Unit 8

TITLE: THE INNOVATION PROCESS IN THE COMPANY

PURPOSE: The purpose of this unit is to provide a brief introduction to the innovation process as it operates in the company setting. Thus, it is a transitional unit between Unit 7 (The Technological Innovation Process), which looks at the innovation process from a formal perspective, and Unit 9 (Technology Transfer and the Private Sector), which describes private-sector motives for innovation in great detail.

OBJECTIVES: Upon completion of this unit, participants will:

- Have a basic understanding of how the formal innovation process described in Unit 7 actually functions within a company.
- Be in a position to tackle Unit 9.

MATERIALS:

Transparency 8-1:	The Innovation Process in the Company
Transparency 8-2:	The Company
Transparency 8-3:	Environments
Transparency 8-4:	Company Innovation
Transparency 8-5:	Outcome
Transparency 8-6:	Research
Transparency 8-7:	Entrepreneurship
Transparency 8-8:	Company Approaches

REQUIRED READING: Stephen J. Kline and Nathan Rosenberg, "An Overview of Innovation," pages 275-305 in Ralph Landau and Nathan Rosenberg, eds., The Positive Sum Strategy, National Academy Press, Washington, D.C., 1986.

OPTIONAL READING:

1. Donald A. Schon, Technology and Change, Chapters III (Ambivalence Toward Innovation), IV (The Drama of Corporate Innovation), and V (Models for Change), Delacorte Press, New York, 1967.

2. H. W. Coover, "Programmed Innovation--Strategy for Success," pages 399-416 in Ralph Landau and Nathan Rosenberg, eds., The Positive Sum Strategy, National Academy Press, Washington, D.C., 1986.

Unit 8

THE INNOVATION PROCESS IN THE COMPANY

Transparency 8-1: The Innovation Process in the Company

NOTE: EXPLAIN THE PURPOSE OF THE UNIT AND WHAT PARTICIPANTS SHOULD HOPE TO ACCOMPLISH.

NOTE: IF NECESSARY, REVIEW THE BASIC CHARACTER OF THE INNOVATION PROCESS PRESENTED IN UNIT 7.

INTRODUCTION

Unit 7 (The Technological Innovation Process) described the innovation process from a formal perspective by looking at a technology as it moves from creation through adoption. This approach, though useful for making various points, gives the impression that the innovation process is composed of discrete, sequential activities, suggests that the technology moves itself, and does not tell us who is doing the work. If we are interested in exactly how product and process innovation takes place, we will need to introduce at this point a major actor: the company; and, more specifically, a company that produces technological products.

THE COMPANY AND ITS ENVIRONMENTS

Transparency 8-2: The Company

Every company is a purposive organization. Companies usually have existing manufacturing capabilities and an existing product line, and company strength is usually based primarily on the capabilities of its personnel. Since a company exists in time and changes over time, particularly with respect to its personnel, we can represent a company as a flow.

Transparency 8-3: Environments

In product innovation, and sometimes in process innovation, need is drawn from the market environment, the functional capabilities to meet the need are envisioned within the company, and the technical solution is drawn from the technical environment, particularly that portion of the technical environment that resides within the company itself.

The movement of technology through the innovation process within a company is a juggling act that cannot be represented in its richness. At a minimum, the company needs to balance market needs, the requirements of the new product, and the available manufacturing processes, while at the same time maintaining an effective organization.

Throughout the process, the company reaches into the technical and market environments, discarding various opportunities and carrying others forward in constant refinement.

NOTE: DISCUSS WHY ADOPTION HAS BEEN LEFT OUT OF THE DIAGRAM.

NOTE: THE MARKETING COMPONENT OF THE DIAGRAM REFERS TO THE MARKET INTRODUCTION OF THE TECHNOLOGY AND NOT TO THE MARKETING DEPARTMENT OF THE COMPANY, WHICH, OF COURSE, IS ALWAYS GATHERING INFORMATION FROM THE MARKET ENVIRONMENT.

NOTE: THE CREATION PROCESS PRESENTED IN THE DIAGRAM IS DEPENDENT ON AN UNDERSTANDING OF TECHNOLOGICAL CREATION AS DISCUSSED IN UNIT 7.

IF THE OPTIONAL READING BY SCHON HAS BEEN USED, WHAT DO THE PARTICIPANTS THINK ABOUT SCHON'S VISION OF THE INNOVATING COMPANY?

OUTCOME

Transparency 8-5: Outcome

Assuming that something makes it through the process, it becomes part of the technical environment and is introduced into the market environment, where customer feedback initiates cycles of product improvement. The market environment is also a competitive environment,

Transparency 8-7: Entrepreneurship

In Unit 7, we began the innovation process with creation rather than with research, but we also used a sequential schema. Although useful for discussion purposes, such schema give the false impression that technologies are self movers and that the innovation process is segmented and orderly.

As it is practiced within the company, the innovation process is a complex structure of feedback mechanisms in which each apparent stage in the structure is an iterative effort, and every stage is closely related to the others. Many companies that recognize that successful innovation requires the integration of all stages have formed project teams drawn from R&D through marketing that carry technologies from the beginning of the process to its end.

In addition, the innovation process within the company must be seen as a directed activity whose success is ultimately dependent on the marketplace. This mobilization of resources toward the development of commercially viable products is an entrepreneurial activity carried out by company management.

NOTE: FOR A FULLER CLARIFICATION OF THE INCREASING INTERRELATEDNESS OF COMPANY FUNCTIONS, THE INSTRUCTOR MAY WISH TO REFER TO EDWARD B. ROBERTS, "STRATEGIES FOR IMPROVING RESEARCH UTILIZATION," TECHNOLOGY REVIEW, MARCH/APRIL 1978, PAGES 32-39.

NOTE: THE CONCEPT OF ENTREPRENEURSHIP PRESENTED IN THE DIAGRAM IS SOMEWHAT DIFFERENT FROM THE WAY IN WHICH THE TERM IS COMMONLY USED. FOR AN EXPANDED CONCEPTION OF ENTREPRENEURSHIP, THE INSTRUCTOR SHOULD REFER TO JOSEPH SCHUMPETER, THE THEORY OF ECONOMIC DEVELOPMENT, CHAPTER II (THE FUNDAMENTAL PHENOMENON OF ECONOMIC DEVELOPMENT).

WHAT IMPLICATIONS DO THE PARTICIPANTS THINK THAT THE INCREASING INTERRELATEDNESS OF INNOVATIVE ACTIVITIES WITHIN THE COMPANY HAS FOR TECHNOLOGY TRANSFER?

gives rise to rational behavior that is often mistakenly identified with the "not invented here syndrome."

NOTE: AT THIS POINT, THE INSTRUCTOR SHOULD LEAVE TRANSPARENCY 8-8 ON THE SCREEN AND USE THE REQUIRED READING BY KLINE AND ROSENBERG AS A BASIS FOR DISCUSSION. THE UNDERSTANDING THAT SHOULD EMERGE FROM THE DISCUSSION IS THAT THE DECISIONS THAT MUST BE MADE BY A COMPANY ARE COMPLEX. COMPANIES CANNOT BE CONCERNED WITH TECHNOLOGY OR THE INNOVATION PROCESS PER SE, BUT RATHER WITH HOW TO ACHIEVE PROFITABILITY. IMPLICATIONS FOR TRANSFER ACTIVITIES SHOULD BE PART OF THIS DISCUSSION.

Transparency 8-8: Company Approaches

The company is influenced in its innovation activities by its personnel, products, and manufacturing processes. Existing products compete with new product opportunities. Cost reductions can be gained for existing products by investments in manufacturing process improvements, and product improvements can be made through the incorporation of new or improved components that may require no inventive activity within the company.

New opportunities, which are often abundant within the company, compete with each other. A new opportunity may not be compatible with internal skills. Manufacturing equipment already within the company limits what can be produced, and changes involve costs.

Moreover, companies have little interest in technology per se or in completion of the full innovation process. Products, not technologies, are to be sold. Most technologies are a cost to the company because they don't result in products, and many product-embodied technologies prove to be market failures. The grand technology may be a market failure and the simple technology a tremendous commercial success.

With respect to the innovation process, the company may choose to imitate another company's product or to select an invention from outside the company for development. This bypasses the creative act. Or, the company may make investments in product improvements through the incorporation of new components, and this is generally not considered invention. Most importantly, the company that completes the innovation process quite often does not reap the commercial benefits.

The activities of the company are directed toward commercialization in the full sense of market success under competitive conditions and therefore cannot be fixated either on technology or the innovation process; for the main concern of businessmen is the total cost and the total profitability or loss of the entire venture. This

since other companies are offering products that satisfy similar needs, and many of them are waiting in the wings to produce the same product at lower cost. Thus, it is not surprising that innovation within a company is a highly confidential activity.

In addition, the market environment is constantly changing. What appeared to be market need when the process began may no longer be a need when the product is introduced. Also, new products may have been introduced in the meantime that satisfy the need, and changed regulations may prohibit product introduction or severely limit its use.

NOTE: THE NEED FOR SECRECY IS AN IMPORTANT POINT THAT SHOULD BE DISCUSSED SINCE IT CAN LEAD TO MISUNDERSTANDINGS IN TRANSFER ACTIVITIES.

INTEGRATION OF EFFORTS

Transparency 8-6: Research

The innovation process is often represented as beginning with research and moving sequentially through adoption. However, it has been found that most innovation does not proceed out of research activities, but out of existing technologies in the technical environment. Also, research has been found to operate most effectively when it is harnessed to specific development efforts as a problem-solving function.

NOTE: THE FUNCTION OF RESEARCH WITHIN THE COMPANY IS COMPLEX AND CHANGING. THE DIAGRAM PRESENTS A REVISED MODEL THAT MORE CLOSELY APPROXIMATES CURRENT TRENDS IN COMPANY RESEARCH ORGANIZATION, WHICH ARE ILLUSTRATED IN THE OPTIONAL READING BY COOVER. FOR FULLER CLARIFICATION OF THESE POINTS, THE INSTRUCTOR MAY WISH TO REFER TO STEPHEN J. KLINE, RESEARCH, INVENTION, INNOVATION, AND PRODUCTION: MODELS AND REALITY, REPORT INN-1B, DEPARTMENT OF MECHANICAL ENGINEERING, STANFORD UNIVERSITY, NOVEMBER 1985.

WHAT IMPLICATIONS DO THE PARTICIPANTS THINK THAT THE REVISED MODEL OF THE FUNCTION OF RESEARCH WITHIN THE COMPANY HAS FOR TECHNOLOGY TRANSFER ACTIVITIES?

Every company finds itself in two different environments. The first of these may be called the technical environment, which includes technological knowhow, engineering science, old and new phenomenon-oriented science, the historic body of technologies, technologies in use in the form of products and processes, and unutilized technologies in the form of inventions. The technical environment is also a stream that develops over time.

The other environment is the market environment, which is controlled by production, sales, and purchase decisions made by firms, households, and public entities. These decisions, in turn, are influenced by a multitude of factors, including socio-cultural features such as the people and their mores and desires, the political realm with its solicitations and regulations, and other companies with product needs and their own lines of products. The market environment is also a stream.

The company is a participant in these two environments and has windows on the larger dimensions.

DO THE PARTICIPANTS THINK THAT THESE ENVIRONMENTS ARE SUFFICIENT TO CHARACTERIZE THE ENVIRONMENTS IN WHICH A COMPANY FINDS ITSELF?

WHY DOES THE DIAGRAM SHOW THE COMPANY AS A PARTICIPANT IN ITS ENVIRONMENTS?

NOTE: THE INSTRUCTOR MAY WISH TO DISCUSS THE ENVIRONMENTAL COMPONENTS. THE POLITICAL REALM, FOR EXAMPLE, PROVIDES BOTH INCENTIVES AND RESTRICTIONS THAT ARE FUNDAMENTAL FOR COMPANY OPERATIONS.

INNOVATION IN THE COMPANY

Transparency 8-4: Company Innovation

Now let's place the innovation process that has been described in Unit 7 within the company. Adoption has been deliberately left out because this happens only when the company is its own market, which generally is the case with process improvements.

NOTES TO INSTRUCTOR:

1. The content of this unit is not fully intelligible apart from the understanding of the nature of the technological innovation process presented in Unit 7 (The Technological Innovation Process). If the participants have not been introduced to Unit 7, the instructor should briefly review the nature of the technological innovation process before proceeding with the present unit.

2. The present unit is somewhat in tension with Unit 7, since its focus is on the innovation process as it occurs within a company and not on the innovation process per se. The technology must still pass through various stages; but within the company, the focus shifts to the way in which the innovation process is organized. Participants should be led to understand that the innovation process can be looked at in different ways, depending on what particular aspects of the process need to be understood.

3. The required reading by Kline and Rosenberg is a recent, insightful look at commercial innovation that also deals with models. The optional reading by Schon should not be used unless the first two chapters have been read in conjunction with Unit 7 (The Technological Innovation Process). The optional reading by Coover is an illustration of how research functions in the modern corporation.

4. The points for discussion provided in this manual are merely suggestions. The instructor may wish to proceed without discussion or to insert his own questions.

ESTIMATED TIME:

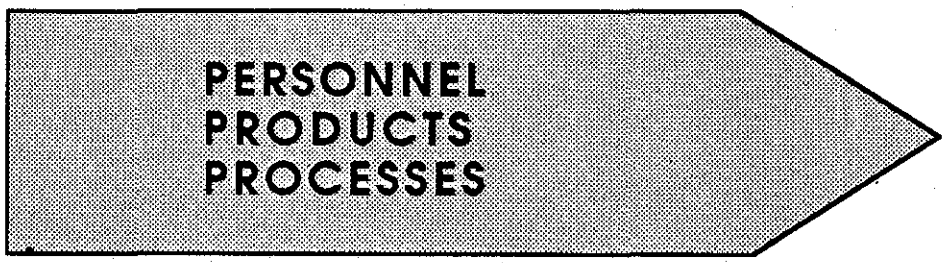
10 minutes for presentation
20 minutes with discussion

NEXT

TRANSPARENCIES FOR UNIT 8

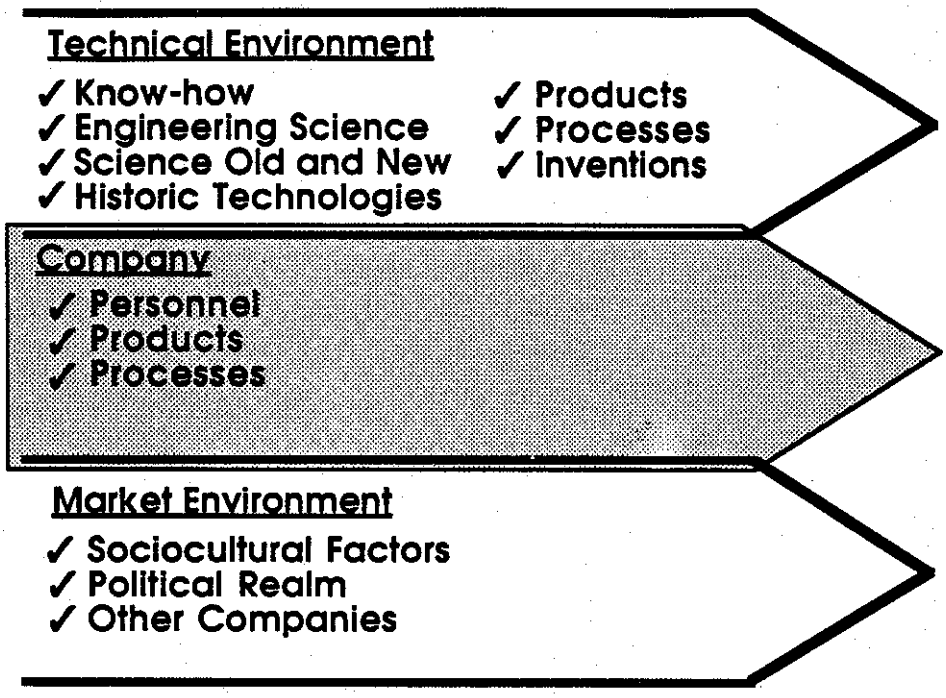
THE INNOVATION PROCESS IN THE COMPANY

THE COMPANY



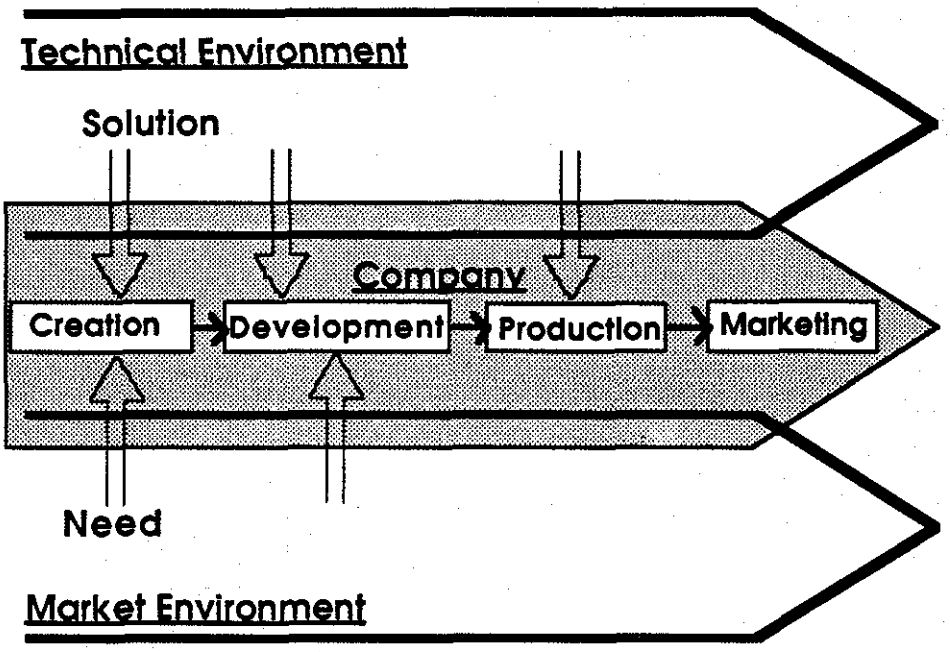
gsri

ENVIRONMENTS



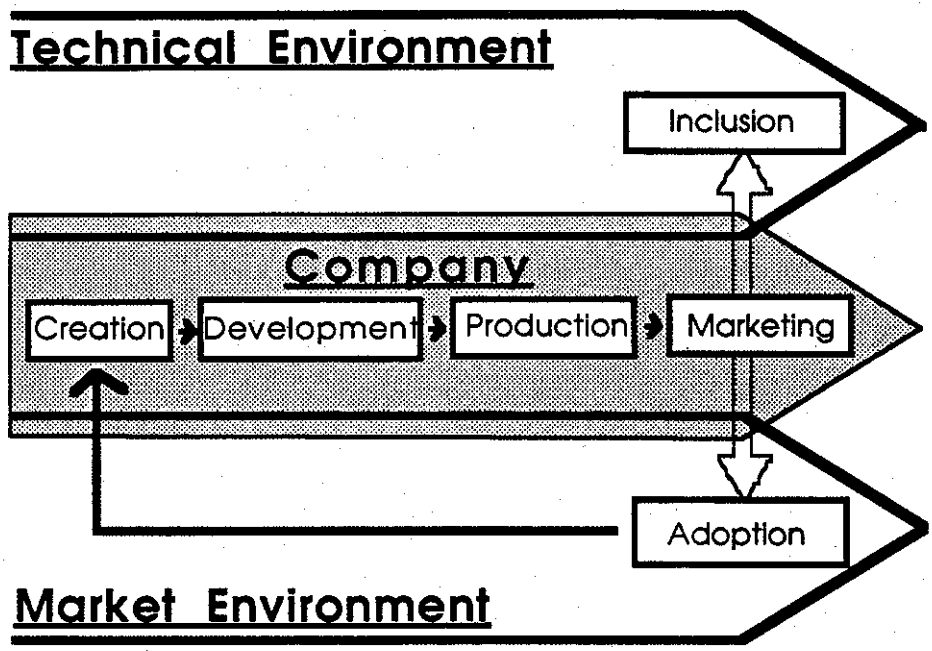
gsri

COMPANY INNOVATION



gsri

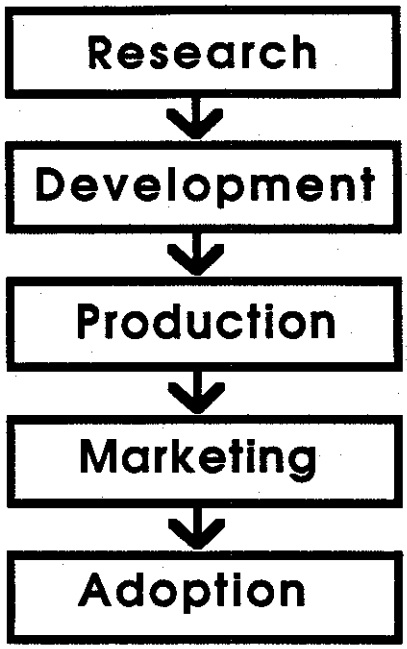
OUTCOME



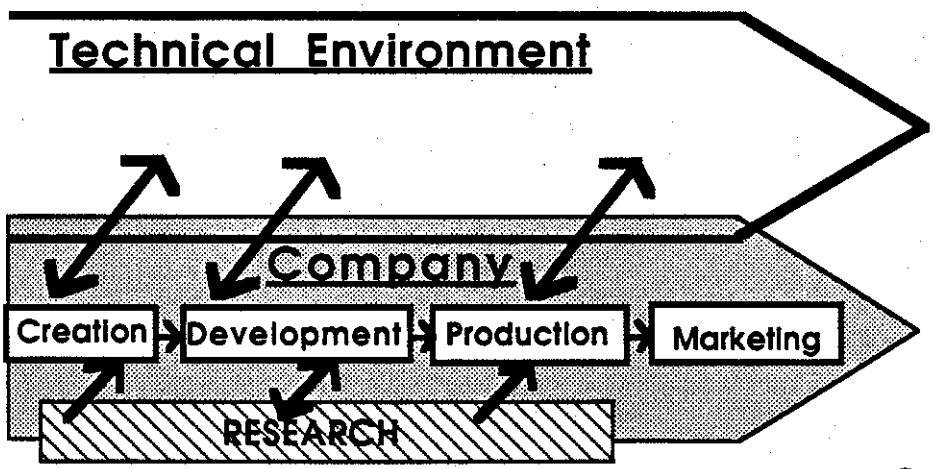
gsri

RESEARCH

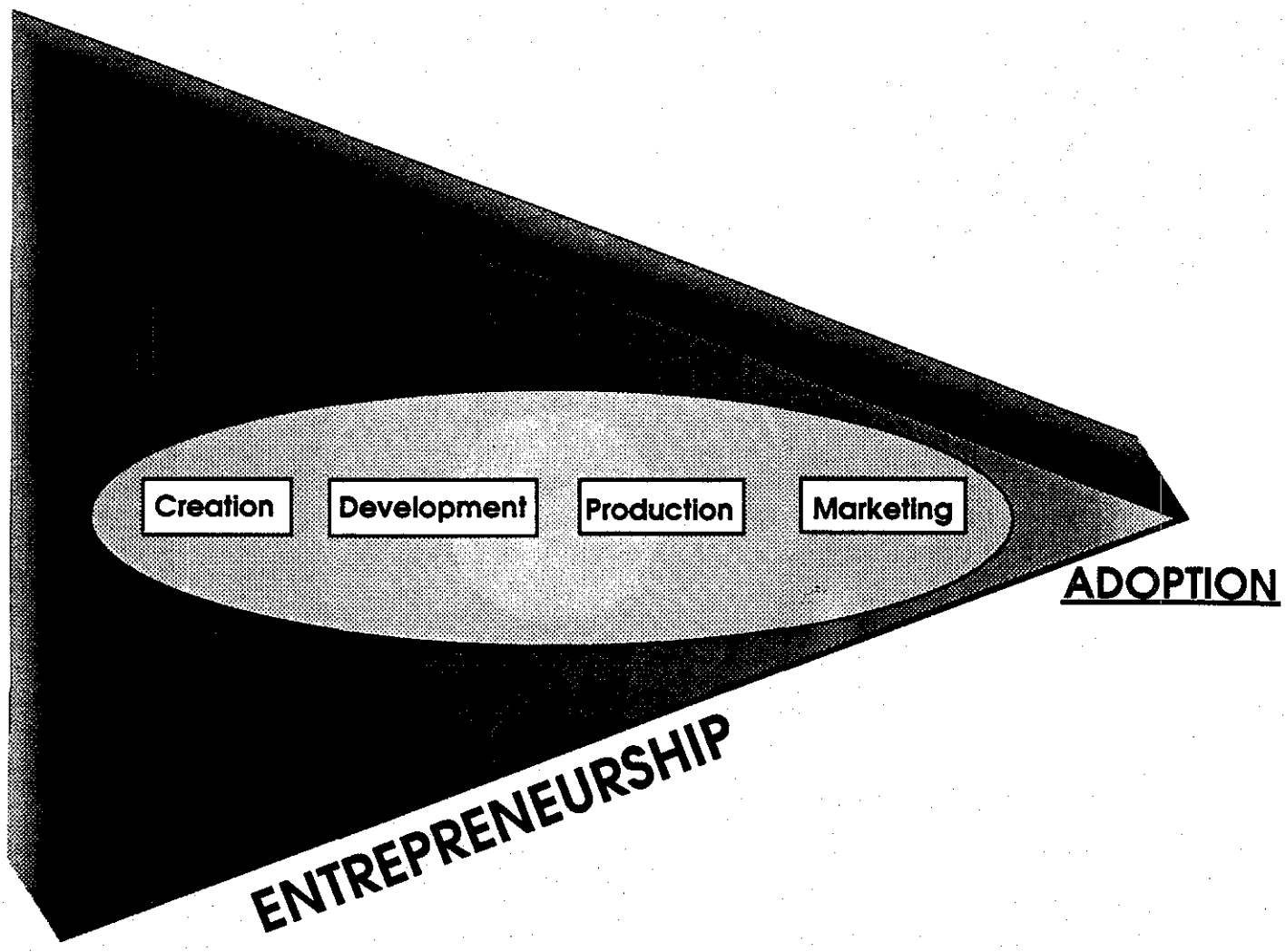
Traditional Model



Revised Model



gsri


Creation
Development
Production
Marketing
ADOPTION
ENTREPRENEURSHIP

gsri

Company Approaches

Influences

- Opportunities are many
- Activities are constrained

Concerns

- Products, not technologies
- Innovations, not the innovation process
- Profitable innovations, not innovation itself
- Commercialization

gsri

9

Unit 9

TITLE: TECHNOLOGY TRANSFER AND THE PRIVATE SECTOR

PURPOSE: This unit focuses on the private sector in relation to technology transfer. It is intended to provide a basic understanding and appreciation of the motives, operational procedures, and requirements that drive the private sector's participation in the innovation process and in technology transfer efforts.

OBJECTIVES: Upon completion of this unit, participants will:

- Have gained familiarity with the innovation process and technology transfer process from the innovating firm's perspective
- Have been introduced to the concept of technological possibilities
- Have reviewed the inputs and outputs of the innovation process for a firm
- Understand a firm's motives for participating in innovation
- Be aware of the cost structure of industrial innovation
- Have an overview of the market and industry structures supporting innovation
- Be aware of the firm's major resistances to technology transfer
- Understand the basic data and information requirements needed to support technology transfer to the private sector
- Be alerted to concerns of particular sensitivity to the technology buyer.

MATERIALS:

Transparency 9-1:	Technology Transfer and the Private Sector
Transparency 9-2:	Model of Innovation in the Firm
Transparency 9-3:	Technological Possibilities
Transparency 9-4:	Inputs to the Innovation Process
Transparency 9-5:	Outputs of the Innovation Process
Transparency 9-6:	The Genesis of Innovation

optional reading by Chapman is based on an industry survey and is related to the second half (Technology Transfer) of this unit.

4. The points for discussion provided in this manual are merely suggestions. The instructor may wish to proceed without discussion or to insert his own questions.

ESTIMATED TIME:

40 minutes for presentation
60 minutes with discussion