Article

Climbing the Needs Pyramids

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Abstract

Abraham Maslow's theory of human adult motivation is often represented by a pyramid image showing two proposals: First, the five needs stages in emergent order of hierarchical ascension and second, a percentage of the adult population suggested to occupy each needs tier. Specifically, Maslow proposed that adults would be motivated to satisfy their unfilled needs until they reached the hierarchy's apex and achieved self-transcendence. Yet how adults can purposefully ascend Maslow's pyramid through satisfying unfilled needs remains elusive. This brief article challenges this on the theory's 70th anniversary by presenting a new image of the needs hierarchy, based on ecological design principles to support adults' purposeful endeavors to climb the needs pyramid.

Keywords

Maslow, motivation, ecological interface design, cognitive engineering

How do we climb Maslow's pyramid? It is now 70 years since Maslow (1943a) proposed his theory of human adult motivation as the process of satisfying needs arranged in hierarchical levels of prepotency, now often simplified to the visual image of a pyramid. For Maslow, adults were a driven "wanting animal" (Maslow, 1943a, p. 87) until their needs were satisfied. Maslow however did not provide a means for satisfying those unfilled needs and from this author's research neither did he produce the iconic pyramid image. Referring back to Maslow's original papers, the closest indication of a pyramid hierarchy appears to be

> for the sake of illustration, it is as if the average citizen is satisfied perhaps 85 per cent in his physiological needs, 70 per cent in his safety needs, 50 per cent in his love needs, 40 per cent in his self-esteem needs, and 10 per cent in his self-actualization needs. (Maslow, 1943b, pp. 388-389)

When an image such as the pyramid image is used to describe a process, that image becomes a diagram, and ultimately for a diagram to work the meaning of the original idea and the visual representation must be maintained. Yet the pyramid diagram goes further than Maslow proposed by constraining the theory within a framework of solid lines and textures that compartmentalize each needs stage into distinct tiers. These subsequent additions are not acting as separators but boundaries, generating false mental representations that may hinder an adult's ability to recognize the early appearance of satisfied or emergent needs. Furthermore, without the support of an appropriate mental model, adults can fail to solve problems effectively. This is supported from numerous studies that show that adults who consider they cannot perform a task, such as walking up stairs, do not try (Warren & Whang, 1987) or when they do not see the action potential of a horizontal door handle, do not see the potential to open the door (Tipper, Paul, & Hayes, 2006). Considered together it is questionable that the pyramid of needs as a diagram adequately represents Maslow's theory of motivation.

In devising a diagram for Maslow's needs hierarchy, we must avoid creating mental barriers that could discourage a person from believing they can pass from one level of the hierarchy to the next. It should also provide a means of showing the degree of needs satiety at each stage and offer support in developing unsatisfied needs by identifying the developmental needs that will aid an owner's ascension through the hierarchy. However, a problem lies in how a person can first access their own needs hierarchy to assess their levels of needs satiety. To address this, we can use a new technology called Emergent Feature Displays (EID; Vicente & Rasmussen, 1992) to provide a direct perceptual interface between a person and their own hierarchy of needs.

The Ecological Interface (EI) Effect

EI displays work by showing the results in the form of a shape instead of displaying the results of data searches as bits of related information for a person to mentally manipulate. An example of the EI effect is when we purchase a large product over the Internet, but when a small package arrives we can immediately see that it does not contain our

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purchase because the package is too small. Preliminary investigations suggest that such direct perception may be useful when looking for patterns in data, such as the early identification of cardiovascular disease (McEwen, Flach, & Elder, 2012) and anesthesia monitoring in noisy operating rooms (Watson, Russell, & Sanderson, 2007). Hazardous areas are also suggested to benefit from the EI effect where operators need to be able to quickly assimilate operational status, such as the petrochemical industry (Jamieson, 2002), military tactical operations (Hall, Shattuck, & Bennett, 2012), and in nuclear power stations (Kim, Suh, Jang, Hong, & Park, 2012). Hall et al. (2012) go further and suggest that in their study of tactical commanders ($N = 16$) who completed reports using information taken from either traditional or EI displays, not only were EID reports completed faster and with more accuracy, but the EI went further, supporting participants' decision making and evoking their expertise. One account for this is that EID supports the decision-making process by not drawing heavily on an operator's limited cognitive resources as the task becomes more cognitively challenging (Vicente & Rasmussen, 1992). The aviation sector is another emerging area where EID is considered useful as pilots are not able to see the operational status of their aircraft when airborne and rely on instruments to provide in-flight status information. Coekin (1969) produced a feature display that was adapted by Dinadis and Vicente (1999) as part of a new instrument panel providing pilots with functional and overall status of an aircraft's engines when in flight. It is an adaptation of this display that forms the basis for a person to see their hierarchy of needs and measure needs satiety.

The Design

Figure 1 shows an adaptation of Dinadis and Vicente's (1999) prototype instrument display that was developed on EI design principles for pilots to monitor the in-flight health of the Lockheed C-130 Hercules aircraft's engines.

The star diagrams (Coekin, 1969) in the top row show each engine's current operational performance through a dynamic status line superimposed onto a static octagon diagram incorporated into the display. Each axis represents a predefined subsection of an engine's operating parameter (e.g., fuel, oil, air, etc.) with colored tick marks along the length indicating degrees of alarm should the parameter fail. More tick marks extend the star diagram's outer rim mark indicating the engine's safety envelope, the engine's utmost functional capability before capacity thresholds are breached. Each engine has its own state diagram in the shape of a trapezium below it that shows the engine's higher order performance parameters, for example, 0 to 1 Heat, 1 to 2 Wind flow, and so on. As shown in Figure 1. Engine 1 is performing as expected, and therefore, its star diagram and state diagrams are symmetrical. However, Engine 2 is functioning outside operational expectations, and therefore, the

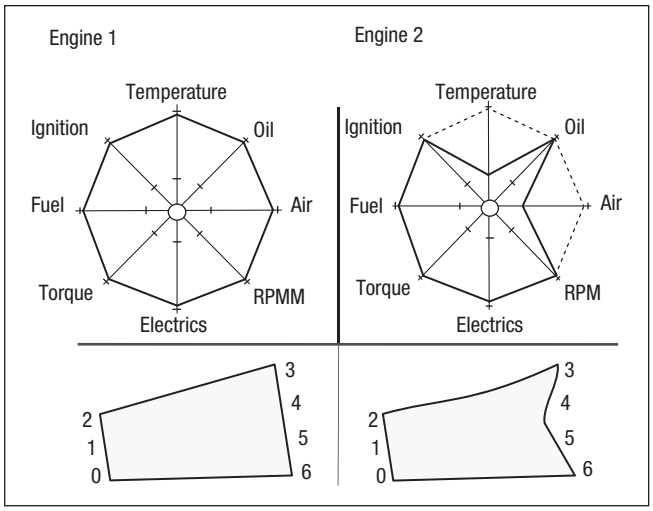

Figure 1. Section of the C-130's engine display showing Engines 1 and 2's in-flight performance parameters as star diagrams with overall engine state diagrams below.
Source. Adapted from Dinadis and Vicente (1999).

superimposed line in the star diagram has moved toward the errant parameter's axis alarm tick thus incurring loss of shape symmetry. The color of the entire polygon then changes to the same color as the most acute alarm tick identified by the status line. Simultaneously that engine's state diagram loses shape symmetry in a manner indicative of the engine's overall health. For example, in Figure 1, Engine 2 shows some problem with the temperature and air so the corresponding state diagram below shows a loss of shape symmetry between the higher order stages 4 to 5—the turbines output.

It is the principles used here to monitor the aircraft's in-flight health that form the basis and process for adults to climb Maslow's pyramid.

Climbing the Needs Pyramid

Figure 2 is the same engine display adapted to reflect Maslow's (1943a) original hierarchy of needs. Now presented as a computer or phone application, Engine 1 is replaced by a circular hierarchy of needs sectioned into five segments, each representing one stage in the needs hierarchy. The outer rim tick marks have been removed to encourage adults to apply their resources only within the circle.

The solid axes that previously displayed the engine's functional parameters are now serrated; acting as a scale to show the satisfaction of each needs components and, as a visual prompt to remind the owner of the transferability of learned skills and the dynamic manner of needs satiety. A centrally placed traffic light system with subdued amber and red color coding now functions to alert, not alarm, the owner of concerning unsatisfied needs per stage. Engine 2 is replaced by a current task circle to show the owner's

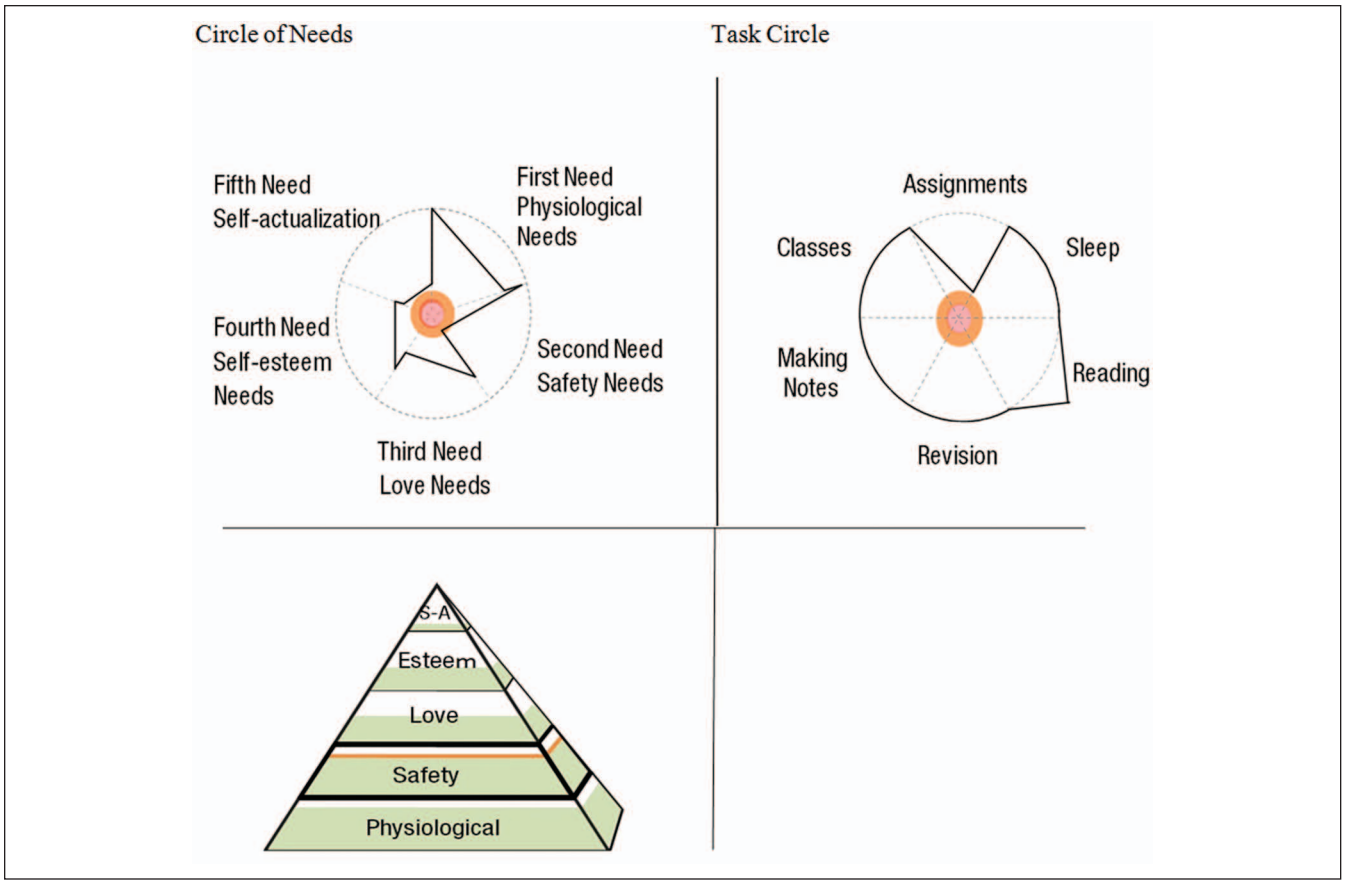

Figure 2. Example of an adults completed circle of needs with an academic task circle.
Note. The state diagram is now a typical hierarchy of needs pyramid showing needs deficits by stage, stage significance, and self-perceived degree of concern.

self-perceived assessment of their top-down endeavors to fill their bottom-up unsatisfied needs identified in the needs hierarchy. The state trapezium shape is replaced by Maslow's pyramid to provide a visual overview of the owner's self-perceived degree of needs satiety with their current developmental stage highlighted.

Figure 2 shows one possible distribution of Maslow's illustration of the average person's satisfied needs mentioned earlier. Typically figures would be provided by the owner who chooses what percentage they believe each component of a need is satisfied gained from a needs satisfaction checklist (the appendix). Percentages are then ranked with the highest and lowest figures shown between the relevant needs segment's axes. This is a departure from Dinadis & Vicente's display that shows the engine's functional status on one axis. However, by using the space between the axes we can now reveal the functional behavior of the needs components—the developmental needs. The emergent feature now shows the owner's hierarchy of needs and the owner's concern of each stage's component needs. These color-coded results are then transferred to the hierarchy of needs pyramid below that now acts as the owner's state diagram.

In Figure 2, we can see from the shape's loss of symmetry into the amber alert zone that there is a needs component in the Safety needs stage that is causing the owner concern. The owner however is not obliged to satisfy this need and is free to choose which outstanding needs to develop based on need motivation, the position of the superimposed line to an alert zone, what resources are available (from the checklist), and personal desires. Nevertheless the EI effect is supporting the owner in their choice of which needs stage to address by drawing their attention to the alert. Identifying which particular component is generating the alert (security of employment) can then be gained from the checklist. If the owner chooses to remove the threat causing the amber alert they could draw on their "security of resources" component, and perhaps choose to enroll on an educational course to enhance their job prospects with the support from their spouse, Stage 3—Love needs.

Once enrolled Student Services or the Internet can provide the important variables involved in successful study, that is, library skills, efficient note taking, and so on, which are then added one variable per segment to the current task circle. The number of segments in the task circle can be

increased or reduced as required to accommodate the amount of key variables necessary for success. Each academic term can then be time-tabled on Pareto principles and incorporated into a countdown organizer such as the Franklin Planner, Gantt chart, or a similar Student's Services initiative. Figure 2 also shows the emergent feature extending the circle rim suggesting excessive resources are being allocated to one segment while another segment is approaching the amber alert, for example, procrastination. Suitable progress is gained by the owner trying to regain circle symmetry throughout their course by adhering to the important variable requirements for their chosen task and, in achieving this, moves them away from the central alerting zones.

Another scenario for Figure 2 could be that of an obese owner who agrees their Safety needs are not satisfied yet chooses to develop their Esteem needs (self-esteem) that also benefits their Safety needs (affordable health insurance) by incorporating key variables identified with successful weight loss onto the task circle, that is, exercise, food choices, counseling, and so on. Alternatively, Figure 2 could be that of an individual employee in the workplace who wants to satisfy their Love needs so attends the organizations' health and fitness initiatives, boosting their group membership component and also perceived job security (Safety need). According to Maslow once the owner's unsatisfied needs start being filled new needs in the next stage of the hierarchy emerge and so the cycle of redrawing the circle of needs, identifying the new emergent features then choosing tasks to satisfy those needs restarts at a higher tier of the hierarchy and so forth till the owner reaches the apex. Keeping needs satisfied so as not to descend the pyramid requires following chosen task requirements, for example, clients attend all scheduled therapy appointments, students passing all academic assignments, or an employee's sustained better time-keeping practices. In this manner, an adult's path through the needs hierarchy is guided and not dictated, by the internal traffic light system, the location of the deviation from shape symmetry, the results from the checklist, what is meaningful to the owner, and the resources they have available.

However, there are limitations that need further investigation, for example, we know more about the lower hierarchical needs than the higher stage needs that may restrict the owner's choice of needs components as they rise through the checklist. Another consideration is what impact is there on a person's ability to effectively problem solve now the developmental and deficiency needs are incorporated into the EI effect. Moreover, the owner must estimate what percentage they think each need is satisfied, unlike that of an aircraft engine where every part and its functioning are known and fed directly into the display. Clearly then this presentation will need further investigation; however, it suggests an alternative view of Maslow's hierarchy of needs, the process by which people could ascend the needs hierarchy and offers further opportunities to empirically measure needs satiety and human motivation.

Appendix

One Possible Distribution of Maslow's Average Person's Satisfied Needs

Needs Satisfaction Checklist.

	Stage 1—The physiological needs	Percentage satisfied	Percentages ranked	Highest/lowest
1	Food	83	98	
2	Clothing	70	95	
3	Warmth	93	94	
4	Rest	87	87	
5	Sex	83	85	
6	Sleep	72	83	
7	Oxygen	98	81	
8	Shelter	95	79	
9	Water	81	76	
10	Temperature regulation	79	72	98-72

(continued)

Appendix (continued)

	Stage 2—The safety needs	Percentage satisfied	Percentages ranked	Highest/lowest
1	Order	83	93	
2	Security for property	70	83	
3	Security of resources	93	83	
4	Security of employment	Amber	80	
5	Freedom from physical threat	70	80	
6	Stability	65	76	
7	Protection from dangerous situations	80	70	
8	Freedom from psychological threat	76	70	
9	Limits	80	65	
10	Law	83	Amber	93-Amber
	Stage 3—The love needs	Percentage satisfied	Percentages ranked	Highest/lowest
1	Spouse	72	72	
2	Family	51	68	
3	Friendships	36	61	
4	Intimacy	68	52	
5	Groups	31	51	
6	Acceptance	49	49	
7	Affection	61	48	
8	Relationships	32	36	
9	Trust	48	32	
10	Receiving/giving love	52	31	72-31
	Stage 4—The esteem needs	Percentage satisfied	Percentages ranked	Highest/lowest
1	Self-esteem	26	54	
2	Esteem from others	48	50	
3	Respect from others	50	48	
4	Recognition	40	44	
5	Feelings of mastery	35	40	
6	Self-worth	44	36	
7	Reputation	54	35	
8	Approval from others	36	34	
9	Sense of competence	33	33	
10	Status	34	26	54-26
	Stage 5—Self-actualization	Percentage satisfied	Percentages ranked	Highest/lowest
1	Creativity	10	11	
2	Fulfillment	10	11	
3	Morality	10	10	
4	Acts spontaneously	9	10	
5	Problem solving	10	10	
6	Authenticity	11	10	
7	Tolerance	10	10	
8	Lack of prejudice	11	10	
9	Acceptance of facts	10	9	
10	Concern for humanity	9	9	11-9

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