A MODEL OF TECHNOLOGY STRATEGY

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Overview

• Introduction to technology strategy

• Developing technology strategy model

• Time basis of the model

• Components of the model

• Conclusion
Introduction

• Relatively new concept in management theory which describes how firms might use technology to gain competitive advantage

• Time-based model of the process of technology strategy has been developed

• Six technologically related tasks were linked with decreasing time frames based on Jaques’ organizational constructs
Lack of a Technology Strategy Paradigm

• This topic was first mentioned in the literature in the mid-1980s

• Research has developed disjointedly through the identification of many issues for consideration

• The variety of ideas has not converged towards a single, holistic concept or an integrated knowledge base.
Technology Strategy

• Defined as the process by which firms utilize their technological resources to achieve corporate objectives.

• Porter and Ansoff have developed technology strategic ideas from a basis in corporate strategy theory

• However, they did not specifically addressed the concept of technology strategy as a distinct entity

• It will be approached as a company-wide issue to be handled by the firm

• It considers both conceptual and practical perspectives
Developing Technology Strategy Model

• Apply general problem-solving techniques by posing a series of converging questions

1. Where are we, i.e. what are the boundaries of our universe?
2. Where is everyone else going and where do we want to go?
3. Which path is the best one for us to take?
4. How do we get on to this path
5. How can we move along this path most effectively?
6. How can we move along this path most efficiently?

• This encourages the development of an idiosyncratic technology strategy for the firm
Developing Technology Strategy Model

• Six major tasks in the process of technology strategy

1. Setting horizons
2. Industry forecasting
3. Technology positioning
4. Determining technology availability
5. Appropriating technology
6. Managing technology
Task 1: Setting Horizon
Task 2: Industry Forecasting
Task 3: Technology Positioning
Task 4: Determining Technology Availability
Task 5: Appropriating Technology
Task 6: Managing Technology

Number of Year (s)
1 2 5 10 20

Operational Strategic Concerns
Business Strategic Issues
Corporate Strategic Concerns
Time basis of the technology strategy model

• Can be reinforced with a complementary time perspective of the process

• Combination of tasks and time-frames corresponds closely to Jaques’ ideas on effective organizational systems

• The basis of Jaques’ theory is the finding that different levels of management have different requirements and abilities in handling complexity.

• The corporate strategy process itself is not developed or undertaken sequentially, but should operate in parallel, in a continuous and iterative manner.
Components of the Technology Strategy Model

- Setting horizons
- Industry forecasting
- Technology positing
- Determining technology availability
- Appropriating technology
- Managing technology
Task 1: Setting Horizon

Task 2: Industry Forecasting

Task 3: Technology Positioning

Task 4: Determining Technology Availability

Task 5: Appropriating Technology

Task 6: Managing Technology

Operational Strategic Concerns

Business Strategic Issues

Corporate Strategic Concerns

Year 1 2 5 10 20
Task 1: Setting Horizons

• Firm needs to consider the industry in which it intends to compete

• It requires a strategic analysis of the firm and its environment in determining which industries are likely to prove favourable to the firm.
  – ‘Five forces’ model of Porter

• The industrial sector in which a firm operates is the major determinant of the types of technological innovation which are implemented by a firm.
Task 1: Setting Horizons

- Firm explicitly defines the specific technologies which are use to it and from which benefits might be derived

- It is the most complex task, according to Jaques, should have a time-frame of over 20 years, as activities involved almost purely corporate strategic activities

- The essential task is to determine whether the industry in which the firm is presently competing provides the profit potential to allow the firm to meet its corporate objectives
Corporate Strategic Concerns

Task 1: Setting Horizon

Task 2: Industry Forecasting

Task 3: Technology Positioning

Task 4: Determining Technology Availability

Task 5: Appropriating Technology

Task 6: Managing Technology

Year 1 2 5 10 20

Operational Strategic Concerns

Business Strategic Issues

Yearly Strategic Issues

Operational Strategic Concerns
Task 2: Industry Forecasting

- Necessary for the firm to understand where its industrial competitors are heading

- It aimed at gaining understanding of the forces:
  - Which are likely to impinge on the industry over the long term
  - How they will affect the general direction in which the industry is likely to develop
Task 2: Industry Forecasting

Technology trajectory of the industry:

“the directions of technical development which are cumulative and self generating, without repeated reference to the economic environment external to the firm”

• It implicitly assumes a form of technological determinism in that future technical developments are primarily determined by technical considerations
Task 2: Industry Forecasting

- Porter has provided a different method of looking at an industry forecast through his value chain analysis
  - Examines the operations of the firm in terms of technology used in each segment of the chain and how these technologies interact
  - Value chain analysis has been reconfigured in a more recent emphasis on clusters of technology
  - It may reflect on the maturity of the industry and on the possibilities for further development
Task 2: Industry Forecasting

• Time frame
  – Time frame of 10-20 years set for industry forecast with reference to Jaques’
  – May appear unrealistically long, given the increasing rate of technological innovation
  – The ability to undertake reasonable industry forecast is dependent on the industrial sector and more specifically, on the maturity of the industry
Task 1: Setting Horizon
Task 2: Industry Forecasting
Task 3: Technology Positioning
Task 4: Determining Technology Availability
Task 5: Appropriating Technology
Task 6: Managing Technology

Year 1 2 5 10 20

Operational Strategic Concerns
Business Strategic Issues
Corporate Strategic Concerns

Corporate Strategic Concerns
Business Strategic Issues
Operational Strategic Concerns
Task 3: Technology Positioning

• Defining Technology position based on:
  – Strategic direction already defined
  – Likely future business environment

• Important step: how the firm is going to use technology for **competitive advantage**

• One essential dimension: ‘Distance’ of the firm from the frontier or leading edge of the relevant science or technology.
  – ‘Distance’ = Development time by which the firm lags behind the leaders in the field.
Task 3: Technology Positioning

- To narrow the ‘distance’ requires resources and time:
  - The firm must decide the most appropriate time to make the change and on the time-frame over which it is to be achieved.

- Timeframe - 5 to 10 years:
  - Technological concerns to be kept in perspective with regard to both overriding corporate goals
  - Changes in the business environment of the firm
Task 6: Managing Technology

Task 5: Appropriating Technology

Task 3: Technology Positioning

Task 2: Industry Forecasting

Task 4: Determining Technology Availability

Year 1 2 5 10 20

Operational Strategic Concerns

Business Strategic Issues

Corporate Strategic Concerns

Task 1: Setting Horizon
Task 4: Determining Technology Availability

- This task involves assessing the possible methods of acquiring the technology.
  - Often encapsulated within firm’s R&D strategy

- Sources of technology:
  - Internal (*Eg: funding of an R&D facility*)
  - External (*Eg: direct purchasing of technology*)
  - Mixed internal / external (*Eg: funding of joint ventures*)

- Important role: Enhancing firm’s technological resources
Task 4: Determining Technology Availability

• Major form in enhancing technological resources: through exploring synergies between technologies
  – High synergy = Held new tech internally
  – Low synergy = Buy in tech

• Arguments:
  – Overinvesting in base technologies does not provide leverage for further progress in the technology relative to the competition. In contrast, insufficient attention is paid to new technologies which could provide competitive advantage. (Steele)
Task 4: Determining Technology Availability

• First practical step:
  – Determine what technologies are available to the firm, both externally and internally, and how these relate to the technology position which the firm is trying to adapt.

• Timeframe - 2 to 5 years:
  – Time required to install and optimise a radically new technology in operations
Task 1: Setting Horizon

Task 2: Industry Forecasting

Task 3: Technology Positioning

Task 4: Determining Technology Availability

Task 5: Appropriating Technology

Task 6: Managing Technology

Year

1

2

5

10

20

Operational Strategic Concerns

Business Strategic Issues

Corporate Strategic Concerns
Task 5: Appropriating Technology

- ‘Appropriability’: The ability to derive an economic rent from a particular innovation (Klein).

<table>
<thead>
<tr>
<th>Problems:</th>
<th>Solutions:</th>
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<tbody>
<tr>
<td>Knowledge is costly to produce but cheap to spread</td>
<td>Keep individual projects secret</td>
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<tr>
<td>Technological transfer is uncodified (i.e. cannot be written down)</td>
<td>Minimise the knowledge gap between the source and target for the technology</td>
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Task 5: Appropriating Technology

• Timeframe - 1 to 2 years:
  – Time needed for a new technology to be implemented
  – Allow a fairly significant change in the way operations are performed
Task 6: Managing Technology

• The ability of the firm to undertake continuous improvement activities on all its operations would also allow implementation of new technology in a more efficient manner:
  – Staff appear to be more willing to implement new technology within a dynamic environment
  – Ensures a more thorough awareness of operational details, enabling new technology to be tailored to fit firm’s operation

• Timeframe - less than 1 year
  – Main cognitive processes used are data accumulation and diagnosis
The Role of R&D

• 3 major R&D roles

1. Relates to projects which produce a direct return on investment. Includes process and product development (Usually less than 2 years)
   • Encompassed within task 5 and possibly 4.

2. Strategic benefit arises with longer term projects
   • Encompassed within task 4 and possibly 3

3. Formalized information gathering processes with which the firm can develop new or imported technologies. R&D act as a repository of advanced technological knowledge
   • Encompassed within several components of technology strategy (depending on the timeframe)
Table 1. The six tasks of technology strategy

<table>
<thead>
<tr>
<th>Task</th>
<th>Time-frame (Years)</th>
<th>Decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting horizons</td>
<td>20+</td>
<td>Choice of industrial sector; technological implications of this choice</td>
</tr>
<tr>
<td>Industry forecasting</td>
<td>10–20</td>
<td>Future direction of industry; industrial revolution vs evolution</td>
</tr>
<tr>
<td>Technology positioning</td>
<td>5–10</td>
<td>Core technologies of firm; position relative to frontiers of science and technology</td>
</tr>
<tr>
<td>Determining technology availability</td>
<td>2–5</td>
<td>Information sources on technology; technology acquisition internal and external</td>
</tr>
<tr>
<td>Appropriating technology</td>
<td>1–2</td>
<td>Effective use of technology; getting new technology into operation</td>
</tr>
<tr>
<td>Managing technology</td>
<td>0–1</td>
<td>Efficient use of technology; continuous improvement of technology</td>
</tr>
</tbody>
</table>
Conclusion

• Technology strategy is not a single process but a variety of activities undertaken by employees on a continuous but differentiated basis, the result of which is the progression of the firm towards its corporate objectives