Everything of Value is Relative

- 'Short Odesys Story' -

Difference is what gets things moving!

With the following thought exercises, I aim to engage you in reflecting on the concepts of time, energy, and especially preference, along with their associated mathematical operations and scales. This 'food for thought' is intended to help you better understand preference value and its correct mathematical application, as it is the only truly relevant metric for decision-making. The foundation of this line of thinking underpins Preference Function Modelling (PFM), fundamentally and originally developed by Prof. Jonathan Barzilai; see: Barzilai, J. (2022). Pure Economics. FriesenPress. Below you will find ten 'PFM teasers':

1. A family had a daughter born on 1 January 2020; at that moment, she was 0 days old. How many times older is their daughter today? And how many times older was she on 6 January 2020 compared to 2 January 2020?
2. Today the temperature is 0°C outside, which feels quite cold. A man decides to stay indoors. Tomorrow it will be twice as warm. Could he possibly go outside tomorrow?
3. The oldest son was born in 2002, and the oldest daughter in 2004. In 2004, the family therefore had 1 + 1 = 2 children. But what does the sum 2002 + 2004 represent? In 2006 and 2009, a third and fourth child were born respectively. Over how many years did the man become father to four children?
4. Given that t_1 is 14u = 2p.m and t_2 is 15u=3p.m . Is the ratio $t_2/\ t_1$ equal to 3/2=1,5 or to 15/14=1,0714… ?
5. A man travels by train from Delft to Eindhoven, departing at 14:00 from Delft and arriving at 16:00 in Eindhoven. During the journey, he changes trains once in Breda. Can one calculate how many times longer the travel time from Delft to Breda is compared to Breda to Eindhoven? If yes, how many times? If no, what additional information is needed?
6. What is the potential energy of a 1 kg ball placed on top of a 15-storey building, assuming each storey is 4 meters high? What is its potential energy when located on the first floor? What is the difference in potential energy between these two positions?
7. A dredger pump is installed in a supply pipe. On one side of the pump, the pressure is X, and on the other side, the pressure is Y. Under what condition will fluid flow occur?
8. In a design problem, two options remain: Option A with value X and option B with value Y. Can a designer make a definitive choice between these options? Can the designer state how many times 'better' one option is compared to the other? If yes, how can they calculate how many times better or worse Option A is relative to Option B? If no, what additional information is needed? Please illustrate your answer with an example.
9. A person must choose between two jobs, A and B, based on the criteria 'growth opportunities' and 'salary', weighted at 0.6 and 0.4 respectively. Growth opportunities are 15 and 20 for positions A and B; salaries are €50,000 and €45,000 per year respectively. Which job does the person choose if they use the weighted average? However, upon checking the contract, the salary is not in euros (€) but in kilo-dollars (k$). The exchange rate is 1 € = 1.1 $, so the salaries become 55 k$ and 49.5 k$ per year respectively. After recalculating, the person chooses differently. Why can they not make a final decision?
10. A professor receives an overall teaching evaluation score of 7, based on the weighted average of three equally weighted subscores: 'clarity', 'comprehensibility', and 'explainability'. At home, he tells his children about this 'good' result, upon which one child says: 'That result means nothing to me, Dad!' Is the child right? If no, explain why not. If yes, what is needed to assess a 'good' result? Is the weighted average a reliable basis for this assessment??

Preference[1] is the only metric that truly matters in decision-making. Unlike objective measures such as time or energy, preference is subjective and dependent on the context of the choice and the individual's experience. In social sciences, decision-making is fundamentally driven by preference differences — just as height differences are key to potential energy in physics. Since preference is inherently relative, depending on the alternatives under consideration and how we assign scales and weights, it becomes essential to employ an appropriate mathematical approach to model these relative preferences.

Preference, like time and distance, is part of a one-dimensional affine space, in which mathematical operations such as multiplication and addition are not defined. Using undefined scales and weighted averages does not accurately represent how we truly arrive at sound decisions. To make a choice, at least two different options with corresponding preference values are needed, and to perform calculations with them, a minimum of three alternatives is required[2]. This raises the question: how can preferences be mathematically represented in a way that truly supports decision-making? The answer lies in the effective application of 'preference function modelling' (PFM) theory[3] within multicriteria decision and design models.

Besides these core ideas on the correct mathematical representation of preferences, there are some fundamental considerations that clarify the relationship between difference, value, and movement. The phrase "*everything of value is relative*" means that values depend on context and perspective, without an absolute standard. Protagoras emphasized that value is subjective, while Einstein showed that even objective quantities such as time and space are relative to the observer. This notion underlines that expressions of preference are situation- and experience-dependent. Preference reflects the degree of 'satisfaction' or 'well-being' — a relative human experience of infinity, experienced through all (internal and external) organs of perception and senses.

"*Difference is the source of motion*" reflects the idea that difference is the driving force behind action and change. This concept applies across various contexts. For instance, pressure differences in the physical world cause flow, differences in potential energy lead to movement, and voltage

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[1] The word '**preference**' means 'to choose one thing over another.' Literally, it means 'to esteem or value something more than others, to set it before others in liking or esteem,' and comes directly from the Latin *praeferre*, meaning 'to place or set before, to carry in front,' from *prae* ('before') + *ferre* ('to carry'). Preference expresses the **degree of satisfaction** and reflects the **value**, **utility** or **usefulness** of something to a person. Preference is synonymous with choice or decision, since one selects what one prefers (for example A ≻ B). Preference is a quantity without a physical unit. To enable calculation with preference scores, they are expressed as real numbers on a scale — for example, from 0 (worst alternative) to 100 (best alternative). The meaning of these scores is purely relative and is determined by the differences between alternatives.

[2] Note that with only **two options**, only **an ordinal choice** is possible when all criteria of one option are greater or smaller than those of the other. In that case, one can say that one option is better than the other, but not by how many times. If the criteria are mixed or evenly distributed, the choice is 50-50 and we speak of indifference. Only when there are **three or more mutually different options** can a ranking be determined and the relative ratios between options be calculated.

[3] **PFM** was developed by Jonathan Barzilai and addresses shortcomings in traditional microeconomic models by mathematically modelling preferences correctly as the core of decision-making. Odesys has extended the PFM approach from multi-criteria decision analysis (MCDA) to multi-objective design optimization (MODO). For this purpose, Odesys developed the Preferendus tool, based on the advanced IMAP optimization method and the A-fine Aggregator algorithm. See also the following footnotes 4 and 5.

differences generate electrical current. Similarly, in the social realm, differences in preference values determine actions or decisions. These physical and social differences exist within an infinite field without an absolute zero point and represent relative configurations of different object states or subjective experiences. In short, a potential difference drives dynamics in physical systems (such as current and motion), while a preference difference is the driving force in social systems (such as design and decision-making). Humans evolve to make an actual difference — their own 'potential difference'! When a person no longer cares — becomes *indifferent* — no difference is made; everything stays the same, idem dito: "*it's ol' the same*."

The above considerations resonate with Lucebert's statement, "*Everything of value is defenseless*," which highlights the vulnerability of what is precious—such as love, art, nature, and human values—and calls for their protection and care. This idea reflects a holistic vision in which even the smallest or most fragile element makes an essential contribution to the greater whole. Even the tiniest difference in value sets a decision into motion!

Odesys has integrated the above core ideas and considerations into its IMAP optimization method[4] and Preferendus tooling[5] to support pure a-priori decision-making—drawing from an 'infinite' design space rather than selecting a posteriori from a limited set of curated options. In doing so, IMAP/Preferendus overcomes fundamental flaws inherent in traditional aggregation methods—such as the weighted average—as well as the use of monetization to get around the aggregation problem. These approaches fall short when tackling complex, multi-objective problems, where the goal is to find the solution with the highest aggregated preference value. Furthermore, it eliminates the modeling error inherent in Pareto front-based approaches. Each design point in the solution space reflects a distinct preference value for the decision-maker, making solutions along a Pareto front—with allegedly equal values—essentially meaningless, aside from their underlying mathematical flaws. That is the *difference Odesys makes*: by enabling informed decisions driven by preferences and design principles—and thereby *creating genuine value* in complex contexts with multiple objectives and interests.

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[4] **IMAP** stands for *Integrative Maximization of Aggregated Preference* and is a state-of-the-art preference-performance-based optimisation method that outperforms existing multi-objective optimisation methods by integrally connecting subjective preferences and objective performances within a single decision space, and is based on a mathematically rigorous foundation.

[5] The **Preferendus**, grounded in Preference Function Modelling (PFM) theory, is Odesys' quantitative decision-support tool. The Preferendus identifies the best-fitting solution using the IMAP optimization method by selecting the option with the highest aggregated preference value for the group, calculated through the PFM-based A-fine Aggregator algorithm.

See below for the brief answers in response to the original 'provocation' at the beginning.

Short Answers to Ten 'PFM Teasers'

1. a) Insolvable, since a time ratio is undefined;; b) k=(6-1)/(1-0) = 5 times.
2. 2 x 0 =0 in absolute terms) is undefined and meaningless. Think of 0 as 0 degrees Celsius, with an absolute zero point at -273°C (a one-dimensional vector space). Then: 2 x (0— -273) = 546 = +273 degrees Celsius. So: you absolutely cannot go outside – perhaps to a cool cellar under your house?
3. 2002+2004 = 4006 – mathematically correct, but meaningless: addition is not defined on a time scale. However 2009-2002 = 7 years is meaningful: this time difference does represent something (time exists in a one-dimensional affine space).
4. None of the time ratios are defined. Time always exists and belongs to a one-dimensional affine space, where division is not defined.
5. Only if I know, for example, that I arrive in Breda at 14:45, change trains and depart at 15:00, can I say: (60-0)/45-0) = 4/3 times longer from Breda to Eindhoven than from Delft to Breda.
6. a) Cannot be determined without explicitly choosing an absolute zero point on the ground: then 1x10x(15x4)= 600 Nm; otherwise: undefined (infinite number of outcomes); b) Similarly, but now 1x10x(1x4)= 40 Nm; c) Difference= 560 Nm which may cause the ball to move from high to low.
7. Only when $X \neq Y$ ($X > Y$: a pressure difference causes flow from X to Y).
8. a) Only when X≠Y can a decision be made: there must be a difference; b) "How many times better" can only be determined with: $k = (a-b)/(c-d)$. That is, by defining an extra third option C a as an absolute zero point, you can calculate: if A=70 and B=50, then k= (70-0)/(50-0)=1.4 → A is 1.4 times better than B *relative* to 0. Alternatively, if C is a third alternative with preference score C=10, then: k= (70-10)/(50-10)=1.5 → A is 1.5 times better than B *relative* to C.
9. a) He 'unconsciously' uses a weighted average: overall weighted score yields A= 20009 > B=18012. So he chooses A; b) Overall weighted score yields A= 31 < B=31,8. So he chooses B; c) Now he can't decide. Why? Because the weighted average is not defined in a one-dimensional affine space.. Moreover, physical units are not part of the definition of the weighted average. The weighted average operator gives an infinite number of non-equivalent outcomes and is therefore unusable for decision-making!
10. The child is absolutely right: a) The scale is undefined: what does a '7' mean on a scale of…?; b) The three partial scores cannot be added, and the weighted average is not defined; c) Above all, the claim of a 'good result' is relative to the other participants. Imagine, for instance, that four other professors each received a score of 9—or alternatively, all scored 6. The weighted sum, without any relative and normalized context, therefore provides no meaningful information. Even if the scores were relativized and a reference point were introduced to justify operations such as addition or multiplication, this would still yield only absolute information, which fails to reflect reality. What the child doesn't know, however, is that the problem is in fact solvable—by normalizing the scores and then applying the weighted least squares difference method within the affine preference space.