CONCLUSION

This paper is the result of survey of various stakeholders involved in development and transferring of technology to the industrial firms. It has emerged that the technology manager plays a very central and crucial role in enhancing the whole process.

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