Feature Complementarity and Large Assortments: Role of Feature Complementarity in Developing Product Assortment

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Abstract

Companies developing new products must consider feature complementarity of the assortment as it plays a crucial role in consumers' preference and evaluation of options they finally choose. Consumers derive more utility when features of assortment are complementary than in an assortment with non-complementary features. When options in the assortment have complementary features, it leads to more trade-offs and the choice process becomes difficult, which may lead to choice overload for larger assortments. Feature complementarity studies in the past have found the presence of choice overload even at 5 options as a large assortment size, which is very low as compared to extant choice overload studies. Past studies have used the mean of 27.8 options for a large assortment and 5.4 options for a small assortment. It is important to know what would happen for an assortment size larger than five and whether choice overload would stagnate or increase further. The present study tests the role of feature complementarity as a moderating variable to choice overload effect. Results found a significant increase in the mean regret scores for assortments with complementary features when the assortment size increased to 24 options and found support for feature complementarity as a moderating variable for choice overload. This study contributes to the existing choice overload and product development literature.

Key Words: *Feature complementarity; choice overload; product design; assortment choice*

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Introduction

Consider a consumer who has to choose from two choice-sets of computers. The first choice set contains three colours: silver, white and black. The second choice-set contains three computers differentiated by the following features: high RAM size, extra storage and touch screen. Which of the above choices are easier to make? In the second choice set, if a consumer opts for a computer with high RAM size, he has to forgo extra storage and touch screen features. The combined utility of all three features is more than the individual utility of each of the features. A computer with all the three features is clearly better than a computer with a single feature. But it is not the case in the first choice set. Combined utility derived from the three colours is not necessarily more than utility derived from an individual colour. A computer with all the three colours may not be better than the laptop with a single colour. The first choice set has features which are non-complementary while options in the second choice set have complementary features. Feature complementarity in choices was first studied by Chernev (2005). He defined the term complementarity using utility associated with the features of the options in the assortment. If U_a is the utility associated with feature "a", U_b is the utility associated with feature "b", and U_{ab} is the utility associated with features "a" and "b" combined. Features "a" and "b" are complementary when $U_{ab} > U_a$ and $U_{ab} > U_b$. In contrast, "a" and "b" are non-complementary when $U_{ab} <= U_a$ and $U_{ab} <= U_b$. For example, if the same chocolate is available in differently designed packages, then choosing all the packages does not make it a better product, and the combined utility is not more than individual utilities. These features would be classified as non-complementarity features of the product. Chocolate packs can offer features in the following manner: the first pack has chocolate with roasted almonds; the second pack has chocolate with crunchy wafers; the third pack has chocolate with cashew nuts and so on. In this case, if a consumer picks one chocolate, he will have to forgo other features. A chocolate pack with combined features in one chocolate will make a better product. This classification of the feature has been defined as complementary features. It is argued that when consumers choose from an assortment with complementary features, then trade-offs are more and a consumer choosing one feature will have to forgo the other feature.

Feature complementarity is very similar to the concept of alignability (Gourville and Soman, 2005) and product modularity (Ulrich, 1994). Initial research on alignability and non-alignable assortment was initiated early (Gentner 1983; Markman and Gentner 1993; Gentner and Markman 1994). Gourville and Soman, (2005) extended the alignability construct and defined it as alignable assortment, which varies along a single compensatory dimension e.g. the number of mangoes stored in a gift box or fat content in yogurt. They tested alignability construct in a consumer choice context as a potential moderator to the choice overload effect. Alignability was found to moderate the choice overload effect in this study (Gourville and Soman, 2005). Although very similar to complementarity, the alignability construct does not take into account the utility associated with the features of options. But in feature complementarity, consumers evaluate options and their features with respect to their utility.

Product modularity was studied in the seminal paper by Ulrich (1994). This concept talks about the individual components of the product and similarity between the elements of the products. But this concept focuses more on the physical product design from the manufacturing and operations perspective of product development than from a marketing standpoint. However, feature complementarity focused more on the marketing perspective -on how to design the product options in a way which will help the

consumers in the choice process.

This study extends the findings of the feature complementarity studies by using the concept on a broader category of laptop accessories where the actual products are quite different from each other. However, the core idea of feature complementarity remains the same where the combined utility of all the options should be more than the utility derived from each option. In this study, two assortment groups were created with one having complementary assortment and the second having non-complementarity assortment.

Theoretical Background and Hypothesis Development

In a series of experiments conducted by Chernev (2005), he found that the likelihood of purchase from a given assortment is dependent upon feature complementarity. Results of the experiments conducted found that when respondents chose from complementary features, trade-offs were more. When the number of options was increased, the probability of respondents choosing from complementary assortments decreased as compared to non-complementary assortments. Three experiments were conducted to test the feature complementarity and its role in assortment choice. The first experiment examined the impact of feature complementarity on purchase likelihood. This experiment found that consumers choosing from an assortment with complementary features were less likely to purchase than consumers choosing from an assortment with non-complementary features. The second experiment examined whether feature complementarity moderates the impact of assortment on choice. This experiment demonstrated that a larger assortment had a negative impact on choice for an assortment with complementary features than an assortment with non-complementary features. The third experiment studied choice sets with one having a single option and the other having either complementary or non-complementary options. The results indicate that non-complementary options had a higher choice share than complementary options.

Feature complementarity is also important in product design and development literature (Kalyanaram & Krishnan, 1997; Eppinger et al., 1994; Krishnan & Ulrich, 2001). In the seminal paper on deliberate product definition by Kalyanaram & Krishnan (1997), they highlighted the importance of customising the product specification process so that by the time products come to the market, they don't become obsolete. The success of the product can be dramatically improved by forecasting consumer response by future conditioning and accelerating the information to the consumer (Urban et al., 1994; Urban et al., 1997). For designing and introducing a new product in the market, a company needs to identify the key attributes and product specifications, which will help in fulfilling the needs of the consumers. Therefore, feature complementarity is very crucial in the design process as it highlights the importance of the features that should be presented to the consumers, which will decide the success of the product in future.

On one hand, there is very little research evidence on feature complementarity and on the other hand, choice overload research has rapidly grown over one and the half decades after the seminal study by Iyengar and Lepper (2000). In today's world, choices across all consumer decisions are multiplying at an ever increasing pace. Consumers manage so much variety by applying filters like price points, favourite brands etc. Even after filtering all the options, consumers are still left with a lot of options unless they have previously decided their favourite options. This large variety is present across both offline and online channels. More choice has many benefits as highlighted in extant literature (Kahn and Lehmann,

1991; Hoch et al., 1999; Kahneman et al., 1997; DeCharms 1968; Deci, 1975; Deci and Ryan, 1985). However, a large variety may not always be beneficial for consumers. Despite all these advantages, larger assortments have many disadvantages also. Past studies found that more choice can lead to lesser satisfaction (Chernev, 2003b; Iyengar, 2010; Iyengar et al., 2006), more regret (Sagi and Friedland, 2007; Schwartz, 2000), and a lack of motivation to choose (Iyengar, 2010; Huberman et al., 2007). Choosing from large assortments may lead to weaker preferences for the chosen option and to more regret (Chernev, 2003b; Schwartz, 2003). More choice can be overwhelming, and choosing from large options may lead to decision difficulty and regret (Berger et al., 2007; Iyengar and Lepper, 2000). When variety increases, most attractive options get even more similar. As a result, it becomes very difficult for consumers to justify their choice (Sela et al., 2009). When the choice is made from more options, it leads to conflict and deciding the best option becomes a challenge. This may force consumers to defer choice or not to choose at all (Dhar, 1997; Iyengar et al., 2004; Tversky and Shafir, 1992). The phenomenon of occurrence of negative consequences like the decrease in motivation to choose, not making a choice, feeling of regret or dissatisfaction with the chosen option or decreased consumption rates when consumers choose from extensively large options has been defined in the extant literature as choice overload (Scheibehenne et al., 2010). After this study, many researchers have observed the choice overload effect for a variety of product categories, such as crackers (Townsend and Kahn, 2014), gift boxes (Reutskaja and Hogarth, 2009), prizes (Haynes, 2009), coffee (Mogilner et al., 2008), pens (Shah and Wolford, 2007), mutual funds (Huberman et al., 2007), consumer electronics (Gourville and Soman, 2005) and chocolates (Chernev, 2003b; Berger et al., 2007).

Although there is a strong and growing evidence of choice overload, there is still lack of clarity in many areas. In extant literature, there is no clarity on what are small and large assortment levels. Small assortment size varies from 2 to 60 choices and large assortment size varies from 3 to 300 choices, and the presence of choice overload has been reported at completely different levels of assortment sizes. In the feature complementarity study by Chernev (2005), assortment size of 2 was considered as small and 5 as large assortment size. But, assortment size of more than 5 is taken as a small assortment size in most of the choice overload studies in the past. Chernev et al. (2015) have summarised small and large assortment sizes used across various choice overload studies. An assortment size of 6 has been taken as a small assortment size and 24 has been taken as a large assortment the maximum number of times. Assortment size 6 and 24 are also the median values of small and large assortments. Mean assortment size for a small assortment is 5.4 and for a large assortment is 27.8. In a recent study conducted by Sharma and Nair (2017), they plotted choice overload as a function of number of options from 2 to 300. They found choice overload increased very sharply initially and then stagnated after a certain assortment size, and a further increase did not affect the choice overload. However, in the feature complementarity study by Chernev (2005), he used 2 as a small assortment size and 5 as a large assortment size, which is quite different from the prior choice overload studies. He found the presence of choice overload even for an assortment size of 5 options. It is important to know how assortment size and feature complementarity interact for assortment size of more than 5 options and whether choice overload would stagnate for more than 5 options.

This study is designed to test the role of feature complementarity using assortment sets in line with previous choice overload research. It used options of 6 as a small assortment size and options of 24 as a large

assortment size. The present experiment aims to find the moderating role of assortment complementarity on choice overload effect. Decision regret is used as a dependent variable to capture choice overload. It is hypothesised that when consumers choose from a large assortment, they are likely to feel more regret from their chosen option when assortment options are complementary than when they choose from a small assortment.

Hypothesis: Increasing the assortment size by adding options differentiated by complementary features is more likely to increase the regret of consumers than adding options differentiated by non-complementary features.

Overview of the Present Study

This study was conducted to assess the role of feature complementarity as a moderating variable for choice overload effect. Past experiments tested feature complementarity at extremely small assortment sizes. Chernev (2005) used 5 options as a large assortment size, which is even lesser than a small assortment size for most of the past choice overload research studies. This study uses 6 options as a small assortment size and 24 options as a large assortment size.

A between-subject factorial experiment design was used to test the role of feature complementarity for larger assortment sizes.

Research Design: The research methodology employed for the present study is experimentation. The ability to manipulate the independent variables is a very important prerequisite to establishing the cause and effect relationship while using experimentation as the research methodology. The independent variable for the present study is the number of options presented to respondents to choose from. The number of options to be presented to the respondents can be manipulated experimentally. Therefore, the methodology employed in this paper is experimentation and it is in line with prior research, which also used experimentation to study choice overload. A 2×2 experimental design was used in the present study where a separate group of respondents was assigned to each experimental treatment. Choice overload studies may not be suitable for a within-subject experimental design as respondents learn and gain knowledge about the assortment while choosing. Therefore, showing different assortment combinations to the same set of respondents may sacrifice the internal validity of the experiment. In this experiment, the number of options was manipulated along with moderating variable feature complementarity, which created four experimental treatments. Respondents were randomly assigned to each of the four experimental treatments.

Stimuli and Participants: For this experiment, four different menus were created for each of the four experimental treatments in 2×2 between-subject factorial design. Four experimental treatments for this experiment are - 2 (Assortment type: Complementary and Non- complementary) × (Assortment size: 6 options and 24 options). The first menu contained 6 options with complementary features, the second menu had 6 options with non-complementary features, the third menu had 24 options with complementary features and the fourth menu had 24 options with non-complementary features.

For the complementary features, the assortment of various laptop accessories was selected. As discussed earlier, in case of complementary features, the combined utility derived from the options should be more than the utility derived from the individual option. Laptop accessories' assortment can be considered as having complementary features because the combined utility of all the accessories put together would be more than the individual utility derived from each accessory. For the non-

complementary features, the assortment of different colours of laptop skin was selected. These options can be considered as having non-complementary features because the combined utility of more than one colour is not more than the utility from an individual colour (Chernev, 2005). Each menu represented a separate experimental treatment and respondents were randomised across all these menus. All the options used in the menus are shown in the appendix.

This experiment was conducted in Navi Mumbai, India. Respondents were students of educational institutes situated in Navi Mumbai. No financial remuneration was provided to the respondents. The total sample size for this experiment was 202. Females constituted 54.4% of the sample.

Pretesting and Manipulation checks: Manipulation checks were done for the experiment to find out whether large and small assortment sizes were operationalised properly. All the respondents were asked, "How much variety do you think there is in this list?" Options varied from 1 to 9, where value of 1 represented –"Very little variety" and value of 9 represented –"A lot of variety". The results showed that for respondents who chose from 24 options, the mean rating was 7.15, which was significantly more (p=0.000) than a mean score of 5.55 for respondents who chose from 6 options. A prerequisite for choice overload is that respondents should not have strong prior preferences in the given assortment. To ensure that there is no dominant option, assortment of both skin colours and laptop accessories was shown to a few respondents from the sample. In the skin colours menu, common colours like black, white, silver, etc. were repeatedly selected by the respondents. These options were removed from the list. There was no option in the laptop accessories, which was dominantly selected by respondents. All the options for both assortments which were finally chosen are shown in the Appendix.

Dependent and independent variables: The dependent variable used in this study was regret adapted from the scale used by Scheibehenne, Greifeneder & Todd, (2009). Three questions were used for capturing regret. The first two questions used in the scale were, "If you could repeat the choice, would you choose the same option again?", "Do you think that a different option from the menu would have been better than the one you chose?" with options from 1 to 9, where 1 was represented as "rather not" and 9 as "probably yes". Finally, the third question was, "Do you regret your choice?" and again options were 1 to 9, where 1 was "No regret at all" and 9 was "Very much regret". The first question was reverse coded for analysis and for mean regret score; 1 represents the least regret and 9 represents the maximum regret. The reliability analysis for the regret scale shows Cronbach's Alpha of 0.775. The independent variable used in this study was assortment size with 6 options as a small assortment and 24 options as a large assortment.

Procedure: In this experiment, four different menus were prepared. These menus contained the following combination of options: Menu 1: small - laptop accessories, Menu 2: small - laptop skin colours, Menu 3: large - laptop accessories and Menu 4: large - laptop skin colours. Respondents were approached one at a time and shown one of these four menus to select their preferred option. Respondents were given the following scenario for laptop accessories menus: "Assume you are buying a new laptop and you will get one of these accessories along with the laptop. Please choose the option which you like the most and let us know the final chosen option." For laptop skin colour menus, the following scenario was used: "Assume you are buying a new laptop and you can choose one of the following skin colours along with the laptop. Please choose the option which you like the most and let us know the final chosen option." After they made their choice, they were asked to fill a questionnaire, which captured the regret from the chosen option. It was

ensured that if a respondent was choosing from one menu, he or she was not aware of other choice-sets or menus available.

Results

Results of the present experiment found that regret scores increased significantly when the number of options was increased for complementary assortment. Mean regret scores for the 4 treatments are summarised in Table 1. The results show that when the assortment size increased from small to large for non-complementary options, the mean regret score increased to 3.30 from 2.93. For complementary options, there was a sharp increase in mean regret score from 3.11 to 4.71.

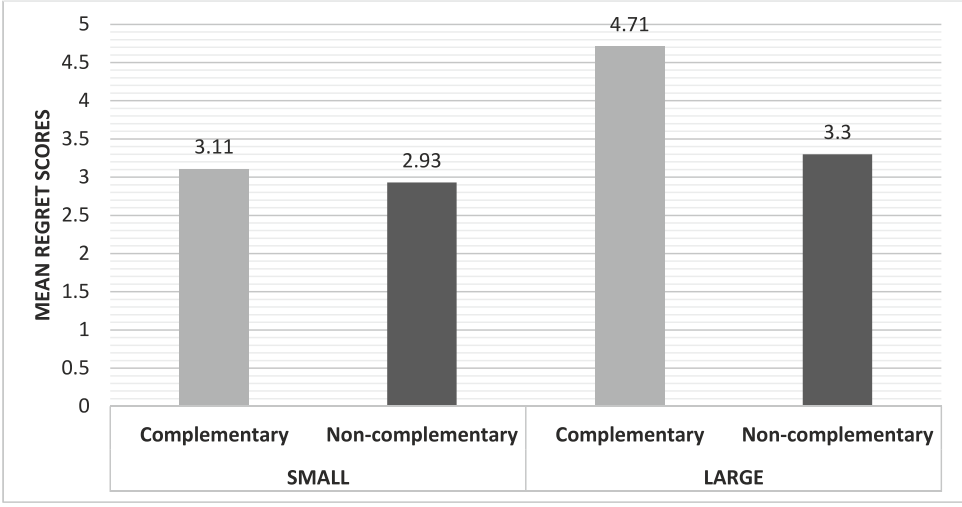
Table 1: Experimental treatments for the present study

Assortment Size	Assortment Type	Mean Regret Scores
Small	Complementary	3.11
	Non-complementary	2.93
Large	Complementary	4.71
	Non-complementary	3.30

Source: Authors' research findings

ANOVA test was conducted to find the interaction effect of the independent variable, assortment size, moderating variable and assortment complementarity. From ANOVA results, it is evident that the interaction effect between assortment size and assortment complementarity is statistically significant (F=4.15, p=0.043). Results found the mean regret for a small assortment as 3.01 and it increased to 4.01 for a large assortment menu. It shows a significant main effect for assortment size (F = 49.07, p=0.001). Results also found a significant main effect for assortment complementarity (F = 31.71, p=0.009). Hence, the findings of the experiment support the hypothesis for the present study.

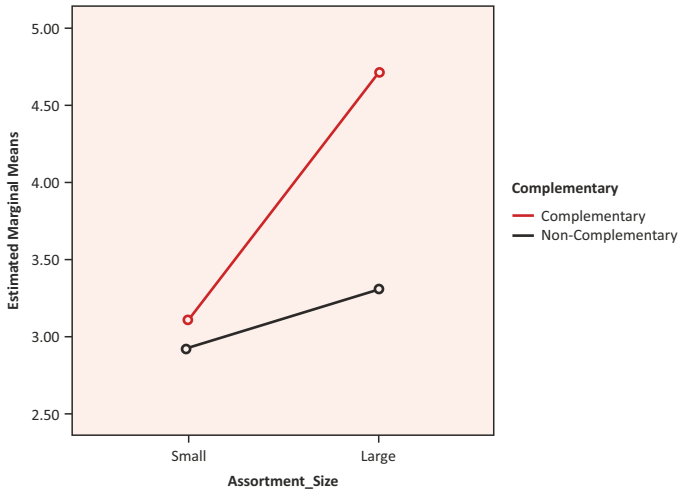
Figure 1: Mean regret scores for small and large assortment for both complementary and non-complementary assortment



Source: Authors' research findings

Figure 1 shows the mean regret scores for complementary and non-complementary options for both small and large assortments. The graphical representation of interaction effect of assortment size and assortment complementarity is shown in Figure 2.

Figure 2: Interaction effect of assortment size and assortment complementarity



Source: Authors' research findings

General Discussion

The present experiment studied the moderating role of assortment complementarity on choice overload. This experiment studied the interaction effect of assortment size and assortment complementarity. Previous feature complementarity studies used very small assortment sizes both for small and large assortments. Small assortment used 2 options and large assortment used 5 options (Chernev, 2005). The present study used larger assortment sizes to test feature complementarity, which is in line with prior choice overload studies (Chernev et al., 2015). In the present experiment, 6 options were used as small assortment and 24 options were used as large assortment size. Results found the mean regret for small assortment as 3.01 and it increased to 4.01 for a large assortment menu. It shows a significant main effect for assortment size (F = 49.07, p=0.001). Results also found significant main effect for assortment complementarity (F = 31.71, p=0.009). When the assortment size increased from small to large for non-complementary assortment, the mean regret increased to 3.30 from 2.93, but for complementary assortment, there was a sharp increase in mean regret score to 4.71 from 3.11. From ANOVA results, it is evident that the interaction effect between assortment size and assortment complementarity is statistically significant (F=4.147, p=0.043). Therefore, the findings of the experiment provide support to the notion that assortment complementarity is a potential moderating variable for the choice overload effect.

Managerial Implications: The experiment conducted in the present study contributes to the existing literature on choice overload and product development. The findings have important implications for practitioners. While developing new products, companies want to provide more features to their consumers. Offering more features is very important for satisfying the diverse needs of consumers. But if the assortment is designed in such a way that it makes the options complementary, then it may lead to negative consequences for consumers, which, in turn, may eventually reduce the company's

sales. For example, mobile handset companies like Nokia and Samsung offer a lot of variety. If they offer their assortment highlighting the complementarity features, then consumers will have to make a lot of trade-offs, which may reduce the probability of purchase. However, if the assortment is arranged using non-complementary features, for example colours of the handset, RAM size, screen size, etc. then the choice process will be easier for consumers. The present study has important managerial implications for multi-brand retailers because they offer more variety from different brands. Therefore, chances of multi-brand retailers having complementary features for their assortments are high. They should organise their products in stores or websites highlighting non-complementary features of their products to avoid any negative consequences to their consumers.

Limitations and Future Research: While this study contributes to choice overload literature, it also has limitations, which should be addressed in future research. First, only one experiment is conducted, which has limited external validity. To increase the generalisability of the findings, more studies must be conducted for different product categories and contexts. Future studies should also look at the findings of the mere categorisation effect (Mogilner et al., 2008) which contradict the findings of feature complementarity. In the feature complementarity study by Chernev (2005), assortment was arranged using complementary features like extended battery life, user friendly design, clear sound etc. The authors used only one option for each of these features. However, in the real world, consumers will have many options in each category e.g. mobile handsets with extended battery life. When the number of options under each head increases, the assortment looks very similar to an informative categorised assortment as studied in mere categorisation effect (Mogliner et al., 2008; Langner & Krengel, 2013). Mere categorisation suggests that such kind of categorisation will help in the choice process and hence, would reduce choice overload. These findings then become contradictory to feature complementarity findings. Future studies should address these possible contradictions. The present experiment studied the role of feature complementarity as a moderating variable to choice overload. In this experiment, all the options were created considering only the criteria that the combined utility of all the options is more than an individual option. Otherwise each option in the laptop accessory category was a different product altogether under the broader category of laptop accessories. Future studies should also be designed with assortment of the same product with complementary features as compared to assortments with different products within a broad category. It may also explain why choice overload was found even at an assortment size of 5 in feature complementarity study (Chenev, 2005). Feature complementarity may affect choice overload differently for high and low involvement choice decisions (Korgaonkar and Moschis 1982; Zaichkowsky 1985; Zaichkowsky 1986; Andrews et al. 1990). It is possible that consumers may experience choice overload at different assortment levels for high versus low involvement choice decisions. Future studies can be designed where consumers' involvement can be manipulated to study its interaction with feature complementarity for a variety of product categories and contexts.

Prior studies have identified many other moderating variables for choice overload; however, focus was not much on studying the interaction of multiple moderating variables. Future research may be conducted to study the interaction effect of other moderating variables and assortment sizes with feature complementarity. Future studies should be designed to study the combined effect of these moderators. Although a sufficiently large sample of 202 respondents was taken in this study, the criticism of using students as the sample and laboratory

Appendix

List of Laptop skin colours used in the experiment as non-complementary assortment:

Alice Blue	Canary Yellow	Magnet Gray
Cadet Blue	Antique White	Burly wood
Amazon Moss	Olive Green	Lavish Lime
Azure	Blanched Almond	Aqua Marine
Cardinal Red	Blue Violet	Chartreuse
Bisque	Espailer	Orange Accent
Acron	Cornsilk	Thistle Power
Blue Sway	Cyan	Lavender Blush

List of Laptop accessories used in the experiment as complementary assortment:

Screen Cleaning Kit	Cooling Pad	Wireless Mouse
Mini USB Vacuum Cleaner	Laptop Table	Laptop Sleeves
Customised Laptop Skin	Bluetooth Speakers	External Hard Drive
Wireless Headphones	8 GB Pen Drive	Laptop Bag
Surge Protector Power Strip	Dongle	Laptop Cable Lock
Customised Mouse Pad	Multi-USB Ports	Wi-Fi Finder
LED USB Light Lamp	Stereo Headset	USB Notebook Light
HD Detachable Web Cam	Digital Pen	Finger Print Sensor

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