

## Gender difference in information processing limit during online decision making

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### Abstract

According to the report of the Internet and Mobile Association of India (IAMAI) and GSM Association (GSMA), in India, there is a huge gender gap in mobile ownership. The report says (GSM Association) Forty two percent of women in India are aware of the Internet and can use mobile phone; yet women hold 28 percent less likeliness than men to own a mobile phone. Researchers relate this gap in ownership to the differences in socio-economic condition and educational background however it could possibly be due to other psychological factors also. Considering this bigger picture in mind, the study was planned to explore 'the gender difference in information processing for online mobile purchase decision'. The study was conducted on 300 participants (Female, N = 160, Mean age = 24.07; Male, N = 140, Mean age = 25.81) and data was collected during October 2017- March 2018. The data was collected with the help of questionnaires to measure the psychological tendencies and the online shopping experiment to measure the information processing in online mobile purchase decision making. The results clearly shows that males prefer more information before they make a decision and focus on increasing the control and reducing the uncertainty. On the other hand, females prefer the medium amount of information for decision making, and until they have a high need for order and are impulsive, they may prefer to postpone or cancel their decision making altogether.

**Keywords:** Online decision making, Information load, Gender differences, Psychological tendencies, Information processing limit, Buying behaviour.

### Introduction

Information has the ability to change the holistic view of the individual, this is required for every action, reaction or decision making of a human. Earlier it was only in the hand of the privileged population. Digital era has shifted this power from vertical to the horizontal framework, and now anybody can use, search, gather and evaluate any amount of information. Traditionally, the decision-making literature assumed that the decision maker searches for sufficient information and then takes the decision. However, with the technological revolution and internet boom, the reality is reversed, and many researchers are arguing about the effect of over information on the decision. The limited capacity of information processing (Bettman, 1979) also supports the link between information overload and decision difficulty. Pilli and Mazzon (2016) suggested that at present normative and empirical evidence favor an increase in availability of information and choice (in the decision environment) and at the same time dysfunctionality of information overload.

Information overload or infobesity, a term grounded in Cognitive Psychology has permeated the academia; as the digital revolution has made it a reality of personal, formal/informal and business world. One area which has seen the most drastic change due to digital revolution is a movement of the market to online platforms. Resnick (2001) suggested that the online decision-making environment has almost all the feature of real-life decision environment (space for error, confusion, uncertainty, ambiguity, time constraint, profit/loss, etc.) and it even intensified it. Therefore, decision making research in an online environment can help in providing insight into the contradictory conclusions related to benefits of increasing information/choice and dysfunctions originating from overload. Li and Zhang (2002) sums up the factors moderating decision as how much one needs information, how they seek, compare and chose an

alternative, to context factor, product characteristic, and individual factors.

As we know individual variability and complexity contribute a major role in this. Accepting this contribution e-commerce service provider are trying hard to evaluate every perspective of the individual (Szalma, 2009). They have build efficient website and they recorded every activity of the individual to help them in using internet. For example sites remember, items in your shopping cart, your log-in name, your preferences, like always showing the weather in your home town. According to Website developer the marketer importantly focus on the individual psychological and cognitive ability and try to present information according to their need.

The literature of online consumer decision making has several established trends relating to gender, cognitive processes, and purchase behavior. Park et al. (2009) suggested that females need more detailed information and assistance than males while shopping, probably because males effectively use more heuristic approach in information processing (Downing, Chan, Downing, Kwong, & Lam, 2008). Previous studies also found the significant difference towards male and female motivational level of online shopping. Huang and Yang (Huang & Yang, 2010) reported that males are mainly looking for utilitarian motivation (convenience, choice, availability of information, lack of social interaction and cost saving) whereas females are looking for hedonic motivations (adventure, sociality and fashion and value). Javadi, Rezaie Dolatabadi, Nourbakhsh, Poursaedi, and Asadollahi (2012) commented that online decision making includes financial risk and non-delivery risk and therefore there could be significant gender differences due to females being more risk averse than males (Meyers-levy & Loken, 2014). In general, researchers say "Women need the right atmosphere, space, and time to find just the

right item. Men want to get the job done”, according to the situation, they use different proposition to choose, select and process information.

Extending and exploring Meyers-levy and Loken (2014) suggestion for integrating connection between genders cognitive processes and their temperament, especially under the condition of the rapidly growing online market of India and one of the biggest online market (more than 100 million by the end of 2017, ASSOCHAM, 2017) is worthwhile. Therefore, present research considers the relevance of online platform for infobesity and importance of individual factors and context factors, and thus explores the “amount of information processed by Indian males and females and influence of psychological tendencies in information processing while deciding on the through online market platform.”

### Objectives

Therefore the present study aims to explore the “Gendered information processing limit as influenced by psychological tendencies in online decision making.”

Specifically:

1. Gender differences in psychological tendencies.
2. Gender differences in information processing limit for online decision making.
3. Distinguishing the gendered information processing in the face of different choices and attribute level.
4. Psychological tendencies (need for control, uncertainty avoidance, and impulsivity) influencing information processing in both the genders.

**Hypothesis:** On the basis of previous literature, the hypothesized trend for the objective mentioned above could be as follows:

1. Females will show more impulsive and uncertainty avoidance behavior, whereas, males will show more need for control.
2. There will not be any gender difference in information processing limit.
3. There will be a significant difference in information processing with different choice and attribute level.
4. The impulsivity and uncertainty avoidance will influence information processing in females.
5. The need for control will influence information processing in males.

### Methodology

The study was conducted on 300 participants (Female, N = 160, Mean age = 24.07; Male, N = 140, Mean age = 25.81) for data collection during October 2017- March 2018; with the help of questionnaires to measure the psychological tendencies and experiment to measure the information processing in online decision making.

### Questionnaire

Need for closure, uncertainty avoidance, and impulsivity, all three of these tendencies associate with the way an individual seeks, process and react to the information

and therefore they were explored in the study. Intolerance of Uncertainty Scale was used to assess uncertainty avoidance. The scale has 27 items for four factors naming desire for predictability, uncertainty paralysis, uncertainty distress, and inflexible belief. The need for closure scale has 42 items for five factors naming order, predictability, decisiveness, ambiguity, and close-mindedness. The impulsivity scale has 30 items for three factors naming non-planning impulsiveness, cognitive impulsiveness, and motor impulsiveness.

### Experiment

The e-commerce websites give an advantage of studying decision-making process, similar to the real-world scenario and it may also provide scope for experimental manipulation. Thus an online platform for the product purchase was created. The mobile phone was chosen as the products due to it being a common use and being sold through e-commerce websites in reality. The mobile website named ‘Mobile bazaar’ was created and participants were asked to use the website assuming that they are purchasing a mobile and hotel room. The experimental interface was created with the Xampp software; the frontend is HTML CSS JAVASCRIPT and Backend is PHP MySQL.

### Technical Description

The experiment follows the two-phase plan. To start the experiment participant had to fill in their demographic information then the phase one starts. In phase one, participants had to create a wish list from multiple mobile choices. The mobile options were organized into three categories (four, eight, and twelve options per page) x three attribute level (four, eight, twelve attributes per option). Total of 72 mobile options were created and displayed on nine pages, creating nine factors (4 x 4, 4 x 8, 4 x 12, 8 x 4, 8 x 8, 8 x 12, 12 x 4, 12 x 8, and 12 x 12). The pages follow an increasing amount of options and attribute wise information. The choices were arranged in basic (least price and lowest version of attribute), fully loaded (highest price and best version of attribute), and middle option (gradually increasing the price with mix versions of attributes), in every factor. Fully loaded options were always the last display on every page.

A participant can choose as many mobiles as they want (minimum four), which was automatically added to the cart and then if they want to make the final choice they can go to the cart. The cart is the phase-two of the experiment, where the participant can see and compare their wish list choices to make the final decision.

In the phase-one, participants can see any page as many times as they want with the help of ‘previous’ and ‘next’ button, or they can go to the cart with the help of ‘go to final choice’ button. Every page has a button labeled as ‘end experiment’ if the participant wants to terminate the experiment without choosing any option they can do so by this button and it is considered as an indicator of deferral decision.

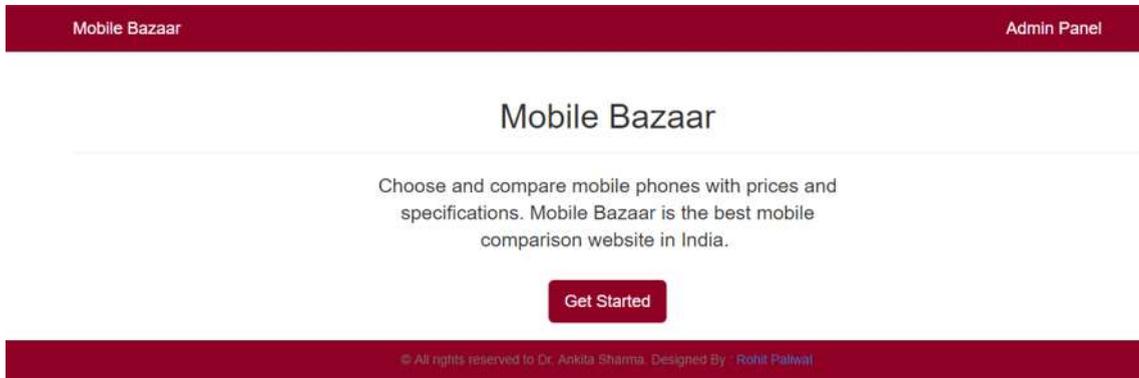


Fig. 1: Depicting homepage of experiment

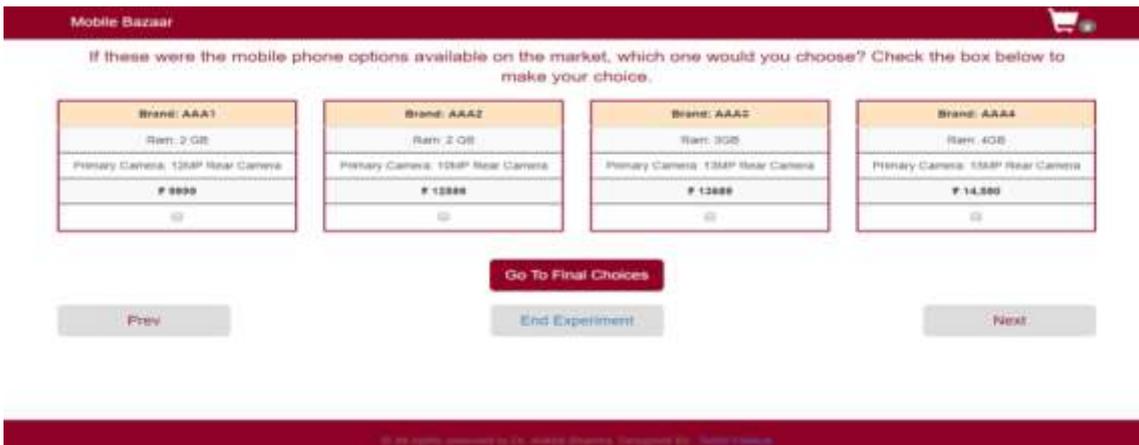


Fig. 2: Depicting the 4x4 factor of the online platform

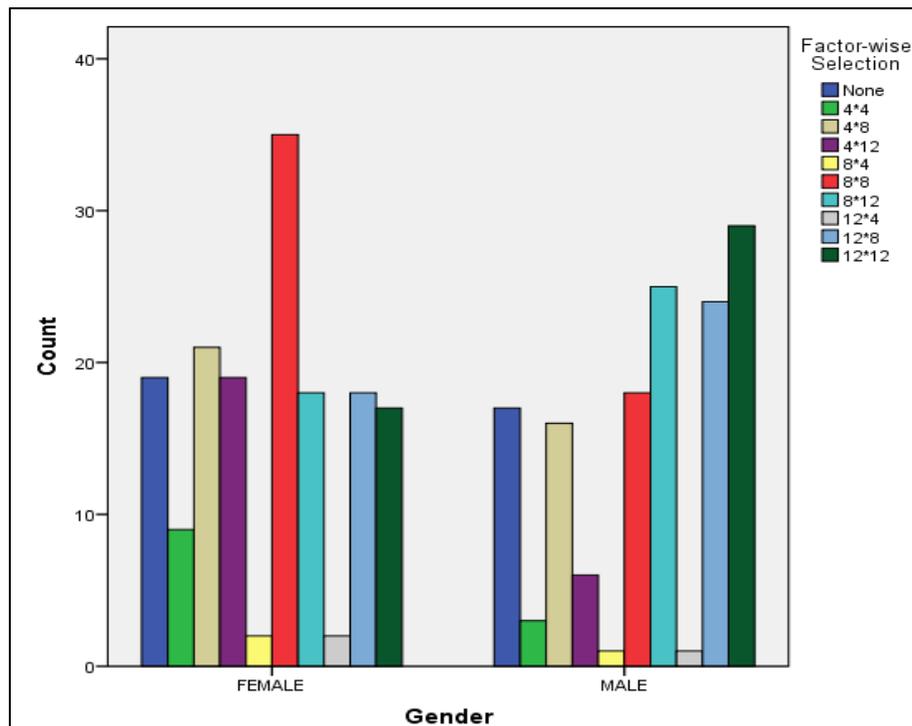


Fig. 3: Includes details of attributes provided in each option level

An example of factors, factor one (with four options and four attributes), factor two (with eight options and eight attributes), and factor three (with twelve options and twelve attributes) is illustrated in table 1. For each choice, the brand was the first attribute displayed, and the price was the last one.

**Analysis**

The choice of mobile in connection to the participant’s gender and psychological tendencies is analyzed to answer the objectives. SPSS version 23.0 is used for the analysis. As the present study extends (Lurie, 2002) study with manipulation of attribute level also the number of alternative provide (following the traditional and structural approach); different factors were combined to create different information load.

**Information Load: Combined information of Alternatives and Attributes**

After the factor wise analysis of data, the mobile options were combines to create the different information load.

According the definition of information load or amount by (Jacoby & Jacoby, 2017) different mobile choices are combined to form different information load categories (low, middle and, high information load). Low information load category was created by combining 4x4, 8x4, and 12x4 factor, assuming that only four attributes per choice is least information processing requirement. Medium information load category included 4x8, 4x12 and 8x8; similarly, high information load includes 8x12, 12x8 and 12x12 factor choices. Table 2 elucidate the information load categorization. Alphabetic order like A, B, C, and D etc, represent a number of alternatives whereas numeric order like one, two, three, and four etc, represent the number of attributes in each level (numeric represent attribute like Brand, RAM, Primary Camera etc., as reported in Table-1).

Further analysis was done with the data related to the selection of alternative in phase-1 from this information load category, to explain the information load proceeds by both the genders (Objective 1 and 4); if psychological tendency influences the information load processed by both the genders (Objective 2)

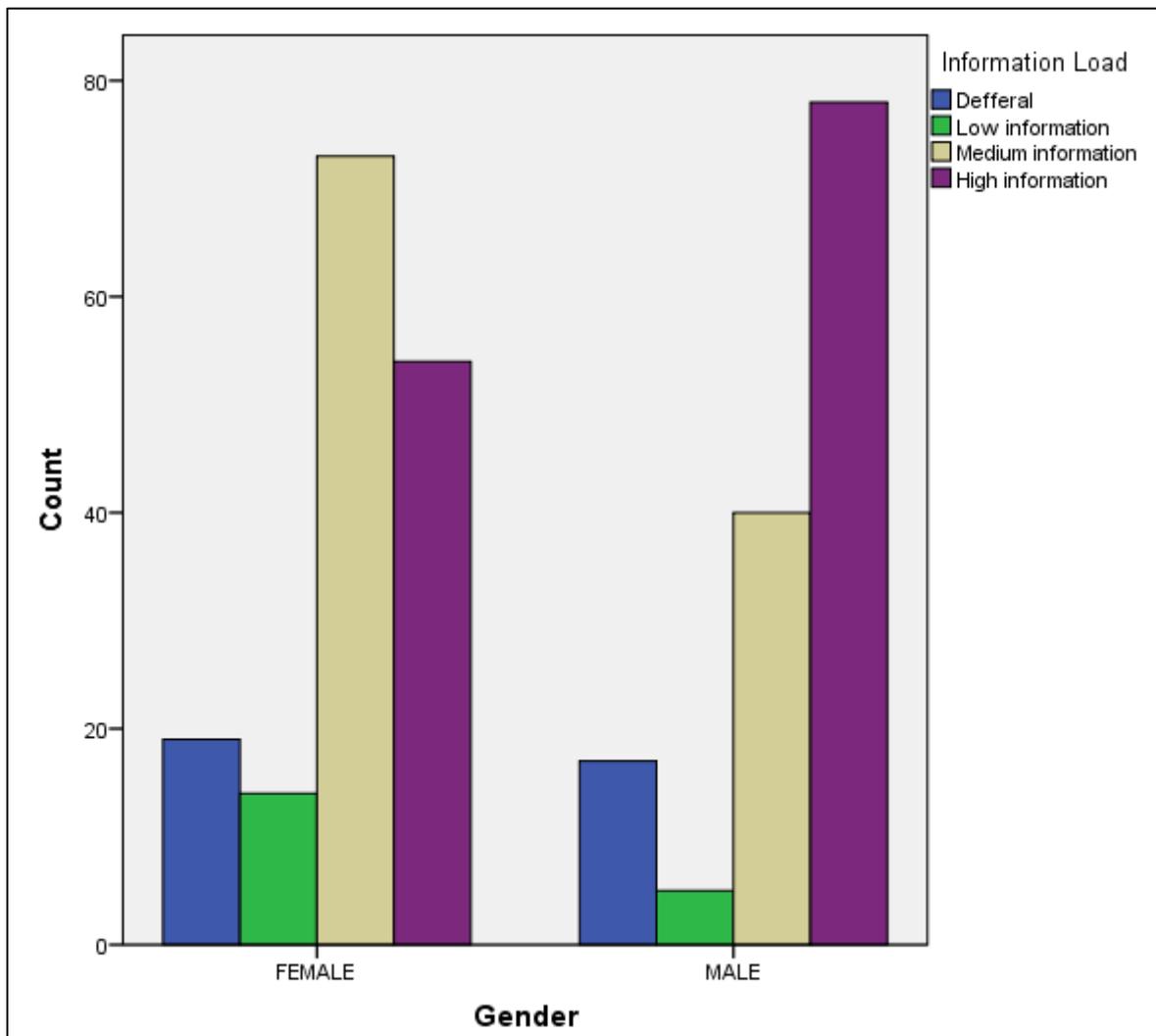


Fig. 4: Elucidating the creation of information load categories by different factors

Results

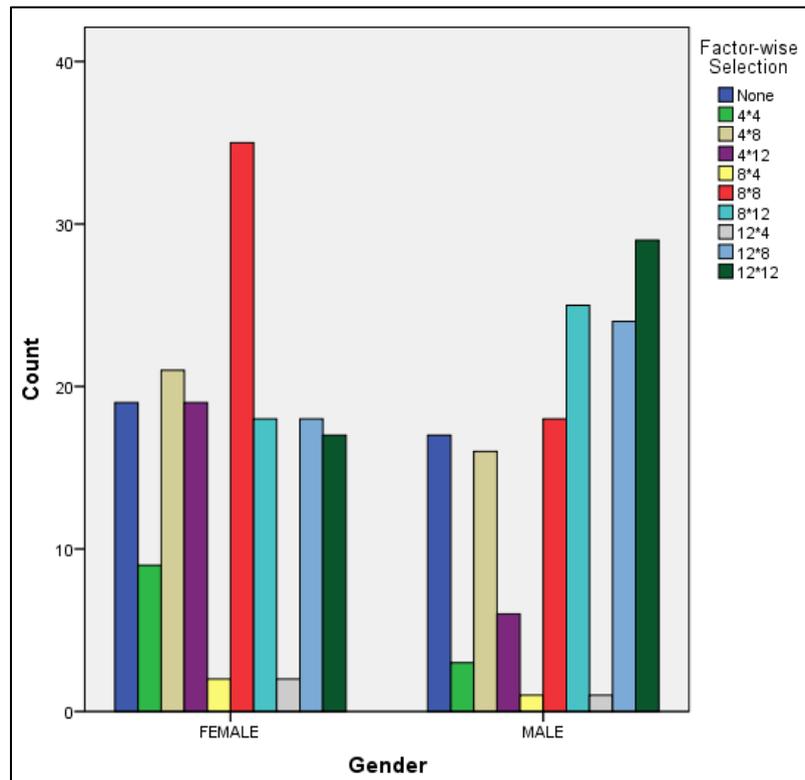


Fig. 5: Gender differences in factor wise mobile selection

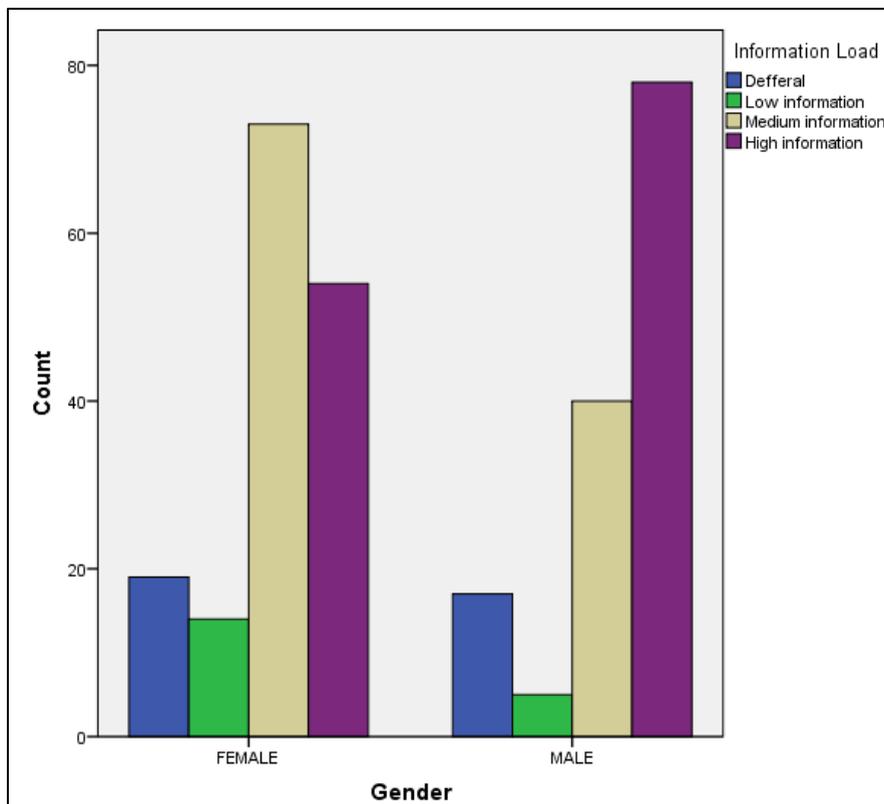


Fig. 6: Gender difference in information load processing

**Table 1: Gender differences in factor wise mobile selection**

Gender	Factor wise mobile selection												X <sup>2</sup>	p
	None	4*4	4*8	4*12	8*4	8*8	8*12	12*4	12*8	12*12	Total			
Female	19	9	21	19	2	35	18	2	18	17	160	20.55*	.015	
Male	17	3	16	6	1	18	25	1	24	29	140			
Total	36	12	37	25	3	53	43	3	42	46	300			

\*p<.05, \*\*p<.01, \*\*\*p<.001

**Table 2: Gender difference in information load processing.**

Gender	Information load wise selected mobile options					X <sup>2</sup>	P
	None	Low Load	Medium Load	High Load	Total		
Female	19	14	73	54	160	17.12***	.001
Male	17	5	40	78	140		
Total	36	19	113	132	300		

\*p<.05, \*\*p<.01, \*\*\*p<.001

**Table 3: ANOVA for differences in Psychological Tendencies for information processing among females.**

		Sum of Squares	df	Mean Square	F	Sig.	$\eta p^2$
NFC order	Between Groups	267.408	3	89.136	3.03	.031	0.05 Small
	Within Groups	4579.535	156	29.356			
	Total	4846.944	159				
NFC predictability	Between Groups	81.005	3	27.002	.992	.398	0.02
	Within Groups	4246.970	156	27.224			
	Total	4327.975	159				
NFC decisiveness	Between Groups	11.170	3	3.723	.220	.882	0.00
	Within Groups	2634.524	156	16.888			
	Total	2645.694	159				
NFC ambiguity	Between Groups	16.408	3	5.469	.234	.873	0.00
	Within Groups	3652.336	156	23.412			
	Total	3668.744	159				
NFC closed mindedness	Between Groups	7.577	3	2.526	.165	.920	0.00
	Within Groups	2385.398	156	15.291			
	Total	2392.975	159				
Need for Control: Total	Between Groups	341.395	3	113.798	.531	.662	0.01
	Within Groups	33445.799	156	214.396			
	Total	33787.194	159				
IUS: Desire for Predictability	Between Groups	26.439	3	8.813	.339	.797	0.01
	Within Groups	4055.061	156	25.994			
	Total	4081.500	159				
IUS: Uncertainty Paralysis	Between Groups	52.446	3	17.482	.772	.512	0.01
	Within Groups	3534.654	156	22.658			
	Total	3587.100	159				
IUS: Uncertainty Distress	Between Groups	38.139	3	12.713	.780	.507	0.01
	Within Groups	2541.605	156	16.292			
	Total	2579.744	159				
IUS: Inflexible Uncertainty Beliefs	Between Groups	7.373	3	2.458	.239	.869	0.00
	Within Groups	1607.071	156	10.302			
	Total	1614.444	159				
IUS Total	Between Groups	425.003	3	141.668	.640	.590	0.01
	Within Groups	34536.972	156	221.391			
	Total	34961.975	159				
Impulsivity: Non-planning Impulsiveness	Between Groups	173.865	3	57.955	2.825	.041	0.05 Small
	Within Groups	3200.510	156	20.516			
	Total	3374.375	159				

Impulsivity: Cognitive Impulsiveness	Between Groups	19.387	3	6.462	1.002	.394	0.02
	Within Groups	1006.107	156	6.449			
	Total	1025.494	159				
Impulsivity: Motor Impulsiveness	Between Groups	219.054	3	73.018	4.149	.007	0.07 Small
	Within Groups	2745.190	156	17.597			
	Total	2964.244	159				
Impulsivity: Total Impulsiveness	Between Groups	230.885	3	76.962	2.720	.046	0.05 Small
	Within Groups	4414.715	156	28.299			
	Total	4645.600	159				

\*p<.05, \*\*p<.01, \*\*\*p<.001

**Table 4: Tukey HSD post-hoc for ANOVA on Psychological tendencies and information load among females.**

Psychological Tendencies	Information Load	Deferral	Low information	Medium information	High information
Need for order	Mean	M=16.36	M=19.71	M=19.43	M=19.70
	Deferral	-----	-3.34	-3.06*	-3.33*
	Low information		-----	.275	.010
	Medium information			-----	-.265
	High information				-----
Non-planning impulsiveness	Mean	<b>M=38.15</b>	<b>M=32.92</b>	<b>M=35.04</b>	<b>M=34.42</b>
	Deferral	-----	5.2*	3.1	3.7
	Low information		-----	-2.1	-1.5
	Medium information			-----	.62
	High information				-----
Motor impulsiveness	Mean	<b>M=16.73</b>	<b>M=21.71</b>	<b>M=18.80</b>	<b>M=19.55</b>
	Deferral	----	-4.97*	-2.07	-2.81
	Low information		-----	2.90	2.15
	Medium information			-----	-.747
	High information				-----
Impulsiveness: Total	Mean	<b>M=18.21</b>	<b>M=21.14</b>	<b>M=21.43</b>	<b>M=22.24</b>
	Deferral	-----	-2.93	-3.22	-4.03*
	Low information		-----	-2.9550	-1.09788
	Medium information			-----	-.74734
	High information				-----

Fisher's Exact Test, \*p<.05, \*\*p<.01, \*\*\*p<.001

**Table 5: ANOVA for the difference in Psychological Tendencies for information processing among males.**

		Sum of Squares	df	Mean Square	F	Sig.	$\eta^2$
NFC order	Between Groups	108.769	3	36.256	.995	.397	0.02
	Within Groups	4954.631	136	36.431			
	Total	5063.400	139				
NFC predictability	Between Groups	226.894	3	75.631	3.084	.029	0.06 small
	Within Groups	3334.792	136	24.521			
	Total	3561.686	139				
NFC decisiveness	Between Groups	32.131	3	10.710	.695	.556	0.01
	Within Groups	2094.755	136	15.403			
	Total	2126.886	139				
NFC ambiguity	Between Groups	35.436	3	11.812	.420	.739	0.01

	Within Groups	3824.450	136	28.121			
	Total	3859.886	139				
NFC closed mindedness	Between Groups	22.455	3	7.485	.516	.672	0.01
	Within Groups	1971.088	136	14.493			
	Total	1993.543	139				
Need for Control: Total	Between Groups	833.864	3	277.955	1.217	.306	0.03
	Within Groups	31049.307	136	228.304			
	Total	31883.171	139				
IUS: Desire for Predictability	Between Groups	109.366	3	36.455	2.100	.103	0.04
	Within Groups	2360.377	136	17.356			
	Total	2469.743	139				
IUS: Uncertainty Paralysis	Between Groups	58.493	3	19.498	.997	.396	0.02
	Within Groups	2660.328	136	19.561			
	Total	2718.821	139				
IUS: Uncertainty Distress	Between Groups	99.356	3	33.119	2.391	.071	0.05 small
	Within Groups	1884.037	136	13.853			
	Total	1983.393	139				
IUS: Inflexible Uncertainty Beliefs	Between Groups	102.287	3	34.096	3.490	.018	0.07 small
	Within Groups	1328.649	136	9.769			
	Total	1430.936	139				
IUS Total	Between Groups	1309.827	3	436.609	2.607	.054	0.05 Small
	Within Groups	22774.595	136	167.460			
	Total	24084.421	139				
Impulsivity: Non-planning Impulsiveness	Between Groups	38.194	3	12.731	.750	.524	0.02
	Within Groups	2309.599	136	16.982			
	Total	2347.793	139				
Impulsivity: Cognitive Impulsiveness	Between Groups	10.817	3	3.606	.493	.688	0.01
	Within Groups	994.119	136	7.310			
	Total	1004.936	139				
Impulsivity: Motor Impulsiveness	Between Groups	46.055	3	15.352	1.112	.346	0.02
	Within Groups	1877.166	136	13.803			
	Total	1923.221	139				
Impulsivity: Total Impulsiveness	Between Groups	1.763	3	.588	.023	.995	0.00
	Within Groups	3466.779	136	25.491			
	Total	3468.543	139				

\*p&lt;.05, \*\*p&lt;.01, \*\*\*p&lt;.001

**Table 6: Tukey HSD post-hoc for the need for predictability and information load among males.**

Psychological Tendencies	Information Load	Deferral	Low information	Medium information	High information
Need for predictability	Mean	<b>26.29</b>	<b>25.20</b>	<b>26.97</b>	<b>24.17</b>
	Deferral	-----	1.09	-.68	2.11
	Low information		-----	-1.77	1.02
	Medium information			-----	2.79*
	High information				-----
Inflexible uncertainty beliefs	Mean	<b>11.76</b>	<b>14.00</b>	<b>12.22</b>	<b>10.69</b>
	Deferral	-----	-2.23	-.460	1.07
	Low information		-----	1.77	3.30
	Medium information			-----	1.53 (.061)
	High information				-----

Fisher's Exact Test, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

## Discussion

The study aimed at exploring information processing limit as influenced by psychological tendencies in online decision making for males and females and result reflected significant gender differences for preferred amount of information processing and psychological factors influencing decision making.

We exposed the participants with a relatively large number of alternatives (total 72 alternatives, in comparison to previous studies) and we found that majority of participants have made selection decision (only 36 out of 300 participants made deferral decision) and spent on average five minutes five seconds on the whole experiment. Therefore, even with this large amount of information processing requirement, it is not possible to comment on information processing limit in online decision-making scenario from the present study. However, results are very clear on the preferred amount of processed information for making the decision, and there is a very significant gender difference in it and thus partially supporting the first hypothesis.

Females preferred significantly less information than males for decision making ( $X^2 = 20.55$ ,  $p = .015$ ; factors wise selection). Females appear to prefer 8x8 factor most, whereas males seem to prefer 12x12, 8x12 and 12x8 most (as depicted in graph 1). Though previous studies have mostly used very few information (four-six attributes) about every alternative and focused on increasing alternatives only; it is clear from present results that neither males nor females have preferred four attribute alternatives for decision making. At the same time, where suggested that more than eight attributes negatively influence decision quality, however according to current results, it may hold true for females but not for males. The differential preference for information processing amount by males and females emerges more clearly in information load wise analysis ( $X^2 = 17.12$ ,  $p = .001$ ), where females preferred medium information load and males prefer high information load for decision making and thus supporting the second hypothesis about significant differences in information processing with different amount of choice and attribute level.

The findings from present study went back to the initial assertion of 'no gender difference for cognitive theories,' as there were no significant gender differences for the need for control, uncertainty avoidance or impulsivity, therefore rejecting the third hypothesis. But when it comes to psychological tendencies influencing information processing; there were stark gender differences in the results. Females seems to significantly differ on the amount of information load they take for decision making as per their need for order [ $F(3, 156) = 3.03$ ,  $p = .031$ ,  $n_p^2 = .05$ ], non-planning impulsivity [ $F(3, 156) = 2.825$ ,  $p = .041$ ,  $n_p^2 = .05$ ], motor impulsivity [ $F(3, 156) = 4.149$ ,  $p = .007$ ,  $n_p^2 = .07$ ] and overall impulsivity [ $F(3, 156) = 2.720$ ,  $p = .046$ ,  $n_p^2 = .05$ ]. The small effect size was observed for the need for predictability and cognitive impulsivity also, but the p-value was not significant. The post hoc analysis using Tuckey HSD indicated that females making deferral decision are significantly different than females making selection decision from any information load category. For instance, females making deferral decision have less need for order in comparison to low information load ( $p = .034$ ) and high information load ( $p = .052$ ); less overall impulsivity in comparison to high information load ( $p = .026$ ) than females making selection decision. At the same time, females making deferral decision are high on non-planning impulsivity than medium information load ( $p = .046$ ), high information load ( $p = .032$ ) and high on motor impulsiveness in comparison to low information load ( $p = .005$ ). This result overall suggests that females who make deferral decision have significantly less need for order and impulsivity. These findings partially support the fourth hypothesis as impulsivity significantly influenced the information processing, but there was no significant effect of the uncertainty avoidance.

The analysis for males suggested significant differences on need for predictability ( $F(3, 136) = 3.084$ ,  $p = .029$ ,  $n_p^2 = .06$ ), inflexible uncertainty belief ( $F(3, 136) = 3.490$ ,  $p = .018$ ,  $n_p^2 = .07$ ) and overall uncertainty avoidance ( $F(3, 136) = 2.607$ ,  $p = .054$ ,  $n_p^2 = .05$ ). The differences in uncertainty paralysis and uncertainty distress were close to significance value with small effect size, and many of the pairwise comparisons were also close to significant. These results provide the initial trend of the data which may become

significant with increasing sample size. The existing significant result suggests that males with a high need for predictability choose from medium information load in comparison to high information load ( $p = .002$ ). Males making selection decision from low information load ( $p = .104$ ) and medium information load ( $p = .061$ ) have significantly more inflexible uncertainty belief than high information load selection makers. These findings support the fifth hypothesis.

Overall, the need for control emerges as an important cognitive style determining the amount of information preferred for decision making for males and females both. Impulsivity for females and uncertainty avoidance for males appear as driving personality tendency for preference of information processing load.

### Conclusion

The findings from the present study support the emphasis given to the gender as segmentation in consumer and market research. The present study clearly shows that males prefer more information before they make a decision and focus on increasing the control and reducing the uncertainty. On the other hand, females prefer the medium amount of information for decision making, and until they have a high need for order and are impulsive, they may prefer to postpone or cancel their decision making altogether.

### Limitation and Future Suggestion

Present work is based on gender differences, but the importance of age is paramount when considering the e-commerce or online scenario as reported in our previous work therefore a comprehensive understanding requires a balance of gender and age/generation combination in the sample. It is also important to note that the difference in preferred amount to information processing could be due to the product type in the experiment (i.e., mobile) and it may be different for other gender-specific products. Therefore the results need validation through a similar experiment with different products.

**Conflict of Interest:** None.

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