

The Factors that Influence Views on Gender-Segregated Higher Education  
in Saudi Arabia and its Implications on the Workplace

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## **Executive Summary**

This research contains findings and recommendations about gender-segregated higher education in Saudi Arabia addressing issues about factors that influence views on gender-segregated education and the implications it has on society. As universities are gender-segregated while the workplace is mostly a mixed-gender environment, it generates a gender communication gap which negatively affects productivity in the workplace. The aim of this research is to decide whether the gender-segregated education system of Saudi Arabia should be reviewed. This can be determined by highlighting factors that influence gender views and implications in the workplace.

Our team collected information from 109 students in the Graduate Development Program of the Public Investment Fund. The students are from different cities in Saudi Arabia and studied different majors in universities all around the world. They are all in their 20s and 30s, and they all speak English. We acknowledge the limitation of this sample and we hope this research functions as the basis for future research as this field is not researched yet. The survey measured the factors that influence the students' views about gender-segregated higher education in Saudi Arabia. We found factors that significantly affect gender interactions in the workplace which are the level of conservatism, introversion, comfort in interacting with the opposite gender, exposure to mixed-gender higher education. Furthermore, we found other factors including gender, marital status, and region does not affect gender interaction in the workplace. Our main findings are the following:

- Saudi society is changing due to modernizing policies.
- Gender-segregation in higher education should be reviewed.
- Our data analysis showed that 68% of the survey participants are with mixed-gender education.

- There are variables that affect gender views. Conservatism, level of comfort, and exposure strongly and positively influence people's views about implementing mixed-gender education in Saudi Arabia. Therefore, to increase the support for mixed-gender education, we need to focus on improving gender perceptions.
- Mixed-gender higher education in Saudi would enhance gender equality.
- Our evaluation of five policy options was based on the scoring model and the timeframe.
- Our short-term recommendation consists of mixed-gender e-learning, our mid-term recommendation is to teach high school students a subject about gender norms, and our long-term recommendation is a policy that coeducates students in public universities in Saudi Arabia.

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## **1. Introduction**

Gender-segregated education is a common practice in many countries. It is more prevalent in undergraduate programs. At this stage, students undergo certain psychological developments, and a segregated education system influences this. The comfort that boys and girls develop around each other in co-educational institutions goes a long way in determining how they behave with the opposite gender in the future (Waller, 2016). Higher-education segregation plays a massive role in how each gender views the other. It also affects their ethical behavior, respect, and the boundaries between them (Ransom, 2016).

The people who have studied in the gender- segregated system may be less comfortable interacting with colleagues of the opposite gender in the workplace. This system is often held responsible for the gender inequalities that show up in the labor market. People who are part of the segregated education system even during their under graduation or post-graduation years are more sensitive in an environment that requires them to interact with people of the opposite gender (Blau, 2016).

The sensitivity is more on the part of women as compared to men (Derntl, et al., 2010). Women may feel uncomfortable in workplaces where they work closely with men. They also become concerned with their safety when around male colleagues. With males, it has been observed that talking to a female colleague or pairing up with a female makes them uncomfortable at the workplace. Such instances reveal the fact that comfort level is something that builds over time and, therefore, should begin at an early age. The college environment shapes the way a person thinks and behaves in society (Qian, 2018). In this research, we assess whether or not gender-segregated higher education in Saudi Arabia should be reviewed.

## **2. Background**

In Saudi Arabia, gender-segregation is based on religion, culture, and norms (Alwedinani, 2016). The interaction of both genders was prohibited after the rise of the Sahwa Movement in the 1980s (Meijer 2010). Unlike neighboring countries, gender-segregation is embodied in all social interactions in Saudi Arabia (Alwedinani, 2016). “Education in Saudi Arabia follows the policy of gender segregation” (Alwedinani, 2016). Although gender segregation is the norm in Saudi Arabia, lately, it has been discussed publicly (Hamdan, 2005). It is very important to discuss gender-segregated education in Saudi Arabia as the country is achieving Saudi Vision 2030. Vision 2030 has three pillars: a vibrant society, an ambitious nation, and a thriving economy. Having gender-segregated education reinforces the old Saudi tradition, while Vision 2030 is creating a quantum leap between the past and the future. It strives for prosperity and modernization. Therefore, our research focuses on whether or not gender-segregated education serves Saudi Arabia and Vision 2030 goals. As gender-segregated education is the norm in Saudi, there are some challenges in conducting the research. There is no past research on the topic in Saudi Arabia. Also, gender-related topics are sensitive to discuss amongst people. With these limitations, we aim to create the basis of gender-segregated education research that allows future research to expand and build upon.

### **Problem Statement**

There is a considerable contrast between gender-segregation in the Saudi workplace and higher education. A typical domestically educated Saudi college graduate will move from a conservative segregated education system into an open mixed-gender working environment. In theory, this creates a gender communication gap that reduces productivity and efficiency. According to the General Organization for Social Insurance’s private-sector employment data, more than 76% of female Saudi workers leave their jobs after less than one year. This is closely correlated with the skills mismatch. The

study indicates that employers in Saudi Arabia face difficulty in finding female job-seekers with soft critical skills, such as communication and work ethics (Domash, 2017).

### **Research Objectives**

This research aims to highlight the factors that influence gender-segregated higher education and its implication on the workplace. There are two main objectives; first, to consider whether or not we should reconsider gender-desegregation in higher education in Saudi. The second objective is to examine the factors that are strongly correlated with one's views on gender-segregated education which influences gender perception and communication in the workplace. This research will also contribute to the body of literature by identifying, studying, and understanding other factors that affect gender views.

## **3. Literature Review**

### **3.1 Gender-Segregated Education in Saudi Arabia**

Segregated education has been embedded in the Saudi culture for decades. Wahhabism is an Islamic movement that inferred the Qur'an's warning about the mixing of genders as tightly restricted, causing the force of serious limitations in the Saudi society that majorly impacted education and employment (Baki, 2004). This led to the perception that women and men in Saudi society believe that each gender is different; therefore, in many cases, women are not allowed to study or work with men (Hamdan, 2005). Most Saudi educational premises allocate separate classes for men and women, causing gender stereotyping in the workplace. Looking back at the history of Saudi Arabia, women faced many restrictions publicly, and education was limited due to the cultural norms and traditional practices of the Saudi society (Quamar, 2013). A study conducted by Alselaime (2012) found that segregation can restrict many development opportunities, especially for women. Abdul-Aziz Bin Baz (former religious jurisconsult of Saudi Arabia) said that single-gender educational institutions allow women to remove their



veil or hijab which will make them more comfortable while studying, as well as allowing men to focus on their studying without the interference of distractions from the other gender (AlWedinani, 2016). A book written by Jamjoom and Kelly (2013) discussed major challenges that women in segregated universities face; one is that they're not prepared to take part in employment settings that are occupied by both men and women. Second, maintaining all-women universities in Saudi Arabia stimulates the thought of completely separating men from women. The effect of segregated education is not only limited to social norms, it extends to economic costs as well (Mayan, Ismail, & Al-Shahrani, 2014). Currently, Saudi Arabia consumes its oil wealth funds to enhance women education based on providing gender-segregated schools and colleges and enhancing the curriculum for both men and women educational levels (AlSuwaida, 2016). The theory of gender segregation has extended to work segregation as well where most administrative areas consist of two separate branches of male and female and coordination of work is processed through virtual communication handled by a median to avoid direct interaction between genders (Alotaibi & Kuk, 2011).

### **3.2 Gender-Segregated Education in the Gulf Region**

Most gulf countries still apply single-sex education at least in schools because of cultural traditions. A study in Kuwait, which looks at the relationship between gender segregation in schools and peer relations, shows a significant impact of gender-segregated education on peer relationships with the opposite gender. Moreover, they found that other variables such as self-esteem, spiritual values/religion, and parental relationships, also have a strong influence on peer relationships. The research studied seventy six participants who took part in a questionnaire that included the variables to be considered. They did, however, find that self-esteem has the largest impact on peer relations when compared to mixed-gender education and other variables (AlMatrouk, 2016).

### **3.3 Gender-Segregated Education in the United States**

Historically in the United States, women were not admitted into male universities (Harwarth et al, 1997). Women colleges were established to allow women to study for university degrees. As society moved toward gender equality, single-sex colleges faced challenges such as financial problems, social movements, legislation, and low enrolment rates (Harwarth et al, 1997). Therefore, many of them became coeducational to mitigate their challenges. At the same time, “beginning in 1969, Yale, Princeton, and Dartmouth began to make plans to move to coeducation” (Harwarth et al, 1997). Many believed the coeducation is better than single-sex colleges for both sexes (Smith et al, 1995). Some women colleges faced further challenges as they became coeducational as males dominated the faculty and classroom discussions. The colleges felt that they reinforced gender inequality (Harwarth et al, 1997). Women were treated as second-class citizens (Smith et al, 1995). Other women’s colleges remained the same. They believed that women colleges are the best for women to succeed. Harwarth et al found that women in single-sex colleges tend to major in math, science, and computer science more than in coeducational institutions, but the difference is not significant (1997). If women succeeded slightly more in single-sex colleges, will they succeed in the workplace with real-life challenges? American Civil Liberties Union said, “Real life is not separated by gender”.

### **3.4 Gender Segregation in the Workplace in Saudi Arabia**

In countries like Saudi Arabia, gender segregation has traditionally been extreme not only in workplaces but also in education systems. According to Al-Asfour et al. (2017), laws in Saudi Arabia state that women and men are not permitted to share the same workplace; ladies need to be in an isolated office, with a separate entrance and safekeeping guard outside. According to the Global Gender Gap Report (World Economic Forum, 2018), Saudi Arabia is one of the most gender-segregated countries in the world

and is ranked at 141 out of a total of 144 countries representing high gender disparities in economic and political empowerment.

#### **4. Methodology**

This research intends to use a quantitative approach for data collection. We have chosen two data sources to represent our findings. One is gathering information from a particular group of people through a survey, and the other is data collection from trusted resources.

The primary source of data used is distributing a survey that contains 16 questions. The research examines approximately 130 students of the PIF GDP who attained higher education inside and outside the Kingdom. This group is considered representative because it is composed of university graduates from all over the Kingdom. The research will not include individuals who are not enrolled in the PIF GDP. The first few questions are identification questions that contain the main variable and other factors that influence gender views. The next set of questions would give us an idea of how the GDPs interacted with the opposite gender in their previous work and/or internship experience. The main variable in the research is whether the GDP had completed their undergraduate studies in Saudi or abroad. The other influencing factors include gender, culture, and personality. With this data, we will measure the effect of each factor that influences the views on gender-segregated education. The answers from the survey will be analyzed through finding correlations between different aspects of the survey and determining whether they are relevant or not. We will also use a linear regression model to look into the significance of the results.

The secondary source of data will be through collecting information from Springer Link, Emerald Insights, E-book Central, and Cambridge University Press. In addition, data will be collected from credible websites including organizational, and educational websites that will contribute toward the development

of this research. Furthermore, the use of Google Scholar and Google Books are essential since they provide beneficial information regarding this topic.

## **Limitations and Challenges**

### ***Sample Limitations***

The primary data source of the study is a survey distributed to the Graduate Development Program students of the Public Investment Fund in Saudi Arabia. The sample size will be approximately 130 students from different cultures, backgrounds, educational levels, and universities. However, some similarities prevent us from making assumptions about the overall population. For example, our sample's age group lies between 20 to 30; hence, specifying that past job experiences are within entry-level jobs with few exceptions. This might influence the level of comfort due to the lack of work experience. Furthermore, individual personality traits such as introversion and extroversion need to be taken into consideration. The limitation of controlling for personality traits is that our data will result from self-awareness, questioning data integrity, and reliability.

### ***Data Limitations***

This topic is controversial and sensitive in Saudi Arabia due to religious reasons and social norms. There is a shortage of research papers that exists, examining the current status of gender segregation in college education and its effects on the labor market. Also, there are no undergraduate universities. This does not come without cost since it will significantly increase the number of possible lurking variables affecting our study.

## 5. Findings and Discussions

### Data Analysis

The analysis of the research was conducted using the data analytics life cycle. The investigation will go through six phases to examine the data and come up with significant findings. The six stages are shown below in figure [1].

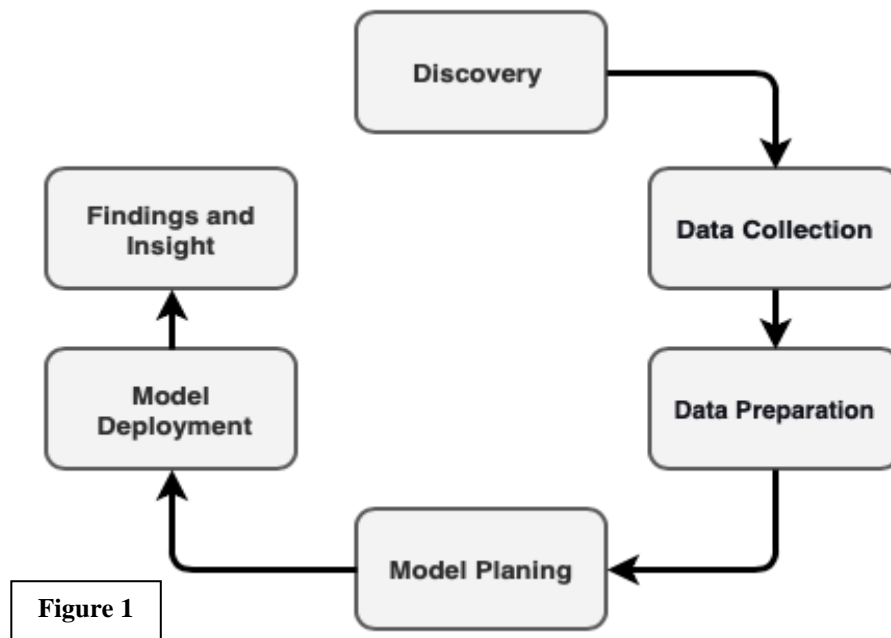
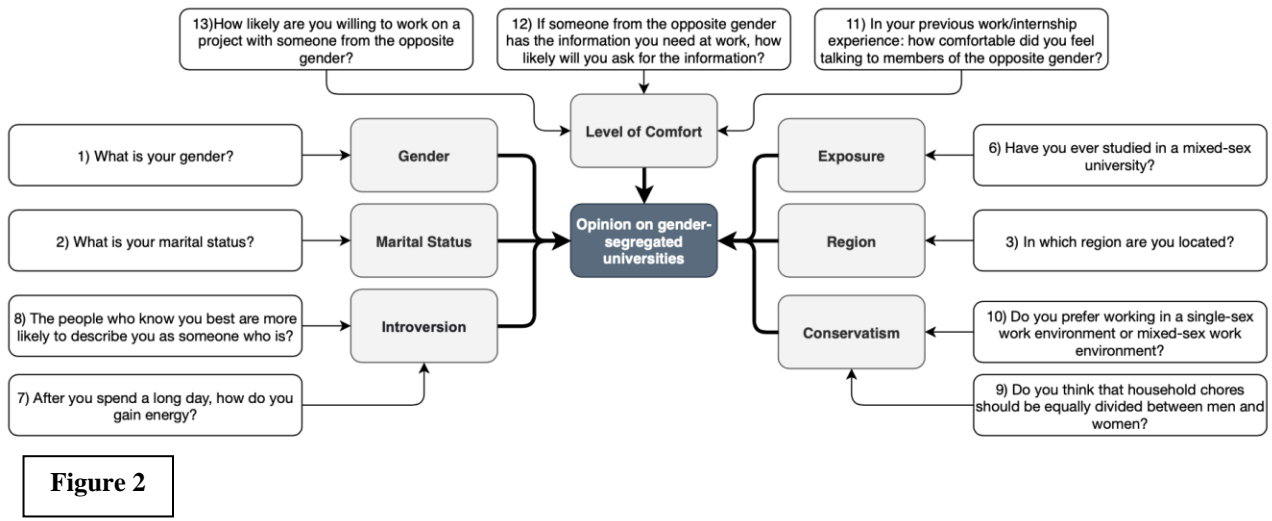


Figure 1

### Data Collection

To gather the data, a voluntary survey was distributed electronically to almost 130 participants in the Graduate Development Program of PIF. 109 responses were collected, which served as the study's primary data source. The survey included 16 questions, leading to 16 data points on each participant. Seven variables that might influence opinion on gender-segregated education were identified. The variables are gender, marital status, and region, exposure to mixed-sex education, conservatism, introversion, and comfort in interacting with the opposite gender. These variables will be further evaluated to try and justify what might influence opinion on gender segregated education. Below is a map that explains how the variables were structured in the questionnaire [2].



## Data Preparation

The data preparation process includes data cleaning, which is identifying and removing the errors in the dataset. It's an important step that will affect our model's performance. Our method for cleaning includes:

- Remove duplicates or irrelevant observations.
- Handle missing values
- Fix data structures
- Handling categorical values by mapping or scaling.

After the data cleaning process, intensive feature engineering went into the process to extract representative data points mapped to the chosen variable specifications. While the features gender, region, marital-status were straightforward, other features were extracted for a better understanding of the subjects' values, opinions, and beliefs. The features extracted are as follows.

### *Introversion*

This feature measures the person's level of introversion. Two main characteristics were taken into consideration to extract this feature. The answer to question seven, 'After you spend a long day, how do

you gain energy?' measures the person's perception of their level of introversion. Question eight 'The people who know you best are more likely to describe you as someone who is?' measures people's perception of the subject's level of introversion. These two variables were merged and scaled to create a more generalizable variable representing a person's introversion level.

### ***Level of comfort***

To account for a possible high correlation between our dependent variable 'opinion on gender-segregated education' and the level of comfort between the two genders. The level of comfort was extracted from three questions included in the survey. Question thirteen, 'How likely are you willing to work on a project with someone from the opposite gender?' showed the subject's willingness to work on a project with the other gender. Question twelve, 'If someone from the opposite gender has the information you need at work, how likely you will ask for the information?' indicated the subject's shyness/hesitation to ask for help from the other gender. Finally, question eleven, 'in your previous work/internship experience: how comfortable did you feel talking to members of the opposite gender?' touched upon the subject's past experiences interacting with the other gender. These three features were mapped and scaled to become our indicator of the individual's comfort level in cross-gender interaction.

### ***Conservatism***

Conservatism is a variable derived from two questions in the survey. It represents the person's commitment to traditional values and norms. Question nine, 'Do you think that household chores should be equally divided between men and women?' indicates the individual's openness to gender equality in the household. Question ten, 'Do you prefer working in a single-sex work environment or mixed-sex work environment?' indicates the subject's work environment preference. When the two variables are combined, we can form a better image of the person's conservatism, which might influence the opinion on gender-segregated education.

## Exposure

Previous cross-gender education exposure was identified as a possible variable influencing opinion on gender-segregated education in Saudi. To account for that, question six, 'Have you ever studied in a mixed-sex university?' measures the previous exposure. According to most universities, a bachelor's degree will take approximately four years to complete. A master's degree will take two years on average. Therefore, with a maximum of six years of exposure, each year will be weighted at '.16667' for the sake of scaling and cumulating the years of exposure.

The overall descriptive statistics for the variables are shown below in figure (3). The descriptive statistics represent the data after cleaning and encoding categorical variables.

Stats	region	introversion_mapped	exposure	level_of_comfort	Conservatism	gender_Male	marital_status_Single	With mixed-sex universities
Mean	1.606	1.211	0.450	3.486	2.657	0.624	0.927	0.679
Standard Error	0.076	0.080	0.033	0.062	0.116	0.047	0.025	0.045
Median	1	1	0.667	3.667	3	1	1	1
Mode	1	2	0.667	4	4	1	1	1
Standard Deviation	0.794	0.840	0.341	0.650	1.207	0.487	0.262	0.469
Sample Variance	0.630	0.705	0.116	0.423	1.456	0.237	0.069	0.220
Kurtosis	-0.371	-1.459	-1.354	2.707	-1.238	-1.764	9.174	-1.423
Skewness	0.947	-0.418	-0.270	-1.644	-0.407	-0.519	-3.318	-0.777
Range	3	2	1	3	3.667	1	1	1
Minimum	1	0	0	1	0.333	0	0	0
Maximum	4	2	1	4	4	1	1	1
Sum	175	132	49	380	289.667	68	101	74
Count	109	109	109	109	109	109	109	109

**Figure 3**

## Model planning

Several models will be implemented to thoroughly evaluate the influence of the chosen variables on opinion toward gender-segregated higher education in Saudi. However, our analysis will consist of two methods. The first method of modeling will utilize the entire dataset consisting of 109 responses for a linear regression model to identify the influence of our independent variables on our dependent variable's outcome. The outcome of the linear regression model will also give us the statistical significance of each independent variable. The second method of modeling will be approached as a supervised classification machine learning problem. The two classes identify if the subject is either 'with gender-segregated education' or 'against gender-segregated education.' This will test our ability to predict whether a person



is with or against gender-segregated education in Saudi given the seven chosen variables. In order to achieve that, the cleaned survey dataset will be split into two batches with a ratio of 7:3. The training batch will consist of 76 responses, while the testing batch will be 33 responses. The testing batch will be used for cross-validation and extracting the confusion matrix to test results. The classification models that will be used are:

***Logistic regression:*** Used to analyze the relationship between various independent variables and a categorical dependent variable. The model estimates the probability of occurrence of an event by fitting data to a logistic curve (Park, 2013).

***K Neighbors Classifier:*** A basic calculation that stores every accessible case and groups new cases dependent on a similitude measure (e.g., separation capacities). KNN has been utilized in measurable estimation and example acknowledgment since the 1970s as a non-parametric system (Harrison, 2019).

***Support Vector Machine Classifier (SVC):*** A discriminant technique that always returns the same optimal hyperplane parameter. SVM elegantly groups multiple features by using what is referred to as the maximal margin classifier to predict which class the dependent variable belongs to (Awad et al, 2015).

***Random forest:*** A Meta estimator that fits several decision tree classifiers on various sub-samples of the dataset and uses averaging to improve the predictive accuracy and control over-fitting (sklearn, n.d.).

### Model building and Findings/insights

<i>Regression Statistics</i>	
Multiple R	0.582
R Square	0.339
Adjusted R Square	0.293
Standard Error	0.394
Observations	109

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	-0.127	0.251	-0.506	0.614	-0.625	0.371	-0.625	0.371
region	-0.025	0.050	-0.508	0.613	-0.125	0.074	-0.125	0.074
introversion_mapped	-0.085	0.047	-1.805	0.074	-0.178	0.008	-0.178	0.008
exposure	0.055	0.127	0.433	0.666	-0.198	0.308	-0.198	0.308
level_of_comfort	0.170	0.069	2.470	0.015	0.033	0.307	0.033	0.307
Conservatism	0.175	0.036	4.819	5.09E-06	0.103	0.247	0.103	0.247
gender_Male	-0.014	0.089	-0.159	0.874	-0.191	0.162	-0.191	0.162
marital_status_Single	-0.135	0.157	-0.860	0.392	-0.446	0.176	-0.446	0.176

**Figure 4**

Below is a demonstration of our first model which was a multiple linear regression model with the dependent variable being (with mixed-sex universities), which is a representative of opinion on is mixed gender-segregated education. The linear equation of the model is as follows:

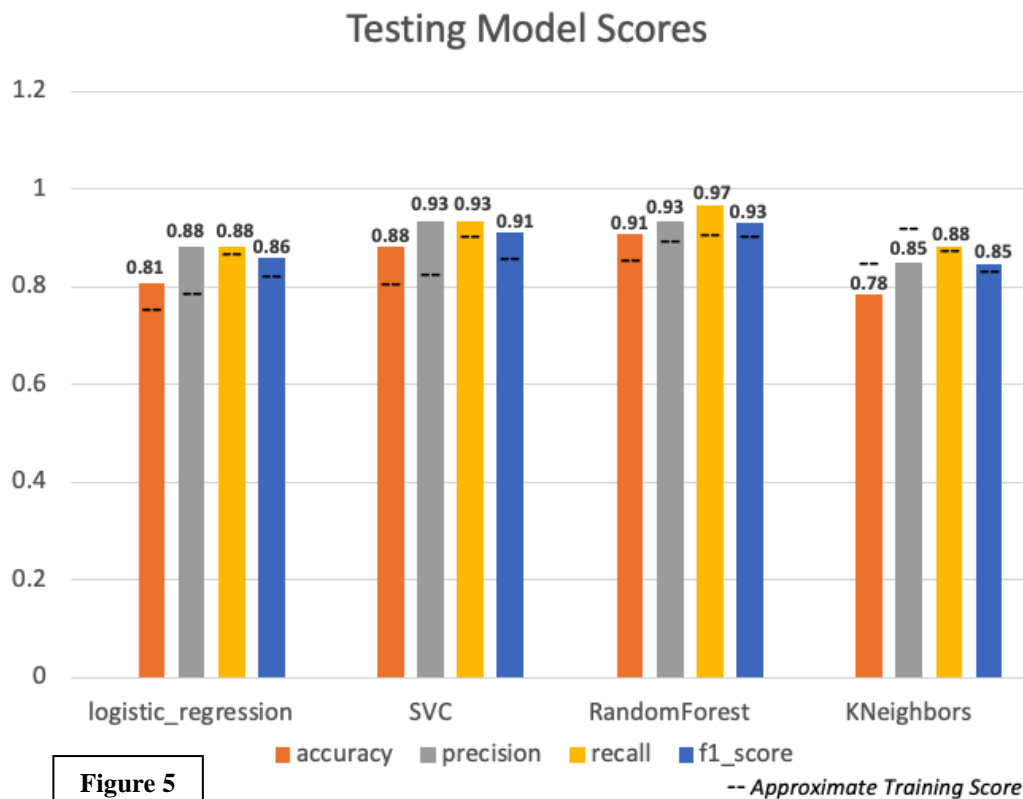
$$y = \beta_0 + \beta_1 \text{Region} + \beta_2 \text{Introversion\_Mapped} + \beta_3 \text{Exposure} + \beta_4 \text{Level\_of\_Comfort} \\ + \beta_5 \text{Conservatism} + \beta_6 \text{Gender\_Male} + \beta_7 \text{Marital\_status\_Single}$$

$$\text{with mixed-sex universities} = (-0.1272 - (0.0254 \cdot \text{region}) - (0.0847 \cdot \text{introversion\_mapped}) + \\ (0.0551 \cdot \text{exposure}) + (0.1701 \cdot \text{level\_of\_comfort}) + (0.1752 \cdot \text{Conservatism}) - (0.0142 \cdot \text{gender\_Male}) - \\ (0.135 \cdot \text{marital\_status\_Single}))$$

With an R squared of .339 the seven variables explain %33.9 of the variation in the dependent variable (with mixed-sex universities). Assuming that statistically significant results can be used as a basis for noteworthy conclusions. Regarding  $P < .05$ , we conclude that level of comfort is statistically significant, and for each one-unit increase of (level\_of\_comfort) it influences a rise of .17 units in the

dependent variable (with mixed-sex universities). Conservatism is also statistically significant and for each unit of increase in conservatism leads to a rise of about .175 units of the dependent variable. The last statistically significant finding is (introversion\_mapped), which if increased by one-unit, the dependent variable decreases by .08. The variables of gender, marital status, region, and exposure are not statistically significant; therefore, they are not generalizable to the population.

Several supervised machine learning classification models were used to try and predict whether a person is with or against mixed sex higher education from the survey questions. After the cleaning and feature engineering process, the seven independent variables led to a high accuracy when predicting the dependent variable (with mixed-sex universities). The accuracy, precision, recall and F1\_score represent the mean of 10 folds of cross validation scores to ensure model robustness. The highest mean testing scores reported was by the Random Forest Classifier shown in the scoring graph below (5).



**Figure 5**

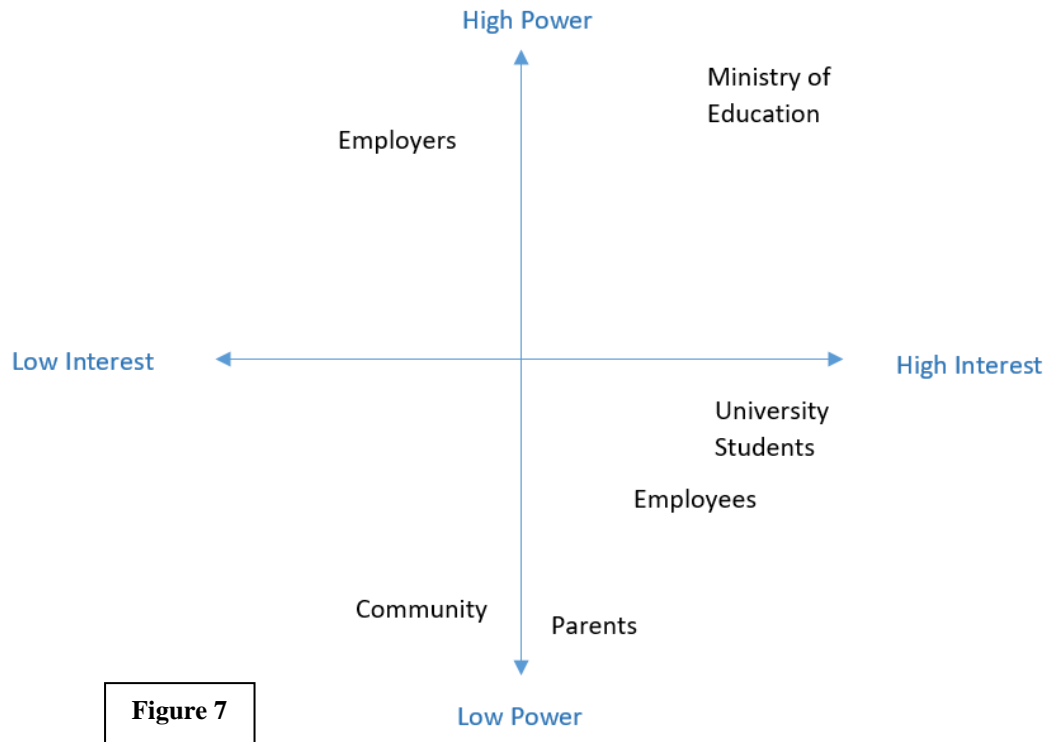
## **Stakeholder Analysis**

To assess potential stakeholders, they need to be prioritized based on power and interest. Those who have high power and high interest in gender-segregation are the decision-makers. The less power the stakeholder possesses, the less there is a need to satisfy that stakeholder. And the less interest the stakeholder has, the less the need there is to manage that stakeholder. Figure (6) displays the placement of each potential stakeholder based on the level of power and interest.

The potential stakeholders for this research were chosen based on the direct and indirect effect of gender-segregation on different people of the community, and they are as follows:

- Ministry of education: The ministry of education lies in the upper right quadrant of the power-interest grid, which means they are the key players and they hold the power to make decisions.
- University students: University students are directly affected by segregation and therefore have the most interest in this issue but they do not have enough power to make changes.
- Employees: Employees are also directly affected but they might have less interest since they are out of the education loop.
- Employers: Employers are considered as stakeholders because they have the power to choose whether their employees come from a gender-segregated education or not. However, the issue might not be of interest to them if the effect of segregation is not significant.
- Parents and community: Students are a small but major part of the community, and whatever affects them affects the whole community and their parents especially. They may not have much power,

and their interest could vary, but they need to stay informed and be monitored for reactions should there be any decisions regarding the issue at hand.



## 6. Policy Options

In Saudi Arabia the whole education system is segregated, to un-segregate higher education we should implement a gradually changing policy. In these types of policies where you are changing the culture of a country, it's preferable to be gradual. These are some realistic option that can applied:

### - **Mixed Gender E-learning**

Due to COVID-19, most educational institutions are implementing online education as the main way of teaching. This policy will allow students of both genders to attend online classes together.

- **Optional Mixed-Gender Classes**

This policy will require universities to assign three different classes for each course, one that would be fully mixed, and the other two classes would be separated based on gender.

- **High School Subject**

Develop a subject to be taught in the last year of high school where students will be lectured a mandatory course about ethics and behavior with the opposite gender in college and work environment.

- **Mixed-Gender Public Universities**

The objective of this policy is to desegregate all public universities across the Kingdom of Saudi Arabia, taking into account the university terms and conditions.

- **Optional Single Gender E-learning**

Since the virtual classes and online communication during the pandemic proved that there is a new era where distant work is effectively implemented and generates pleasing results along with amazing opportunities, we can implement a policy that requires all university classes to be mixed. Students who are not willing to attend mixed classes can attain their education online.

- **Desegregating Major Universities**

The policy will be implemented only in public universities located in the big cities of Saudi Arabia. This means all the university facilities are mixed, taking into account the university terms and conditions.

## 7. Evaluation Criteria

In this section, the criteria that will be used to assess the evaluation process is the scoring model and the timeframe. In the scoring model, the policy options listed above will be evaluated based on specific indicators. The four indicators are effectiveness, social acceptance, administrative feasibility, and cost-effectiveness. This method will allow us to determine which policy option is suitable to recommend since it's an efficient and precise way that provides aid and clarity in the evaluation process. Furthermore, the timeframe is the way by which the policymaker should base the recommendations and choose the most suitable policies for the short-term, medium-term, and long-term.

### Scoring model

Figure (8) shows the scoring model technique by which all policy options are listed, and weighted according to the main four indicators. The first indicator is effectiveness which measures the degree at which this policy is capable of delivering the desired outcome or productive results. The second indicator is the level of social acceptance which includes the ability to undertake society's diversity and distinction with lenience. The third indicator is administrative feasibility which measures the degree to which a policy is simple to implement. Finally, the fourth indicator is cost-effectiveness that measures the degree to which a policy is effective with relevance to its cost.

<u>Scoring Model</u>	Effectiveness [10]		Social Acceptance [ 5 ]		Administrative Feasibility [ 8 ]		Cost Effectiveness [9]		Total
Mixed-Gender e-Learning	5	50	3	15	5	40	5	45	150
Optional Mixed- Gender Classes	3	30	5	25	2	16	2	18	89
High School Subject	4	40	4	20	4	32	2	18	110
Mixed-Gender Public Universities	5	50	2	10	3	24	5	45	129
Optional Single- Gender e-Learning	3	30	5	25	3	24	3	27	106
Desegregating Major Universities	4	40	3	15	2	16	4	36	107

**Figure 8**

According to this scoring model, we will be able to make recommendations that are feasible and reflect positively on the future of education in Saudi Arabia. Each policy option is separately evaluated by each indicator, then adds the weighted values together. Each indicator is converted to a numerical value to make the calculations. Our team discussed the importance of each indicator out of 10 and the relation between each indicator and policy option out of 5, and gave a score accordingly. We decided that an indicator with a score of zero shows that it has the lowest priority. On the other hand, an indicator with a score of ten shows that this indicator has the highest priority and will add value to the evaluation process. Regarding the policy options, each policy is scored out of five based on the relevance to the four indicators. The scoring model helps us choose the best three policy options to make recommendations for the short-term, medium-term, and long-term.

### **Time frame**

There are five policy options that its implementation and effectiveness process vary in time. Some policy options can be implemented temporarily for the short-term, other options are proper to implement for the medium-term, and other options are preferably implemented in the long-term.

### ***Short-term***

#### **Mixed Gender E-learning**

During the pandemic, most academic institutions switched to remote education and students were taking their classes online. Therefore, the policy will be feasible to implement in the short-term since all resources are available on-hand.



### Optional Mixed-gender Classes

This policy option will allow the students to choose whether to take the class online or attend a mixed classroom physically. Allowing the students to choose their preference will give them the freedom of choice. Therefore, it is feasible to implement in the short-term.

### ***Medium-term***

#### High School Subject

The policy option aims to educate students on understanding views of the opposite gender and learn to better communicate with the opposite gender. Adjusting the current curriculum and adding a new subject require effort and supervision, therefore, it can be implemented in the medium-term.

#### Optional Single Gender E-learning

Regarding this policy option, it will allow students to have the freedom of choice whether to attend mixed classes, or continue attaining education online. Since this option will be costly and would require a plan to balance between online and face-to face education and consider specific arrangements, it's most likely to be implemented in the medium-term.

### ***Long-term***

#### Mixed-Gender in Public Universities

This policy option shapes a major transformation in the education system of Saudi Arabia. Allowing a mixed-gender environment in public universities is possible to be implemented in the long-term since it must be critically and carefully studied.

### Desegregating Major Universities

The policy option will only be implemented on major universities across Saudi Arabia. This will provide freedom to students on whether they prefer to attend a mixed-gender university, consider private universities, or attend public universities in rural areas. The policy is feasible and can be implemented in the long-term.

## **8. Policy Analysis**

In this section, each policy option will be analyzed in order to assess the evaluation process. By analyzing each policy option, we will easily determine the applicable recommendation based on each policy option advantages and disadvantages.

### **Optional Mixed-gender Classes**

This policy option allows Students to be offered the opportunity to decide whether they want to enroll and attend mixed-gender classes or not. This option is favorable since the university students in Saudi Arabia will be offered a choice of the type of class they want to attend. However, the policy option raises the cost of providing education for the university owing to the need to offer different classes for different genders. Also, there are space limitations of the university that might restrict construction of new courses to host the student.

### **Desegregating Major Universities**

As a first phase, this policy will apply in the major universities, and it will start from three different cities. The Capital, Riyadh, Jeddah, and Dammam. The policy option provides university students with classes comprising both genders and no separate services or learning areas. What makes this policy option advantageous is that the university students will be offered the opportunity of socializing and observing

the other gender behaviors to expand their knowledge about the opposite gender. In addition, there will be major reduction in costs on teaching both genders by saving office spaces and reducing faculty. However, the disadvantage of this policy option is that the mixed-education system goes against some university students' religious and cultural beliefs.

### **Optional Single-gender E-learning**

Regarding this policy option, university students will be offered the opportunity of attending a single-gender class through online means. The benefits of implementing this policy is that e-learning offers a convenient way for learning for students in distant areas and hinders effective interaction between students. Nevertheless, there is a negative aspect of implementing this policy, such as students with no information technology literacy will be disadvantaged. Also, costs will increase for universities running e-learning and in-class learning modules at the same time. Lastly, students lack the chance to interact with other genders.

### **Mixed-gender E-learning)**

Implementing this policy option will grant university students the opportunity of attending e-learning courses with the opposite gender. The major advantage of implementing this policy is that students will be able to interact with members of the opposite sex, learn from one other, and expanding their areas of knowledge. However, this policy of learning could negatively impact students whose cultures refrain from learning with the opposite gender.

### **Mixed-gender in Public Universities**

The policy option requires that public universities provide classes housing both female and male genders. There are two advantages that accompany this policy option; one is that it will ensure a uniform

and quality education is provided to all genders. Also, different genders will be offered an opportunity to learn from each other. On the other hand, this policy option has a negative aspect which is that it could also go against cultural or religious norms for students from cultures that restrict interactions between genders.

### **High School Subject**

To implement this policy, it requires a lot of work with different parties, a subject will be developed in cooperation with the Ministry of Education and developed countries in education about ethics and behavior with the opposite gender. This course will be taught in the last year of high school and it will be mandatory. The advantage of implementing this policy option is to prepare the student for mixed higher education. On the other hand, it will cost a lot of money to develop this subject, and it may take time to develop it.

## **9. Policy Recommendations**

Based on the findings and the data analysis of the survey, the gender-segregated education in Saudi Arabia should be reviewed. In this section, we recommended short-term, mid-term, and long-term policies that must be taken into consideration. These recommendations are a key toward improving the gender-segregated education system of Saudi Arabia and will further promote an inclusive society.

### **9.1 Short-term Recommendation**

#### ***Mixed Gender E-learning***

Providing mixed-gender classes remotely is a feasible policy that can be implemented in the short-term. Currently, the Saudi education system switched remotely after COVID-19. Instead of streaming

segregated virtual classes, males and females can be merged into one classroom. Implementing this policy will encourage students to engage more, and consider the opposite gender views as well.

According to the evaluation analysis, the policy option is highly effective since it will allow students to experience interacting with the opposite gender virtually, this can increase the level of comfort between both genders. Moreover, the analysis shows that this policy option is socially acceptable since there will not be any direct interaction between both genders. The policy is administratively feasible due to the availability of resources. The virtual classroom has a larger capacity and yet can handle a larger number of students. Therefore, the merger of classes would be effective and costs less since fewer instructors will be assigned to lecture courses.

## **9.2 Medium-term Recommendation**

### ***High School Subject***

Regarding this policy, schools will add a new subject to the curriculum that will provide a comprehensive understanding of gender nature, ethics, and educate students on how to properly interact with the opposite gender. This course can enhance students' views about the opposite gender and will allow them to be prepared when studying or working in a mixed environment. Not only limited to that, but this course will also enrich students' knowledge, and provide a better understanding of what benefits a mixed environment entails.

After evaluating this policy option, the effectiveness level of the suggested high school subject is very high and will reflect positively on the younger generation. Moreover, it shows that it's highly accepted socially since it will enhance people's beliefs about gender, and could further eliminate gender

bias. Moving on, the policy is feasible since the ministry of education can implement this policy in the medium-term. Nevertheless, subject creation is costly and requires a budget to implement this policy.

### **9.3 Long-term Recommendation**

#### ***Mixed-Gender Education in Public Universities***

Allowing a mixed-gender environment in public universities would be a challenge, yet, it is a golden opportunity that will assist in liberalizing the market structure and this is what the Kingdom of Saudi Arabia is currently heading towards. Classes will be fully mixed and taught by both male and female professors. This policy will broaden individuals' knowledge and raise their roof of aspirations by establishing an environment of mutual respect and professional synergy.

The evaluation of this policy indicates that this policy is feasible in the longer term and has a strong effect on the students' education system. However, the implementation of this policy might not be socially acceptable since it will require direct interaction between both genders and the results of the survey shows that 32% are against having mixed-gender universities in Saudi Arabia. Furthermore, in the longer term, the policy will be administratively feasible since Saudi Arabia is ready to embrace social change and thrive to build an urbanized and well-educated generation. Lastly, the policy is cost-effective since it aims to reduce the number of buildings and merge male and female students in one building.

## **10. Future Scenarios**

Our research team aims to assess the future for gender desegregation in higher education in Saudi Arabia for 5 years by examining a possible future archetype that is business-as-usual. In the case of business-as-usual, online-learning will continue to be used and promoted. The Saudi Minister of Education Dr. Hamad Al-Sheikh said that online learning is not merely a backup plan, it is a strategic plan itself (Diaz, 2020). Currently, online learning is segregated by gender. If the desegregation policy was

implemented, both male and female students will study online together. They will be taught by male and female instructors. This process will ease the transition toward physical desegregation in higher education. It will also troubleshoot any potential problems. Further research should examine the male and female instructor roles and ways to engage male and female students together in projects and encourage class participation.

Looking into Horizon Scanning, we begin with discussing organizational, transactional, and contextual environments. It is plausible for The Ministry of Education to influence university students and faculty members and change building capacity and budget as they are part of the organizational environment. Examining the transactional environment, the Ministry of Education may influence the Ministry of Media to promote gender desegregation in higher education to shape the public view, especially of the university student's families. COVID-19 and Vision 2030 lie within the contextual space. COVID-19 will affect the style of learning such as online, social distancing, or the traditional pre-Covid way if COVID diminished. Vision 2030 will highly impact public approval. As one of the Vision 2030 pillars is to create an ambitious society, people are willing to see positive changes. Moreover, the contextual environment might include multiple driving forces with different STEEP categories. Individualism is an impactful and uncertain social trend that is positively aligned with gender desegregation in higher education. Individualism is an essential result of modernity (Ham, 2000). Individualism advocates for one's needs as they move away from the collective tradition which will allow students to engage with the opposite gender. A shift toward sustainable energy is an impactful and uncertain environmental and economic trend that is positively aligned with gender desegregation as having a campus for both male and female students will save university resources. Universities will no longer need a dual facility for males and females. There will be various shared spaces and supplies. Shared spaces and subjects will promote gender equality as both males and females will use the same facilities and study

the same majors. Tech policies is an impactful and certain technological and political trend that is positively aligned with gender desegregation as it will advance learning methods.

The Future's Triangle has three dimensions of weight, push, and pull which help to analyze past, present, and future. In the context of our research, the weight of the past consists of conservative tradition, gender segregation as a societal norm, and resistance to change. From our own experience, the conservative tradition was promoted by both culture and religion. People who interacted with the opposite gender were demonized. Families and schools continued to teach little ones to abstain from any interaction with the opposite gender to be "good" and "safe". We grew up living in a gender-segregated society and change was uncommon. Today, the push of the present is promoted by the Vision of 2030. Policy change became common as women were allowed to drive in 2018 (Hubbard, 2017). The Abaya, women's attire, was no longer necessary in public areas in 2019 (Fattah et al, 2019). Moreover, gender-segregated areas in restaurants were abolished (Gassem, 2020). Gender segregation still exists in the fields of education and some work environments. Gender segregation at work and education is reinforcing tradition which is in a conflicting nature with Vision 2030. The pull of the future is neutralizing gender interactions in education and work. The future will have common areas for men and women at all levels in education and the workforce.

## **11. Conclusion**

Saudi Arabia is marching into a more liberalized society, where job opportunities are now being equally created for young men and women. However, most men and women are facing issues when interacting with the opposite gender. The Saudi Ministry of Education should take this opportunity to enhance the mixed-gender workplace environment by reviewing gender-segregated education in Saudi Arabia.



After conducting the data analysis, we identified three variables that have a strong and positive correlation with the dependent variable which is mixed-sex universities. Conservatism, level of comfort, and exposure strongly influence people's views about implementing mixed-gender education in Saudi Arabia. The analysis showed that 68% of the survey participants are with mixed-gender education.

Implementing the recommendations that were introduced in this paper will enhance people's views about gender and establish a well-grounded generation that will firmly grasp their principles and beliefs. With the current education approach, men and women enter a mixed-environment workplace without knowing the basics of interacting with the opposite gender and further generate serious issues such as misunderstanding one another, sexual harassment, or inequality between genders. Therefore, gender-segregated education in Saudi Arabia should be reviewed.

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### 13. Annexes

Model Scores:-

model	accuracy	precision	recall	f1_score	data_type
<b>logistic_regression</b>	0.76	0.80	0.88	0.81	training
<b>logistic_regression</b>	0.81	0.88	0.88	0.86	testing
<b>SVC</b>	0.81	0.83	0.90	0.85	training
<b>SVC</b>	0.88	0.93	0.93	0.91	testing
<b>RandomForest</b>	0.85	0.88	0.90	0.89	training
<b>RandomForest</b>	0.91	0.93	0.97	0.93	testing
<b>KNeighbors</b>	0.83	0.88	0.87	0.86	training
<b>KNeighbors</b>	0.78	0.85	0.88	0.85	testing

### Survey

We are your fellow colleagues conducting research as a capstone for the GDP Program. The survey will cover some past-work experience and the perceived level of comfort when interacting with the opposite gender. The survey consists of approximately 16 questions. Your anonymity is guaranteed therefore please reflect your honest opinion. Your cooperation is highly appreciated.

Important key terms:

- Single-sex university: A university that has separate campuses for males and females.
- Mixed-sex university: A university where males and females study together.

#### 1) What is your gender?

- Male
- Female

#### 2) What is your marital status?

- Single
- Married

**3) In which region are you located?**

- Western
- Eastern
- Center
- Northern
- Southern

**4) Did you get your bachelor degree in Saudi or Abroad?**

- Saudi
- Abroad

**5) If you have a master's degree, did you study in Saudi or Abroad? If not applicable, please choose N/A.**

- Saudi
- Abroad
- N/A

**6) Have you ever studied in a mixed-sex university?**

- Yes,Undergrad
- Yes,Grad
- Yes,Both
- No,Neither

**7) After you spend a long day, how do you gain energy?**

- Inner reflection and solitude
- Going out with friends

**8) The people who know you best are more likely to describe you as someone who is:**

- Quiet and reflective
- Outgoing and talkative

**9) Do you think that household chores should be equally divided between men and women?**

- Strongly agree
- Agree
- Disagree
- Strongly disagree

**10) Do you prefer working in a single-sex work environment or mixed-sex work environment?**

- Mixed-sex work environment
- Single-sex work environment

**11) In your previous work/internship experience: how comfortable did you feel talking to members of the opposite gender?**

- Very comfortable
- Comfortable
- Uncomfortable
- Very uncomfortable

**12) If someone from the opposite gender has the information you need at work, how likely will you ask for the information?**



- Highly likely
- Likely
- Unlikely
- Highly unlikely

**13) How likely are you willing to work on a project with someone from the opposite gender?**

- Highly likely
- Likely
- Unlikely
- Highly unlikely

**14) If you studied abroad, can you identify any event that influenced your views about gender?**

(Unstructured / Text)

**15) Are you with or against mixed-sex universities in Saudi?**

- With mixed-sex universities
- Against mixed-sex universities

**16) What do you think about having mixed-sex universities in Saudi? Please list three reasons why or why not**

(Unstructured / Text)