MARKETING NOTES AND COMMUNICATIONS

HIT: Heuristic Ideation Technique— A Systematic Procedure For New Product Search

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The validity of some commonly used group approaches for generating new product ideas, such as brainstorming, has been questioned by researchers. This article presents a systematic approach for generating product ideas. It is based on a definition of creativity and utilizes an illustration from the food processing industry.

THE generation of new product ideas is as important to the success of new products as is product development, testing, or marketing; successful new products are unlikely to emerge without good ideas. Raymond Haas noted that most companies are continually searching for and evaluating new ideas.[1]

Sophisticated methodologies have been developed to screen new products. These were formulated in response to the questionable but fear-invoking attrition rates of new products (e.g., 80%) and their attendant costs. Many large firms have ongoing machinery for testing and screening new product candidates (new product departments with development engineers, scientist, and market research analysts), where many of the individuals involved devote full time to the effort. However, much less time and effort has been expended on developing a systematic search methodology to generate new product ideas. None of the five large food processing firms surveyed by this author possessed any search technology beyond simple brainstorming sessions or similar group-thinking formats. Given the tremendous proliferation of products in the food industry, and to a similar extent in other industries, a systematic approach for generating new ideas is becoming a necessity.

A possible explanation for this alleged misallocation of effort concerns the type of problems associated with the performance of each of the two activities. Screening presents management with a situation more closely akin to what Simon and Newell call a "well-structured problem."[2] Here, the problem can be described in terms of numerical variables, and the goals to be attained can be specified in terms of a rather well-defined objective function. Idea generation, on the other hand, possesses the opposite characteristics and would be classified as "ill structured."

When a firm lacks a systematic procedure for generating new product ideas, the timing of idea inputs to the firm will be random. Therefore, at any one point in time the firm's portfolio of alternative ideas may or may not contain a sufficient number of "good ideas" which could lead to a successful product if properly developed and marketed. Since most firms have established machinery for developing and screening new product candidates, they are reluctant to have their development engineers and market research analysts remain idle. Thus, when good ideas are scarce, many marginal ones may be injected into the screening process. Out-of-pocket screening and marketing costs, loss of employee morale, and an opportunity cost from a lack of successful new product introductions are the costs associated with the product attrition and failure which usually occur.

The validity of the formalized approaches which have been used (brainstorming, synectics, and other group methods) has been questioned in a number of experimental studies.[3] The findings indicate that individuals working alone are more effective in generating more and better creative solutions than groups. Thus, develop-

[1] Raymond M. Haas, *Long Range New Product Planning in Business* (Morgantown, West Virginia: West Virginia University Library, 1965).

[2] Herbert A. Simon and Allen Newell, "Heuristic Problem Solving: The Next Advance in Operations Research," *Operations Research* (January-February, 1958), pp. 4-5.

[3] See Norman R. F. Maier, *Problem Solving and Creativity in Individuals and Groups* (Belmont, Calif.: Brooks/Cole, 1970); T. J. Bouchard, "Personality, Problem Solving Procedure and Performance in Small Groups," *Journal of Applied Psychology* (February, 1969); D. W. Taylor, P. C. Berry, and G. H. Block, "Does Group Participation When Using Brainstorming Facilitate or Inhibit Creative Thinking," *Administrative Science Quarterly*, Vol. 3 (1958), pp. 23-47; and O. K. Moore and S. B. Anderson, "Search Behavior in Individual and Group Problem Solving," *American Sociological Review* (December, 1954), pp. 702-714.

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ment of an idea-generating tool which could be used by the individual was deemed desirable.

This article presents such a tool called the heuristic ideation technique (HIT) with illustrations from an application in the food processing industry.[4] It is believed that this method could be readily adapted to other product areas.

The Technique

Most psychologists accept the definition of creative output (the ideas) as combinations of two or more concepts in the mind of the creator. If one could obtain all "relevant" concepts that apply to a product area, then, by definition, the set of all possible combinations of these concepts (the power set) would represent the total set of product ideas in that area given today's knowledge.

The steps suggested in using this approach are:

(1) Locate all "relevant" concepts (hereafter referred to as factors) that could be associated with a given product area (e.g., the food processing industry).

(2) The total set of ideas is the set of all possible combinations (the power set).

A similar idea generator was proposed by Zwicky in what is termed a morphological box. Here, all parameters relating to a problem are identified, and the set of possible values for each parameter is collected. The alternative solutions are found in the n dimensional box where each cell contains a combination of one value drawn from each parameter. The HIT idea generator is similar, but it acknowledges that a solution could contain zero or more than one value from each parameter; e.g., two vegetables in a processed food, or two types of locomotive power in a car.[5]

Some major benefits can be seen for such an idea generator. It could be employed to provide ideas for all product categories within an industry (e.g., beverages, main meal items, and breakfast food). Another desirable feature would be the reduction of some of the usual constraints or blocks to creativity. For example, in generating new snack food ideas, words which naturally come to mind are those already relating to known snack foods —cheese, chips, corn. Psychologists call this habit-transfer. Similarly, the limitation of memory may lead to the exclusion of applicable words. Thus, with unaided thinking, the likelihood of generating new and unusual combinations tends to be restricted. The proposed mechanical idea generator has no such barriers.

The first step in operationalizing the proposal involved obtaining a comprehensive list of factors for the industry. It was observed that if a number of factors combine to make a product idea, then existing products should be able to be decomposed into a list of factors.

After locating as many existing food products as could be identified, each was "decomposed." For example, brownie mix would yield: brownie, chocolate, walnuts, mix, box, mixing, baking, and so on. Such basic ingredients as sugar, flour, water, and salt were not included since the same combination of these would produce many different food items. Each food was decomposed at a higher level; i.e., types of meat, fruit, and vegetables. The resulting list of factors was then classified into the various dimensions of the food world. This classification related directly to the questions: What? (product form, technology, packaging, ingredients); how? (consumer preparation, kitchen appliances); when? (meals); and why? (consumer benefits).

Heuristic Search Procedures

The fluency of this idea generator is at the same time its greatest drawback. Since the number of possible combinations is enormous (2^n-1), efficient ways of reducing the number to be reviewed had to be found.

The difficulty and extreme cost of analyzing and selecting from millions of combinations is prohibitive for any organization; however, satisfactory solutions to problems can often be obtained without searching through the entire set of alternatives. "Intelligent problem-solving . . . implies selective rather than just rapid behavior. Humans achieve this selectivity through heuristics."[6]

Heuristics are rules-of-thumb often derived from trial and error experiences that have been successful in producing "acceptable" solutions (though not necessarily "optimal") to a type of problem. They represent "any principle or device that contributes to the reduction in the average search to solution"[7] by "eliminating sets of alternatives likely to result in poor solutions while retaining sets of alternatives which have a high probability of yielding optimal or near optimal solutions."[8]

In the food industry it was observed that for any particular new product problem the optimal solution could not be guaranteed unless *every* combination of factors was evaluated. A simple example will demonstrate why.

Conceptually, one can evaluate an idea as being some function of the value of the individual factors of which it is comprised. In evaluating the word combinations,

[4] E. M. Tauber, "HIT: Heuristic Ideation Technique, A Systematic Procedure for New Product Search," unpublished doctoral dissertation, Cornell University, September, 1969.

[5] Fritz Zwicky, *Discovery, Invention, Research Through the Morphological Approach* (New York: The Macmillan Company, 1969).

[6] F. M. Tonge, "The Use of Heuristic Programming in Management Science," *Management Science,* Vol. 7 (April, 1961), p. 231.

[7] A. Newell, J. C. Shaw, and H. A. Simon, "The Processes of Creative Thinking," in *Contemporary Approaches to Creative Thinking,* H. Gruber, editor (New York: Atherton Press, 1962), p. 78.

[8] Alfred Kuehn, "Complex Interactive Models," in *Quantitative Techniques in Marketing Analysis,* R. E. Frank, A. Kuehn, and W. Massy, editors (Homewood, Ill.: Richard D. Irwin, Inc., 1962), p. 117.

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synergistic effects were observed. A simple model might show the value of an idea as being equal to the sum of the value of each factor plus any positive or negative interaction effects between them.

$$\text{Value} = A + B \pm (AB)$$

This interaction is usually the key to locating the ideas with the greatest potential. For example, in generating "snack food" ideas, three factors which could be considered are chip, shake, and potato. Individually evaluated, each factor rates relatively low, but the combination potato chip rates very high while potato shake appears marginal. In the first case, the interaction effect was positive, in the second negative. Without reviewing every possible combination of factors, some idea might be overlooked which contains this strong positive interaction effect.

Several powerful heuristics have been developed for idea generation in the food processing industry which attempt to sort out combinations that have high positive interaction. Although HIT only generates ideas and does not screen them, these heuristics considerably reduce screening time. One heuristic is based on the observation that the majority of the positive interaction effects are at the two-factor level; i.e., the "heart" of most food ideas can be described in a two-word combination (toaster tart) even though the idea is incomplete (e.g., it lacks flavors, ingredients, shape, and packaging).

A second heuristic is that certain cross classifications yield more interesting ideas than others. Different technologies applied to the various food forms often produce more meaningful concepts than combinations such as vegetables with fruits.

Some specific heuristics for the food industry suggest cross classifications:

(1) Kitchen appliances applied to various foods (toaster waffles);

(2) Foods adapted to a different meal (breakfast milkshake);

(3) Dessert words applied to nondessert foods (rice cream flakes cereal);

(4) Gaps in consumer benefits applied to existing food forms (nutritious coffee).

Implementation

To simplify usage and to enable the general use of HIT, the more interesting cross classifications from the food industry application were arranged in matrix form; over 300 grids were generated from a list of 554 factors in 26 categories. (Table 1.)

In order to use the idea-generating grids, the creator is instructed to review each cell in the grid, place an X on the number of every word combination that represents an existing item on the market, and circle the number of any combination that might have market potential. After analyzing a grid, the creator should write a short statement about each of the combinations he felt was interesting, describing how he sees the product, its use, and so on. A sample grid is provided below to enable the reader to experiment with the approach.

Experience has shown that people obtain varying results using the same grid due to differences in knowledge, perception, taste, and innate creativity. Since the combinations are incomplete ideas (only two words), imagination is needed in visualizing the product. This apparent limitation is at the same time a benefit since the "rough" combinations (e.g., aerosol butter) act as a stimulus for the creator, and he is challenged to develop a meaningful product concept.

Merits and Limitations of HIT

HIT has several appealing characteristics, especially when the technique is viewed in relation to the methods which are currently being employed. There are also limitations that must be considered in its final evaluation.

Merits:

The approach

(1) is systematic, freeing management from the ills of random timing of new idea inputs;

(2) enables management to consider many alternatives, thus increasing the probability of finding good ideas;

(3) is flexible. The set of factors need be specified only once. The power set should contain ideas for many product areas in the industry.

(4) is designed for use by the individual and requires no special training. Thus, the grids could be used by product managers, employees, and consumers.

Limitations:

The approach

(1) relies on management's ability to specify all "relevant" factors, itself a difficult problem;

(2) employs heuristics which do not guarantee optimal solutions;

(3) only delivers a combination of factors. A crucial step of translating these into a workable product is left to the imaginative individual;

(4) may provide new product ideas which are currently technically infeasible (but where profitable research and development work might be undertaken).

Summary

"Companies with a major interest in product innovation or diversification cannot . . . rely on informal and spontaneous processes of idea generation. An increasing number are recognizing the advantages of seeking out new areas of risk systematically."[9]

HIT does not present a panacea for generating product ideas. It operates neither automatically nor independently of the knowledge, ability, and insight of its

[9] Philip Kotler, *Marketing Management* (Englewood Cliffs, N.J.: Prentice Hall, 1967), p. 319.

TABLE 1
SAMPLE GRID

Food Forms	*Packages*												
	Aerosol	*Bag*	*Boil in Bag*	*Bottle*	*Box*	*Can*	*Envelope*	*Flow-thru Bag*	*Jar*	*On a Stick*	*Pan*	*Sack*	*Tube*
Biscuit	1	2	3	4	5	6	7	8	9	10	11	12	13
Bread	14	15	16	17	18	19	20	21	22	23	24	25	26
Burger	27	28	29	30	31	32	33	34	35	36	37	38	39
Butter	40	41	42	43	44	45	46	47	48	49	50	51	52
Cereal	53	54	55	56	57	58	59	60	61	62	63	64	65
Cocktail	66	67	68	69	70	71	72	73	74	75	76	77	78
Cookie	79	80	81	82	83	84	85	86	87	88	89	90	91
Crust	92	93	94	95	96	97	98	99	100	101	102	103	104
Custard	105	106	107	108	109	110	111	112	113	114	115	116	117
Dip	118	119	120	121	122	123	124	125	126	127	128	129	130
Dressing	131	132	133	134	135	136	137	138	139	140	141	142	143
Fish	144	145	146	147	148	149	150	151	152	153	154	155	156
Fondue	157	158	159	160	161	162	163	164	165	166	167	168	169
Frosting	170	171	172	173	174	175	176	177	178	179	180	181	182
Fruit	183	184	185	186	187	188	189	190	191	192	193	194	195
Glaze	196	197	198	199	200	201	202	203	204	205	206	207	208
Ice cream	209	210	211	212	213	214	215	216	217	218	219	220	221
Jelly	222	223	224	225	226	227	228	229	230	231	232	233	234
Juice	235	236	237	238	239	240	241	242	243	244	245	246	247
Meat	248	249	250	251	252	253	254	255	256	257	258	259	260
Pancake	261	262	263	264	265	266	267	268	269	270	271	272	273
Pie	274	275	276	277	278	279	280	281	282	283	284	285	286
Pizza	287	288	289	290	291	292	293	294	295	296	297	298	299
Salad	300	301	302	303	304	305	306	307	308	309	310	311	312
Sandwich	313	314	315	316	317	318	319	320	321	322	323	324	325
Soup	326	327	328	329	330	331	332	333	334	335	336	337	338
Tea	339	340	341	342	343	344	345	346	347	348	349	350	351
Vegetables	352	353	354	355	356	357	358	359	360	361	362	363	364
Waffle	365	366	367	368	369	370	371	372	373	374	375	376	377

user; it is simply a stimulant for creativity. HIT provides a major reorientation that shifts the focus of the creator from searching for ideas *per se* to discovering and applying heuristics in order to achieve the former objective. The grids provide a framework for systematically applying the heuristics and reviewing the resulting ideas. Although the application of heuristics in this fashion can yield many good ideas, the major breakthroughs often result from the discovery of new heuristics. It is this process which needs further study.