

# **Assessing Engineering Minorities in Saudi Arabian Higher Education: Status and Challenges**

**Mohammed S. Alkahtani**

Industrial Engineering Department  
King Saud University  
Riyadh, 11421, KSA  
[moalkahtani@ksu.edu.sa](mailto:moalkahtani@ksu.edu.sa)

**Ahmed M. El-Sherbeeny**

Industrial Engineering Department  
King Saud University  
Riyadh, 11421, KSA  
[aelsherbeeny@ksu.edu.sa](mailto:aelsherbeeny@ksu.edu.sa)

**Fawaz M. Abdullah**

Industrial Engineering Department  
King Saud University  
Riyadh, 11421, KSA  
[samkry2000@gmail.com](mailto:samkry2000@gmail.com)

## **Abstract**

The Kingdom of Saudi Arabia has recently experienced a remarked, strategic increase in interest in higher education, associated with a corresponding increase in the number of higher educational (public and private) institutions. This has also subsequently led to a growth in the number of expatriated students from different countries, including nearby gulf, Arab, Muslim, and other countries. This paper is aimed at shedding the light at current trends and figures for foreign students currently enrolled and graduates from different engineering disciplines in the currently existing 32 universities nationwide, and the impact that this has had on the quality of engineering higher education in KSA. Furthermore, the authors highlight different challenges that are facing such students through a student survey, as well as present recommendations aimed at promoting a healthier and more successful educational environment for such minorities.

## **Keywords**

higher education, minorities, foreign students, engineering education, KSA

## **1. Introduction**

Without a doubt, as compared to developed countries, higher education was established very late -1950's- in the Kingdom of Saudi Arabia (KSA), with *King Saud University* (KSU) being the first university in the KSA. Since its beginning, higher education has been free for all students. Students also currently receive a monthly salary, a fact that has led to a dramatic increase in the number of students over the years. In the initial years, the number of men greatly surpassed that of women in Saudi higher education, due to various conservative and cultural norms. Recently, these norms have been re-evaluated and now KSA has established many universities and colleges, in which women are currently receiving higher education [Al-Madhari 1998]. The total number of students enrolled in all (public and private) Saudi universities was 151,998 in 2005; in 2011, this figure has currently risen to more than 250,000 [Alturise 2013].

Higher education in KSA rapidly developed from 1970 to 2009, particularly in 1975, the year in which the Ministry of Higher Education was established. This led to a dramatic increase in the number of public and private universities and colleges, as well as enrolled students and graduates in various stages of higher education [Al-Mhaidib 2014].

Currently, there are 32 public and private universities, offering a large number of science and arts majors. Specifically, universities in KSA have been offering a large variety of engineering programs including engineering bachelors, masters, and PhD degrees, and this has recently attracted a large number of international students. The number of international students in Saudi engineering education has dramatically increased in the last decade owing to various incentives (including advanced lab equipment and research) offered by the Saudi government. In addition, the Saudi Ministry of Education has recently declared that the percentage of such minority students (per semester) should represent no less than 5% of all enrolled students in various engineering degrees (at the BS, MS, and PhD levels) [Ministry of education 2016]. International students' issues have become a necessity that should be addressed by researchers to come out with the main problems that face students and to provide appropriate solutions. Attracting international students to engineering is still one of the major challenges that should be improved [Almogbel 2015]. As Theodore Von Kármán states, "Scientists discover the world that exists, while engineers create the world that never was" [Crawley, 2008]. A significant feature of engineering is the use of natural materials, applied science, and technology to create this world 'that never was'.

The purpose of this paper is to shed some light on foreign students currently enrolled (and graduates) in engineering higher education in the currently existing 32 universities nationwide, as well as the impact that this has had on the quality of engineering higher education in the KSA. As a case study, the authors also highlight trends and figures regarding currently enrolled foreign students (and graduates) in King Saud University in its different engineering disciplines; the authors also present challenges that such students are facing, as well as offer recommendations aimed at promoting a healthier and more successful educational environment for such minorities.

## 2. Minorities in Higher Education in KSA

As mentioned earlier, there are currently 32 existing public and private Saudi universities, including about 543 colleges, and about 2,393 departments, with many applied programs in medicine, engineering, and information technology. The oldest and most reputed academic Saudi institutions are –without a doubt– *King Saud University* (KSU), *King Abdulaziz University* (KAU), and *King Fahd University for Petroleum and Minerals* (KFUPM), all of which are now among Asia's top 100 universities [El-Sherbeeny 2014]. KSU is the largest Saudi university, with a capacity of 50,000 students, while the *Islamic University* is the smallest university with a capacity of less than 4,000 [Ministry of Higher Education (MHE) 2001].

### 2.1 Statistics Regarding Minorities in Saudi Higher Education

Figure 1 shows that currently around 75% (24/32) of Saudi universities are public institutions. This is actually a surge in favor of public universities, as it is only recently (since around the year 2000) that the nation has witnessed the establishment of private institutions (as demonstrated in Figure 2).

Similarly, there has also been a considerable increase in the number of student minorities in Saudi higher education over the last 15-16 years, as portrayed in Figures 3 and 4. Figure 3 shows that expatriated students witnessed an increase from 2.0% in the year 2000 to a current 4.2% of the total registered students in Saudi undergraduate education. Similarly for postgraduate (MS and PhD) studies, the percentage of international students has increased slightly (4.7% to 5.4%) from 2000 until the present day [Ministry of Education 2016].

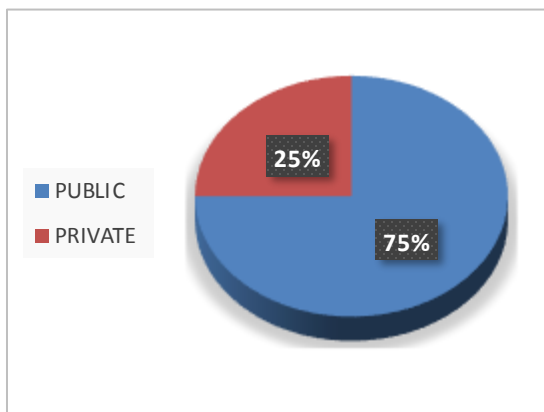


Figure 1. Proportion of public and private Saudi universities.

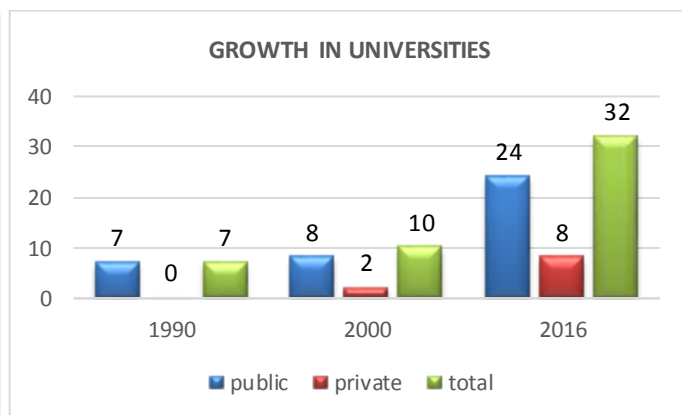


Figure 2. Growth in number of universities in Saudi Arabia (1990-2016).

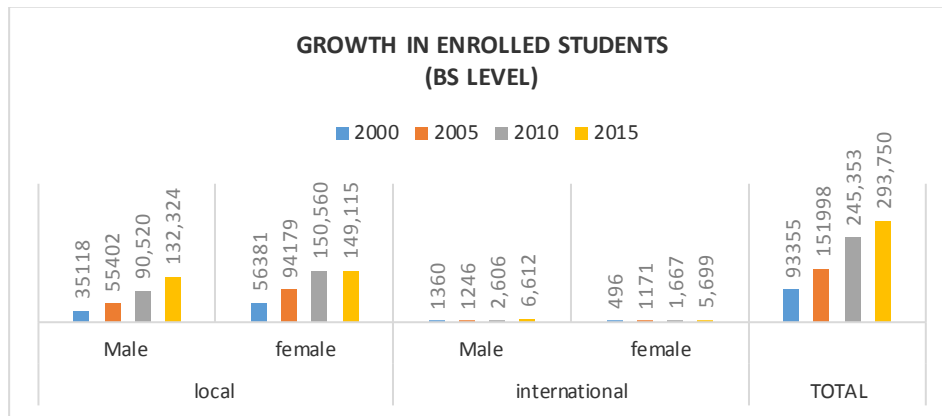


Figure 3. Growth in the number of registered undergraduate (BS) students in Saudi Arabia (2000-2015).

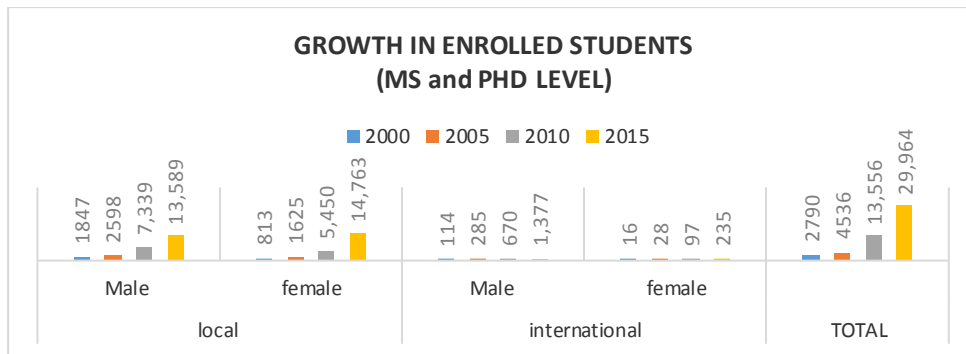


Figure 4. Growth in the number of registered graduate (MS and PhD) students in Saudi Arabia (2000-2016).

From a different perspective, it is evident that there has been a remarked growth in the number of registered international students over the last 15 years, with almost 6-fold for undergraduate students and 14-fold for postgraduate students. This can, in part, be attributed to the evident improvements in facilities as well as the different means of support offered by the Saudi government.

Table 1. Number of graduates (BS) in Saudi universities.

BS	Local			International			Total
	Male	Female	Total	Male	Female	Total	
2000	20474	27126	47600	584	123	707	48307
2005	20649	39851	60500	870	362	1232	61732
2010	29704	52494	82198	1211	1114	2325	84523
2015	56007	73002	129009	2439	2385	4824	133833

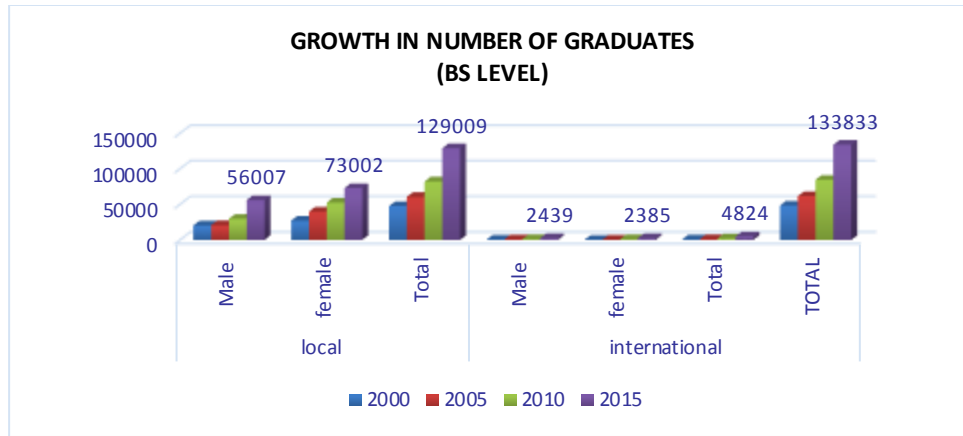


Figure 5. Growth in the number of graduates (BS) in Saudi universities (2000-2015).

Similar to the results shown for registered international students, the Saudi Ministry of Education (SME) reports that there has been a considerable increase in the number of graduates at different levels of higher education, for both Saudi and international students. This is presented in Table 1 and Figure 5 at the undergraduate (BS) level, and in Table 2 and Figure 6 for the postgraduate (MS and PhD) level [Ministry of education 2016].

Overall, there is an increasing trend during the last 15 years, with a notable exception during the period from 2010 until 2012, where there were less graduates (Saudi and non-Saudi alike) when compared with previous years. This can be attributed to the great flow of scholarships issued by the Saudi government at the time allowing many students to study abroad (mostly in US, European, and Asian universities), at both the graduate and undergraduate levels.

Table 2. Number of graduates (MS and PhD) in Saudi universities.

BS	Local			International			TOTAL
	Male	female	Total	Male	female	Total	
2000	5122	3404	8526	641	58	699	9225
2005	7231	4685	11916	821	106	927	12843
2010	2553	1715	4268	193	18	211	4479
2015	8413	7782	16195	326	59	385	16580

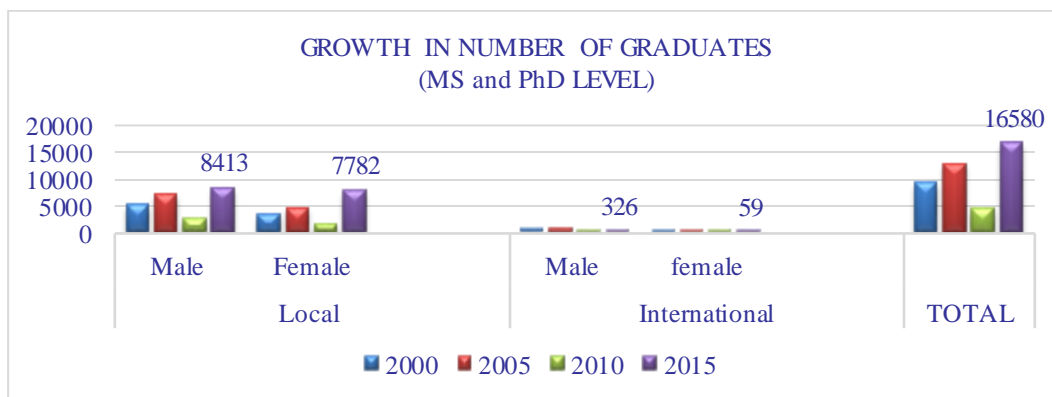


Figure 6. Growth in the number of graduates (MS and PhD) in Saudi universities (2000-2015).

According to the UNESCO Institute for Statistics, the highest recorded concentration of international students in Saudi Arabia was the 71,773 students studying in the Kingdom during the 2012-2013 academic year. This included

students enrolled in all higher education degrees (BS, MS, and PhD), the majority of which were from Yemen, Syria, Egypt, India, Pakistan, Palestine, and Jordan. According to statistics issued by the SME, and as illustrated in Figures 3 through 6, undergraduate (BS) degrees have attracted international students the most to study in Saudi Arabia [College of Engineering at KSU 2016].

## 2.2 Challenges for Minorities in Saudi Higher Education

Higher education in Saudi Arabia currently faces a number of challenges that have been imposed by different economic and social factors. These difficulties may differ from one institution to another, but can be generalized as follows [Alkhazim 2003],

- There are new restrictions with regards to accepting new students into Saudi universities, especially internationals. An example of this is providing study visas and processing acceptance documents in a timely manner.
- Another challenge is that the SME is not able to properly assist internationals graduating from Saudi universities with regards to deploying them directly into the Saudi employment market (as compared to their Saudi counterparts). This has led to the inability to satisfy Saudi employment market needs, in terms of both quality and quantity.
- Furthermore, although there has recently been a considerable increase in the number of academic institutions, the demand in higher education has recently not been completely fulfilled, owing mostly to lack of sufficient financial resources.

## 3. Engineering Minorities in King Saud University

Saudi engineering education was initiated in KSU (Riyadh) in 1962, later to come under the supervision of the UNESCO, at which time it became the first engineering college in Saudi Arabia as well as in the Gulf area. Other universities then caught on, with there currently being more than 18 engineering colleges nationwide, as shown in Table 3 [Abulfaraj 2006]. KSU has, thus, been selected as a representative of engineering education henceforth in this manuscript.

Table 3. Colleges of Engineering in KSA [Ministry of Education 2014]

NO:	College	Year of establishment	University	City
1	College of Engineering	1962	King Saud University	Riyadh
2	College of Engineering Sciences	1965	King Fahd University of Petroleum and Minerals	Dhahran
3	College of Engineering	1975	King AbdulAziz University	Jeddah
4	College of Engineering and Islamic Architecture	1989	Umm Al-Qura University	Mecca
5	College of Engineering	2001	King Kalid University	Abha
6	College of Engineering	2004	Qassim University	Buraidah
7	College of Engineering	2005	Taibah University	Madinah
8	College of Engineering	2005	University of hail	Ha'il
9	College of Engineering	2005	Jazan University	Jazan
10	College of Engineering	2005	Al Jouf University	Turaif
11	College of Engineering	2005	Al Baha University	Al Baha
12	College of Engineering	2005	Najran University	Najran
13	College of Engineering	2006	Al Kharj University	Al Kharj
14	College of Engineering	2007	Northern Borders University	Arar
15	College of Engineering	2008	University of Tabuk	Tabuk
16	College of Engineering	2008	Al Majmaah University	Al Majmaah
17	College of Engineering	2008	King Faisal University	Al Hasa

The college of engineering at KSU currently includes six departments, including Electrical, Civil, Chemical, Mechanical, Industrial, and Petroleum and Natural Gas Engineering. There are seven BS programs, eight MS programs, and five PhD programs, as well as a diploma in Occupational Safety. All engineering undergraduate programs offered by KSU have recently obtained the national (NCAAA) academic accreditation, making KSU's college of engineering the first in the kingdom to receive such an accreditation. The number of graduates during the last five years is shown in Figure 7.

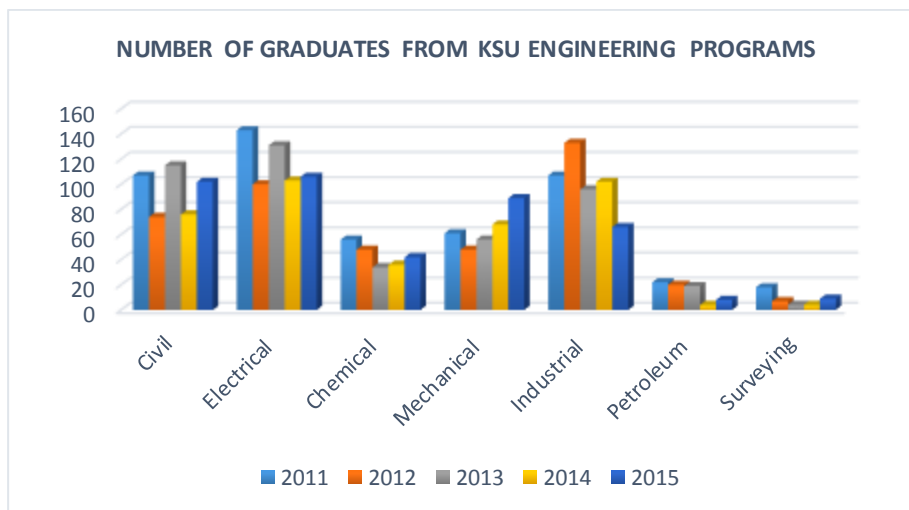


Figure 7. The number of graduates from each program (BS) in KSU's college of engineering (2011-2015).

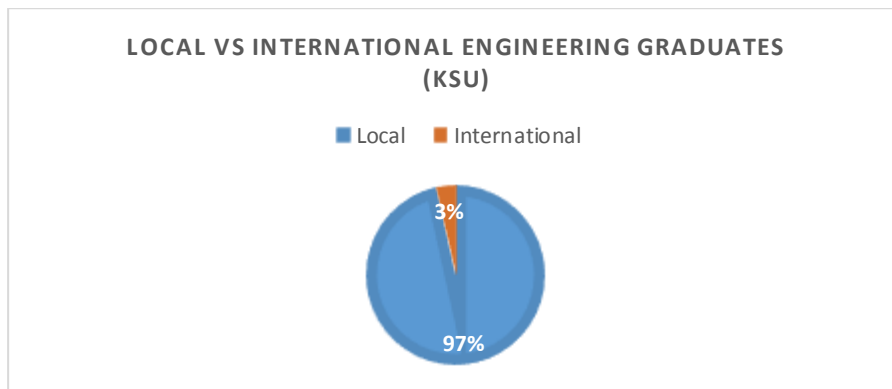


Figure 8. The percentage of local vs international graduates (BS) from the college of engineering in KSU (2011-2015).

It is obvious from Figures 7, 8, and 9 that the number (and percentage) of graduates from KSU's college of engineering has fluctuated during the last five years. In addition, the number of international engineering students is much lower than that of local students. A major reason why only few international students do join engineering is that they are required to receive a GPA of 5/5 in the Preparatory Year. Otherwise, they must select another major.



Figure 9. The number of graduates (BS) in KSU's college of engineering (2011-2015).

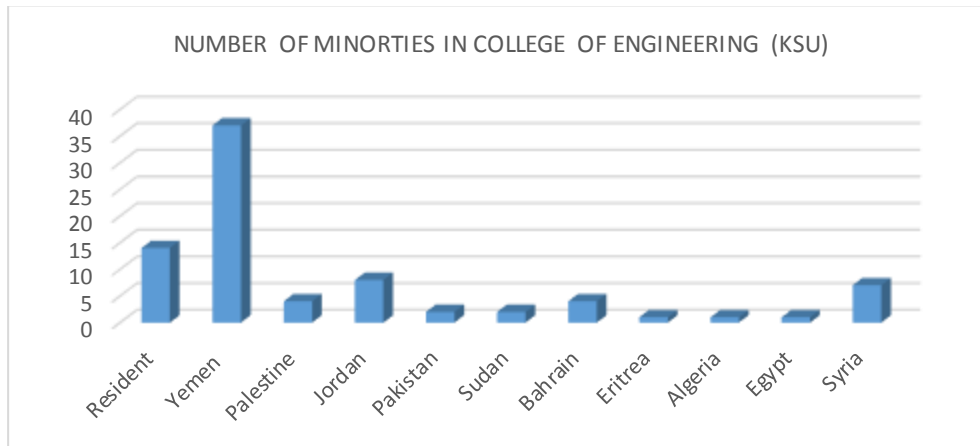


Figure 10. Numbers and nationalities of international graduates (BS) from KSU's college of engineering (2011-2015).

Figure 10 displays the numbers and nationalities of international graduates in KSU's college of engineering during the years 2011 to 2015. Yemeni graduates exceed the number of international graduates combined.

#### 4. Engineering Minorities Education and KSA Vision 2030

The SME is considered one of the major vehicles for national transformation in order to achieve the recently adopted national Saudi Vision 2030 [Saudi Vision 2030]. Development of education can possibly be gradually achieved in the following ways,

- Attracting international students from around the world.
- Establishing new universities.
- Providing various educational facilities for students.
- Improving teaching technologies, and adopting the latest educational techniques.
- Paying more attention to education by allocating sufficient budgets.

#### 5. Survey of International Engineering Students at KSU

A survey has been prepared and conducted on 25 KSU engineering students (BS, MS, and PhD), covering various engineering departments. The survey was aimed at analyzing international students' evaluation and perception of their engineering education at KSU. The survey was focused on five main sections, including their decision for joining KSU, reasons for choosing engineering, college performance, challenges and obstacles, as well as future recommendations.

As shown in Figure 11, more international students participated in the survey than Saudi students. The results are analyzed below.

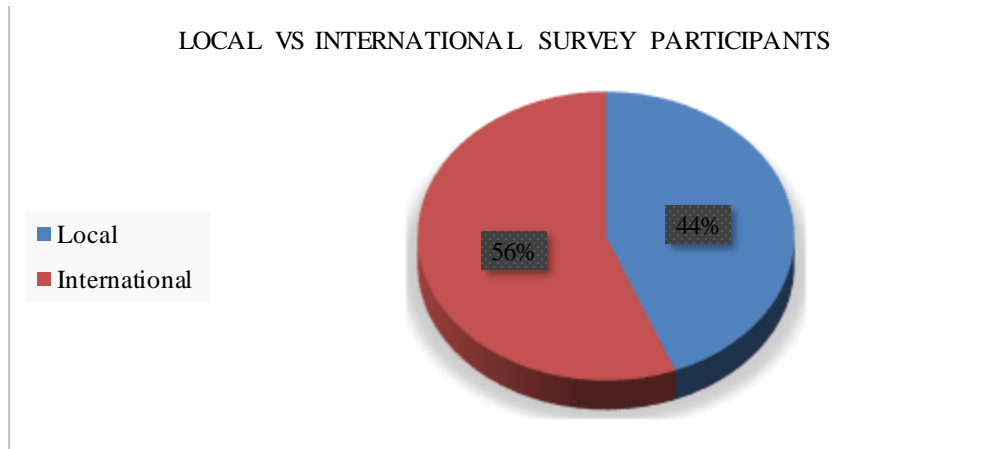


Figure 11. The number of students who conducted the survey at KSU.

The first section of the survey contained 13 questions which focused on students' various decisions to join KSU, with the choices being scholarship, quality of academic programs, the university's good reputation, and choosing a specific career-related program. As presented in Figure 12, most international students joined KSU due to being offered financial assistance and/or scholarships, while Saudi students joined due to the quality of KSU's academic program.

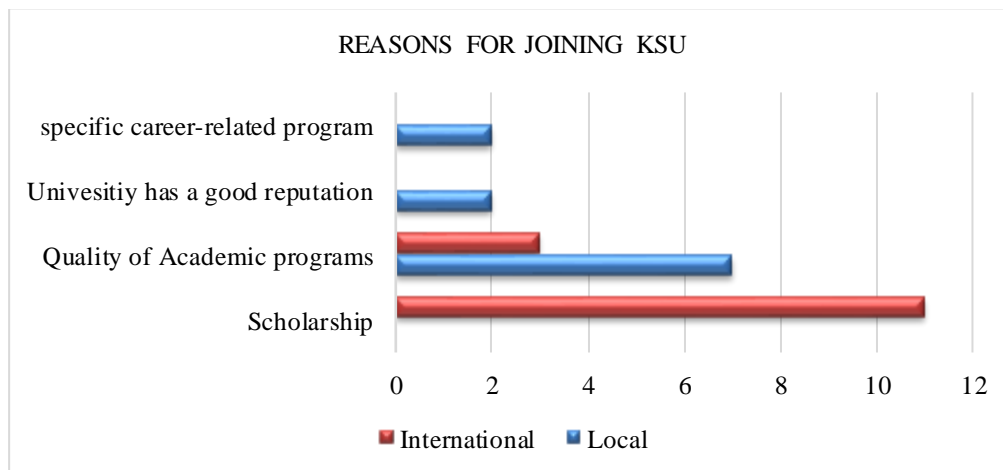


Figure 12. The students' reasons for joining KSU.

The second portion of the survey contained eight questions, which were focused on students' decisions to choose engineering. Participants were asked to choose between 6 potential responses, including a specific job, earning a degree from a high-end college, their interest in scientific subjects, the will to increase their knowledge in an academic field, the will to increase their engineering skills, and other reasons. Most participants (Saudi and international) chose engineering in order to prepare for a specific career in that field, as presented in Figure 13.

The third section contained nine questions, and was targeted at evaluating the college of engineering at KSU. The section focused on the performance of instructors, teaching technologies, practical work, facilities, quality of teaching, and an overall rating of the college. Results show students are generally satisfied with the college of engineering, while some are not satisfied with the practical work in their respective program, as well the need to improve facilities offered by the college.



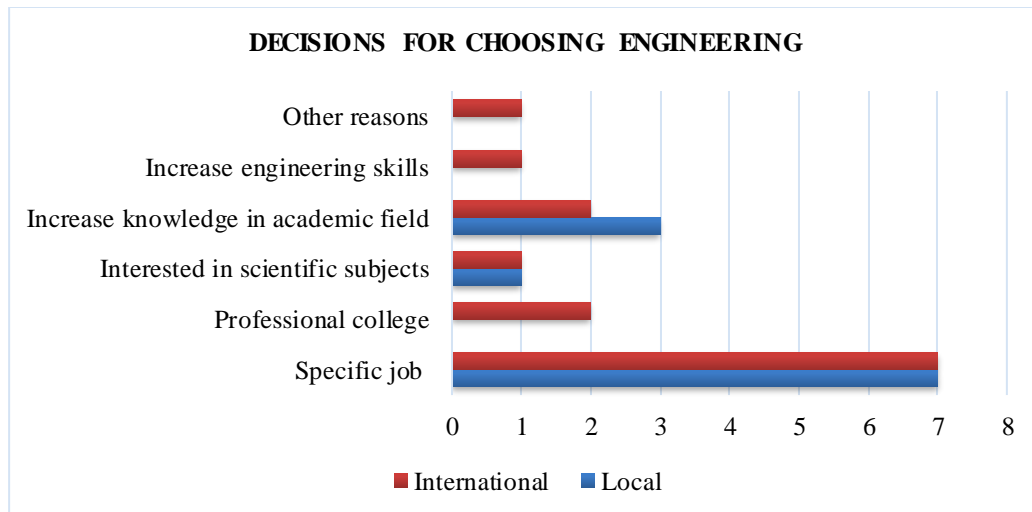


Figure 13. The students' reasons for choosing engineering.

The fourth section contained the challenges and obstacles facing engineering students at KSU. This focused on the following facilities and services including the library, housing, parking, visa, transportation services, campus medical services, food services, facilities for student associations, computer support service, and on-campus Wi-Fi. Challenges and obstacles that faced most students included campus medical services, food services, and visa facilities for international students.

The final section addressed students' recommendations and suggestions regarding the university, in general, and college of engineering, in particular. The section allowed students to express their opinions freely. The participants' feedback included the following,

- The college should pay more attention to practical work.
- There needs to be some training courses for new students (MS and PhD).
- Improving teaching technologies.
- Wi-Fi and parking needs some improvements.

## 6. Conclusions and Recommendations

In this paper, the authors aim at highlighting higher education in KSA, with an emphasis on engineering education offered to international students. Statistics show that international students represent only a small percentage as compared to local students, mostly due to the tough condition requiring internationals to receive a very high grade in their Preparatory Year to enable them to join the college of engineering.

The authors also conducted a survey among engineering students (BS, MS, and PhD) at KSU in order to evaluate their opinions regarding their engineering education. The main challenge encountered by international engineering students included enrollment and visa obstacles, as well as the need to improve various services on campus.

## Acknowledgements

The authors acknowledge the support of the Deanship of Scientific Research, College of Engineering, King Saud University. The second author would also like to thank King Saud University for providing scholarship assistance.

## References

- Abulfaraj, W., Zahed, A. H., Kabesh, M., and Ali, S., The international trends and reforms in engineering education at King Abdulaziz University, *World Transactions on Engineering and Technology Education*, vol. 5, no. 1, pp. 143-148, 2006.
- Alkhazim, M., Higher education in Saudi Arabia : challenges, solutions , and opportunities missed, *Higher Education Policy* vol. 16, pp. 7, 2003.
- Al-Madhari, F.A. Higher education in Saudi Arabia: Statistical analysis of the past and future, *The Scientific Journal of King Faisal University*, special issue, pp. 10-31, 1998.

- Al-Mhaidib, A. I. Aspects of collaborations between college of engineering at King Saud University and industry , *Proceedings of 2014 Zone 1 Conference of the American Society for Engineering Education* , Bridgeport, Connecticut, U.S.A., April 3 – 5, 2014.
- Almogbel, A. N., International education issues in Saudi Arabia's public education curricula: An analytical study, *Journal of International Education and Leadership*, vol. 5, no. 1, pp. 1-24, 2015.
- Alturise, F. and Alojaiman, B, Benefits and challenges of using ICT in Saudi Arabia universities: A literature review, *Int. Conf. Adv. Comput. Eng. Learn. Technol*, Beijing , China, July 15 – 18, 2013.
- [College of Engineering at KSU, 2016]. Available online: <http://engineering.ksu.edu.sa/en>. Last accessed: December 05, 2016.
- Crawley, E. F., Jianzhong, C., Malmqvist, J., and Brodeur, D. R., The context of engineering education, *Proceedings of the 4th International CDIO Conference*, Gent, Belgium, June 16-19, 2008.
- El-Sherbeeny, A. M. Highlighting the need for engineering education for females in Saudi Arabia, *ASEE Annual Conference & Exposition*, Indianapolis, Indiana, USA, June 15 – 18, 2014.
- [Ministry of education, 2014] Saudi Arabian Ministry of Higher Education (MOHE) – Electronic Gate. Available online: <http://www.mohe.gov.sa/ar/studyinside/governmentuniversities/pages/default.aspx>. Last accessed: December 26, 2016.
- [Ministry of education, 2016]. Available online: <http://www.moe.gov.sa/ar/Pages/default.aspx>. Last accessed: December 05, 2016.
- [Saudi vision 2030, 2016]. Available online: <http://vision2030.gov.sa/en>. Last accessed: December 05, 2016.

## **Biography**

**Mohammed S. Alkahtani** is an Assistant Professor in Industrial Engineering Department at King Saud University. He is also the chairman of the Industrial Engineering Department and has recently been elected as chairman of the Industrial Engineering chapter of the Saudi Council of Engineers (SCE). Dr Alkahtani has collaborated on various industrial and research projects. He has experience in teaching a wide range of IE courses, is involved with several administrative duties, and has developed a network of industrial and academic collaborators across the world. Research areas and specialties: 1) Design and analysis of manufacturing systems, logistics, and supply chain. 2) Lean/Agile based approaches for performance improvement of SMEs. 3) Application of simulation, operations research and optimization techniques to solve supply chain and logistics problems.

**Ahmed M. El-Sherbeeny** is an assistant professor at the Industrial Engineering department (since 2010) and head of the Alumni and Employment Unit (since 2013) at the College of Engineering, King Saud University. He completed both his PhD (2006) and Master's (2001) degrees in Mechanical Engineering from West Virginia University (WVU), where he was a graduate teaching and research assistant. He holds a BSME from the American University in Cairo (AUC, 1998). El-Sherbeeny's research interests include cognitive human factors engineering and engineering education. His teaching interests include basic courses in Human Factors Engineering, Manufacturing, introductory Engineering design, Engineering problem solving and programming (with C, C++, and Matlab), Engineering drawing (with both AutoCAD and manual drawing), as well as Mechanical Engineering courses such as Statics, Dynamics, and Thermodynamics.

**Fawaz M. Abdullah** is a Master's student in the Industrial Engineering department at King Saud University. He completed his Bachelor degree (2013) in manufacturing engineering from the International Islamic University Malaysia (IIUM). He has participated in various manufacturing research in which he holds several publications. His teaching experience as a tutor includes manufacturing processes and manufacturing materials. Fawaz's interested research areas are in Manufacturing & Mechanical engineering. He's interested in the following research topics, manufacturing processes, additive manufacturing, advanced manufacturing, CNC turning & milling, petri nets, design of experiments, engineering drawing (Catia, Auto-Cad and Solid Work) etc.