CONCEPTUAL MODELS, LITERATURE REVIEWS AND SOME METHODOLOGY ISSUES

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Summary

The conceptual model is central to an iterative process of selecting a significant issue, forming hypotheses, testing and refining them. Initial intentions should be focussed on a set of aims and objectives that are achievable. The conceptual model uses existing knowledge and creativity as a basis for advancing knowledge by; adapting existing theory, designing new theory, finding new evidence, explanations and applications. Issues of theory, method, explanation, verification, falsification, generalisation, evidence and objectivity are discussed, together with examples.

Introduction

Consider the flow diagram in figure 1 below. The diagram describes an iterative process; continuous refinement. The central element of figure 1 is the conceptual model, the theoretical basis for research. The purpose of a theory is to explain the nature of some phenomena, that is events or things, including; policies, causes, effects, change, the speed of change, evolution; *why they occur, what their consequences are, how they are connected to other phenomena.* Without theory there is only an undifferentiated mass of meaningless information. There is no split between theory and practice. Everything we do, or see, or perceive, or experience is governed by some theory or other. So issues of how theories are generated, how they evolve, whether they should be trusted or not, what distinguishes *good from bad* theory, when and why should theories be rejected are important.

The more general, the more it explains, the wider its reach, the better the theory. The less easy it is to adapt or modify, the better it is[2]. It is argued here that theories are at least as much social as scientific entities. Mostly we work within rather strict paradigms. From time to time paradigms are shifted.

Elements of the conceptual model

A conceptual model is an attempt to answer the questions: *What is the problem? Why has it arisen?* In other words: *How can we explain it*? It is an attempt to specify and describe the nature of a problem (or issue) as accurately as possible and most important; to provide an explaation. The conceptual model is an explanation of the problem that you have chosen to examine.

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[1] This note is designed to accompany lectures given at LSC and TSD in March 2013.   e

[2] See Deutsch (2011); at least chapter 1.

The idea of a conceptual model is illustrated in figure 1. It is part of an iterative process that begins by identifying a problem that is considered significant for any number of reasons, for example; a social, demographic or development issue, a situation where resources seem to be used wastefully or inefficiently or policies or strategies appear to be inept and capable of improvement.
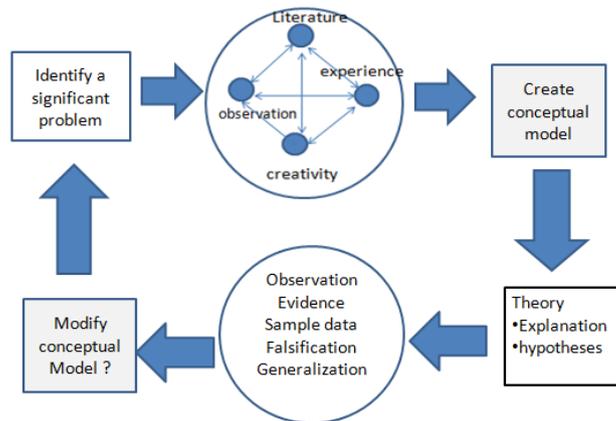

Figure 1

Intention, aims and objectives

Often the initial motivation is more of a vision or intuition that an issue has significance for the person undertaking the research, rather than a solid hypothesis; a statement of intent, often implicit rather than explicit[3]; *such and such a study, or policy will result in recommendations that enhances development, or welfare, or efficiency.* Through the kind of iterative process described in figure 1 the motivation for undertaking research can gradually be made explicit and transformed into more specific aims, a hypothesis, or hypotheses that are observable, and objectives that must be reached in order to achieve the aims.

The subject matter of the work must have significance wider audience than the researcher himself or herself. But the initial vision and motivation are important and should be made explicit at the beginning of an essay or thesis. The answer to the question, *Why is this a significant issue?* is resolved by self questioning.

The next stage is to ask what can be learned, that is relevant, from existing sources. They need to be identified and examined. On the basis of literature, experience and observation, a conceptual model is created. The conceptual model is an explanation of the chosen problem. The explanation is tested against further observations that usually result in modification (or rejection) of the conceptual model and refinement of the problem as it was initially stated.

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[3] This is sometimes described as the process of *sense making;* Weick, Sutcliffe and Obstfeld (2005); or *antenarrative* Boje (2001) Matthews (2013)

Maybe the problem was mis-specified. Maybe the conceptual model does not provide a good enough explanation of the problem. Sources of information, observations, intuitions and perceptions that led to the initial formulation of the problem should be critically scrutinized. Continual revision of ideas is the essence of the scientific (and the academic approach); an *ongoing* Socratic dialogue.

Terminology

This note uses some terms interchangeably; a break with rigorous practice. Often terms in table 1 are used in a confusing and contradictory way and table 1simplifies things by combining synonymous terms in columns and distinguishing them accross rows.

Theory Conceptual model Hypothesis[4] Statement	Axiom Assumption A priori Analytic	Prediction Consequence Hypothesis Consequence Statement	Testable Verifiable Falsifiable	Normative Values Ethics Should/ought What ought to be the case	Empirical Synthetic Positive Facts/events/ Experience What is the case Evidence (of the senses)

Table1: Terms used synonymously and distinguished in this note

Problem types

Is it possible accurately to specify the types of problems that might be considered in a thesis? Probably not completely but I suggest a few varieties.

i. The problem may be roughly speaking causal. It may be concerned with identifying reasons why and how such and such a situation has arisen. For example; *How a country or industry has been affected by the global recession? Is a country or industry insulated against the global recession? If so how and why? If not why not? Will development be helped by attending to governance issues?* It may be of the type; *if the following policies are pursued then the following consequences might be expected to occur.*

ii. Alternatively the problem may concern identifying differences and similarities; for example how the situation (industrial, policy, fiscal or monetary policy, service policy, corporate governance) in one country or organization differs from that in another. *Identifying how situations are similar and/or differ? With respect to what phenomena or variables? What are the implications? Can something be learned from differences?*

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[4] Sometimes hypothesis describes the theory or conceptual model itself: sometimes it refers to a prediction or inference of the theory. The same thing is true of the term statement.

iii.   The problem or issue may be of the type; *We wish to pursue the following objectives for the following reasons. We consider a variety of alternatives and for the following reasons we suggest this (or these) policy (or policies).what are the risks?*

iv.   Alternatively the problem may be a mix of the above varieties.

Specifying a problem

The biggest problem about a problem is the problem of deciding what the problem is. Problems involve contradiction or paradox. They cannot be solved without a change of *mind set*s. They arise for many related reasons; misperceptions about how things are, mistaken assumptions about the world, attempts to pursue policies, strategies and ways of doing things that are not feasible within the underlying parameters.
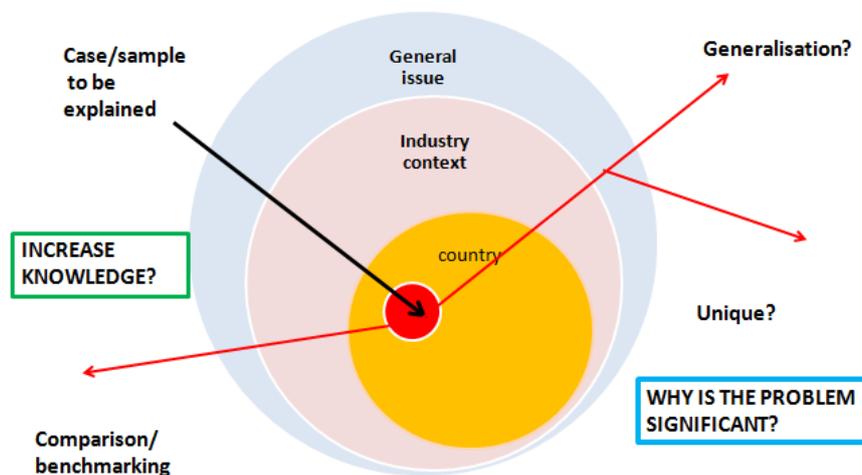

Figure 2

As an illustration, thinking is often like this; *I'm a fifty year old failed accountant, so to rescue my situation, I'm going to become a Barclays Premier League striker.* Sounds crazy, but often the strategies of individuals, corporations, governments or departments, have distinct resemblances; think about it.

Often, once a problem is specified the solution (or lack of a solution) becomes apparent. But it means looking at things from a different perspective. A story illustrates what this means.

A (wise) man or woman is discovered by a friend, one dark night, scrutinising the one piece of ground that is illuminated by a (fluorescent) light. 'What are you looking for? 'My keys', is the answer. After vainly searching for a while, the friend asks, 'Are you sure you dropped them here?''No,' the other replies, 'I dropped them over there.' He points to an area somewhere in the darkness; 'But there's more light here'.

The story can be read in more than one way.

The initial aims are often very general. We decide to focus a narrower context; perhaps a particular industry or country or a subset of a wider problem; figure 2 is an illustration. We may choose to consider a sample of possible data, or information, or a particular case (or cases). Critical questions are; *Is the problem significant/interesting and why? To whom is it relevant? Does the problem relate to a gap in the literature or in knowledge?* Later we may consider questions such as; *Can we generalise what we find out about a specific case? If so, how? If not, why not? What is unique about this case? If it's unique, why or how is it interesting? Significant?*

Designing a conceptual model: the literature review

Where does the conceptual model initially come from? The oval shape in figure 1, reproduced in figure 3 provides a clue.
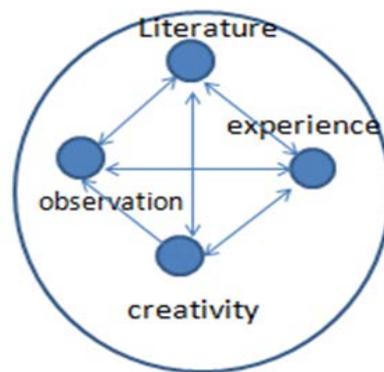

Figure 3

The conceptual model emerges from a combination of the four elements in the oval shape Leaving aside creativity for the moment, the conceptual model emerges from current and past observation and experience together with a study of the relevant literature.

Literature reviews

We live in an information age. Information is vast. There are many sources of information. Libraries have often rechristened themselves as resource centres, proving electronic data, outlets to international databases, in addition to many thousands of books, periodicals and academic journals. I subsume all these sources under the heading, literature.

It is a good idea to distinguish between bibliography and references. Bibliographies are intended to be as completely comprehensive as possible; the sort of thing you find when you do a search on a topic in the British Library. References are the things that you review critically in your thesis. They are the subject matter of the literature review. Other literature (bibliographical) may be mentioned but be peripheral to the main subject matter of the literature review.

 Having decided on the problem area you are going to study, the next step is to review the relevant literature, critically. Critically is the key word. A critical review; (i) identifies relevant literature, (ii) summarizes the main ideas and approaches, (iii) clarifies (iv) synthesises and (v) evaluates them.

In other words a critical approach means asking yourself questions in relation to the problem area you have chosen, such as; *What are positive and negative qualities of existing theories and approaches? What are the limitations? What are the gaps? What is missing?* Literature is often so vast that you have to select a subset.

The problem area you have chosen maybe situated in a particular discipline or it may cross disciplines. In relation to the problem area you have chosen; *How has knowledge evolved over time? Is the problem you have chosen part of a sub discipline? If so how is the sub discipline related to the wider discipline? How do approaches differ? What do they have in common? What methodological approaches will you use? Why and how will you use them?*

Too much time is devoted to narrow, overspecialised areas; more research should be broader, interdisciplinary.

Types of Literature Review

Working within a paradigm: this type surveys literature within a paradigm; theory, method and standard results aiming to adapting them to an issue that has some novelty; a new distinctive area of application. Most research is of this kind[5].

Identifying gaps: this type reviews what is already known about a particular subject looking for gaps, ambiguities shortcomings in knowledge or approach that suggest a novel direction for research.

Synthesising different approaches: this type identifies and critically evaluates, conflicting evidence, attempting to clarify, synthesise and establish *what is and what is not the case*.

Clearly the three types overlap and literature reviews often have elements of more than one of them. **Observation and experience**

We stated above that a theory should be testable against observations and experience. Later we will qualify that by maintaining that theories should be falsifiable[6]. We can never test a theory against all the evidence, since the amount of evidence is infinite and we can never be sure that the future will not contradict the past. So all we can hope for a theory is that it is not yet falsified. But the notions of observation and evidence are not as simple as they might seem. First sense perceptions about what is and what is not the case are often unreliable; viz. the unreliability of eyewitness reports of an accident or crime. Second, things are not observed directly, they are transmitted from the senses via neuronal transmitters in the brain. Third, usually we use some apparatus or other a telescope, microscope, computer image, or measuring instrument to arrive at sensory experiences. We observe social phenomena, such as output, or profit, or development, or any social categories, the family, the firm, the industry, the government, not directly, but through language, categories and symbols that stand for or signify them. Experience is even less direct: it relies on memory and recall. A particularly deep problem is concerns how an image in someone's brain can possibly correspond to something that happens outside that person.

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Observation, literature and the conceptual model

Here are a few illustrations of conceptual models.

1. Consider research on the way that banks in a particular country deal with people with learning disabilities. A Venn diagram is a good way of illustrating the approach to the literature review and indicating the way forward for research.
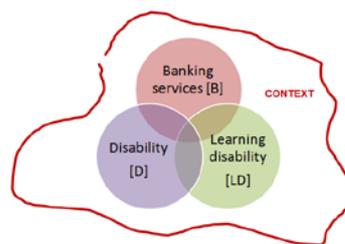

Figure 4

The context of the study is the Cameroon. The literature review focuses generally on disability, learning disability and banking services. Literature with respect to all three areas is identified. Most concentration is on areas of overlap. Not all disability leads to a learning disability. Not all banking services are relevant to either disability or to learning disability. The main focus is on the intersection between them; area S in the diagram. Most literature, perhaps relates to developed markets [DM's]. W*hat is the*

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research question or issue? The implicit hypothesis is perhaps that improving services for the disabled will somehow improve welfare. The implicit hypothesis should be made explicit. Is it to identify problems of provision? Is it an assessment of banking services in the Cameroon with respect to learning disability? Is it to be benchmarked against best practice elsewhere? If so what constitutes best practice? Is best practice elsewhere appropriate for the Cameroon? Notice that the conceptual model as illustrated in the figure is a classificatory framework rather than a a causal relationship. Perhaps causal relationships will emerge from the research.

2. For much of business, social or economic research carried out at the moment, the great recession, triggered by the financial crisis in 2007 is relevant. An important issue for emerging markets [EM's] is whether they are decoupled or not from developed markets [DM's]. Consider research on causes of the financial crisis and its implications. Implications may refer to outlook for the future and/or to a particular industry or country. Four possible causes are usually cited as illustrated in figure. *The figure suggests that they are interdependent. Are they? What are the implications? Is there access to primary data? What sort of data is applicable? What research method?*
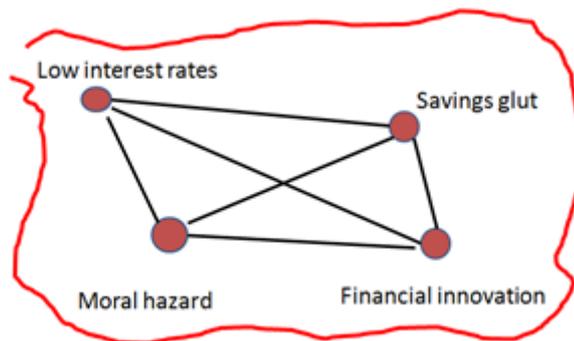
Figure 5

3. The diagram suggests contagion (percolation) from one issue to another. *Does contagion arise from the too big to fail aspects of financial institutions? D*ecoupling is an issue of contagion or insulation. Other disciplines consider such problems, so there is an interdisciplinary problem. A particular theory underlies each of the nodes. These theories reflect a particular paradigm. *Which?* Connecting some or all the nodes suggests a a theoretical connection between them. *What is it? Is there access to primary data? What sort of data is applicable? What research method?*

4. Suppose the initial issue is corporate governance: now, in the great recession, very significant, in finance, the media, corporations; but a very wide subject area. *How to narrow it down?* First consider secondary sources. A way forward is to focus on a particular industry and/or a particular country. The implicit hypothesis is perhaps that

improving services for the disabled will somehow enhance development, efficiency, growth or welfare. Look at figure 2. *What does the literature have to say about the issue of governance generally?* Mostly it focuses on the principal agent problem.the implicit hypothesis should be made explicit. *Should the concept of governance be extended to a wider group of stakeholders? In relation to which industries and which countries? What hypotheses are suggested by the literature? To what extent do circumstances differ as between [DM's] and [EM's]? What circumstances? Is there access to primary data? What sort of data is applicable? What research method?*

Objectivity

The question arises as to the extent that research that is investigation based on the conceptual model explains the phenomena it claims to explain. How reliable is the researcher as a witness of reality? After all results and explanations are based only on a sample of possible observations of data that may not be reliable or may be capable of many interpretations and the wrong one chosen. If the research relates to narrow specific phenomena, even if it is reliable in itself, generalisation to a wider set may not be valid

The starting point in this respect is the relationship between the observer/researcher and the reality; the relationship between consciousness of the observer and the phenomena or events that are observed; between states of consciousness and objects of consciousness.
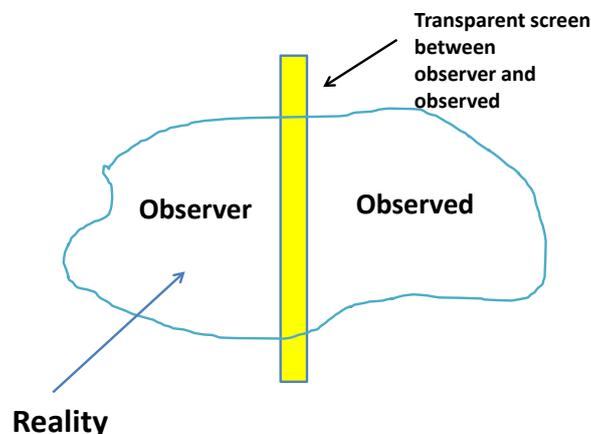
Figure 6

In answer to these questions the starting point of most research is illustrated by figure 6. Human beings are assumed to be subjects, spectators separated by an invisible plate glass window (represented by the yellow vertical bar in the diagram) from phenomena, that is objects and events, observed. The assumptions, often stated implicitly are that

    (a) reality exists external to the observer, and
    (b) it is a material reality experienced by perceptions and observations

(c) rational procedures can be used that ensure that his or her perceptions observations are valid representations of it; observations that are free from the idiosyncratic assumptions, mind set, or moods of the observer, or presented in such a way that such biases are explicit and can be allowed for in interpreting results.   .

Courses in research methods are designed to explicate

(i)   what these procedures are and
(ii)   how valid implications can be drawn from observations.

In summary, scientific research is a process of creative doubt, continuously asking; *What do I know? How can I be certain of it? What am I certain of?* This is the Cartesian method, after Rene Descartes[8] who has had an enormous influence upon scientific thinking.

Transparency/repeatability

How should research be conducted? The minimum requirement is that the research should be so presented that someone reading the results and conclusions, has enough information about how it was conducted, to be able, *in principle* to repeat, verify, modify or falsify results and conclusions for himself or herself. We have to add the qualification *in principle*, because an experiment can never be repeated exactly.

(a) No experiment can be repeated perfectly.
(b) Not all experiments can be repeated; often they relate to past events.
(c) Not all statements can be tested; some for reasons given below are said to be philosophically meaningless by some schools of thought[9].

 We can never step into the same river twice. So what is the minimum statement of the conceptual model that is satisfactory? The methodology, experiments, procedures should be made transparent enough for another scholar or researcher could carry out approximately the same process.

Normative and positive

Normative issues are the subject matter of ethical theory and applied ethics. Ethical theory consists of statements concerning morality, values, norms, questions of right and wrong guilt, shame, duty and responsibility; questions of how people ought or should behave. Applied ethics includes medical ethics, business ethics, human rights, animal rights, good governance, justice, fairness and distribution. Statements about norms or values. W*hat the situation should be*? W*hat the preferred situation or optimal situation would be? What objectives are recommended and why?*

Generally positive statements are about facts, about what is the case. They are empirical statements about the world whose truth value can be established by looking at the world through the senses. Here, I am equating positivism with empiricism. Sometimes statements

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[8] Rene Descartes (1596-1650).
[9] See next section.

are mixed. For example I might say that such and such a policy or situation is desirable (a normative statement) and also say that such and such policies will result in the desired situation (an empirically verifiable statement). The first set of statements are positive and can be resolved with reference to facts (*what is* and *what is not,* the case). The second set of statements are normative and are resolved with reference to norms or values or ethics.

The Logical Positivists[10] in the early part of the twentieth century held to an extreme form of positivism. They distinguished between meaningful and meaningless statements; a distinction that relegated ethical statements as meaningless.

Statements that satisfied neither of these conditions were said by the Logical Positivists to be meaningless. This seems to rule that all normative statements are meaningless. The philosopher Wittgenstein that influenced Logical Positivism immensely, concludes with the statement; "What we cannot speak about we must pass over in silence."

This is extreme verificationism, according to which a statement is meaningful if and only if it had to satisfies one of two conditions. It must be either

(a) An analytic statement, whose truth value, that is; a syllogism, or statement is true or false according to the meaning of the words it contains
or
(b) A synthetic statement, whose truth is established by the sensory experience; observation of the facts of a situation; observation of what is the case.[11]

Since only (a) analytic statements which are true by definition and (b) empirical or synthetic statements which can be tested against perceptual experience, can be either true or false ethical statements as meaningless.

Meaningful ethical statements

Clearly most people think that ethical statements are meaningful. *So in what senses are ethical statements meaningful?*

Ayer, whilst remaining faithful to verification, particularly the idea that meaningful statements should be empirically verifiable, distinguishes two uses of ethical words that renders them meaningful, provided that the people they refer to have shared values..

(a) They may be used to make statements that accord with the *Does the community concerned agree with them or not?*

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[10] Also called the Vienna Circle.

[11] Notice that the verification itself does not satisfy the verification principle. It is not a statement that satisfies either of the two conditions of necessary for meaningfulness according to the principle, because it is neither (a) An analytic statement, ..., or (b) A synthetic statement,.... true or false according to the meaning of the words.,.......nor (b) A synthetic statement.....about what is the case.

(b) : in which case, they are descriptive, sociological statements that can, in principle, be verified: *Does the community concerned agree with them or not?*

(c) Alternatively, some words are 'normative ethical symbols' that have an emotional rather than a factual meaning. They express feelings, approval/disapproval, like/dislike. They are statements about someone's state of mind. They can in principle be verified; *Do you approve of this or that policy?*

If ethical values are not shared, then, Ayer argues, moral disagreements seem to be senseless: like opposing football teams playing on different pitches, or chess players playing to different rules. We could argue further that even if values are not shared, empirically meaningful questions still remain. *How do values differ? Are different sets of values internally consistent? How are different sets of values expressed in behaviour?*

Deduction and induction

Generally analytic statements relate to deduction and empirical statements relate to induction. Before discussing them some remarks on ethical statements are useful.

(a) A deduction is an inference from a set of premises. It concerns logic. The well known syllogism is an example; *All swans are white. X is a swan. So X is white.*

(b) Induction is an inference from a finite number of cases to a further case, for example; a great many swans have been observed, all of them white. The conclusion that the next swan observed will be white or the general conclusion that all swans are white, are inductive inferences.

Deduction and the conceptual model

The conceptual model has (or should have) an internal logic. The internal logic consists of a set of premises or assumptions from which certain causal relationships are deduced. The essence of deduction is; if....then.....; *if such and such is the case, then the following consequences result; if such and such assumptions hold, then we predict these things will happen; they follow from the rules of logic.*

What is meant by *the rules of logic?* They may be syllogisms; we may borrow rules from mathematics and state our conceptual model as (target) variable a, depends on or is a function of (instrumental) variables x, y, z....; $a = f[x, y, z,.....]$. Here the functional dependence (causal sequence) is derived from mathematical reasoning; calculus, algebra, sets, the properties of numbers.

The *truth value* of a deductive process rests on consistency. *Is the logic consistent in the sense that the predictions follow from the assumptions. : Is the model consistent or does it contain logical contradictions? Do the hypotheses follow from the assumptions?* The consistency of theory or conceptual model means that it contains no internal contradictions; essentially, *if a is the case then either x is the case or x is not the case.*[12]

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[12]

Induction and the conceptual model

Clearly a theory can be deductively true (consistent), in that its predictions follow from the assumptions but still be false in that it says something about the world which is evidently untrue. In other word, from an inductive perspective it is evidently false. Consider the syllogism; *All swans are white. X is a swan. So X is white.* Deductively, true. Inductively false. *Why?* Because some swans are black. The conclusions follow from the premises but the premises are false in that they misrepresent the world (of swans).

Since a conceptual model is an explanation of a situation, then the hypotheses that follow from it should be testable against evidence. This is the inductive aspect of the model: it has empirical content. It contains a statement or statements about the world that can be tested against evidence (the evidence of the senses).

The problem of induction: Hume's problem.

We can never prove the theory contained in the conceptual model, because we can never test it against all the conceivable evidence. Another way of expressing the induction problem is this. Because the sun rises today and has risen every day in living memory, we cannot conclude that it will rise tomorrow. We cannot conclude that it will rise tomorrow, unless we make a further assumption: the assumption that unobserved cases resemble observed cases; the uniformity assumption; the assumption that the future will resemble the past..

We may be justified in believing the uniformity assumption; generally observed cases that we experience, resemble unobserved cases. But what about cases that we have not experienced? We expect that cases that are not yet experienced will resemble cases that have been experienced. And we may be justified in believing that. But only with the help of a circular argument. We are justified in making the assumption that that because we expect cases that have not experienced to resemble cases that have been experienced we are justified in making the assumption that cases that we have not experienced will resemble cases that have been experienced. And so on. The uniformity assumption is justified by the uniformity assumption, a fact that is in turn justified by the uniformity assumption; the future will resemble the past.

Falsifiability

But the theory should be stated in a way that enables it to be falsified against evidence. Theories or conceptual models cannot be tested against all possible evidence. They may have turned out to be true so far, but in the future they may falsified by evidence. Theories that have not been falsified so far may be falsified in the future, but they are preferable, more reliable and more useful than theories that have been falsified.

This was Karl Popper's point of view[13]. Knowledge is either negative, we know a theory to be false, or it is positive, positive in the sense that it is a conjecture; it has not yet been falsified. Popper spoke of science as being a process of conjecture and refutation.

Ideally, a conceptual model is a conjecture. It is tested against evidence. The purpose setting it up against evidence is to see how robust it is; how well it stands up against the evidence.

This is a critical aspect of a conceptual model; it should *in principle* contain statements that are capable of being falsified. They should be falsifiable, either (a) from a deductive point of view or (b) from an inductive or empirical point of view.

  (a) Falsifiable from a deductive point of view means asking questions like; Is it consistent? Do the conclusions follow from the assumptions? Does it contain contradictions?
  (b) Falsifiable from an inductive or empirical point of view means asking questions like; Is the conceptual models stated in such a way that it can be tested against some evidence? Is it true of all states of the world? Or are there some states of the world that would contradict it?

Falsification; strong and weak

We can distinguish between (a) strong and (b) weak verifiability or falsifiability. It is verifiable or falsifiable in a strong sense if it can be tested against experience and with respect to that evidence be said to be either true of false. It is verifiable in a weak sense if when tested against evidence it can be said to be either probably true or probably false.

Testing the conceptual model

The next step is to test the hypotheses against evidence. Evidence may be got from examining variables relevant to the problem. The question as to what is relevant depends on the nature of the problem.

Again speaking generally, we might choose two kinds of evidence.

  (a) Evidence from large amounts of data.
  (b) Evidence from relatively small amounts of data, i.e. from representative cases (narratives or stories).

Evidence from relatively large amounts of data.

It is well known that many variables are normally distributed; the heights of men and women, blood pressures in a healthy population, shoe sizes, IQ scores. The characteristics of normal distributions are well known and it is convenient to use. Two parameters, the mean and variance (μ and σ^2 respectively) describe it precisely. But we can only ever take samples. So two questions arise; *How do we deal with populations that are not randomly distributed? How can we be sure that the sample is representative of the whole?*

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With respect to the first question, the central l Central Limit Theorem (CLT) is adopted: approximately, when a large number of samples are drawn independently from a population that is not randomly distributed, the means of the samples will be normally distributed.

Distance from the mean
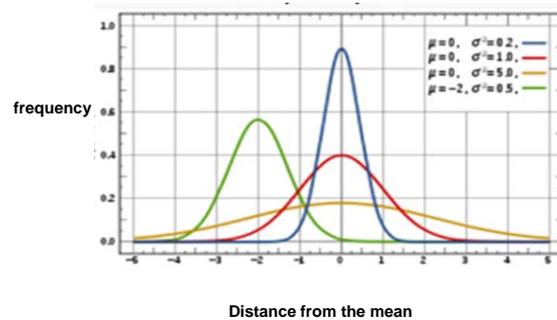
states (approximately) that if repeated samples are chosen independently from a population of variables then the means of these samples will be normally distributed.

The second kind (b) of evidence is got from a small number of variables contained in particular cases or stories. The questions that arise here are; *Are we able to gain in depth insights into the nature of the cases examined? Can we detect patterns or similarities between cases? Is what we learn about a particular case or small number of cases generalisable to a broader situation? Do the cases contain unique features?*

Quantitative and qualitative

With respect to both kinds of evidence, in the previous section, the data is said to be either quantitative or qualitative. I find this distinction quite blurred. One distinction concerns whether the variables concerned are measurable; *Can they be mapped (or transformed) into (real) numbers?*

Certainly not all evidence can be reduced to numbers. Often the most interesting evidence concerns qualities (qualia); preferences, satisfaction, effectiveness, utilities, perceptions, emotions and so on.

Qualitative factors affect quantitative factors and vice versa. The questions then are; *How they do so? Why. With which consequences?*

Theories are probability statements

The idea of weak verifiability suggests that an answer to Hume's problem (above) is to say that theories are probability statements. Although we cannot test a theory against all possible observations in space or time, we can say that it is probably true or probably false. We can't say that it is certainly true (probability 1) or certainly false (probability 0), but perhaps we can say that it is true with a probability of (say) 0.9 and false with a probability of 0.1.

The discussion of probability makes distinctions; between (a) subjective and objective probability and (b) between classical (or a priori) probability and frequency (or a posteriori) probability.

(a) Subjective and objective probability

Subjective probability measures someone's strength of belief in the truth of a proposition. Objective probability concerns the chance that an event will occur irrespective of whether anyone thinks it likely to occur or not.

We might say subjectively that the chance of a particular policy being successful (in achieving its objectives) is 50:50, even chances. We might say that our assessment of the current great recession is that it won't recover until 2017/18.

In contrast to subjective probabilities we might say that objective probabilities exist in the world irrespective of whether people believe in them or not. If a coin is fair, then the probability of a head resulting from a toss is 0.5. If a die is fair the probability of six turning up twice, on two consecutive throws, is 1/36. If after **n** repetitions of a scientific experiment, an outcome occurs **h** times, then we may say that the probability of the event is **h/n**.

(b) A priori (classical) and a posterior (frequentist) probability

Examples in the previous paragraph capture the distinction between classical and frequentist probability. The coin example illustrates the classical approach. There are only two possible outcomes. The coin is fair (unbiased), there are only two ways a coin can turn up. So the probability of a head (or tail) is 0.5.
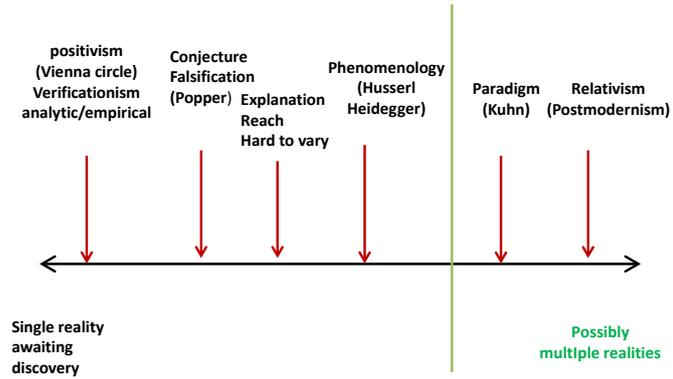
The **n** repetitions of an experiment where **n** is large results in h outcomes that are the same so the probability of the outcome is **h/n**.

Bayesianism

Bayesianism concerns how a person's degree of belief in a hypothesis should be affected by a change in the light of evidence. Because it is about degrees of belief, Bayesianism reflects a subjectivist approach to probability.

Objectivity and phenomenology

**Scientific explanation:
A very approximate scale**

positivism
(Vienna circle)
Verificationism
analytic/empirical

Conjecture
Falsification
(Popper)

Explanation
Reach
Hard to vary

Phenomenology
(Husserl
Heidegger)

Paradigm
(Kuhn)

Relativism
(Postmodernism)

Single reality
awaiting
discovery

Possibly
multiple realities

Figure

To be continued