Chapter 4
Introduction

Advancing to present research

After you have presented a contextual setting and discussed the previous work of other researchers, you use the final part of the introduction to focus the attention of the reader on the ***specific research problem*** you will be dealing with in the body of your report. This is done in three addition stages, which I designate as III, IV and V. Stage III indicates an area that is *not treated* in the previous literature, but that is important from the point of view of your own work; Stage IV formally announces *the purpose* of your research; and stage V indicates possible *benefits or applications* of your work.

Ordering your Information

The kinds of information contained in Stages III, IV, and V are sequenced in order to move the reader logically from the literature review to the purpose of your study. We examine each stage individually to see how the information is presented.

Writing STAGE III: Missing Information

Stage III serves to signal the reader that the literature review is finished. It sums up the review by pointing out a gap-that is, an important research area not investigated by other authors. Usually Stage III is accomplished in only one or two sentences. Here are three alternatives you can choose from in writing your Stage III statement.

ALTERNATIVES FOR STAGE III

1. You may indicate that the previous literature described in Stage II is inadequate because an important aspect of the research area has been ignored by other authors

2. You may indicate that there is unresolved conflict among the authors of previous studies concerning the research topic. This may be a theoretical or methodological disagreement.

3. You may indicate that an examination of the previous literature suggests an extension of the topic, or raises a new research question not previously considered by other workers in your field.

In indicating some kind of gap left by earlier studies, Stage III prepares the reader for your own study.

STAGE III: Missing Information

Gap	+	Research topic
However,	few studies have reported on	the effects of computer assisted instruction
But	there is little information	the air flow rates on available on simple flat plate solar collectors.

Writing Stage IV: The Statement of Purpose

Stage IV serves to state as concisely as possible the specific objective(s) of your research report. This stage, the statement of purpose, thus follows directly from Stage III because it answers the need expressed in Stage III for additional research in your area of study.

You may write the statement of purpose (Stage IV) from one of two alternative orientations:

1- The orientation of purpose may be towards the report itself- that is, it may refer to the paper (thesis, dissertation, or report) that communicates the information about the research.

STAGE IV:
Statement of Purpose Research question

Report Orientation	+	**Research question**
The purpose of this thesis The aim of the present paper The objective of this report system		is to determine whether an auto matic measurement can be applied to educational setting

2. Or the orientation of the statement of purpose may be towards the *research activity*, in other words the study itself, rather than the written report .

STAGE IV: Statement of Purpose
Research Orientation

+

Research Orientation		Research question
The purpose of	this study this investigation this research the research reported here	was to determine whether or not genetic differences in germination exist at low temperatures in pepper species.

Writing Stage V: The Statement of Value

In Stage V you justify your research on the basis of some possible value or benefit the work may have to other researchers in the field or to people working in practical situations. I can call this stage the *statement of value*.

Stage V is not included in every introduction. You should include Stage V in your introduction when you write a thesis, dissertation, or a thesis proposal. *The statement of value is also commonly included in research reports written to describe a project conducted with money from outside sources*. In reports written up as journal articles, Stage V is often omitted.

You may write Stage V from either of two alternative points of view.

1. The statement of value may be written from the point of view of the *practical* benefits which may result from applying the findings of your research.

STAGE V: Statement of Value
Practical Orientation

EXAMPLE A: *This research may provide* an alternative to the problem of manually demonstrating instrumentation principles in classroom environments.

EXAMPLE B: *The results of this study could be useful* to educators responsible for planning course work in consumer education.

2. Or you may write the statement of value to emphasize the theoretical importance of your study in advancing the slate of knowledge in your specific area of research.

STAGE V: Statement of Value
Theoretical Orientation

EXAMPLE A: Both of the factors under investigation in this study *may be of importance in explaining* the irregular occurrence of this disease.

EXAMPLE B: Results of this study *may suggest a broader hypothesis for further research* into the effects of atmospheric chemicals on rubber.

LANGUAGE CONVENTIONS

Signal Words and Verb Tenses in Stages III, IV, and V

As I have seen, when you write each of the last three stages to your introduction, you have several choices in determining the kind of focus you wish to give to your information. The choices you make in each case will determine the vocabulary and grammatical structures you will need in order to write these stages".

STAGE III: Signaling Missing Information

Signal word	**Gap (present or present perfect)**	**Research topic**
However, But,	- few studies have been done on - little literature is available on very - little is known about - no work has been done on	the effects of air flow rates on simple flat plate solar collectors

Subordinating conjunctions like *although* and *while* can also be used to signal Stage III. If you use these kinds of signals, you must write a complex sentence, using modifiers like *some, many,* or *much* in the first clause, and modifiers like *little, few* ,or *no* in the second clause.,

STAGE III: Signal Words (continued)

Signal word	+	Previous work (present or present perfect)	+	Gap +Topic
Although While Meanwhile		- some literature is available or X, - many studies have been done on X, - much research has been denoted to X,		little information is available on Y.

Notice that nouns like *literature, research, and work* are uncountable and are therefore followed by singular verb forms.

Stage IV : Orientation and Tense

I have already seen that Stage IV, the statement of purpose, can be written either of two points of view, a research or a report orientation. If you choose the research orientation you should use the past tense, because the research activity has already been completed.

STAGE I V: Verb Tenses
Research Orientation

Research orientation	+	Main verb (past)	+	Research question
The purpose of this study		was		to investigate the effect of computer-assisted instruction on the computer literacy of fifth grade children.

On the other hand, if you choose to use the report orientation, use the present or future tense.

STAGE IV: Verb Tenses
Report Orientation

Report orientation	+	Main verb (present or future)	+	Research question
This paper		describes presents		the results of surveys conducted in Honduras to determine the distribution of manatees in that country.
This thesis		will deal with will discuss		the implementation and operation of an automatic measurement system appropriate for classroom and laboratory demonstrations.

Notice that in both research as well as report orientation, phrases like *this study* and the *present paper* reinforce the fact that Stage IV refers to your work, not the work of the other authors mentioned earlier.

Stage IV and Your Research Question

Your statement of purpose (Stage IV) should be directly related to the research question upon which you based your study. Although you may not need to include the research question explicitly in your report, the statement of purpose should be written so that your reader can infer the research question behind your study.

If the implied research question is a yes or no question, the connecting words whether or if are used in Stage IV, and a modal auxiliary like would or could accompanies the verb.

STAGE IV:
Implied Questions in the Statement of Purpose
Yes or No Questions

Research question	Purpose (implied question)
Is an automatic measurement system suitable for classroom and laboratory demonstrations?	The purpose of this thesis is to determine if an automatic measurement system would be suitable for classroom and laboratory demonstrations.

When the implied question is an *information question*, *if /whether* omitted and an infinitive or noun phrase is used.

STAGE IV: Implied Questions in the Statement of Purpose
Information Questions

Research question	Purpose (implied question)
What the distribution and status of manatees in Honduras?	This paper reports the results of surveys and interviews conducted in order to determine the distribution and status of manatees in Honduras. This paper reports on the distribution and status of manatees in Honduras.

Stage V -Modal Auxiliaries and Tentativeness

Stage V, the statement of value, is usually written in a way that suggests an attitude of *tentativeness* or *modesty* on the part of the author. When reporting your own study, you should not sound too sure of the benefits, either practical or theoretical, of your work. It is conventional to sound more cautious. This is accomplished in Stage V by using modal auxiliaries, principally *may*.

STAGE V: Statement of Value Using Modal Auxiliaries

Your research	Modal auxiliary	Value
The application of the strategies described here	may should	increase the proportion of drug abusers who can be identified.
The system described here	could	serve as the basis for a study of automatic measurement systems in an instrumentation course.
This study	may	lead to a better understanding of phosphorus in natural systems.

Selecting the Best Modal Auxiliaries for use in Stage IV and V

Selecting the most appropriate modal auxiliary is often a problem because the meaning of some of these words differ only slightly from one another. Use the chart below to help you choose the best modal auxiliary when you are writing these stages. The modals are listed here in their degree of *tentativeness*.

MODAL AUXILIARIES: Degree of Tentativeness

SURE

STAGE IV		EXAMPLES
No doubt about the future.	will	The data contained In this report will supplement that presented in our earlier publication.
No doubt about the future , assuming certain conditions	would	The purpose of this study was to determine *if* the use of home computers *would* improve the math scores of third grade children.
STAGE V		
Reasonable expectation about the future.	should	This alternative method *should* simplify the analysis procedure
Some doubt about the future	may	Both of the factors studied here *may* be of importance in explaining the occurrence of the disease.
More doubt about the future	could	Results of this study *could* have considerable impact on estimates of land values.

(TENTATIVE)

COMMON PROBLEMS

Too much detail and hence too long:

Remember, this is the *introduction*, a kind of overview. Although you will cover important points, detailed descriptions of method, study site and results will be in later sections. Look at the proportion of a research paper an introduction takes up. Notice it is comparatively short because it serves as a *summary* of what follows.

Repetition of words phrases or ideas:

You will have keywords that are crucial to your study. However, your reader doesn't want to read them over and over! A high level of repetition makes your writing look careless. To reduce it, highlight repeated words or phrases - then you can easily judge if you are overusing them and find synonyms or pronouns to replace them.

Unclear problem definition:

Without a clear definition of your research problem, your reader is left with no clear idea of what you were studying. This means that they cannot judge your work's relevance to their own work, or its usefulness, quality, etc. As an exercise, you should be able to complete a sentence that starts, "The purpose of this study is "that encapsulates the problem you are investigating. Of course you will not include this exact sentence in your thesis, but it serves as an easy way to check that you have a clearly defined problem. In your thesis you should be able to write your research problem in one sentence, you can add details in the sentences that follow. You should also ensure that your research problem matches the title of your thesis as well as its methodology and objectives.

Poor organization:

Writing an introduction that effectively introduces your research problem and encapsulates your study is not an easy task. Often when we write we discover gradually what we want to say and how we want to say it. Writing is often a process of discovery. Bear this in mind when you write your introduction, and be prepared to go back and make big changes to what you have written, and the order in which you have presented your ideas and information. Your introduction must have a logical sequence that your reader can follow easily. Some suggestions for how to organize your introduction are given below

General Overview

First you need to establish the area of research in which your work belongs, and to provide a context for the research problem. This has three main elements:

Claiming centrality:

Claiming that the area of research is an important one, and therefore implying that the research done is also crucial.

For example:

"Minimum safe low temperatures (above freezing) and high humidity control are the most important tools for extending shelf life in vegetables." (Barth et al.,1993). Here the words "the most important tools" indicate centrality by showing that these two factors are crucial.

General to specific:

Most writing starts with general information and then moves to specific information. This is true of introductions too.

For example:

In recent years, there has been an increased awareness of the potential impact of pollutants such as heavy metals. Moreover, the traditional methods for treating aqueous streams containing metal contaminants are expensive and can have inadequate facilities (1). This is particularly true in developing countries. This has led to the use of alternative technologies. The use of biological materials is one such technology which has received considerable attention. (Ho et al., 1996)

Explanation

The first sentence: impact of heavy metals (general).

The second sentence: *expense and shortcomings of methods of removing* heavy metals (less general).

The third sentence: expense and shortcomings of methods of removing heavy metals *in developing countries* (more specific).

The fourth sentence: *alternative technologies* to overcome expense and shortcomings of methods of removing heavy metals (yet more specific).

The fifth sentence: *biological materials* as an example of alternative technologies to overcome the expense and shortcomings of methods of removing heavy metals (very specific).

Previous research:
Often the introduction will refer to work already done in the research area in order to provide background (and often also to help define the research problem).
For example:
Numerous studies on the utilization of plant proteins as a partial or complete replacement for fish meal in diets have been conducted using various freshwater and marines fishes (Lovell, 1987; Tacon et al., 1983; Murai et al., 1989a; Cowey et al., 1974). (Takii et al., 1989)

PROBLEM

Your research must be new in some way. It must add knowledge *to your field* so you need to show in what way your work explores an area/issue/question that has previously not been explored, or not been explored in detail, in not explored in the way that you are going to use. In other words, you need to give a *rationale* for your work (i.e. show the reasons for doing it).

There are four ways to demonstrate
that you are adding to the knowledge in your field:

1- Gap:
A research gap is an area where no or little research has been carried out. This is shown by outlining the work *already* done to show where there is a gap in the research (which you will then fill with your research). For example:
Numerous studies on the utilization of plant proteins as a partial or complete replacement for fish meal in diets have been conducted using various freshwater and marines fishes (Lovell, 1987; Tacon et al., 1983; Murai et al., 1989a; Cowey et al., 1974). However, very little is known about the feasibility of using soybean meal as a dietary protein source in practical feeds for yellowtail Seriola quinqueradiata. (Takii et al., 1989)

2- Raising a question:
The research problem is defined by asking a question to which the answer is unknown, and which you will explore in your research.
For example:
The question we address here is how technological change occurs when it is the overall system that needs to be changed. In particular, how can we begin and sustain

a technological transition away from hydrocarbon based technologies? (Street and Miles, 1996)

3- Continuing a previously developed line of enquiry:

Building on work already done, but taking it further (by using a new sample, extending the area studied, taking more factors into consideration, taking fewer factors into consideration, etc.).

For example:

Taking all these elements and their possible variations into account is often far too complex and tedious for determining efficient gas development patterns with simple back of the envelope calculations. In their survey of these elements, Julius and Mashayeki [8] present a detailed analysis of these different interactions. They suggest that these be taken into account through gas planning models constructed in the same spirit as the planning models developed in the power generation sector.

In this paper, we present a gas planning model that fulfils some of the specifications established in Julius and Mashayeki [8]. (Boucher and Smeers, 1996)

4- Counter-claiming:

A conflicting claim, theory or method is put forward. Here, for example, the researchers argue that previous researchers' assessments of cost effectiveness were too complex, and that a simplified process could and should be used instead:

Evaluating the cost effectiveness of distributed generation is a crucial resource planning issue. Many have assessed cost effectiveness by dividing the utility system into many parts and estimating distributed generation's value to each part. When this is done, total value can be composed of ten or more individual components (Hoff and Shugar, 1995), substation transformer (El-Gassier et al., 1993), transmission system, generation system, voltage support (Hoff et al., 1994) reliability, energy savings, electrical loss savings (Hoff and Shugar, 1995) minimum load savings, modularity and flexibility (Morris et al., 1993) and financial risk reduction values (Awerbuch, 1994).

Although impressive, this list of value components suggests that determining the value of distributed generation requires a team of experts assembled from each department within the utility. This paper describes a simplified evaluation process based on the observation that distributed generation is of value because it reduces variable costs or defers capacity investments.

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SOLUTION

Once the field and problem have been defined, it is time to give the "solution." In other words, how will the research gap be filled? How will the question that was raised be answered? This last part of the introduction can also be used to show the benefits, to explain the objectives, to clarify the scope of the research, to announce what was found from doing the research and how it can be used.

Notice that an introduction will discuss a number of the following points but is unlikely to cover them all.

1- Outlining purpose:

Often researchers will described their objectives in their introduction in order for the reader to have a clear idea of what they set out to accomplish. Usually there is a general objective written in one sentence (details of more specific objectives can be given in following sentences).

For example:

This work aims to establish the extent of interaction of alginate with calcium and aluminum ions with respect to the influence of algal exudates have on the removal of humic substances by aluminum coagulation during drinking water treatment. (Gregor et al., 1996)

Note: Always give an overall objective before giving specific objectives. This will help you explain much more clearly to your reader what your work aimed to accomplish.

2- Announcing present research (method):

Important points about the methodology used are outlined, perhaps including the scope of the study. However, the methodology is *not* given in detail (since details are given in the methodology section).

For example:

This paper examines the use of peat for the removal of two metals, copper and nickel, from both mono-solute and bi-solute solutions. In particular, it reports the effect that a competing ion has on the rates of removal and examines the mechanisms which may affect the uptake of minerals. (Ho et al., 1996)

3- Announcing principle findings (results):

Researchers may indicate the kind of results they obtained, or an overall summary of their findings.

For example:

Different operating modes of the MESFET mixers, gate mixers, drain mixers, and resistive mixers were investigated in this work and the results proved that good conversion characteristics could be achieved.(Angelov, 1991)

4- Indicating the structure of the research:

It is useful to outline the organization of the written up research that follows so that the reader has a clear idea of what is going to follow, and in what order.

For example:

This paper is organized as follows. Alternative representations of demand and supply are discussed in sections 2 and 3 respectively. The model is described in section 4. Section 5 presents an application of the tool to a gas reserves development timing problem in Indonesia. The full set of equations is given in the appendix and is referred to throughout the text. (Boucher and Smeers, 1996)

5- Indicating directions for further research:

Research often opens up other areas where research could or should be done, so it is common for these areas to be defined in the introduction. It is also a way of indicating that the current study is not designed to be comprehensive.

This paper takes a first step in this direction by laying out the rationale for incorporating feedback and feed forward mechanisms in decision support for dynamic tasks such as software project management (Sengupta and Abdel-Hamid, 1993).

6- Indicating benefits of current research:

Indicating the benefits of the research helps to justify why it was carried out and emphasizes the value of the study.

For example:

The paper further suggests a multidisciplinary management approach to effect a favorable outcome for the whole fishing community (Lim et al., 1995).