The Effects of Experience and Education on the Organization of Marketing Knowledge

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ABSTRACT

This research investigates changes in the cognitive organization of marketing knowledge as experience and education increase. In the first of two studies, marketing managers and marketing students were asked to sort terms from an introductory marketing text into groups of related concepts. In the second study, the same managers sorted terms specific to their corporation into groups of related concepts. Unbeknownst to the subjects in both studies, there was an underlying functional structure to the terms. The organization of marketing knowledge corresponded more closely with the expected structure as education increased and, to a much greater extent, as experience increased. Implications of the results for exploiting managerial expertise and for training managers are discussed. © 1993 John Wiley & Sons, Inc.

The role of knowledge in solving real-world problems is of current research interest in marketing (e.g., Leigh & McGraw, 1989; Sujan, Sujan, & Bettman, 1988; Szymanski, 1988) and psychology (e.g., Murphy & Wright, 1984; Wagner & Sternberg, 1985). Greater factual knowledge of a domain and greater understanding of how to use that knowledge combine to produce what is often called expertise. Much of the superior performance of experts appears to be due to their highly organized

knowledge structures in memory (Chi, Feltovich, & Glaser, 1981). Novices, on the other hand, suffer both from a smaller quantity of knowledge and from less well organized knowledge.

Knowledge organized in memory is the foundation from which problem solving begins. Studies of human problem solving have concluded that the quality of the cognitive representation of a problem greatly influences the quality of the problem solution (Newell & Simon, 1972). Domain-specific knowledge gained through experience and education is crucial in guiding the construction of cognitive representations (Simon, 1979a). Because the quantity and quality of knowledge differ by expertise, the problem representation will differ, and consequently the solution itself. Therefore, to begin to understand marketing problem solving requires first understanding the structure of marketing knowledge.

This research investigates how the organization of marketing knowledge changes with marketing education and marketing experience. In two exercises, subjects sorted marketing terms into groups of related concepts. Their groupings were compared to an expected, target organization of the concepts. The agreement between the subjects' organization of the concepts and the target was expected to increase as experience and education increased. The quantity of knowledge involved in the task was held constant by requiring all subjects to use the same set of concepts. Thus, differences in how experts and novices organize their knowledge, rather than simply the volume of information they know, were examined. By studying the way in which knowledge is organized, this research is one step toward an improved understanding of marketing problem solving.

KNOWLEDGE AND MARKETING

The primary theory for examining knowledge in real-world domains has been the categorical model of memory. A cognitive category structures our knowledge about a domain by organizing similar items into a cohesive grouping (Rosch, Mervis, Gray, Johnson, & Boyes-Brean, 1976). Two types of knowledge are associated with categories—declarative knowledge of facts about a domain and procedural knowledge of heuristics that guide behavior related to the domain. Applying the categorical model to marketing, Weitz, Sujan, and Sujan (1986) state that declarative knowledge provides the data base for understanding a domain. Again from a marketing perspective, Szymanski (1988) defines declarative knowledge as attribute information associated with a category. Procedural knowledge, on the other hand, is a set of learned howto routines (Leigh & McGraw, 1989) that are performed in a specific situation, much as one would follow a prespecified script. According to these researchers, and others outside of marketing, both the quantity

and the quality of categorical knowledge could be expected to change with expertise.

There are, however, relatively few empirical studies of experts' knowledge related to marketing tasks (see Sujan et al., 1988 for one example). One reason for this deficiency may be methodological and another more philosophical. As builders of expert systems attest, explicating expert knowledge has been more difficult than originally anticipated (Davies & Hakiel, 1988). Expert knowledge is often tacit and unarticulated; thus acquiring that knowledge then codifying it has been a major bottleneck in system development. Marketers have employed several additional techniques to extract expert knowledge besides those traditionally used in consumer behavior research. In developing a media planning system, Mitchell (1987) used four methods to acquire knowledge from experts—free elicitation, problem sorting, protocol analysis, and solving simulated problems. When building an advertising planning system, Rangaswamy, Burke, Wind, and Eliashberg (1987) started by compiling variables and decision rules from published materials such as textbooks and manuals, but also gathered detailed input from experienced decision makers. However, after surveying the field, Wierenga (1990) concluded that there are very few (three or less) operational expert systems in marketing today. Overall, it appears that we are at a rather primitive stage of development where we are learning how to extract categorical knowledge from experts but are farther from being able to utilize that knowledge to solve marketing problems.

A second reason for the small number of studies of expert knowledge in marketing may be the problem of validating the quality of that knowledge. In other words, even when it is possible to gather knowledge from experienced marketing managers, how do we know that it is in fact expert-level knowledge? The existing studies of expertise in marketing management have been able to demonstrate differences between novices and experts, but have not attempted to validate the quality of the subjects' knowledge against a norm. The knowledge acquired from marketers could be validated against a known, objective standard. Chakravarti, Mitchell, and Staelin (1979), for example, compared managers' judgments to the output of a simulation model. But, of course, that method assumes that the model is correct and the experts' judgments are then unnecessary. Instead, in marketing we rarely have empirically derived generalizations to use as a standard (e.g., Leone & Schultz, 1980). This difference in the kind of knowledge available in marketing suggests that experts may have to be validated relative to other experts, in a more consensual fashion. Keon and Bayer (1986), for example, asked experienced sales managers questions about promotions, then compiled the results into consensus judgments among the managers.

In sum, the categorical model of memory provides a theoretical framework for understanding how the knowledge of experts and novices differ.

But so far, little empirical research has been conducted to examine the knowledge of marketing experts or to validate the quality of that knowledge.

RESEARCH ISSUES AND HYPOTHESES

Experts and novices differ in terms of how much categorical knowledge they have and, what seems to be especially crucial, in terms of how well they have organized their knowledge. Two issues related to the impact of expertise on the organization of knowledge are changes in the number of cognitive categories and changes in the content of those categories. Concerning the first issue, most research has hypothesized that the number of categories for a given level of abstraction will increase with expertise (Rosch et al., 1976). Because experts know more, they need more categories to handle the greater volume of knowledge. For example, chess masters may have as many as 50 times the number of chessboard configurations in memory as even good chess players (Simon & Gilmartin 1973). In addition, experts may use more categories to differentiate more precisely between concepts. The larger number of differentiated categories allows for more exact problem categorization and consequently more effective problem solving (Chi et al., 1981). Previous research has not always concluded that the number of categories increases with expertise. Expert probation officers have been found to use fewer schemata (Lurigio & Carroll, 1985), presumably because they enriched a few useful cognitive structures rather than simply adding new ones as they gained experience.

The first question to be considered in this research is how the number of categories used to structure marketing knowledge changes with increasing education and experience. Do experts use a few broad groups or several distinct groups or even a combination of both? Most previous research has found that the number of categories does increase with expertise. Hence, it is hypothesized that

H1: The number of cognitive categories used to structure marketing knowledge will increase with education and experience.

The second major issue relates to changes in the content of cognitive categories with expertise. Both the amount of declarative knowledge and the amount of procedural knowledge associated with a category increase with expertise (Sujan et al., 1988). It is usually assumed that the quality of that knowledge also increases. As Chi (1983) has noted, experts' knowledge is better not merely in terms of amount known but in terms of what knowledge they organize together in each category. Experts appear to organize knowledge on the basis of domain-relevant functionality. Chess masters organize their knowledge by meaningful relationships, such as strategic chess positions (Chase & Simon, 1973).

To study the organization of knowledge, Lurigio and Carroll (1985) asked probation officers and clerical staff to sort items of information (e.g., age, race, sex, mental status) into offender case profiles. As expected, the officers matched an a priori expected organization of the information to a greater extent than did the staff. It was inferred that the officers' groupings represented a more highly developed cognitive organization of their knowledge of offenders. In other words, they knew what bits of information fit together to form a meaningful offender profile. Similarly, in physics, Chi et al. (1981) found that undergraduate students sorted physics problems into groups on the basis of the physical objects involved in the problems, compared to graduate physics students who sorted on the basis of the physics principles underlying the problems. Again it was inferred that experts grouped according to the deeper, underlying meaning of the problems. In marketing, Mitchell (1987) and Weitz et al. (1986) also suggest using sort methods as a way to measure knowledge structures.

Experienced marketing managers could also be expected to organize concepts on the basis of meaningful, functional marketing relationships. As experience increases, the pieces related to new product development, for instance, should fit together into a unified understanding of that aspect of marketing. Categories of marketing management tasks should be learned through both education and experience. The question to be considered in this research is what knowledge is contained in each category. It is hypothesized that

> **H2:** The functional organization of marketing knowledge will increase with education and experience.

In sum, it is expected that as marketing experience and education increase, the number of cognitive categories used to structure marketing knowledge will increase and in addition the functional content of those categories will increase.

STUDY 1

Research Method

To study the effects of education and experience on marketing knowledge, hypothetical categories of related marketing concepts were constructed to serve as a standard of comparison. Each category represented a major marketing function. The ideas within each category are logically related and usually learned together, in order to understand the marketing function. If a person has indeed learned the relationships between the concepts, the group becomes "unitized" so that a chunk of connected concepts will be activated rather than individual concepts (Hayes-Roth, 1977).

These hypothetical categories were developed from a well-known graduate introduction to marketing text, *Marketing Management* (Kotler, 1980). Six marketing terms were selected from each of the chapters on advertising, sales promotions, new products, and competitive strategy. As illustrated in Table 1, significant terms embodying important marketing concepts were chosen. For example, the terms "carry-over effects, copy testing, flighting, image, reach, and recall" appear in the chapter on advertising. Most terms appeared in section headings or in italics. Both generic, superordinate terms such as advertising or new products, and specific, subordinate terms such as types of trade promotions—off invoice or billbacks—were excluded.

Subjects. The study involved three groups of subjects with varying levels of marketing experience and education. First, 15 brand managers from a large corporation that produces consumer packaged goods participated. They averaged over two years of brand management experience; 13 held an MBA degree. These subjects represent the marketing experts.

Table 1. Study 1—Marketing Terms Used in Sorting Task.

New product development strategy
    Adoption
    Cannibalization
    Concept testing
    Penetration
    Test market
    Trial
Competitive marketing strategy
    Brand management
    Dominant firm
    Niche
    Market share
    Market structure
    Market position
Advertising decisions
    Carry-over effects
    Copy testing
    Image
    Flighting
    Reach
    Recall
Sales promotion and publicity decisions
    Coupons
    Direct mail
    Point of purchase
    Premiums
    Public relations
    Trade allowance

These terms were taken from Kotler (1980).

The second group of subjects consisted of 30 MBA students who had recently completed a graduate introduction to marketing course, using the text *Marketing Management* (Kotler, 1984). The majority of these students worked full time with an average of about six years of work experience, though none had any brand management experience. Less than 40% had taken marketing courses in undergraduate school. These subjects represent an intermediate level of marketing knowledge, in that they have had graduate marketing education but no marketing experience.

The third group was 30 undergraduate marketing majors who had recently completed the introductory marketing course. About half used *Principles of Marketing* (Kotler, 1986) in the course and about half *Principles of Marketing* (Kinnear & Bernhardt, 1986). Very few of these students had any significant work experience. They represent the novice level.

Procedure. Students performed the sorting tasks in class with the exercise taking less than 30 minutes. Each subject received an envelope containing 24 small pieces of paper with one of the marketing terms printed on each piece. The terms had been arranged alphabetically with a code on each piece numbered from 1 to 24. Subjects were instructed to sort the 24 terms into groups of related marketing concepts. They were not told that there was any underlying structure to the terms. The instructions stated that they could use as many or as few sort groups as they wanted and that there was no correct or incorrect way to sort the terms. Terms that they did not understand were to be placed into a separate "unclear" category. Most students took about 10 minutes to sort the terms. After sorting the terms, they wrote down a label for each group that described what was similar about all the terms in that group.

Managers followed the same procedure except that the task was performed individually at their corporation.

Analysis and Results

Knowledge Structure. For clarity, the Kotler-based organization of the terms (as shown in Table 1) will be referred to as categories; the subjects' sortings of the terms will be referred to as groups. The managers averaged more groups ($m = 6.8$) than the MBAs ($m = 5.3$) or the undergrads ($m = 5.6$), for a significant main effect by level of expertise ($F = 8.17, p = 0.01, df = 2{,}72$). Upon further investigation, the primary reason the managers had more sort groups was their tendency to create groups containing only one term. The average manager had almost two singletons. Excluding the singletons, the number of sort groups did not differ by level, averaging 5.2 groups overall.

The number of terms in each group indicates how many concepts the subjects perceived as being related. For both sets of students, the distribution of group sizes was bell shaped with a modal response of three terms in a group. The managers had a modal response of one term in a group, or 24% of their groups being singletons, compared to less than 5% singletons for the students. Interestingly, the next most common group size for the managers was five terms in a group. Managers produced both more single-item groups and more large-size groups than students, as evidenced by a larger standard deviation for the distribution of group sizes for the managers ($s.d. = 2.12$) than for the MBAs ($s.d. = 1.85$) or the undergrads ($s.d. = 1.40$).

The undergrads averaged almost three "unclear" terms compared to less than one per MBA or manager, for a significant difference by level ($F = 18.26$, $p = 0.01$, $df = 2{,}72$). One-third or more of the undergrads considered flighting, cannibalization, and adoption to be unclear. Terms that a subject labeled as "unclear" were excluded from the next set of analyses because they were not seen as belonging to any marketing category.

Knowledge Content. Each individual's sort data were coded into a 24×24 lower triangular matrix (276 cells) with a 1 in the cell if two terms were sorted together and a 0 otherwise. The expected pairings were also coded using the same 0,1 coding scheme. For the four Kotler-based categories, there were a total of 60 expected pairings among the terms (6 terms choose 2 per chapter times 4 chapters), leaving 216 expected zeros.

A measure of the association between the actual sorting results and those expected under Kotler's categorization scheme was then calculated for each subject. The measure involves summing up the number of agreements and disagreements between observed and expected. The 276 cells in the matrix of expected responses were compared to the corresponding observed cells as follows:

		Expected cell contains:	
		1	0
Observed cell contains:	1	$A1$	$D1$
	0	$D2$	$A2$

Termed Jaccard's coefficient (Aldenderfer & Blashfield, 1984), the measure is defined as

$$\text{association} = \frac{A1}{A1 + D1 + D2}.$$

In effect, this measures the number of hits divided by the number of hits plus misses. Mutual absences, $A2$, are ignored because they simply represent the fact that both Kotler and the subject agreed not to put two terms together. The level of association ranges from 0 to 1 with larger numbers indicating greater correspondence with the expected, underlying functional structure. For simplicity, this association score will be analyzed as an ordinal measure.

The median level of association was 0.24 across all subjects. Managers, however, had a higher median, 0.36, than MBAs, 0.23, or undergrads, 0.15. Treating the calculated level of association for each individual as an observation in a Kruskal-Wallis one-way analysis of variance by ranks (Siegel & Castellan, 1988), there was a significant main effect by expertise ($X^2 = 21.96$, $p = 0.01$, $df = 2$). The degree of agreement with the expected categorization of concepts increased with more experience.

To investigate the effect of more marketing education, holding brand management experience constant at zero, the level of association with the expected categorization scheme was analyzed using only the students. Those who had previously taken marketing courses, 13 MBA students, were compared to the 47 other students. Employing a Wilcoxon ordinal test, those students with previous courses had a significantly higher median score, 0.26, than those without, 0.19 ($z = 2.41$, $p = 0.02$). Even considering only the MBAs, the 13 who had taken marketing as an undergraduate were marginally higher ($z = 1.36$, $p = 0.09$). It appears that more marketing education did increase the correspondence between the students' groupings and the expected categorization.

STUDY 2

Research Method

In the first study, managers created more sort groups than students when structuring their knowledge of marketing. Managers also agreed more highly with the categorization scheme developed from Kotler. It could be argued, however, that only the best students should be compared to the managers, because the managers represent a select sample of highly motivated, talented individuals from leading graduate schools. Considering the level of association with Kotler, the top 10% of student subjects ($n = 6$) had a median score of 0.35. The majority of managers, 8 out of 15, performed even better than those top students. The results suggest that, even if the best students were selected to become managers, on-the-job experience still had an additional, positive effect.

The second study specifically examined the effect of job experience on managers' knowledge structures and knowledge content, holding

education constant. The subjects for this second study were the same 15 brand managers who participated in the first study. It was expected that marketing knowledge would change with the amount of corporate brand management experience. The managers ranged in experience from 3 months to 72 months, the five senior brand managers averaging 46.4 months, the five associates 23.8, and the five assistants 3.8. Staff level correlated strongly with months of brand management experience (Spearman rho $= 0.88$, $p = 0.01$). Thirteen of the managers had an MBA degree.

Using the same research design as in the first study, the effects of job experience were investigated by sorting 14 information sources specific to the participating corporation into groups of related terms. During the prestudy phase, five corporate managers, who were not in the later study, identified the information sources shown in Table 2 as important for new product introduction decisions or consumer promotion decisions. Seven of the sources pertain primarily to new products and seven primarily to consumer promotions, though they are not completely exclusive to one type of decision. Following the sorting task, managers rated the usefulness of the 14 types of information for new product introduction decisions and rated them again for promotion decisions. In a repeated-measures analysis of variance, the usefulness ratings did differ by type of decision ($F = 9.84$, $p = 0.01$, $df = 13,182$). Ratings for 12 of the 14 pieces of information differed in the expected direction, indicating the reasonableness of the two categories.

As in the first study, the managers' sort groupings were compared to the expected categorization of the terms. Managers' groupings were hypothesized to correspond more highly with the two categories shown in Table 2 as their months of corporate experience, and thus, staff level,

Table 2. Study 2—Corporate Terms Used In Sorting Task.

Consumer promotion scheduling information
    Ad schedule
    Competitor promotion
    Consumer promotion budget
    Responsiveness to previous promotions
    Season of the sales year
    Trade promotion
    Weekly sales report
New product introduction information
    Competitor new product introduction
    Consumer research
    Diary panel data
    Headquarter's support
    Merchandiser word of mouth
    Nielsen store audit data
    Peer opinion

increased. Subjects followed the same procedure as before, sorting terms into groups of related concepts then labeling each group.

Analysis and Results

Knowledge Structure. Contrary to the first hypothesis, the number of sort groups created by managers did not increase consistently with staff level ($F = 1.91$, $p = 0.19$, $df = 2,12$). Senior managers produced an average of 4.2 groups, associates 4.0, and assistants 5.0. Senior managers did use more singletons, compared to the other managers. When the singletons were excluded, the number of sort groups actually decreased marginally by staff level ($F = 2.96$, $p = 0.09$, $df = 2,12$), from a high of 4.6 for assistants to a low of 3.2 for seniors.

The modal number of terms in each sort group equaled 3. Senior managers produced a wider variety of group sizes than junior managers, as shown by a larger standard deviation for the distribution of group sizes for the seniors ($s.d. = 1.51$) than for the associates ($s.d. = 1.28$) or the assistants ($s.d. = 1.02$).

Knowledge Content. Using the same formulation as in the first study, Jaccard's coefficient was calculated to measure the degree of association between the expected and observed sort results for each manager. For the new product and promotion terms, there were a total of 42 expected pairings among the terms (7 terms choose 2 per marketing decision task times 2 tasks), and 49 expected zeros.

Agreement with the expected categorization scheme did increase significantly by staff level as hypothesized ($X^2 = 8.93$, $p = 0.01$, $df = 2$). Senior managers had a median score of 0.27, compared to 0.24 for associates and 0.17 for assistants.

Besides agreeing with a predetermined standard, the managers might also be expected to agree with each other by staff level, or at least become more similar over time. To estimate this convergence, the level of agreement between each of the 15 managers was calculated, again using Jaccard's coefficient. The resulting 15×15 matrix of coefficients was then clustered with VARCLUS (SAS Institute, 1985), a type of oblique component analysis that starts with all observations in the same cluster then breaks them down into smaller groups.

The first split produced one group containing four seniors, three associates, and one assistant, and the other group held the remaining seven managers. This two-cluster solution accounted for 43% of the variance. These two clusters differed marginally in terms of staff level ($X^2 = 3.37$, $p = 0.07$, $df = 1$). Considering the mean number of months of management experience, the two clusters differed significantly with the cluster containing four seniors averaging 34 months of experience compared to only 14 months for the other cluster ($t = 2.01$, $p = 0.03$,

GENERAL DISCUSSION AND CONCLUSIONS

Both experience and education were shown to affect the organization of marketing knowledge as defined in these two studies. With regards to the hypothesis on the functional organization of knowledge, the more experienced and more educated subjects perceived the underlying categorical structure of the marketing terms to a significantly greater extent. In the first study, marketing managers matched the Kotler-based categorization scheme best, followed by MBAs who had taken more marketing courses, and finally all other students. Taking more marketing courses did have a positive effect, but it was a relatively small effect compared to real-world marketing experience. The second study examined the effect of job experience on the organization of marketing knowledge. The most experienced, senior managers agreed the most highly with the expected categorization scheme, followed by associates and assistants. In addition, clustering managers on the similarity of their sorting data, more experienced managers dominated one cluster and less experienced ones fell into a second group. The managers converged on how they organized the marketing terms as experience increased.

The results are less clear on the effects of education and experience on the number of cognitive categories. In the first study, managers did create more sort groups than students, whereas in the second study, no significant relationship was found between the number of groups and experience, and the trend was actually negative. In both studies, however, the most expert subjects used the widest variety of sort group sizes, in particular creating more single-item groups. The results suggest that it is not simply the number of categories that increase with expertise, but the variety of types of categories that increases.

These findings have implications for using managers as a source of expert knowledge and for preparing students to be managers. First, the results provide some assurance that managers can serve as a valid source of marketing knowledge. Experienced managers' cognitive structures appear to be organized by marketing function. In marketing, managerial knowledge is a critical element in many situations. Particularly in less structured areas, such as new product design and advertising planning, knowledge derived from managerial experience may at times be the only knowledge available (Rangaswamy et al., 1987). Thus, acquiring knowledge from managers appears to be a worthwhile, and often necessary, step toward developing marketing expert systems. Using several knowledge acquisition methods and pooling the knowledge of several managers provides greater assurance than relying

on a single method or single expert (e.g., Keon & Bayer, 1986; Mitchell, 1987).

Second, in terms of preparing managers, the results point out the limitations of traditional classroom education. Even though most of the students had just finished a course using a text very similar to the one upon which the first study was based, most failed to see the expected relationships between the concepts. But the fault may not lie with the text itself. The practicing managers' conceptualization of the four marketing areas resembles the theoretical structure provided by the text. The differences between managers and students appear to be the result of real-world experience. Expert-level knowledge may require learning by doing rather than simply textbook education (Anzai & Simon, 1979).

Two general limitations to the studies should be addressed. First, the operationalization of the research problem allows for statements about the organization of knowledge, but tells us little about the use of knowledge. As discussed earlier, the quality of the organization of knowledge may differ by expertise, thus the quality of the cognitive representation of a problem, and ultimately the quality of the problem solution. Ideally, a study might demonstrate the link between experts' improved cognitive structure and their improved ability to solve problems. Those subjects who have performed well in marketing tasks (i.e., the managers) did organize the terms differently than novices. However, the link from a measure of cognitive structure to solving problems can only be inferred. As Simon (1979b) has noted, cognitive studies can only show that a hypothesized model of cognition can be shown sufficient to account for the experimental data, but cannot show that the model is necessary.

A second limitation concerns the experimental procedure itself: sorting marketing terms. The stimuli could be characterized as sterile and impoverished, bringing into question the ability of the task to measure real-world cognitive structures. The marketing terms used in this study represent the declarative knowledge of the facts related to a category. The task is more similar to that employed in Lurigio and Carroll (1985), where probation officers sorted offender characteristics, but less similar to Chi et al. (1981), where students sorted physics word problems. As in this study, Lurigio and Carroll (1985) were able to calculate a score for each respondent, measuring the quality of their sorting results. There is, however, a trade-off between employing such clear-cut, pre-specified stimuli, which allow for a quantitative measure of quality, and the use of a richer stimuli that may not lead to a precise measure.

Future research should investigate how managers use the knowledge associated with their marketing categories to solve problems. The study of knowledge in marketing will highlight the numerous gaps and flaws in our understanding of business phenomenon. Students would benefit from a greater understanding of real-world managers. Managers would benefit from an explicit analysis of their own behavior.

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