Escaping the Tyranny of Choice: When fewer attributes make choice easier

Marketing Theory (2006)

Final Version (11 November 2005)

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Abstract

In the age of the Internet and easy access to almost infinite information, the problem of information overload amongst consumers is bound to become of great importance to marketers. By means of simulations we show that this “tyranny of choice” is avoidable. Consumers can neglect most product information and yet make good choices, so long as either there is no conflict among the product attributes or the attributes are unequally important. In these conditions, only one attribute is enough to select a good option—one within 10% of the highest value possible. We conclude with marketing implications of these findings.

Choice is a double-edged sword. On one side we are inherently attracted to choice and are utterly disappointed when we have too little of it. For example, Bown, Read and Summers (2003) showed that an option is more often chosen when it is offered jointly with another option than when it is offered alone. In the same spirit, consumer researchers have long documented consumers' attraction to variety. For instance, Iyengar and Lepper (2000) showed that more consumers stopped to taste a jam from a stand with a large selection of 24 varieties than from a stand with a small selection of 6 jams. On the other side more choice is not always a good thing. Choosing from overly large sets makes consumers feel that the decision is difficult and dissatisfying (Beattie, Baron, Hershey, and Spranca, 1994). Too much choice can even deter consumers from purchasing: In the same study above, Iyengar and Lepper also showed that *fewer* consumers actually redeemed a coupon when they received it in front of the large selection of jams as opposed to the small selection.

The paralyzing feeling of having too much choice is one that decision makers often report, as argued in a recent book on the "tyranny of choice" (Schwartz, 2004). Schwartz reviews a number of every-day domains where too much choice is a problem for consumers, even if the choice is very important to them, as in the case of choice of health insurance and retirement plans, medical care, job, family arrangement, utilities, and beauty treatments, among many others.

The finding that decision makers are overloaded by too many options is not novel, and it was anticipated by marketing researchers 30 years ago, as evidenced by the heated information overload debate (e.g. Jacoby, Speller, and Kohn, 1974; Russo, 1974). Yet, the problem of too much choice is as current as ever in today's shopping environments, especially on the Internet. While real shops have at least a physical limit on the maximum number of products they can display to consumers, online shopping sites have virtually no limit and can easily present thousands of different items.

The problem of too much choice has been mostly rooted in the *number of options* presented to decision makers, but in this article we address a second source of choice overload: the *number of attributes*. Each product that a customer sees on a shelf or on a shopping site is defined by a number of attributes that distinguish it from the others. Even a product as simple as a container of yogurt can offer at least ten different attributes that distinguish it from other yogurts: price, flavor (e.g. strawberry vs. natural), size, package (glass or plastic), whether it is organic or not, whether it is made from soy or cow milk, and all the nutritional facts (calories, carbohydrates, fats, proteins). The problem of too much attribute information is again exacerbated for consumers shopping on websites, where hyperlinks can always make room for detailed attribute descriptions that would be impossible to fit on the physical surface of the product package. For example Activebuyersguide.com, a popular website assisting consumer decisions, presents information on around 50 different attributes for products like digital cameras. Interestingly, *Consumer Reports* has for decades only presented consumers with a handful of attributes, and yet, this course of action has not (to our knowledge) been implemented practically in online shopping environments.

Studies conducted in the 1970s provided initial evidence that an abundance of attributes can be a serious source of information overload. When choosing among products described by more attributes, people reported feeling more confused and unsure of having made the right choice than when faced with fewer attributes (Jacoby, Speller and Berning, 1974). A study by Malhotra (1982) examined information overload when both the number of attributes and the number of options were increased. In the study consumers reported having too much information when the number of attributes was increased but not when the number of options was increased. Arguably, abundance of attributes is perceived as more disconcerting than abundance of options.

The goal of this article is to show that there are conditions under which "more information is not always better" (see Hertwig and Todd, 2003), such that consumers can make good choices by, for instance, examining only one attribute and ignoring all others. We start by reviewing recent psychological research indicating that in a wide number of domains outside of consumer choice "less is more": Using just some of the information available in a task need not sacrifice accuracy, and indeed can also have important benefits for decision making.

When less is more

Over the last few years, a number of studies have shown that processing only a subset of the available information can often yield inferences as accurate as, or even more accurate than, processing all the available information. This effect has been documented extensively in the work of Gigerenzer and Goldstein (1996; Goldstein and Gigerenzer, 2002) and colleagues. In one of their simulation studies, they measured the accuracy of deciding which of two German cities was larger in population, based on knowledge of up to nine cues (e.g. whether the city has a university, has a major league soccer team, etc.). Their study revealed that "fast and frugal" heuristics that processed little information (e.g. only the first distinguishing cue found) were nearly as accurate at inferring the cities' relative sizes as was multiple regression, which used all nine cues. Even more surprisingly, when the different heuristics were tested on a new set of cities they had not previously encountered, these fast and frugal heuristics outperformed those that drew on all the information available, such as multiple regression (for a survey, see Gigerenzer, Todd and the ABC Research Group, 1999). The reason for this effect was that the simple heuristics relied on the most valid cues, whereas multiple regression considered all the cues, even when they only added noise. By trying to pull some sense out of all the cues including the noisy ones, multiple regression can overfit the data and perform worse when generalizing to new data. Experimental studies (e.g. Bröder, 2000; Newell and Shanks, 2003; Goldstein and Gigerenzer, 2002) have also shown that people often use "one-reason" decision heuristics such as Take The Best (which makes a decision based on just the most valid distinguishing cue, i.e. the cue that most often leads to a correct inference) or the recognition heuristic (which decides on the basis of highly valid recognition knowledge).

Two important points emerge from this literature. First, considering only part of the information does not necessarily lead to worse decisions and can even lead to better ones when generalizing to new situations. Second, the benefit from using partial information comes from the goodness-of-fit between a heuristic and the decision environment. For instance, the Take The Best heuristic leads to accurate decisions when it is used in an environment with at least a few highly valid cues. This research raises a question about consumer choice: Under what circumstances can consumers ignore much of the information they have available and yet still make good choices?

When considering fewer attributes does not impair the quality of consumer choice

A common paradigm in consumer research is to investigate consumer phenomena in the simple case of options differing on *two* important attributes, such as price and quality, or two quality attributes (e.g. Nowlis and Simonson, 2000; Simonson and Tversky, 1992; Tversky and Shafir, 1992). The focus of this article is on natural consumer settings where quality itself must typically be inferred from a large number of attributes. Among the researchers who have examined how consumers process many attributes (e.g. Dhar, 1996; Saad and Russo, 1996), most have highlighted the important trade-off between accuracy of choice and effort spent (in terms of time spent to reach the choice, or the amount of information seen, e.g. Payne, Bettman, and Johnson, 1993). In this article we show conditions when consumers need not trade off effort and accuracy of choice. Specifically, we propose that there are at least two properties of choice environments affecting whether a choice based on few available attributes will be as good as a choice based on all of them: attribute correlation and relative attribute importance.

1. Attribute correlation

Attribute correlations vary widely from positive to negative in consumer choice. Choice attributes are said to be positively correlated when options that are good on one attribute tend to be also good on the other attributes available, and conversely when options that are poor on one attribute tend to be also poor on other attributes. This can be called a “friendly” choice environment (Shanteau and Thomas, 2000), because attributes agree rather than conflict in terms of the choices they support. Attributes are said to be negatively correlated when options that are good on one attribute tend to be poor on others. This environment is “unfriendly,” because trade-offs need to be made between conflicting attributes. Correlations are necessarily negative when the options are non-dominated (i.e. no one option is best on all attributes—McClelland, 1978) and all of the dominated options are eliminated. Negative correlations[1], such as those between cost savings and quality, are common, cause choice conflict (e.g. Dhar, 1996), and lower consumer confidence and satisfaction (Fasolo, McClelland, and Lange, 2005). Nonetheless, positive correlations are also possible in consumer choice. For instance, even if cost savings and quality are typically conceived as negatively related, researchers who correlated *Consumer Reports* quality ratings with the prices of the corresponding products found for some product categories as price increases (and therefore savings decrease), quality *decreases*, thus making the savings-quality correlation positive (e.g. Curry and Riesz, 1988).

2. Relative attribute importance

Consumers' perceptions of attribute importance can vary widely from equal (when the individual gives the same weight to all the attributes available) to highly skewed (when the individual assigns a much greater weight to the most important attribute than to the least important one).Being inherently subjective, the judgment of relative importance of a set of attributes can differ from consumer to consumer. For instance, in front of the same set of options (e.g. five models of laptops) some consumers might assign equal weights to their distinguishing attributes (e.g. hard disk capacity, memory, etc.), and other consumers might assign unequal weights to those same attributes. Researchers have found that the weights an individual assigns to attributes typically reflect a subjective evaluation of importance of each attribute (e.g. Stewart and Ely, 1984). Furthermore, these weights can also be influenced by the extent to which options vary on that attribute, with a greater weight being assigned when the range of attribute values of the available options is large rather than small (Beattie and Baron, 1991, Edwards and Barron, 1994), though this is not always the case (Fischer, 1995), as with protected values (Baron and Spranca, 1997). Consequently, the distribution of weights could change (e.g. from equal to skewed, or from a very steep to a less steep unequal distribution) depending on the attribute ranges of the options evaluated.

While generalization across choice problems and across decision makers is problematic, researchers who have examined important decision problems such as choice of housing have found that consumers' judgments of relative attribute importance tend to follow a “step-function” shape, with a few highly weighted attributes followed by a number of low-weighted attributes. This is also in line with the idea of a “core” set of attributes to which people give foremost attention (Saad and Russo, 1996).

In this work we consider two extreme cases: one where attributes are all *equally* important relative to each other, and the other where attributes are *unequally* important, meaning that they can be ranked from highest to lowest in order of weight or importance

Previous research on the effects of using few attributes

Previous studies that examined quality of choosing on the basis of only a subset of all the attributes available came to pessimistic conclusions.[2] For instance, Barron and colleagues (Barron and Kleinmuntz, 1986; Barron, 1987; Barron and Barrett, 1999) simulated choices regarding which cities are good places to live, based on information on nine attributes (climate, housing, healthcare, crime, transportation, education, recreation, arts, and economics). Their dataset consisted of 15 U.S. cities rated in the *Places Rated Almanac* (Boyer and Savageau, 1981), which also were "overwhelmingly non-dominated alternatives" (Barron, 1987, p. 200). This means that the choice environment analyzed was "unfriendly," because each option was maximally attractive on at least one attribute and the interattribute correlations were mostly negative. Furthermore, they assumed that all attributes were equally important in making a choice (i.e. all attribute weights were equal), meaning that the attributes left out of consideration were just as important as those that were considered.

The simulations examined the impact of using an incomplete set of the nine attributes on choice inaccuracy. Choice inaccuracy was measured in terms of *proportion of value lost* (or PVL), which is obtained by comparing the value of the option chosen using partial attribute information to the value of the option chosen using full attribute information. PVL ranges from 0, when the option chosen using partial information coincides with the best option determined by full information, to 1, when the option chosen coincides with the worst option determined by full information. Option values were computed by multiplying attribute values by their weights (which would normally be assigned by a decision maker, but as indicated above are here all assumed to be equal) and adding the products, as prescribed by multi-attribute utility theory (e.g. Keeney and Raiffa, 1993).

The results showed that given attributes that are negatively correlated and equally important, choosing on the basis of fewer than nine attributes can lead to substantial increases in PVL. Based on this finding, Barron and colleagues suggested that "rather than omit important attributes ..., using proxies is better than not measuring those attributes at all.” This conclusion conveys the idea—widely shared among decision theorists and economists—that neglecting attributes means neglecting information, thereby violating a central principle of good decision making.

More recently, Barron and Barrett (1999) reevaluated the relationship between the amount of information used and the costs of using less than full information, this time under the assumption of an *unequal* relative importance. The new simulations showed that the value lost when the restricted attribute set contains the most important (strongly weighted) cues was less than found previously with equally important attributes. However, the loss was still negligible only when almost the whole set of attributes was used.

Barron’s studies support the argument that ignoring available information is detrimental to good choice. But is this necessarily the case, or are there situations where less information need not lead to worse performance? To find out, we conducted a new simulation study where we examined the costs of using various amounts of information, from the minimum of considering no attributes (i.e. random choice) to the maximum of considering the complete attribute set. We also explicitly considered attribute correlation and relative importance—only implicitly considered in the earlier studies—in order to identify systematically the conditions affecting the relationship between choice quality and number of attributes used.

Simulating multi-attribute consumer choice

We simulated choices among three different sets of 21 options each. The first was a *positive set* characterized by a positive mean interattribute correlation. The second was a *negative set* characterized by a negative mean interattribute correlation, with the latter implying trade-offs. Besides these two hypothetical sets, we also considered a real-world dataset of digital cameras recommended (in December 2002) in the "Top 10" of Epinions.com, a popular U.S. shopping website. This *camera set* was characterized by a mean interattribute correlation of zero, arising from averaging both large negative and positive pairwise correlations.

Attribute values were drawn from a continuous normal distribution and then rescaled into the range from 0.0 (worst level) to 1.0 (best level). We used Mathematica's routine for generating random multivariate normal observations on nine attributes using one of three correlational attribute structures. In the *positive set*, all correlations were positive and equal to 0.5; in the *negative set* all correlations were negative and equal to -.11 (or -1/9, the lowest it can be); and in the *camera set* each correlation was equal to the actual value for the real cameras (averaging 0.0). We then randomized the order for the nine attributes before assigning their relative importance (if that differed) and used only the first six of the nine attributes. Depending on the simulation we applied "equal" or "unequal" weights. Unequal weights were computed by transforming ranks into rank ordered centroid (or ROC) weights, as recommended by Edwards and Barron (1994).[3]

Option values were calculated by multiplying the attribute values by the assigned (equal or unequal) weights and then combining them additively (i.e. using a weighted additive rule). In this way we used the six weighted attributes to find the "best" of the 21 options. Then for each subset of the first one to five attributes, we determined what would be the option "selected" if only that partial information were used in the same weighted-additive manner. The value of the "selected" option (computed using all six attributes) was compared to the value of the "best" to determine the proportion of value lost (PVL). We ran 1,000 simulations for each of the six combinations of three correlation environments by two weight conditions. In each simulation the attribute rank orders and values were randomly determined.

The choice mechanism simulated is based on the assumption that consumers integrate the subset of pieces of information they consider, seeking additional attributes in order from most to least important. When this mechanism stops after considering only the first, most important, attribute, it is similar to the operation of the Take The Best heuristic (with cue validities replaced by attribute weights), and when it stops after considering any single cue (when they are all equally weighted), its operation is similar to that of the Minimalist heuristic (Gigerenzer and Goldstein, 1996).

Performance measures

Using a subset of the available attributes has obvious direct benefits, such as time and money saved in searching for information. We propose that using less than full information can have also another benefit: the psychological relief of experiencing little choice conflict. Research has shown that the choice conflict that decision makers experience is related to the presence of non-dominated options (i.e. all those options that cannot be beaten on at least one attribute and so are difficult to eliminate from consideration—see Tversky and Shafir, 1992; Dhar, 1996). We therefore measure choice conflict as the *proportion of non-dominated options* (i.e. the number of non-dominated options out of the total number available) and hypothesize that this proportion increases as the number of attributes considered increases. Conversely, the fewer the attributes considered, the fewer the non-dominated options, and therefore the less choice conflict.

Following Barron (1987), we also measure the costs of using incomplete information as PVL relative to using complete information, which ranges from zero (no loss) to one (largest loss). We define a "reasonable" quality of choice to occur when PVL is less than 0.1 (i.e. a loss of 10% of value).

Results

First we present results relevant to the benefits of using few attributes in terms of reduced choice conflict, then the costs of using less than full information in terms of PVL. In each case we indicate the impact of the environment structure described in terms of the interattribute correlations (positive, negative, or zero) and the relative attribute importance (equal or unequal).

1. Choice conflict

The first important result of our simulations is that the fewer the attributes considered, the fewer non-dominated options appear, as shown in Figure 1. The relationship between number of attributes and proportion of non-dominated options is particularly strong with negative interattribute correlations.

When only one attribute is considered and there are no ties, only one (4.7%) of the 21 options is non-dominated. Choosing this one non-dominated option using only one attribute would obviously be an easy choice. In contrast, when all six attributes are considered in the negative-correlation case, there are on average 95% non-dominated options (*s.d*. 5%), meaning that, with full information, the choice gets very complicated because about 20 of 21 options are most attractive on at least one attribute. Thus, considering fewer attributes has the benefit of making the choice less conflicted and less complicated.

We found that the results for the camera set are very close to those for the negative set (Figure 1). This resemblance is important, because it suggests that the hypothetical case with negative correlations produces results close to those faced by consumers, which typically involve a few sharp trade-offs. Finally, the same relationship between number of attributes and non-dominated options is even present with positive attribute correlations. In this case, when all six attributes are examined, there are on average 35% non-dominated options (*s.d*. 14%). This proportion corresponds to about 7 non-dominated options out of 21.

Insert Figure 1 about here

These results shed new light on earlier findings, connecting the research lines on information overload (e.g. Malhotra, 1982) and choice conflict (Tversky and Shafir, 1992; Dhar, 1996). Our results suggest that one reason why decision makers find it easier to choose in the presence of fewer as opposed to more attributes (Malhotra, 1982) might lie in the reduced number of non-dominated options in the former case, which can reduce choice conflict, increase choice confidence, and thereby possibly decrease deferral of choice or purchase (Dhar, 1996).

2. Proportion of value lost

Our second result is that the costs of using less than full information—measured in terms of PVL—can be low. In particular, we found that PVL was very low even when choice was based on a single attribute if attributes were positively correlated. More specifically, as shown in Figure 2, in these friendly environments only one or two attributes are enough to make a choice at our acceptable 10% PVL level. If attributes are unequally important to the decision maker, it is sufficient that he or she knows and uses the most important. If all attributes are equally important, it is sufficient to use *any* of the attributes.

Insert Figure 2 about here

When attributes are negatively correlated, the results depend on the relative attribute importance, as can be seen in Figure 3. When weights are unequal, then it remains sufficient to know and use the most important attribute to make a choice within 10% of the highest value possible (Figure 3). However, when the weights of negatively correlated attributes are equal, it is necessary to use five of six attributes to make a choice at the 10% PVL level. This is true for both the simulated negative set and the camera set (shown in Figure 4).

Insert Figures 3 and 4 about here

The results for equal attribute weights resemble those from Barron (1987), whereas the results for unequal weights resemble those from Barron and Barrett (1999).

By looking in more detail at the interaction between attribute correlations (positive or negative) and relative attribute importance (equal or unequal), we can now understand those earlier results in terms of a coherent framework that emphasizes the role that the structure of the choice environment plays in determining the amount of information necessary to make good consumer decisions.

In sum, we found that it is possible for consumers to make good choices based on one or two attributes, when attributes are positively related or consumers care unequally about attributes and choose on the basis of the most important ones. In such circumstances, simple limited-information choice heuristics have benefits with little costs.

Conclusions and practical implications

In the age of the Internet and easy access to almost infinite information, the problem of information overload amongst consumers is bound to become of great importance to marketers. A common reaction of consumers to information overload is unwillingness to choose, and dissatisfaction with what choices are made. This suggests that consumers are unable or unwilling to neglect information. Since marketers typically choose which (and how much) attribute information is displayed (on a shelf, a package, or a website), we argue that information overload can be prevented in the first place if marketers provided *less* attribute information to consumers. For instance, they could highlight information about a small number of primary attributes and make further information about secondary attributes available only to consumers who actively look for it (e.g. on the backs of packages or via web links).

Our simulations show that providing less attribute information need not impair choice quality if the attributes that are eliminated from consideration are unimportant, or if the attributes that describe the products are positively correlated. Combining our results with previous research, we expect that consumers may be more likely to buy when they have fewer attributes to consider.

We have also identified the factors—namely negative correlations among equally subjectively important attributes—that would lead an involved consumer to seek more information, with the risk that the consumer will become overloaded. We emphasize that attribute overload as it is discussed in this article is more likely to occur where there are *many* attributes *simultaneously* available, as on the Internet or in stores that bombard consumers with extensive labels and attribute information. It is therefore in these kinds of environments that marketers might benefit most from our guidelines.

Notes

[1] Because this work is concerned with correlations between desirable attributes, negative correlations are considered to be a symptom of unfriendly choice environments, and positive correlations are a symptom of friendly choice environments. Consequently, although price and quality might be positively correlated (as price increases, typically quality increases too), we will replace price with "cost savings" of a product, defined as the difference between its price and the most expensive product in the category. If price and quality are positively correlated, then cost savings and quality will be negatively correlated.

[2] Note that these early studies were designed to test one particular decision environment (negative correlations and equal weights) and so do not address all the choice environments we consider in our analysis.

[3] If there are n attributes with ranks 1, 2, …, n, then the ROC weight w_k of the k^{th} most important attribute is $w_k = [\Sigma_{i \geq k}(1/i)]/n$. The sum of all ROC weights is 1.

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Figure 1. Proportion of options not dominated, as a function of increasing number of attributes considered and mean interattribute correlations (positive, negative, and for the real camera choice set).

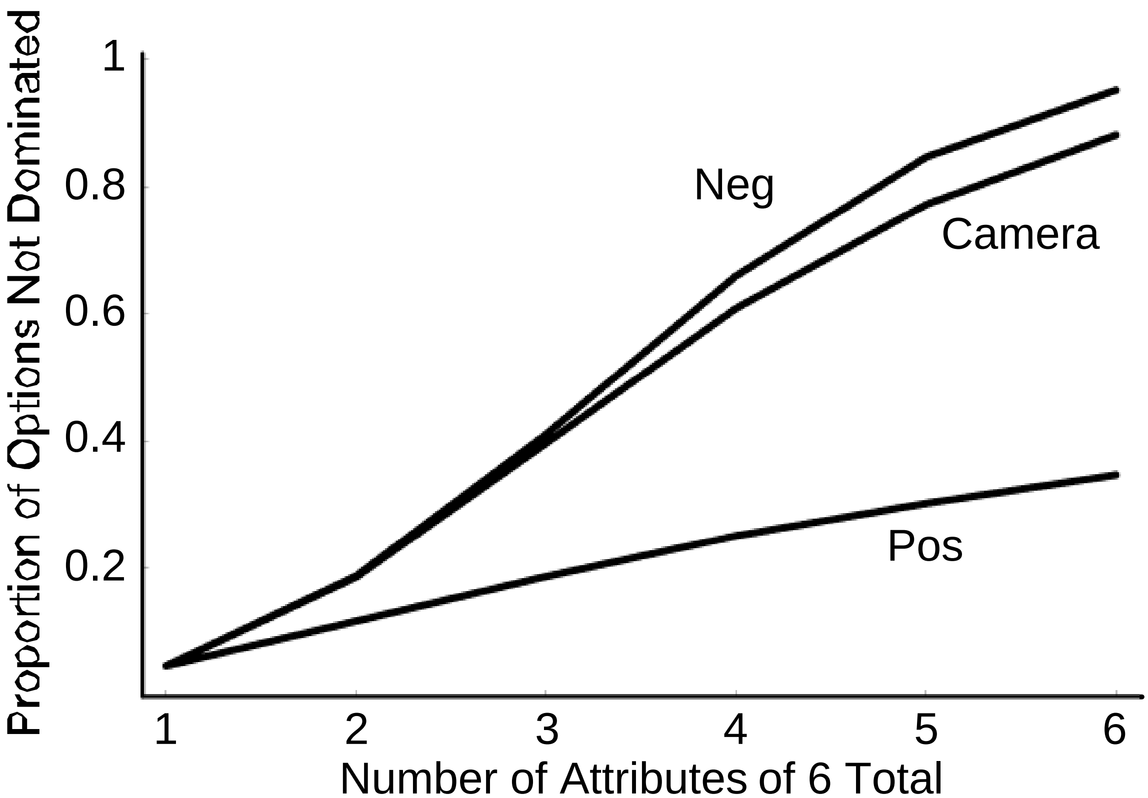

Figure 2. Proportion of value lost in environments with positive correlations, as a function of increasing number of attributes considered and equal or unequal attribute weights.

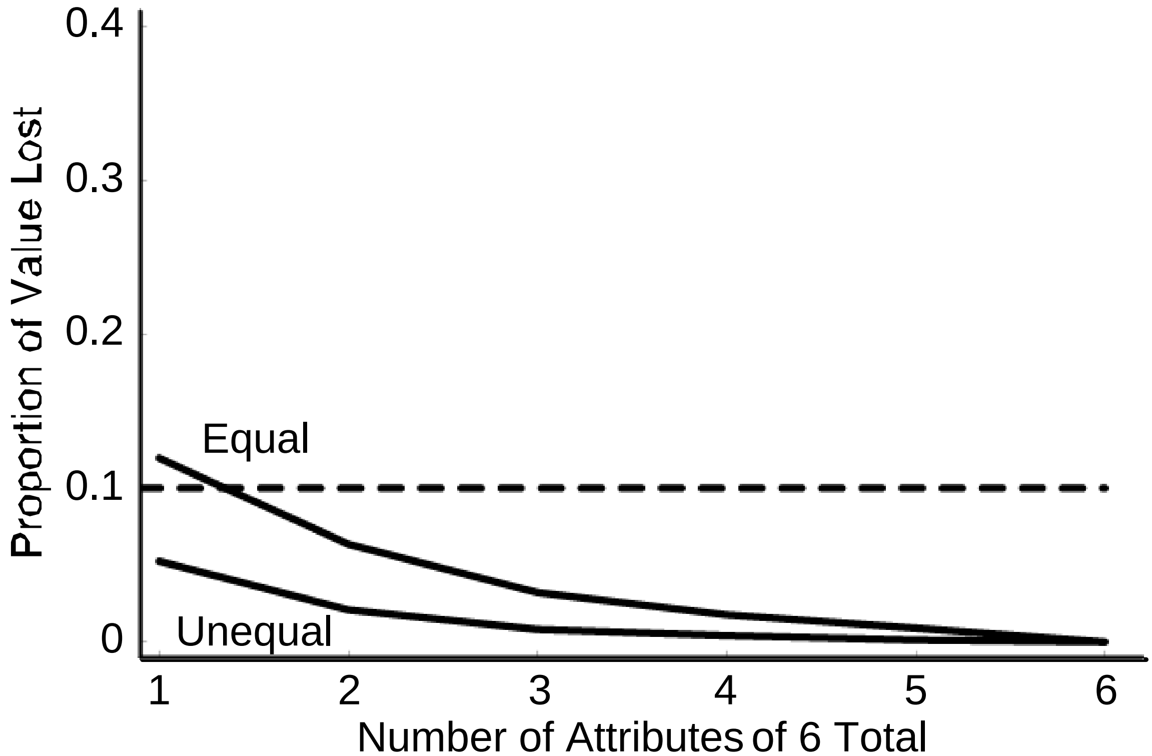

Figure 3. Proportion of value lost in environments with negative correlations, as a function of increasing number of attributes considered and equal or unequal attribute weights.

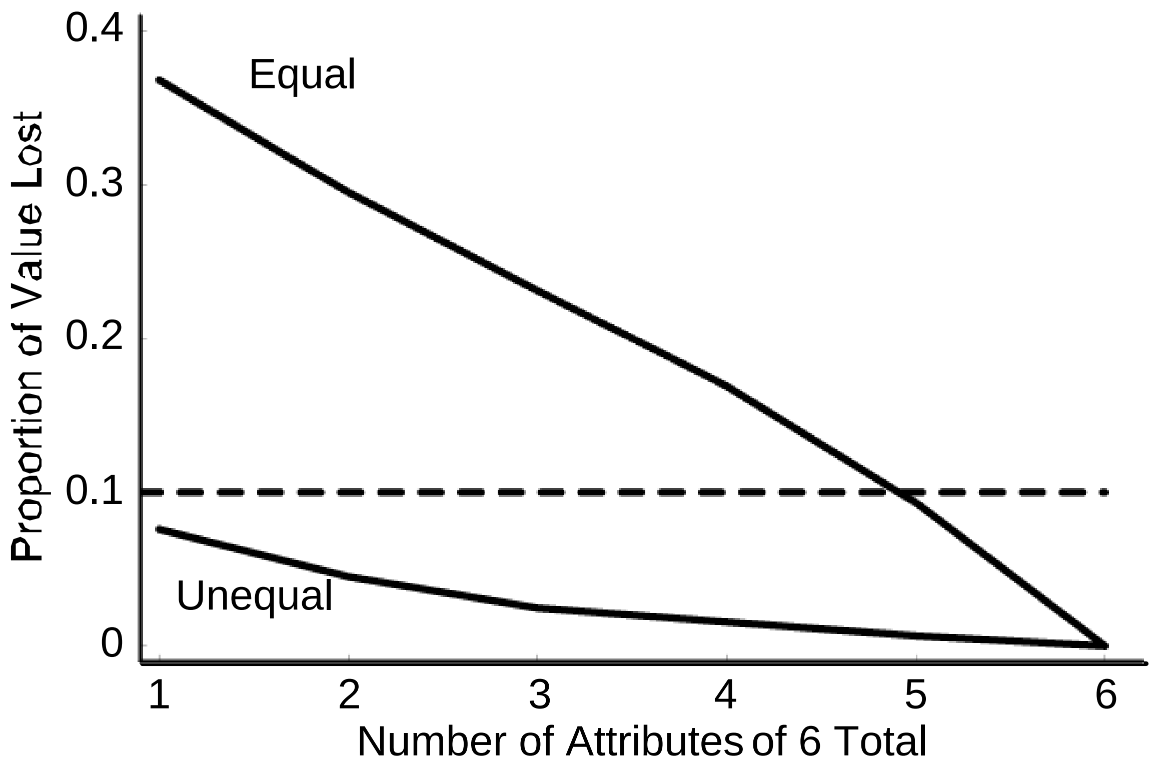

Figure 4. Proportion of value lost in the real camera environment, as a function of increasing number of attributes considered and equal or unequal attribute weights.