THEORY

Theory

The most comprehensive definition of a theory is introduced by Zikmund et al (2012, p. 39) who view a theory as "a formal, logical explanation of some events that includes predictions of how things relate to one another". When analyzing this definition carefully, you will see that it contains some pieces of information that tell us two things about a theory: (1) what are components in a theory, and (2) the purposes that a theory serves. First, let's begin with the phrase at the end of the definition, "*how things relate to one another*". In particular, this phrase tells us about the components in a theory. If we analyze this phrase a bit further, we will see that it mentions about two components, which are "*things*" and "*relationship*". These keywords imply that a theory consists of at least two things that relate in some way.

"Things" that are described in a theory can be called "*concepts*". Concepts are regarded as "the basic building blocks of theory" (Turner, 1989, p. 5). Shoemaker et al (2004) defined a concept as "an abstraction that describes a portion of reality". Using this definition of concept, we can say that a concept can represent anything. It can be an object, an attribute, a characteristic, a process, or anything that we are interested in our research; anything, that has been given a name.

Referring to the definition of a theory, it tells us that the concepts in a theory relate to one another. This means that there must be some type of relationship between them. The relationship between concepts can manifest in many ways. In particular, the type of relationship that academic research emphasizes the most is called a "*causal relationship*" or "*causality*" between concepts. Generally, a causal relationship represents the cause-and-effect relationship between concepts. It suggests that one concept have an effect on another concept. Causal relationship can also manifest in many ways. It can manifest in a positive sense, that is, the emergence of one concept leads to the emergence of another concept, or, the increase in the value of one concept increases the value of another concept. This type of causal relationship can be called *a positive relationship*. Conversely, causal relationship can manifest in a negative sense, that is, the emergence of one concept lead to the cease of another concept, or, the increase in the value of one

concept reduces the value of another concept. This type of causal relationship can be called *a negative relationship*.

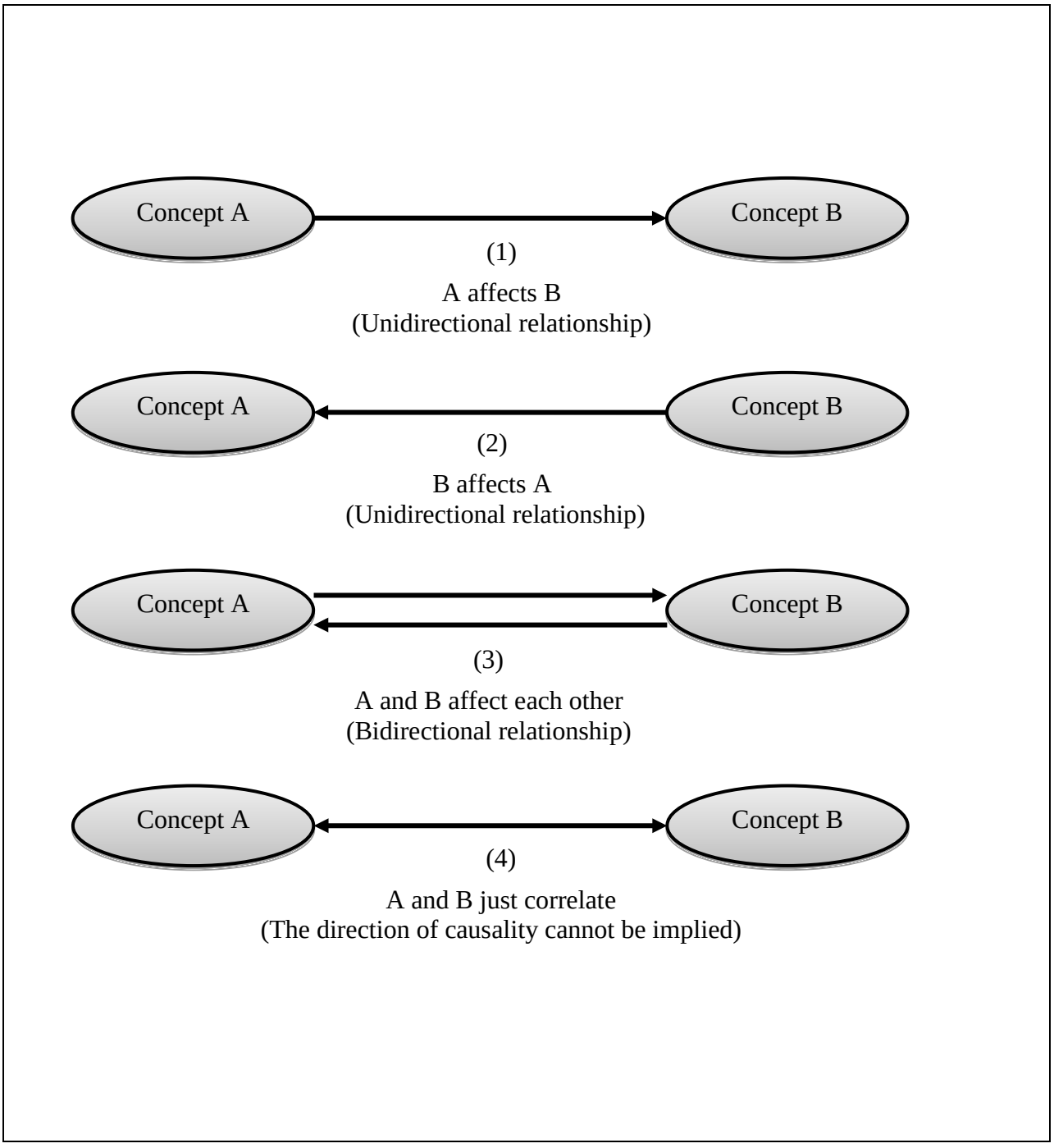
Note that a *positive relationship* does not just mean that the value of one concept will increase as the value of another concept increases. Instead, it suggests that two concepts will move in the same direction. For example, if A increases, B will increase; but if A decreases, B will decrease as well. This is the same for a *negative relationship*. It does not just mean that the value of one concept will increase as the value of another concept decreases. Indeed, it suggests that two concepts will move in the opposite direction. For example, if A increases, B will decrease; but if A decreases, B will increase.

Positive relationship	Negative relationship
A increases → B increases or A decreases → B decreases	A increases → B decrease or A decreases → B increases

In research, concepts and relationship between them can be presented in a graphical illustration called a *conceptual model*. As shown in the figure below, there are two concepts named 'Concept A' and 'Concept B' that are placed in two separated ovals. In the first illustration of the figure you will see an arrow pointed from A to B. The arrow in a conceptual model is a graphical representation of the relationship between concepts. The direction of the arrowhead represents the direction of causality. From the first illustration in the figure, the arrow pointed from A to B suggesting that the causality move from A to B. In other words, it suggests that A is a cause that affects B. In the second illustration, the direction of the arrow turn in the opposite direction; the arrowhead is pointed from B to A. In this case, B is now a cause that affects A.

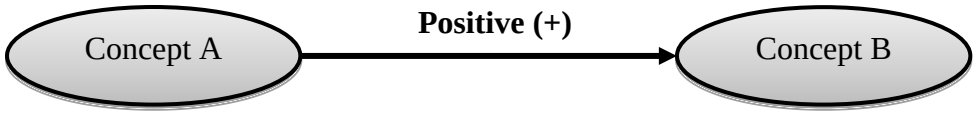
The first and the second illustrations of the figure represent the causal relationship that is called a *unidirectional relationship*. It means that the causal relationship can only move in one direction, either from A to B (as shown in the first illustration), or from B to A (as shown in the second illustration). When a unidirectional relationship is assumed, we eliminate the possibility that the causal direction can move in the reverse direction. For example, if we draw the arrow that points from A to B, we assume that A only causes B; there is no way that B

will cause A. However, in the third illustration there are two arrows; one is pointed from A to B, and another is pointed from B to A. In this case, A and B appear to affect each other; A is a cause that affect B; and B, in turn, is a cause that affect A. The causal relationship between A and B in this case is called a *bidirectional relationship*.

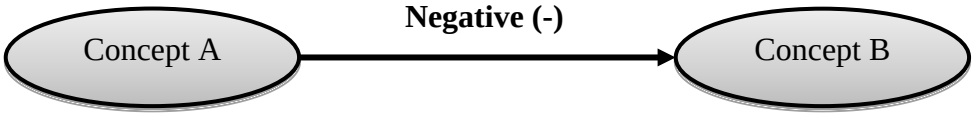


The last illustration in the figure is different from the previous three illustrations. There is only one double arrowhead line that links A and B. A double arrowhead in conceptual model suggests that the direction of the causal relationship between two concepts is unclear; it cannot be implied whether A actually causes an effect to B, or B causes an effect to A. In this case, A and B may just relates by coincidence, but there is no causal relationship between them. The relationship between concepts is merely a *correlation* rather than a cause-and-effect relationship.

As mentioned earlier that the causal relationship between concepts can be either positive or negative, the sign of the relationship between concepts need to be specified. The following figure presents how the causal direction between concepts and the sign of their causal relationship are declared in the conceptual model.



The increase in the value of A increases the value of B
OR
The decrease in the value of A decreases the value of B



The increase in the value of A decreases the value of B
OR
The decrease in the value of A increases the value of B

The first illustration in the figure indicates that the causal direction moves from A to B, and the relationship between the two concepts is positive. This suggests that A affects B in a positive sense; if A increases, B will also increase as a result; or if A decreases, B will also decrease as a result. On the other hand, the second illustration in the figure indicates that the causal direction moves from A to B, and the relationship between the two concepts is negative. This suggests that A affect B in a negative sense; if A increases, B will decrease as a result; or if A decreases, B will increase as a result.

In research, the statement that declares the nature of relationship between concepts is called a "*proposition*". A proposition is a statement that is logically derived from a theory. However, a proposition is still a statement that has not been verified yet. You just make a presumption based on what the theory suggests. In order to prove that a proposition is correct, we need to test it against the real observed data. When we are ready to test the statement declared in the proposition, we move from a proposition to a "*hypothesis*". More detail about a proposition and a hypothesis will be clarified later.

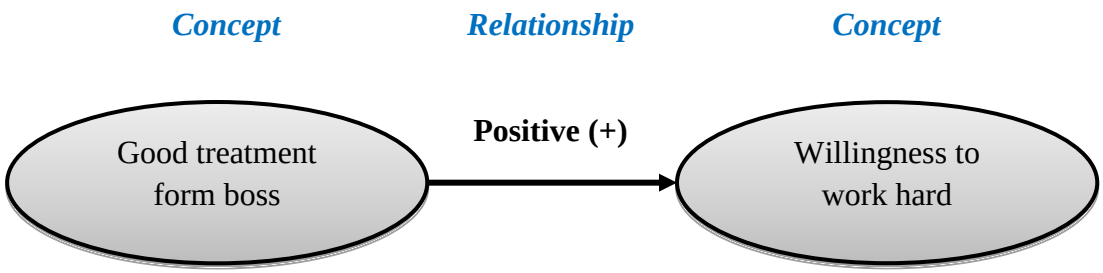
Now that we know some major components in a theory including (1) concepts and (2) a relationship between them declared in terms of a proposition, then it is important to understand what a theory is used for. Let's refer to the definition of a theory stated in the beginning again. If we look at the beginning part of the definition, it shows that there are two main functions that a theory serves: (1) explanation, and (2) prediction.

Using a theory for explanation

First, we use a theory to explain why things happen. To understand how the theory can be used for explanation, let's consider this circumstance. Have you ever wondered why you feel that you are willing to do good things to someone who is kind to you? For example, when someone helped you with something, you feel obliged that you have to help him/her in the future if he/she asks you for help. On the other hand, if someone does bad things to you, you tend to feel that you want to do bad thing back to that person as well. What theory can be used to explain this behavior?

In literature, one theory that can explain this behavior is called the "*Social exchange theory*". According to Blau (1964, pp. 91-92), social exchange theory is mainly about "the voluntary actions of individuals that are motivated by the returns they are expected to bring and typically do in fact bring from others." The theory is basically based on the law of reciprocity, that is, if a person is good to you, you feel obliged to return the favor by doing good thing back to him/her; on the other hand, if someone hurts you, you may think that you want to return bad things to him/her as well (if you have a chance).

The social exchange theory is a major theory that has been used frequently in organizational behaviors research. Generally, one of the major issues that researchers in the area organizational behaviors are interested is how to motivate employees to work harder for the organization. In particular, scholars in this field suggested that one of the motivators that can promote employee dedication is favorable treatments from a supervisor (Kuvaas & Dysvik, 2010; Stinglhamber & Vandenberghe, 2003). In particular, when a boss concerns about wellbeing of employees and treats employees with respect, it will make employees think that their boss really cares about them; and therefore, employees are willing to work hard for their boss because doing so is a way that employees can repay the kindness from the boss.



Proposition: Good treatment that employees receive from their boss will increase their willingness to work hard.

This proposition is drawn from the social exchange theory which suggests that individual will feel obliged to reciprocate what they received from others

If you use a conceptual model to illustrate the relationship between these two concepts, you will get the concept that represents good treatment from a boss and another concept that represent willingness to work hard.

In this case, the social exchange theory can be used to explain the linkage between these two concepts (DeConinck, 2010). Because the theory is based on the law of reciprocity (you are good to me, then I will be good to you), when the boss express kindness to employees, employees tend to feel that they have to do something good to their boss to reciprocate his/her kindness. This is an example of how you use a theory to explain why one concept relates to another concept. In fact, social exchange theory has also been used in many areas in research beyond the field of organizational behaviors. In tourism, for example, this theory is used to explain why the tourists who had pleasant experience in a host country are more likely to develop positive attitude and are willing to spread positive words-of-mouth about the host country (they were treated well so they do good thing back in return) while tourists who experience unpleasant experience in a host country are more likely develop negative attitude and are willing to spread negative words-of-mouth about the host country (they were treated badly so they do bad thing back in return) (Lam & So, 2013; Ward & Berno, 2011). Research in electronic commerce also use the social exchange theory to explain why online customers who are satisfied with online shopping experience are more likely to buy from the same online vender again (Shiau & Luo, 2012).

Using a theory for prediction

Previously we discussed about the first role of a theory, that is, to provide logical explanations why things relate. Another role that a theory serves is for 'prediction'. In fact, this role of a theory is quite straightforward. Based on the nature of the relationship between concepts that a theory portrays, we can make a prediction about what will happen to one concept if something happen to another concept. For example, if the theory suggests that A leads positively to B, we can use this information to make a prediction about what will happen to B if one day there is something happens to A. For example, if one day A increase in magnitude, B will also increase in magnitude as a result; if A reduce in magnitude, B will reduce in magnitude as a result as well.

To make a clear picture about how we make a prediction based on a theory, let's refer to the social exchange theory and the example that we discussed earlier. Based on the law of reciprocity suggested by the theory, when employees perceive that their boss is supportive, they are more willing to work harder. From the logic drawn from the theory, can you imagine what might happen to the level of job commitment of employee when the boss treats employees very well? Right, you can make a prediction that employee will have higher work commitment as a result. On the other hand, if the boss treats employees badly, you can predict that employee commitment will be low as a result as well.

Is a theory universally valid?

In the previous section, we discussed about a theory and how it is used to explain and predict the linkage between concepts. However, to what extent you can believe what a theory mentions? Do you think what a theory say is valid in every situation? Is it possible that a theory be wrong?

Let's consider the Maslow (1968)'s theory of needs. It is a classic theory that has been widely mentioned in the academic areas related to psychology. The theory posits that human needs are classified into hierarchies. In particular, the main prediction of this theory is that the lower level of needs have to be satisfied first before individuals can move to higher level of needs. Despite the prominence of the Maslow's theory, do you think this theory can be applied to everyone and everywhere in a society? In other words, does every mankind in the world have to follow the hierarchical steps of needs suggested by the theory; is it necessary that they have to satisfy the lower orders of needs first before they can move to the higher orders of needs?

If you answer yes, let's consider the group of people who volunteer to serve as a soldier to protect the country. These volunteer soldiers enlisted into the armed forces by free will. Some of them stay in the border areas where sanitary infrastructures are not well-developed and they have to face with dangers every second especially during war time. In fact, they knew about these situations before they enlisted but they still decide to serve in the army and face those challenges. Referring to the Maslow's theory of needs, this group of soldiers does not care about the basic needs and the safety needs. What motivate them to be a solder are

not these lower orders of needs; but instead, the pride to serve the country (the esteem needs) appears to be the main motivator for them to join the arm force (Reese, 2007). From this example, you can see that the Maslow's theory of needs does not apply well to the voluntary soldiers. In fact, the Maslow's theory of needs has received a lot of criticisms in literature (Neher, 1991). However, does it mean that the Maslow's theory is not valid at all, and thus, it should be debunked? The answer is not always.

In fact, a theory can be wrong. In academic, it is widely accepted that a theory can be falsified or can be proved that it is wrong. In particular, fallibility or refutability of a theory is possible when there are new evidences that have repeatedly contradicts what a theory posits. Nonetheless, please keep in mind that the validity of a theory is also domain specific. In this regard, a theory can be true in one context but can be wrong in another context. Considering the Maslow's theory of needs exemplified earlier, just because the theory cannot be applied to a group of volunteer soldier does not mean that the theory is totally invalid to other groups of people. For this reason, a theory is inherently not static, but it can be modified based on the new observed evidences.

Applying a theory across cultures

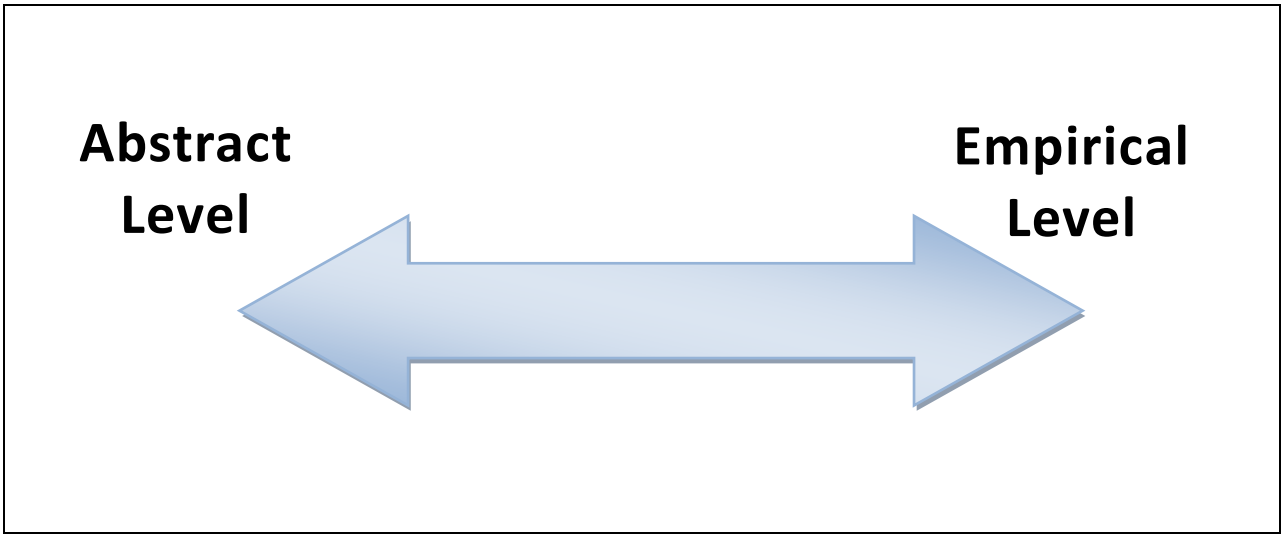
In fact, it is widely accepted that the validity of theory is significantly constrained by the national cultures (Hofstede, 1983). Basically, most of the management theories were initiated by scholars in the Western countries, especially in the United States. Those theories were constructed based on the repeated observations of people who are the Westerners. Nevertheless, when scholars transport those theories across cultures and use them to predict behaviors of people in the Eastern countries, they found that the results were inconsistent with what the theories portray.

For example, while the role of supervisor support can strongly predict the tendency of employees in the U.S. to express extra-role behaviors (e.g., to work more than required by a job description without extra pay), the linkage between these two concepts was found to be weaker in the Asian countries. Whether supervisors in the Asian countries were supportive or not, some scholar found that it has little effect on the extra roles behaviors of Asian employees (Raub & Robert, 2007). In this sense, while the validity of the social exchange theory tends to strong in the

Western cultures, its predictive power tends to be vague in the Eastern culture. In particular, the inconsistency in findings can be explained by the differences in cultural values of people in the East and people in the West. For example, in many Western countries the power distance between a boss and a subordinate is quite narrow. Low power distance implies no significant distinction in the power statuses between being a boss and being a subordinate; they tend to be equal (Hofstede, 1980). Subordinates can easily approach their boss. Questioning or criticizing the decisions made by the superior is also acceptable in this type of culture. However, in the Eastern countries, the power distance is relatively large. In the high power distance culture, less powerful people tend to accept that power is distributed unequally (Hofstede, 1980). In this type of culture, the boss tends to have stronger power over the subordinate. Subordinates tend to obey a decision made by the superior without questioning or criticizing their boss (Lian et al, 2012). Therefore, whether the boss is supportive in high power distant cultures does not necessarily encourage employees to perform extra-role behavior because it is the activity that employees feel obliged to perform to satisfy the superior (Jiing-Lih et al, 2004; Vidyarthi et al, 2014).

CONCEPTS

So far, we have known that concepts are major components in a theory. Now we will discuss about the characteristics of concepts in more detail. Previously we already discussed that concepts can be anything that the researchers are interested to study, anything that was given a name. Anyway, concepts can be classified in terms of the level of abstraction. The level of abstraction has two poles as shown in the figure below. At one end of the continuum is the concept at the abstract level; at another end is a concept at the empirical level. A concept can fall into any point along the continuum. Some concepts are highly abstract concepts, some are less abstract concepts, and some are concepts at the empirical level.



Concept at the abstract level

Before we go into detail about the characteristics of concepts at the abstract level, let's think what does it mean if you say that something is abstract? To help you make sense of it, let's think about the 'abstract art". If you are a big fan of the greatest artist named Pablo Picasso, you will know what the abstract art looks like. Abstract art is different from figurative art in the way that the former does not depict a person, place, or thing in the natural world, whereas the later that is clearly derived from real object sources. The examples of abstract art and figurative art are shown in the illustration below. When you look at the abstract painting, it may take some time for you to think about what the picture represents; you cannot make sense of the picture easily when it is abstract. A concept that is highly abstract is

the same; it is not concrete; you cannot make sense of it easily. In addition, if someone asks you to give a score (e.g., from 1 to 100) to rate the beauty of an abstract painting, it would be more difficult to evaluate it as compared to when you evaluate the figurative arts.

Analogy of a concept at the abstract level

Abstract art

Figurative art

Another analogy that can further explain about the nature of abstract concepts is the "abstract of an article". Most articles, especially research articles, usually start with an abstract that summarizes the main idea of the paper. If you take a look at the abstract of the paper, you can see that it briefly summarizes major sections of the article (e.g., objectives, methodology, findings) in a short paragraph. Generally, the information covered in the abstract is quite broad and it does not focus on one single section of the paper. The concept that is highly abstract is the same. It is quite broad and does focus on a specific aspect of the concept.

In summary, when the concept is highly abstract, it is quite broad, not concrete, and quite difficult to measure. Some example of the concept that is highly abstract is 'intelligence'. You may wonder why intelligence is an abstract concept. To see why it is, please take some time to think about what is intelligence. Are you able to define it? To make it simple, you may look around and spot someone who is near you (may be one of your friends). Can you tell whether that person is

intelligent? In fact, if you ask several people to define the term intelligence, you will also get diverse perspectives of what people think of it.

Abstract of the paper contains broad information

Abstract

Purpose – The purpose of this study is to examine the relationship between software piracy and technological outputs in developed nations.

Design/methodology/approach – The study employs the data of 28 industrialized countries from 2003-2007. The hypotheses were tested using panel data regression.

Findings – The results demonstrate that software piracy appears to have the inverse U curve relationship with the aggregate technological outputs of a nation as measured through the share of high-tech exports.

Research limitations/implications – Even though past studies have tended to focus on the negative impact of software piracy, this study found interesting evidence that its impact is not always absolute. In particular, firms in high-tech industries may benefit from the presence of software piracy when its level is limited at some optimal level. This benefit may derive from: the dissemination of technical knowledge; the diffusion of software deployment especially in small businesses; and the increase in technical skills of labors.

Originality/value – This study is the first that provides the empirical evidence of the inverse U curve relationship between software piracy and technological outputs at the national level.

The topic about what is intelligence is, in fact, the issue that scholars and scientists have been discussing for centuries. To date, there are two major schools of thought that have different perspective about what is intelligence. The early theory of intelligence introduced by Charles Spearman (1904) see intelligence as a single general ability. It is a 'general competency' that makes an individual effectively perform tasks that are apparently unrelated and likely demand very different cognitive abilities (Ackerman et al, 2005). Simply put, if a person is intelligent, he or she tends to be an expert in everything. On the other hand, another theory of intelligence argues that intelligence should not be regarded as a single factor; rather, it can be divided into different domains (Gardner & Hatch, 1989; Gardner, 2000). According to Gardner (2000), major domains of intelligence include musical–rhythmic, visual–spatial, verbal–linguistic, logical–mathematical, bodily–kinesthetic. In this sense, a person does not need to be good in everything in order to be considered intelligent; he/she can be intelligent at some specific domains but not all of them.

Traditionally, what the societies regarded as being intelligent is represented by the level of cognitive capability that an individual possesses. Cognitive capability or cognitive intelligent is the intellectual ability to reason, to analyze and prioritize things. It encompasses abilities such as being able to solve complex mathematic problems or being able to memorize a lot of things in a short time. However, does being smart in this sense is enough to guarantee that a person is intelligent and have high chance to be successful in their life?

Evidently, there are a lot of brilliant people who acted irrationally, and that eventually created difficulties to them. There are two main reasons why being smart (having high cognitive capability) is not enough for a person. First, many smart people may lack the ability to get along well with others. They may be excellent in the tasks they perform, but when it comes to interpersonal issue, they become socially awkward. In the society where we have to rely on other people for supports, being smart by lacks good interpersonal skills can make it hard for people to be successful. Second, it is also evident that some smart people, although they could solve a lot of complex work-related problems, were unable to deal effective with own personal problems. Sadly, many smart persons ended up being on drug or committing suicide when they encountered with life's challenges. They were overwhelmed by negative emotions associated with bad incidents the encountered and didn't know how to manage negative emotions effectively. They let's emotions took over their rationale and actions.

For these reasons, cognitive intelligence may not be a sole aspect of intelligence that individuals have to possess. This is because emotion and cognition are intertwined (Isaacowitz et al, 2000). No matter how smart we are, we may have high chance to act stupidly when we lost control of our emotions, especially the negative ones such as anger and sadness. Thus, scholars proposed that another aspect of intelligence that is critical for human is 'emotional intelligence' (Mayer et al, 2001; Salovey & Mayer, 1990). In fact, emotional intelligence was suggested as the aspect of intelligence that is even more important than cognitive intelligence (Goleman, 2003). Basically, emotional intelligence is the ability to understand and to regulate own emotions effectively, as well as to apply these abilities to help them achieve desired outcomes (Mayer & Salovey, 1997). Simply put, people who have high emotional intelligence tend to have high control over their

emotions; they won't let bad moods affect their life, works, and relationship with others.

Based on two aspects of intelligence previously discussed, you can see that the concept of 'intelligence' by itself is inherently abstract. When you talk about intelligence, you cannot specifically define it. In order to make sense of intelligence, you have to make it become less abstract. When you try to break down the concept of intelligence into some specific domains including cognitive intelligence and emotional intelligence, you have more concrete view about it. In fact, there are also other domains of intelligence beyond the two domains that we have exemplified so far, for example, social intelligence (Thorndike, 1920), ethical intelligence (Wickham & O'Donohue, 2012), and cultural intelligence (Earley & Mosakowski, 2004).

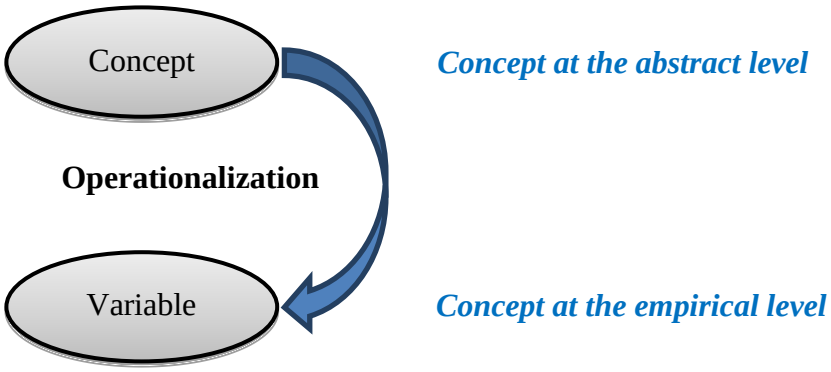
Concepts at the empirical level

Although the concept of intelligence can be broken down into cognitive intelligence and emotional intelligence which are less-abstract concepts, there is one question remains: how can we know whether a certain person has high or low cognitive intelligence or emotional intelligence? To justify the value of the concept, we have to transform the concept into the unit that is measurable or observable. When the concept is transformed into the unit that is measurable, it becomes the concept at the empirical level. The *empirical-level concept* is located at another pole of the level of abstraction. Unlike the concept at the abstract level, the concept at the empirical level is very concrete, very specific, and is in the form that we can measure or assign a value to it. In particular, the process by which we transform the concept into the unit that can be measured is called *operationalization*. When the concept at the abstract level is transformed into the concept at the empirical level, the concept can then be called a *variable*.

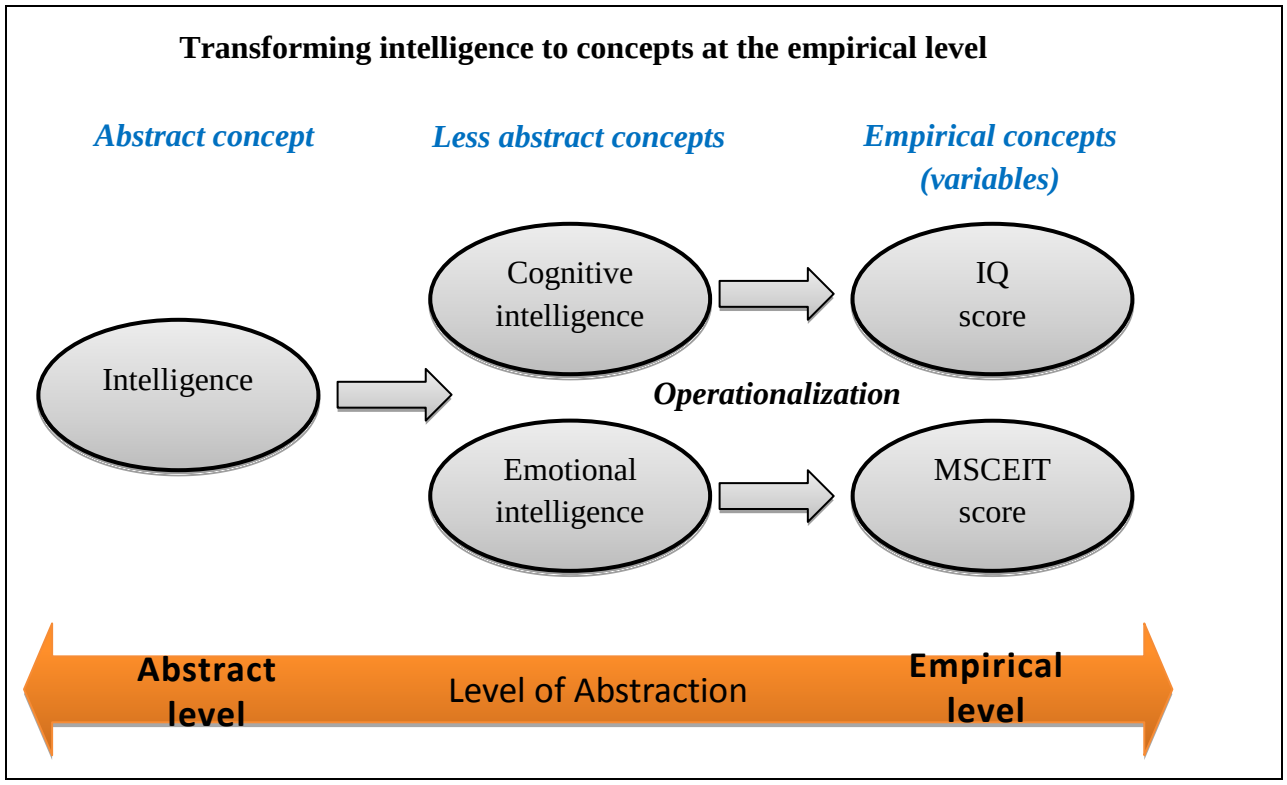
Referring to the concepts of intelligence, if we want to get the specific information about the degree of cognitive intelligence or emotional intelligence that an individual possesses, we need to transform the concept into the empirical-level concept (or a variable). In this case, cognitive intelligence can be operationalized by using intelligence quotient (or IQ score), which can be evaluated using a standard test. For emotional intelligence, it can be operationalized by using the

paper-based test called Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) developed by Mayer et al (2003) to measure the level of emotional intelligence that individuals exhibit.

Transforming a concept at the abstract level to a concept at the empirical level



When the concepts are operationalized, we can assign a value to them; and thus, they are now comparable. For example, when cognitive intelligence is transformed into IQ score, we can use this empirical concept to compare whether one person has higher or lower cognitive intelligence than another. Generally, the researchers need to transform the concepts at the abstract level into the concepts at the empirical level (or variable) so that they can use them for *empirical testing*, which is the process by which observable data are used to confirm whether the predictions declared in a hypothesis is consistent with the theory or not. Results that are obtained from empirical testing will serve as *empirical evidence* to verify or falsify a claim. Empirical evidence from one study also serves as source of knowledge that future studies use to support a hypothesis.



Proposition and hypothesis

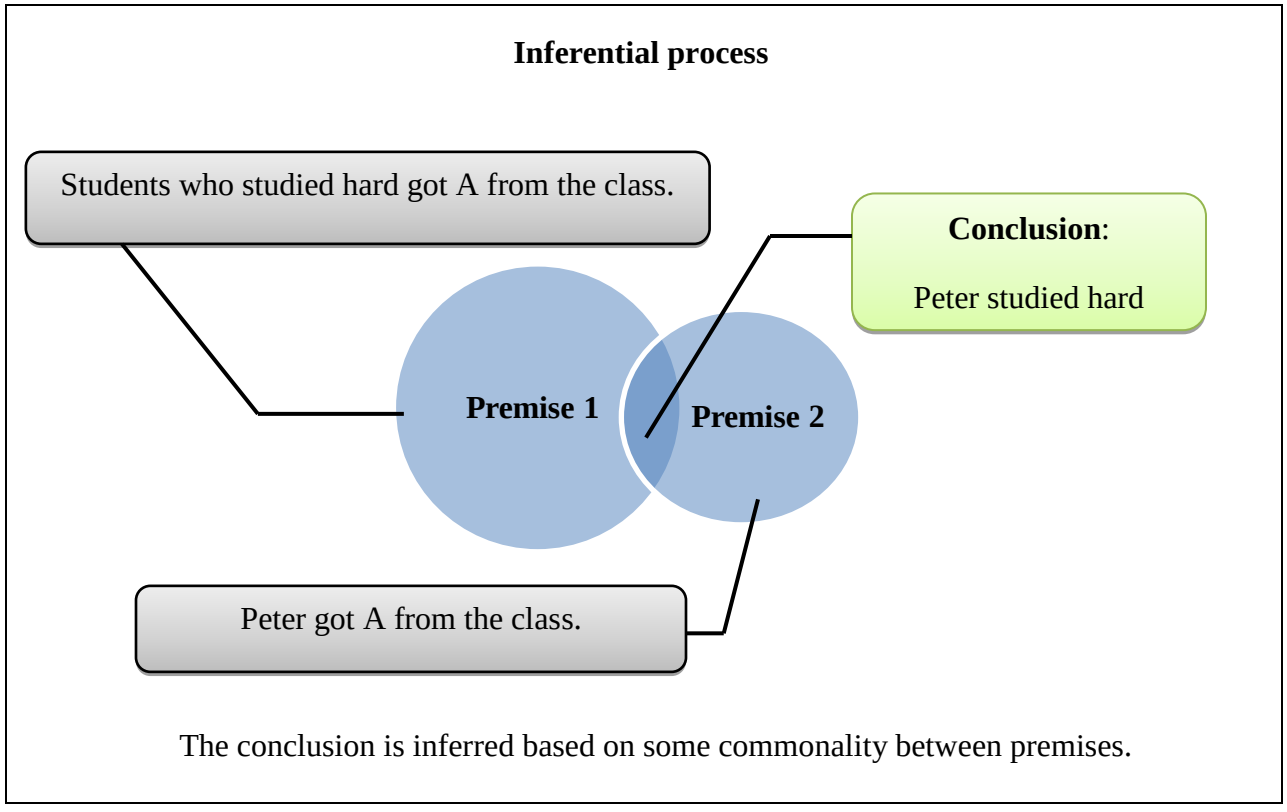
Earlier we came across the terms proposition and hypothesis. Generally, both of them are the statement that declares the relationship between concepts that a study predicts. Although some researchers used these two terms interchangeably, they is a key difference between them. The main difference between these two things is that a hypothesis 'must' be testable; but for a proposition, testability is not necessary. In practice, researchers normally state the relationship between concepts in a form of proposition when they are not ready to test it using the real-world data. A proposition is used, for example, when the data collect is not feasible or when the method to measure the concept is not yet reliable. In this regard, a proposition needs to base extensively on theories, prior research, related studies and evidence, as well as sound logics of the researchers. In academic, the type of research work that aims to propose the relationship between phenomena of interest but does not provide empirical evidence to support the claim is called *conceptual paper*.

On the other hand, when researchers are ready to test the relationship between concepts using the real-world data, they normally state the relationship in terms of

a hypothesis. In particular, the concepts in a hypothesis are normally stated in a form of empirical-level concepts. Referring to what we have learned earlier, empirical-level concepts must be measurable; we can quantify them or assign a value to them. Unless the concepts are measurable, they cannot be used for hypothesis testing. In academic, the type of research work that provides empirical evidence to support the claim provided in a hypothesis is called "*empirical paper*".

REASONING IN RESEARCH

According to the definition from the Merriam-Webster dictionary, reasoning is the process of thinking about something in a logical way in order to form a conclusion or judgment. In research, reasoning is a critical process involves in the development and the verification of a theory (Walton, 1990). Reasoning begins with *premises*, which are the starting points in the reasoning process. Based on overlapped information in the premises, we moves forward to a *conclusion*, which is the end point in the reasoning process. In particular, *inference* is a process by which a conclusion is drawn from premises. According to Runes (1984, p. 281), inference refers to process of passing from certain information already known (e.g., premise 1) to another truth that distinct from them but still following from them (e.g., premise 2), then the conclusion is made based on some common element between those information.



The conclusion is inferred based on some commonality between premises.

A simple example of premises and the inferential process used to draw a conclusion is presented in figure above. From the figure, you can notice that there are two premises:

Premises 1: Students who studied hard got "A" from the class.
Premises 2: Peter got "A" from the class.

From these two pieces of information, it is clear that they mention about two different entities; the first statement mentions about students who studied hard and got A from the class, whereas the second statement mentions about a specific person named Peter who got A from the class. However, although these two statements mention about different entities (students in general VS Peter), there is something that the two statements have in common. Obviously, students in general and Peter got A from the class. By using logical reasoning, the conclusion can be inferred based on the commonality between these two premises. Because it was claimed that those who studied hard got A from the class, if you see a particular person studied hard for the class, you can conclude that he or she would get A from the class as a result. In this case, it makes sense to reach a conclusion that Peter also studied hard because he got A from the class. In fact, the reasoning method used to drawn conclusion in this example is called deductive reasoning. Another type of reasoning is called inductive reasoning. In the next section, we will discuss about these two types of reasoning in more detail.

DEDUCTIVE REASONING AND INDUCTIVE REASONING

Deductive reasoning

In the previous section we presented a brief example of deductive reasoning. Here, we will get more detail about it. Deductive reasoning is a process why which researchers make a conclusion from the more general information to specific information. In this sense, deductive reasoning is regarded as a "top-down approach". The reason why we call it a top-down approach is because we have to start from a very broad or general information and then scope down to the specific information. The conclusion is inferred based on some commonality between the information.

In order to get a clearer picture about deductive reasoning, it is better to have some more example of it. First, let's consider this statement:

All Thai people can sing Thai national anthem

This sentence contains general information (that seems to be a fact). It mentions about Thai people in general without referring to a specific person. All Thai people are supposed to know how to sing Thai national anthem because it makes them proud of being the citizen of Thailand.

Then, let's consider this statement:

Ms. Malee is Thai.

In particular, this statement contains specific information about a person named Manee, who is Thai.

From the general information in the first statement and the specific information in the second statement, what is the conclusion that you can draw? In order to reach a conclusion using deductive reasoning, you have to consider what do these two statements have in common? The first statement mentions that *all Thai people* can sing Thai national anthem. Because Ms. Malee belongs to the population of *Thai people*, then she must possess the ability to sing Thai national anthem as well.

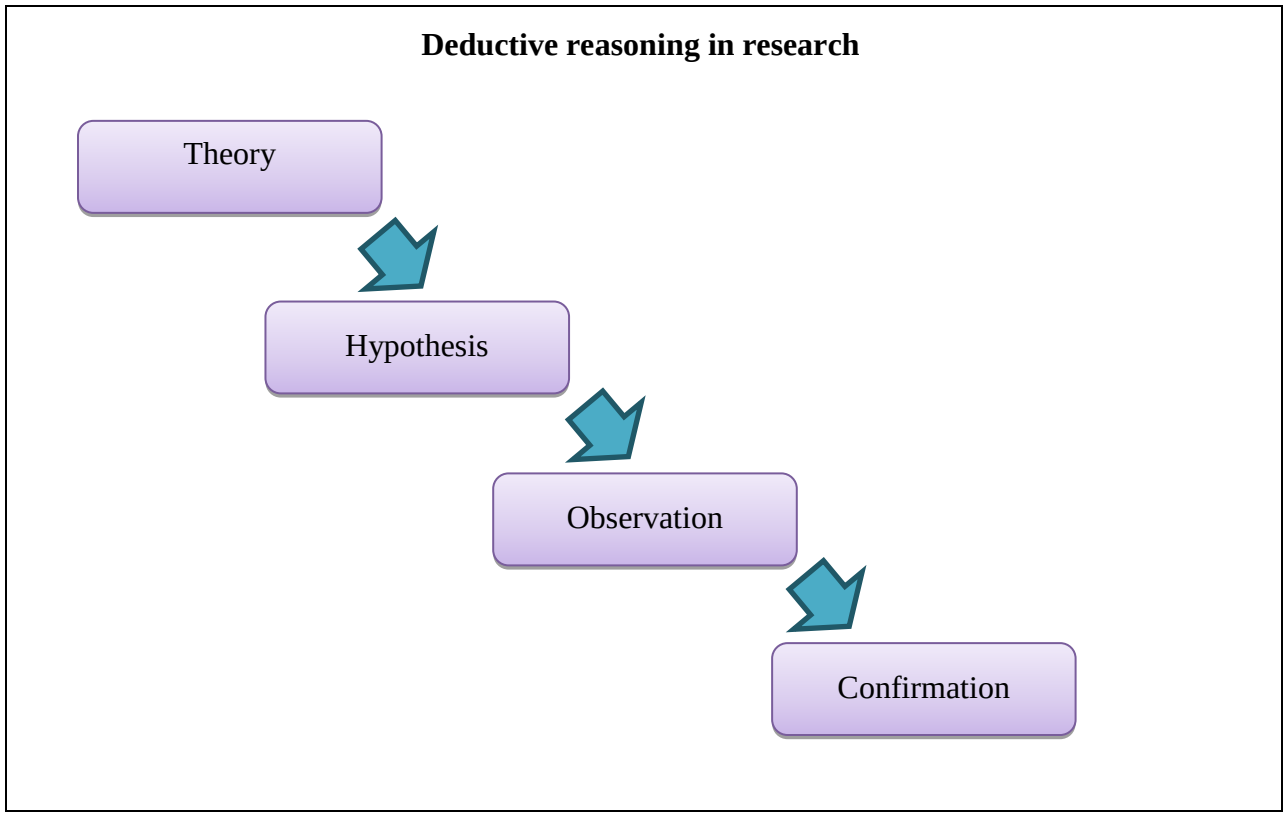
General information:
*"**All Thai people**" can sing Thai national anthem*

Specific information:
*Ms. Malee "**is Thai**".*

Conclusion:
Ms.Malee can sign Thai national anthem

In research, deductive reasoning is used basically for theory testing. As mentioned earlier that a theory is built based on repeated observations that have yielded

consistent results. The validity of a theory, therefore, depends on the degree to which the new empirical evidence fit well with a theory. In this sense, deductive reasoning is used to link the new data with a theory to determine whether the evidence obtained from the new data are congruent with the theory or not. The process of deductive reasoning is presented in the figure below. The process starts with an existing theory. Based on the information that a theory portrays, we draw a hypothesis out of it. After a hypothesis is set, we test it empirically using observable data. Based on the finding we get from the observation, we can verify whether the empirical evidence is consistent with a theory or not. If the empirical evidence is consistent with a theory, then the validity of a theory receives empirical support.



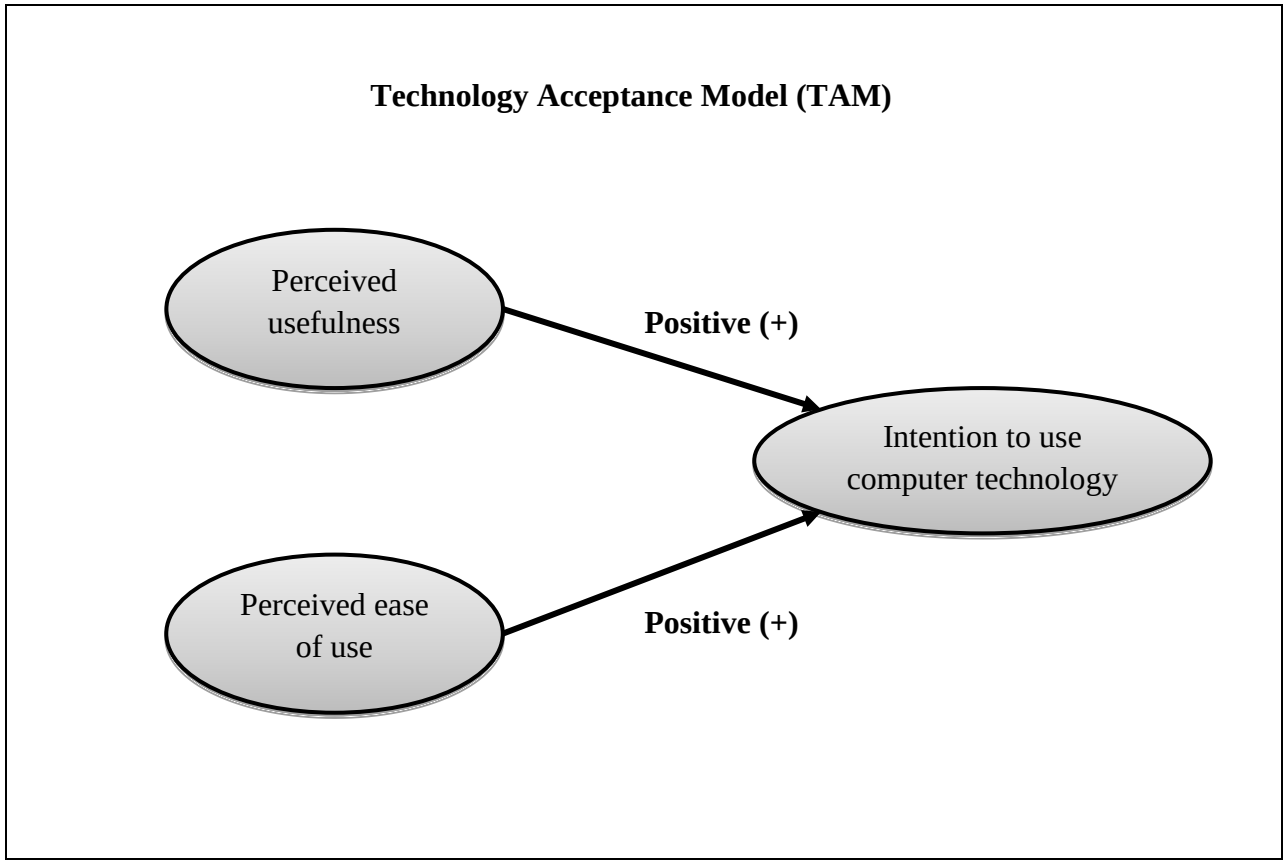
Using deductive reasoning in research: the TAM theory

Let's consider some example of how deductive reasoning is actually used in research. In the field of information system, researchers are interested in the factors that might motivate people to use computer technology. The prominent theoretical framework that are widely used to explain technology adoption is called

the *"Technology Acceptant Model"* or *"TAM"* (Davis, 1989; Davis et al, 1989). TAM suggests that there are two main factors that can strongly predict the tendency of people to accept and use the computer technology. These two factors are: (1) perceived usefulness: the extent to which people think that a specific technology will provide benefits to them; and (2) perceived ease of use: the extent to which people think that using a specific technology requires low effort. The prediction stated in the TAM can be expressed as the following:

> *(1) Perceived usefulness, and (2) Perceived ease of use will lead to intention to use computer technology.*

If we illustrate what TAM predicted in a form of conceptual model, we can get the illustration as the following:

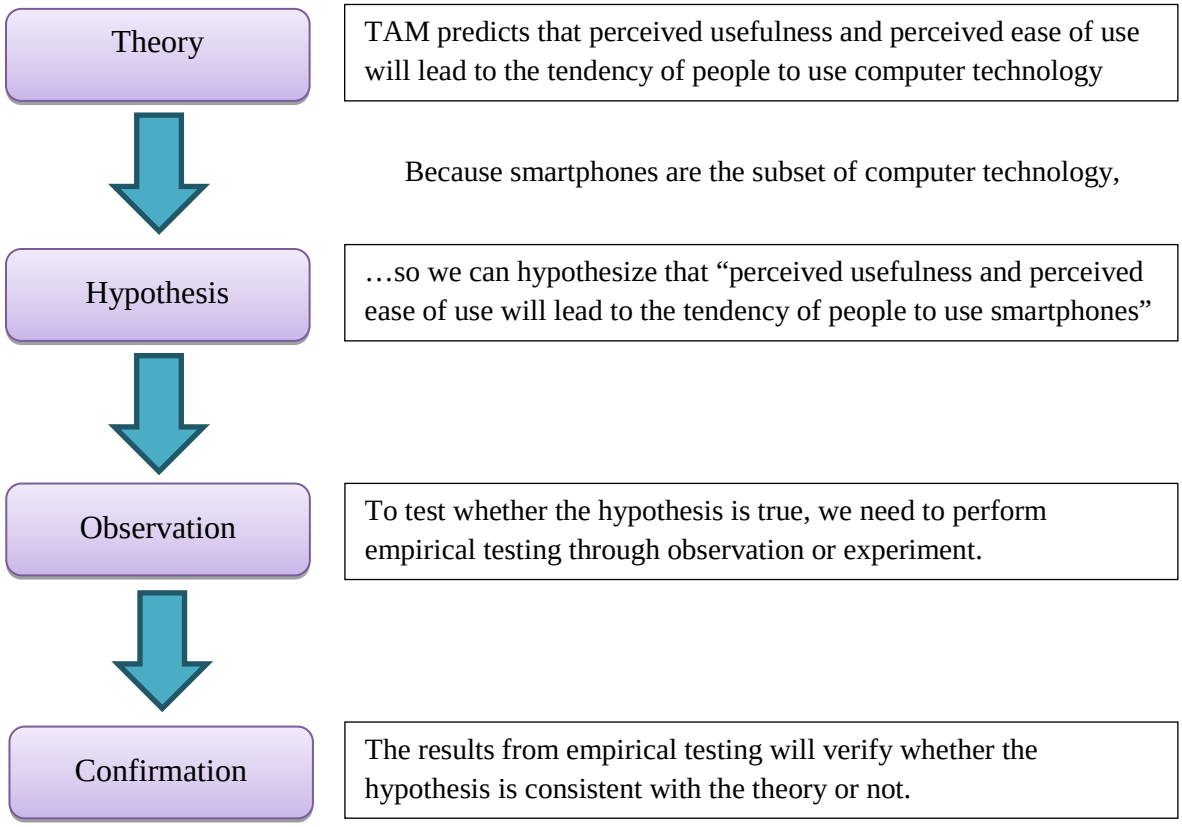


Originally, TAM and its components only apply to computer technology in general (Davis et al, 1989). TAM does not refer to any specific type of technology. For this reason, TAM serves as a theoretical framework that the researchers can apply

to other specific technology as well. If TAM can be applied to computer technology in general, it should be applied to specific technology that is the subset of computer technology as well. In fact, the term computer technology is quite broad. You may name any specific technology if you want, but it is better to come up with something we can use together for the example. Here, let's say...a smartphone. Unarguably, smartphones are considered the subset of computer technology. Therefore, if TAM predicts that perceived usefulness and perceived ease of use will lead to the tendency of people to use computer technology in general, by using deductive reasoning, we can use the general information from the theory to predict that perceived usefulness and perceived ease of use will predict the tendency of people to use smartphones as well.

In particular, the way we use deductive reasoning to draw a specific conclusion from a theory is considered the method that researchers use to come up with a hypothesis to test the theory. The figure below illustrates the steps taken when the researchers want to test the validity of the theory using deductive reasoning. The example is the hypotheses drawn from TAM. The process starts with the theory. Here, it mentions about the general information from TAM which refer to computer technology. Then, we match it with specific information that smartphones are also the subset of computer technology. At this point, when the commonality between general information from the theory and specific information is identified, we can reach the conclusion that the factors that can be applied to computer technology in general will be applied to smartphones as well.

Process of deductive reasoning in research



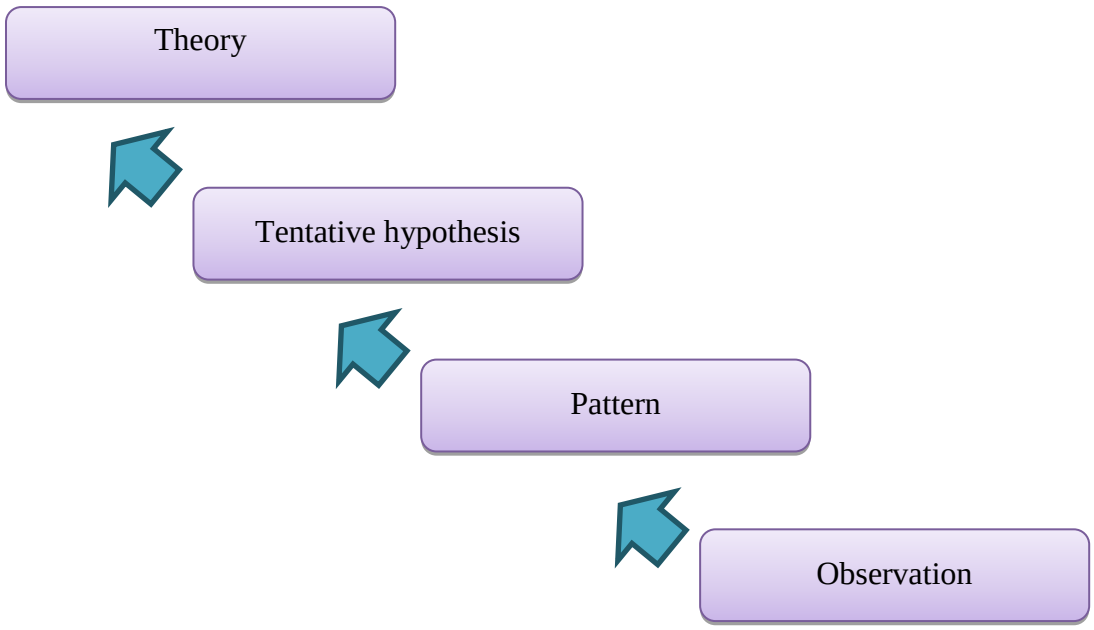
Not only deductive reasoning is used to draw a hypothesis from the theory, it also involves in the process of hypothesis testing as well. After the hypothesis is set, it is important for the researchers to perform the empirical testing to verify it. In particular, the scope of the data that will be observed in the empirical testing encompasses the concepts that are stated in the hypothesis. For example, if we want to test whether perceived usefulness and perceived ease of use will lead to the tendency of people to use smartphones, the data that we need to observe or collect have to focus mainly on these concepts as well (which are perceived usefulness, perceived ease of use, and tendency to use smartphones). Empirical testing can be performed through observation or experiment. The findings obtained from empirical testing are considered the evidence that will be used to verify the theory. For example, if the results from empirical testing show that the majority of people who use smartphones agree that they use smartphones because they think

smartphones are useful and easy to use, then we can reach a final conclusion that TAM can also be applied to smartphones. The evidence will eventually provide additional support to substantiate the validity of the theory.

Inductive reasoning

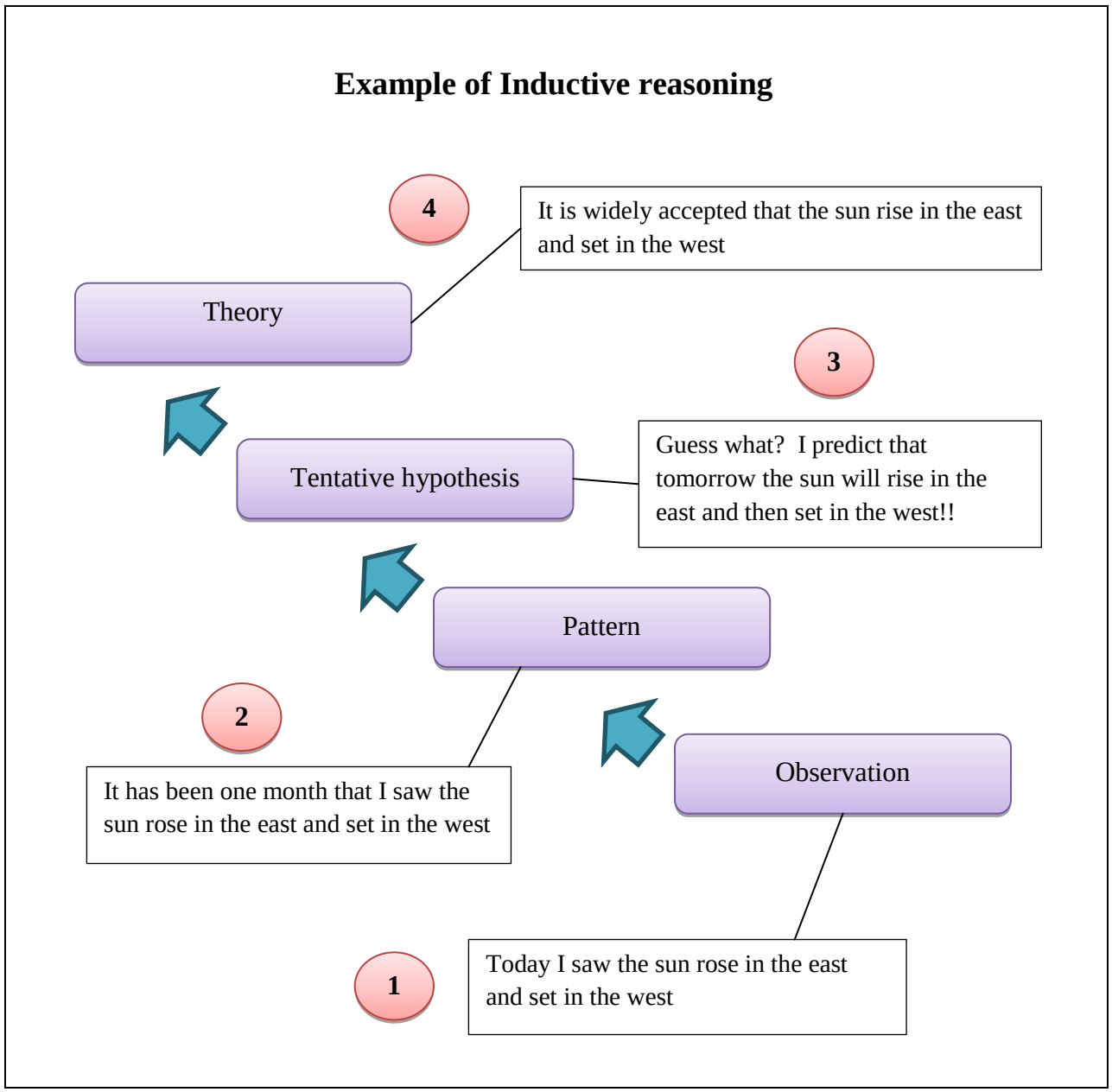
While the process of deductive reasoning starts from general information and then moves forward to more specific information, the inductive reasoning takes the opposite direction. In particular, inductive reasoning is regarded as a "bottom-up approach". The reason why it is a bottom-up approach is because we start from using specific information that has been repeatedly observed to form a general conclusion that will subsequently become a theory.

Example of deductive reasoning



The steps involves in the inductive reasoning are shown in the figure above. It starts when the researchers observe a phenomenon that had repeatedly occurred and became a pattern. From this pattern, the researchers can form a tentative hypothesis; they can predict what will happen based on the pattern of occurrence that they observed. After the tentative hypothesis has been repeatedly verified, a new theory is initiated. In particular, inductive reasoning is widely used for theory

building. In fact, the majority of theories in social sciences all came from inductive process.



To have a clear picture of the inductive process, here is some basic example. Let's have a time travel back to the dinosaur era when the knowledge of sciences is not yet known to humanity. I would like to introduce to you a caveman named John. One day John woke up at dawn. He noticed that the sun rose in the East. In the evening, he noticed something different; the sun set in the West. He was a little bit surprise of this phenomenon. The next day, he also saw the same things happened.

The sun rose in the east and set in the west. Day two, day three, day four, day five had passed; he observed the same things. This phenomenon formed a pattern. One night, he said to himself: "I think tomorrow the sun will rise in the east and set in the west again". He made a prediction based on the pattern of phenomenon that he had observed; the hypothesis is formed. However, his hypothesis is still tentative because the things that he predicted would not turn out as he thought. When the next day came, everything turned out to be what he predicted; the sun rose in the east and set in the west. His tentative hypothesis was supported. But he didn't believe it yet. John still observed the phenomenon to test his hypothesis again and again for many days. Because the things he observed always came out the same and his hypothesis was consistently supported, he finally initiated the theory about sunrise and sunset.

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