

Giới thiệu chung về Phương
pháp nghiên cứu khoa học:
Khái niệm Nghiên cứu

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Intro

- **Aims:**

- To introduce research in the context of computing projects.

- **Learning objectives:**

- Discuss what research means.
- Understand the research process.
- Classify research and understand the different research methods available.
- Understand the issues surrounding interviews, questionnaires and observational studies

What is research

- The good researcher is not *‘one who knows the right answers’* but *‘one who is struggling to find out what the right questions might be’*.
- Research is defined by the Higher Education Funding Council for England (HECFE) as *‘original investigation undertaken in order to gain knowledge and understanding’*.
 - Three key terms in this definition have been italicized for emphasis; *original, gain and knowledge and understanding*.
- These terms are essential to the definition of research and will be discussed in turn

Originality (tính nguyên bản, tính mới)

- There is no point in repeating the work of others and discovering or producing what is already known.
- Quite simply, *originality* is doing something that has not been done before.
- You can be original in two ways.
 - First, you can be original in the way you do things –for example, doing something someone has done before but using a different technique or approach.
 - Second, you can be original by producing or developing something that has not been produced before.

Originality: four areas of original consideration

- **Tools, techniques, procedures and methods.**
 - You may apply new tools and techniques to existing problems or try new procedures and methods in contexts where they have not been applied before.
- **Exploring the unknown.**
 - Although rare, you may investigate a field that no one has thought to investigate before.

Originality

- **Exploring the unanticipated.**

- Although you may investigate a field of research that has been looked at many times before, you may come across unexpected results or exciting new directions as yet unexplored.

- **The use of data.**

- You can interpret data in different ways, use them in new ways or apply them in alternative areas that have not yet been investigated

Gain

- research should actually lead to a *contribution* to knowledge

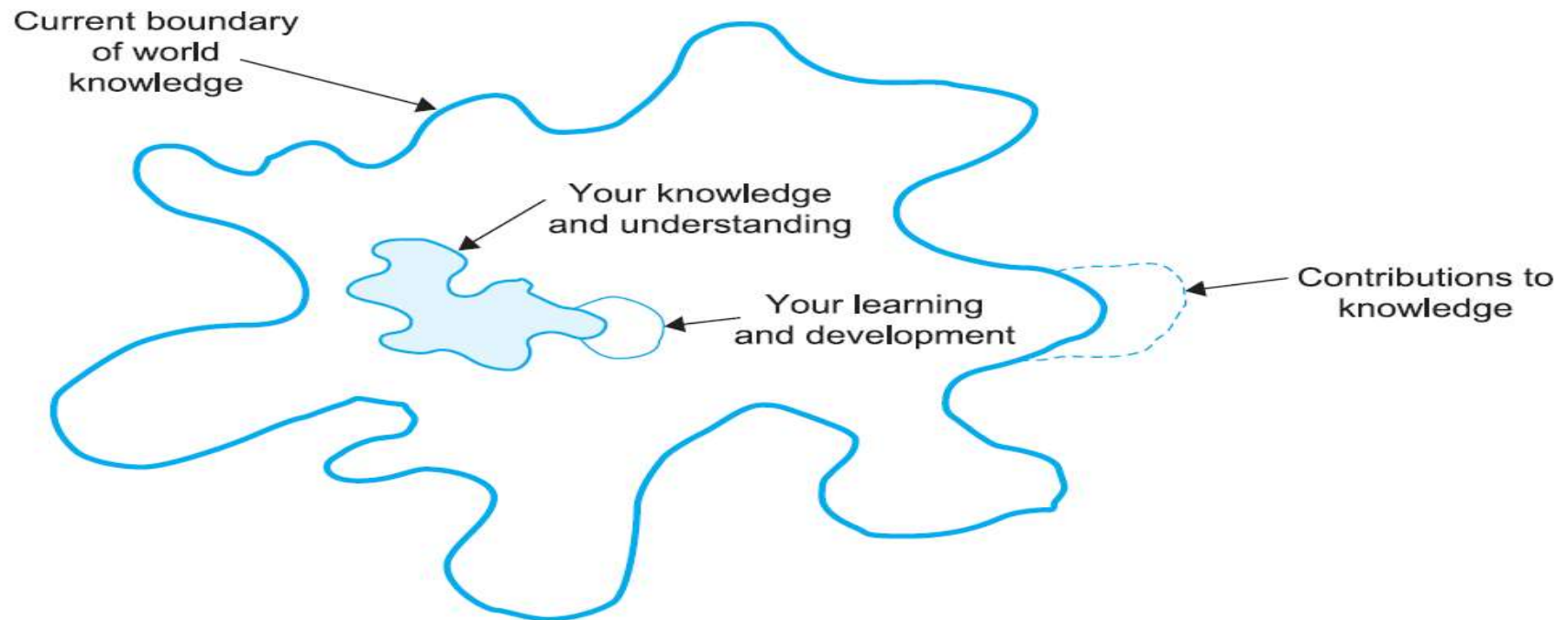


Figure 2.1 Contributions to knowledge

Knowledge

- **Data.** Data are the factual elements that describe objects or events (represent the raw numbers and raw text)
- **Information.** Information represents data that have been processed in order to provide you with some insight into their meaning.
 - What: The data have been analysed, summarised and processed into a more understandable and useful format.
- **Knowledge.** Knowledge is your higher-level understanding of things.
 - Knowledge represents your understanding of the 'why'.
- **Wisdom.** Wisdom represents your ability to put your knowledge into practice.
 - Represents your ability to apply your skills and experiences to create new knowledge and adapt to different situations

Research process (qui trình NC): Sequential

- The sequential process is the simplest view of all. In this process a series of activities are performed one after another as a 'fixed, linear series of stages'.
- An example of such a process is the systematic process model. This process consists of seven unique, sequential steps:
 - **1.** Identify the broad area of study.
 - **2.** Select a research topic.
 - **3.** Decide on an approach.
 - **4.** Plan how you will perform the research.
 - **5.** Gather data and information.
 - **6.** Analyse and interpret these data.
 - **7.** Present the results and findings.

Research process: Generalized

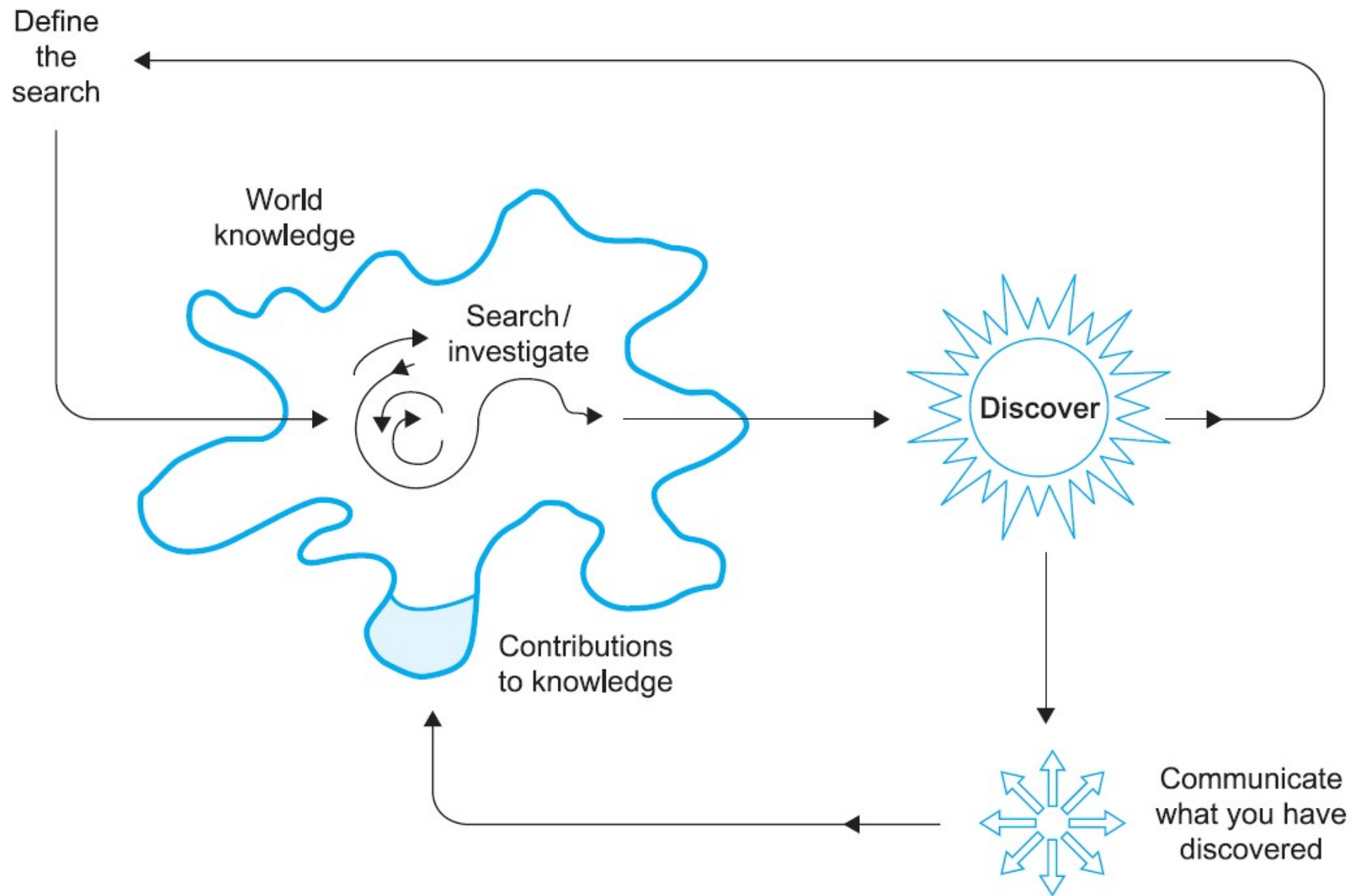
- The generalised research process is identical to the sequential process in that a defined sequence of activities is performed one after the other.
- Note: The generalised model recognises that not all stages are applicable and some steps may require performing in different ways depending on the nature of the research.
- => The generalised model identifies alternative routes that may be taken at different stages depending on the nature and outcomes of the research

Research process: Circulatory

- The circulatory approach recognises that any research is really only part of a continuous cycle of discovery and investigation.
- Quite often, research will uncover more questions than it answers and, hence, the research process can begin again by attempting to answer these newfound questions.
- Experiences of research might lead you to revisit or reinterpret earlier stages of your work.
- The circulatory interpretation also permits the research process to be joined at any point and recognises that the process is never-ending

Research process: Evolutionary

- The evolutionary concept takes the circulatory interpretation one step further:
 - that research must evolve and change over time, not necessarily following a defined circulatory pattern or repeating the same forms of analysis and interpretation that were performed before.
- The outcomes of each evolution impact on later ones to a greater or lesser extent



Research classification

- Research can be classified from three different perspectives; its *field*, its *approach* and its *nature*
- **Field.** The field of research is ‘little more than a labelling device which enables groups of researchers with similar interests to be identified’.
 - For example, in the topic of computing you might identify research fields in areas such as *information systems*, *artificial intelligence*, *software engineering* and so on.
 - These topics may be further sub-divided into more specific topics to aid the more specialist researcher or expert distinguish aspects of the field.

Research classification

- **Approach.** Approach represents the research methods employed as part of the research process – for example, *case study, experiment and survey*.
- **Nature.** The type of contribution that research makes to knowledge depends upon its nature. Three categories that can be used to classify the nature of research:
 - Category 1. Pure theoretical development.
 - Category 2. Research that reviews and assesses pure theory and evaluates its potential for practical application.
 - Category 3. Applied research that has some practical application or outcome.

Research classification

- In more detailed, the nature of research can also be identified according to the following common classifications
 - **Pure theory** – developing theories to explain things without necessarily linking them to practice.
 - **Descriptive studies** – reviewing and evaluating existing theory and knowledge in a field or describing particular situations or events (testing existing theories, describing the state of the art)
 - **Exploratory studies** – exploring a situation or a problem.
 - **Explanatory studies** – explaining or clarifying something or some phenomena and identifying the relationships between things.
 - **Causal studies** – assessing the effects that one or more variables have on another
 - **Resolving a problem** with a novel solution and/or improving something in one way or another.
 - **Developing** or constructing something novel

Good research

- **Open minds.**

- You should work with an 'open system of thought'.
- Be open minded to the questions posed. 'Conventional wisdom and accepted doctrine. . . may turn out to be inadequate'.

- **Critical analysis.**

- Examine data critically. Are these figures correct? Have they been affected in some way? What do these data *really* mean? Are alternative data available? Can these data be interpreted differently?

- **Generalisations.**

- Researchers generalise and specify limits on the generalisations they identify.
- Generalisation allows research to be interpreted and applied to a wide variety of situations. However, researchers must know the limitations of these generalisations.
- Generalisations stem from your own wisdom and evolve from your deductive reasoning which leads you to develop ideas about things you have not encountered before with certain caveats.

Classification of Research methods

- Two main classes of research methods: *quantitative* and *qualitative*.
- Quantitative research methods are associated with measuring things on numeric scales.
 - These methods stem from the natural sciences and are concerned with understanding 'how something is constructed/built/works'.
 - In the natural sciences one is usually concerned with testing hypotheses
 - 'repeatability of the experiments and the testing of hypotheses are vital to the reliability of the results'.
- Qualitative methods, on the other hand, have their origins in the social sciences.
 - These methods are 'primarily concerned with increasing understanding of a substantive area, rather than producing an explanation for it'.

Detailed methods

- Four of the most common research methods that you might use (either individually or combined) are
 - *action research*,
 - *experiment*,
 - *case study* and
 - *survey*

Detailed methods: *Action research*

- Involves ‘the carefully documented (and monitored) study of an attempt by you. . . to actively solve a problem and/or change a situation’.
- Sometimes referred to as *participant observation*, it involves working on a specific problem or project with a subject or, more usually, an organisation and evaluating the results.
- With action research you must ensure that you do not become too obsessed with completing the action itself and neglect the real reason for doing it – i.e., evaluating it as part of your academic project

Detailed methods: *Experiment*

- Involves an investigation of causal relationships using tests controlled by yourself.
- Quite often quasi-experimental research will have to be performed due to problems of insufficient access to samples, ethical issues and so on.
- Experiments typically involve:
 - defining a theoretical hypothesis;
 - selecting samples from known populations;
 - allocating samples to different experimental conditions;
 - introducing planned changes to one or more variables;
 - measuring a small number of variables;
 - controlling all other variables.
- Experiments are usually performed in *development*, *evaluation* and *problem-solving* projects

Detailed methods: *Case study*

- A case study is ‘an in-depth exploration of one situation’.
- It involves the investigation of a particular situation, problem, company or group of companies.
- This investigation can be performed directly, for example, by interviews, observation, etc.; or indirectly by studying company reports or company documentation

Detailed methods: *Survey*

- This is usually undertaken through the use of questionnaires or interviews.
- It allows 'the collection of a large amount of data from a sizable population in a highly economical way'.
- As part of a survey you might have to identify samples and sample sizes, design questionnaires and define interviews as appropriate.
- Three research techniques that crop up again and again in both case study research and surveys are *interviews*, *questionnaires* and *observation*

Summary

- Research is defined as ‘a considered activity which aims to make an original contribution to knowledge’.
- The research process can be *sequential, generalised, circulatory* or *evolutionary*.
- Research can be classified according to its *field, approach* and *nature*. Approaches to research include *case studies, experiments, surveys* and *action research*.
- Research techniques that are used within the above approaches include *interviews, questionnaires* and *observational* studies.

Questions