The Qualifying of Engineering Education in Developing Countries to Adapting the Arrogance Growth

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Abstract: - The paper investigates a concept for increasing the number of superior students in the education system. The current research emphasizes the production of an excellency engineer, not the normal one. A real model (10 years) of a Faculty of Engineering in Egypt is based on low student density in either lecture or practice (Exercise). The distribution of excelled graduates is calculated for ranks 1st, 2nd, and 3rd. The courses are classified into three groups basic sciences, special engineering, and general engineering courses. The graduation of arrogant students is obtained for different fields according to grades. The percentage distribution for the excellency grades is obtained within the period of study. The trend activity for superior enforcing the students is calculated and analyzed. The prediction for the growth in different departments is determined and discussed. The study is exposed to the importance of Arabic the language and how to deal with in b universities within the union of all Arab efforts together in one crucible to promote the Arab nation and quickly adapted to the international level. It is included that the honor degree may be canceled, and the concept of examinations should be modified.

Keywords: - Basic Sciences, COVID-19, Curriculum Grouping, Labor Market, Surpassing Graduation.

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1. Introduction

Globally, education (a constructive means for nations' progress) is an essential tool for the progress of nations, and it is expressed in various specializations to develop its effective value in nation-building. Thus, economists determine education as a key factor for the general national income, which is the primer indicator of economic growth besides raising the national social level [1-2].

Chiefly, engineering education is based on theoretical study geared towards actual application while technical education depends on the operational aspects of theories applicable engineeringly to be integrated into a single system, namely technical engineering education as presented in Egypt in the form of faculties of engineering and technology. Education in human (society wealth) resource tumor is vigorous due to the economic dependency on workforce size and quality (in the era of knowledge economics as a mental capital) [3-4].

Principally, advanced countries are accused of education to maintain a high level as they may find the specific criteria for time keeping up with the practical developments and theoretical innovations. Contrary, many countries require a great effort since they are working to achieve a standard level approving the actual progress according to annual UNESCO reports [4]. For example, the ratio of engineering students to the total number of students at universities in Libya at 93/94 was 9.8 and became 7.5 in 95/96 as a negative value (Table A1 in the Appendix).

Table A1 illustrates the ever-increasing expulsion of students in universities, (i.e., the youth's desire to learn), that characterizes the educational system in Libya and consequentially in Arab countries. Looking at the graduation change, Table A2 in the Appendix presents the sample of Egypt [3-4].

Education quality is a vital source for society's growth since it is the most significant means of enlightenment. Contrary, unguided, and unsubstantiated education is purely theoretical because of the leadership lack although wider horizons may concern individuals and sometimes society. Rarely, resources and programs, increasing or decreasing, may promote improved outputs by controlling multiple variables when linking education outcomes to the labor market [5-8].

A framework for the human tumor in education had to be inserted at key points: (free education and opportunities, education for women's rights, freedom of opinion for men and women under proper national legislation and duties, cultural differences appreciation for society's benefit, education to achieve women's legitimate aspirations, developing individual and societal self-growth to achieve the potential launch) [9-10].

Experts believe that there is an urgent demand to develop all education types, especially curricula because the prevailing education pattern reproduces fragmentation and bad dependency. In Riyad DH 2003, the final statement of the 1st national meeting of intellectual dialogue pointed out that there is a need to address the issues, problems, grievances, practices, and traditions because women are an essential element of progress in modern technologies, especially [11-12].

2. Development Strategy

Universally, education is a social demand for developing a country where today's students are going to be experts, leaders, and scientists of tomorrow. Various components of a society may require education as food to influence both the social and cultural frames of a country. So, the study of affecting parameters in the educational process may be vigorous to get the best scientific technique for the aimed

highest level. The tumor of countries needs to catch the standard of advanced.

The target of the education process is the future growth of a country based on national or international levels. Despite the great variation between the contents of a country, this activity must be investigated to light the future of the next generation. The student groups appear to be the actual force for raising the society towards the higher levels for the graduated students in all fields of study. Since the investigation is related to the engineering society, the modification of engineering education would be affected by the distribution of engineers or students among various specialties according to the requirements for the graduated engineers in the labor market [13-14].

Nowadays, modern technology and its wide range of informatics applications in all fields may accelerate the sequence of growth of engineering education in the already advanced countries. This increases the education important for the Arab world to reach the aimed level of the advanced countries. Thus, this investigation may need a real model of engineering education originating in the affecting parameters for modification. This is more interesting with the presence of electronic and computer engineering as a part of the analysis.

It is well known that scientists have a national value for a country's future to install and support scientific and technological progress. They must be the old surpassing students so that the outstanding phenomena in engineering education would be vigorous [15-16]. Both economic globalization spread and technical tumor rates accelerate communications and information systems as a challenge to develop the national capacity (higher quality) as a strategic choice. Thus, it absorbs advanced technologies and integrates them into the global economy to improve its competitive potential as recorded in Table A3 in the Appendix.

It also obliges focusing on the created information systems, computer engineering, computer science, and relying on TV broadcasting, YouTube of lectures and their transmission via CCTV or educational television channels according to a time plan in which the space of available specialties gradually increases according to actual needs. This strategy becomes more necessary due to the last COVID-19 pandemic. Therefore, the establishment of new specialties in the field of information systems technology, computers, media, guidance, and mentoring of educational and vocational students are introduced in all existing colleges.

Mainly, the Human Wealth Development Program in Engineering Education seeks to achieve one of the project's original objectives, supporting the educational and technical expertise of staff members and associates (teachers and technicians, etc.) in engineering colleges, inviting experts from outside or inside to visit colleges and meet with faculty members to convey experiences for the implementation of growth plans, while the program of developing educational tends using multimedia, including [16]:

1- Implementation, poor continuity, stable in some cases.
2- Sudden change of work sites, without warning.
3- Sudden increase in the number of students admitted.
4- Common financial and administrative complexities.
5- Poor technical support and capabilities of suppliers.
6- The lack of commitment or ability or infrastructure.
7- Failure to use equipment, educational scheduled.
8- Lax maintenance and control of what is supplied [17].

3. Modeling

The research cuts a model for 10 years period from Egypt (a developing country) by the scientifically defined rules and principles [18]:

1- Low ratio of students to faculty members of 2.83.
2- Synchronized rapid international technological growth.
3- Wide departments diversity, including unusual and basic traditional specialties of general industries.
4- The mean level of students is high as deduced.
5- Respecting student desire for specialization.
6- The laboratory availability (from old to newest).
7- Programs allow training in industrial institutions [18].
8- Library (traditional and electronic) is available. Also, printing, electronic photography, and fax mail at nominal prices are permissible (morning and evening), allowing the student to attend lectures and exercises in full or online.
9- Low student density in stands, classrooms, and laboratories, (compatible with the restrictions of the COVID-19 pandemic), to increase the perception efficiency.
10- The Honor grade is obtained as printed in Table A4.

3.1. Curriculum

The curriculum target may be tailored into a few items:

1- The curriculum must be designed (appointed, periodically) based on industrial reality to develop the perception of the course curriculum which incorporates the privations of systems in factories for future planned measurements, internationally.
2- A detailed description of a course would be supported by illustrations, laboratory, and total hours. An updated list of references (local and international) should be available.
3- Updating the clarification means and laboratories including the corresponding numbers of faculty members and assisting staff. This arranges students with different teams within a specialization to develop different visions of courses and tools.

Certainly, the quantity and quality of courses have a meaningful impact not only on the student's grade but also on, his ability to understand and collect. For example, the student at law school must get a large dose of law and economics while the medical student needs the medical doses of courses.

So, the engineering student demands comprehensive engineering doses and therefore shows the benefits of courses to raise the graduation efficiency. This is the core rule of engineering thinking while different courses of graduation are limited. The classification of courses has been developed within three channels (Table A5 in the Appendix):

a) Basic sciences: (mathematics, mechanics, chemistry, and numerical analytical).
b) General engineering sciences: (engineering sciences from other disciplines).
c) Specialized engineering sciences: (engineering sciences in the same discipline).

For example, specialty (A) comprises two specialized courses in the 1st division and becomes six for each of the next three years.

From Table A5 in the Appendix, it is shown that the largest number of courses per year is 11 and the **3rd** year of all

specialties has the largest number of courses. Contrary, the lowest number of courses came to the initial division of all departments offered except specialty (A), in addition to the disappearance of general engineering courses from specialty (E) where students study specialization only unlike other disciplines. It was replaced by courses in science basic and that lasted until the final band.

It is seen from Figure 1 that the dose of specialized courses varies from one subject to another where it fluctuated from 20 to 30. The general engineering courses varied between 4 and 10 and finally, the basic courses were a maximum of 8 and a minimum of 4. Also, the total courses vary between departments from a band to a warm within the same specialization. Globally, the focus on specialized courses increases graduation efficiency.

Basically. The current paper classifies the courses along 5 years of study into two basic titles the non-engineering section (including chemistry, physics, and mathematics) and the engineering one which can be divided into two branches. The first branch is the general engineering courses to teach all departments the original engineering philosophy and fundamentals such as engineering of drawing, practical testing, laboratory, etc. The second is the specialty as specified for the kind of graduation such as electronic, computer, electric, mechanic, etc. the work investigates the effect of each on specialty according to the percentage distribution for each department. The analysis may be easily processed through the neural networks either the simple NN or the SOM type so that the analysis will be simple, especially with the good training phase before applications.

The last two disciplines, in Figure 1, show the disappearance of general engineering courses and basic courses in the final division, where this system has consistently produced superior students, making this topic vital for researchers in this field.

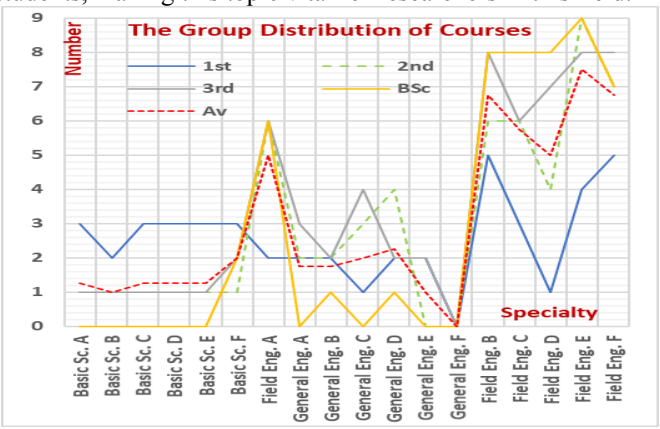

Figure 1: The courses groups of different departments. (Source: Port Said University, Egypt)

The results illuminated that the number of basic sciences groups is approximately constant in all specialties except F (having more) where the general engineering group is disappeared. The dose of specialty sciences is dramatically increased for all but a little dissimilarity between each other. Thus, specialty F has a greater number of basics and specific sciences than other science. Its nature is theoretical engineering as the informatic or communication systems, for example. It is noticed that the last year has no basic sciences at all except the specialty F due to its singular characteristics.

3.2. Graduation Performance

The educational tumor must extend to the treatment ability with technological advancement and innovative foundations by academic researchers (faculty members of universities, higher institutes, research centers, and academic centers), students, postgraduates, and all for self-advancement in all important fields of engineering and technical education. Mostly, scientific exchange between Arab universities in different countries (or internally in the same country) may be activated in both short- and long-term planning if it is intensively supported. Since students represent future generations, the benefit will be continued longer with the old age as in later eras. This concept may include scientific staff exchange and final year students, but in the last semester to implement the graduation project at another university.

Positively, Arab countries demand a real renaissance at the engineering level, which should be addressed at political, technical, or governmental levels, requiring leadership support. Since engineering function is important for a country's growth, the burden of the renaissance has shifted significantly to the level of engineers, i.e., engineering education.

Hence, Arab engineering education should be exposed entirely for the fraternal countries to keep pace with each other to excel internationally, raising the efficiency of Arab engineers. It is worth mentioning that Arab engineers as a real product of cooking processes are at a reasonable level entirely, but the faster-occurring tumor requires more perception.

The input populations for the investigated model are plotted in Figure A1 in the Appendix.

4. Superior Characteristics

Nowadays, the worker quality depends on experience and skill at a competed time. The pillars of engineering education and the educational system continue to suffer from lump due to the associated lack. Principally, Arab countries move together in a system to maximize the actual educational output of engineering education to increase the rates of national economic growth. Figure A1 in the Appendix collects the student distribution in different fields in the model when percentage history for graduation is defined as input data.

Unconditionally, the student presence is extensive in the grades good (G) and Acceptance (Ac), but the number of students in (Ac) is going to a gradual decline in the last three years of the model. Encouragingly, the comprehensiveness of models in terms of the types of students where some come from general secondary education and others come from industrial and technical secondary education besides outstanding students from higher technological institutes. Figure A2 in the Appendix shows that the estimates of honorees have increased in recent years from the 4th year to the end of the analysis (year 7), which invites more study to catch the increased reasons. It is a success goal to get optimal growth since success fluctuates at 73% for traditional specialties and 100% for the desired departments.

4.1. Superior Analysis

If the tumor (of industrial, economic, social, health, and other) depends mainly on the role of engineering and technical

education, it will be necessary to review (regularly) the engineering and technological education system in all countries, especially in developing ones. This leads to graduate students at the required international level (within economic support for environment tumor and the benefit of national income, whether directly or indirectly) by arming them with either scientific or modern engineering and technical skills. The percentage history for brilliant graduation per grade in different departments in the proposed model is as in Figure A1.

Figure 2 proves that the privileged students that receive the graduation degree of Honor (H) and Excellent/Very Good (Ex/VG) grades are approximately 14.286% of the total students who graduated as a high value for the excellency engineers.

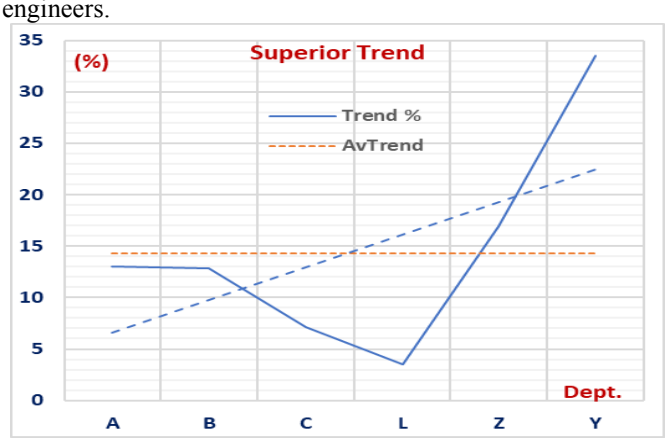

Figure 2: The brilliant graduation for the highest grades.

The deduced percentage is highly affected by the arrogant of graduations in departments Z and Y. Additionally, the specialties A and B are stable and close to the average for all departments, but the lowest percentage appears for the students in the field L in the range of 3.544%. Simply, the trend characteristics clarify the results since it is incomprehensible to be extracted from the curves of graduation distribution.

Figure 3: The student desire for available specialties.
(Source: Port Said University, Egypt)

It is important to illustrate that the highest desire is reflected to the intelligence department because it is the future of life. Additionally, the students try to go with the new science to get the promoted position in the labor market including mainly the international market (not the local). The IT zone is the future target where all countries in the world (not only the developing countries) are emphasizing the new specialty. The system of the worked model is respecting the student's desire where this desire is registered according to the student's opinion as plotted in Figure A3 in the Appendix, which overlaps with the real distribution of students in all disciplines. However, the maximum number of students spread over the departments is indicated in Figure 3 where the history of graduations proves this variation. The same distribution prototype is remarked with a rise sequentially because of the population increase. It clarifies the student's desire to study since a swaying is injected due to the different visions and labor market change. The history of maximum occupation for the divisions of the model may be reflected in Figure 4.

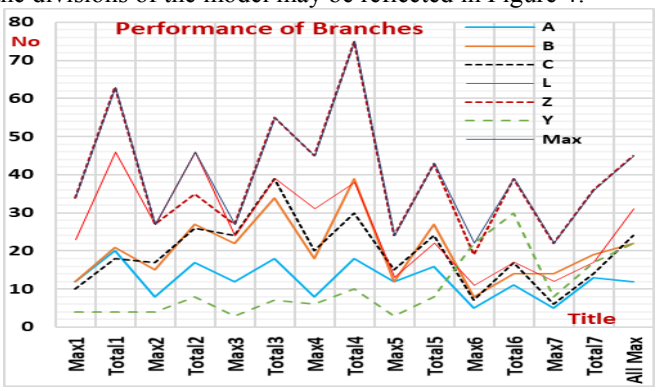

Figure 4: The limited performance of courses distribution.

The distribution of graduates in different specialties in the model is graphed in Figure 5 but artificial intelligence may facilitate the work in the present work.

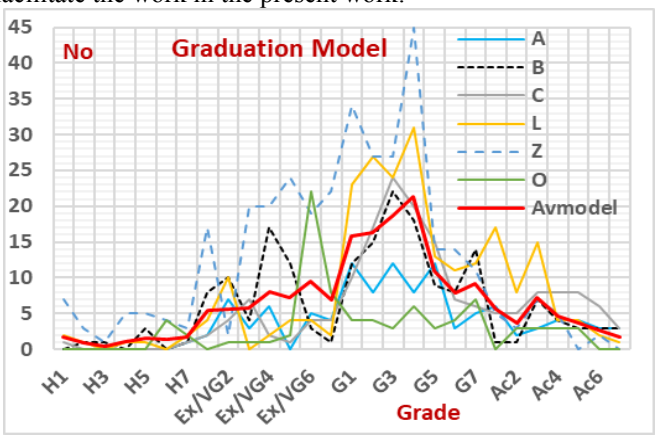

Figure 5 The distribution of graduates on all specialties.
(Source: Port Said University, Egypt)

The curves in Figure 5 prove the validity of the results since the original standard distribution function, as defined statistically, is appeared in Figure 5. Additionally, the average model grade, for all departments, stand with the standard distribution function, too. The distribution of graduates on different subjects in the specific branches (L, Z, O) of the Model is sketched in Figure A1 in the Appendix. The general pattern for the normal grades (G and Ac) is translated into the rate of change historically as drawn in Figure 6 while it indicates the future drop in these grades. This means a rise in other grades corresponding to the appeared reduction in the rate in Figure 6. The last grade (Ac) is going towards the negative to announce that this grade may be disappeared totally.

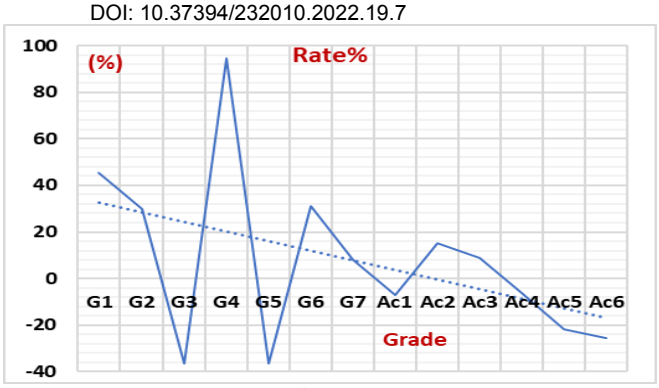

Figure 6: The rate distribution for normal (public) grades (G and Ac).

Table A4 in the Appendix shows the different estimates of graduation success where excellence means honors for graduation. The lowest presence of students appears in the **3rd** year although stability is deduced in the 4th year even roughly for superiority and its fluctuating throughout the study period. The fluctuation rate in the distribution of outstanding students oscillated over the specified period based on the amount of scientific dose received to the raised scientific level of students because of courses quality where they vary from one subject to another. This evaluates the studying of scientific doses of each subject.

4.2. Trend Pattern

All values of derived trends are normalized where this mathematical process is depending on the start point (S) of the linear (for simplicity) trend characteristics as well as the endpoint (E) within a specified margin. This margin may be a time scale or a sequence of specified items as implanted in this case. The total sum value (T) of all differences for all populations becomes the normalization factor where the normalized value (X) for each parameter may be expressed by:

$$X\,\% = 100\ \frac{E - S}{T} \qquad (1)$$

Therefore, the trend analysis for readings can be tailored to various instructions since functions of the second rank sample are calculated as sketched in Figure 7 to prove two cases with two rates. Inevitably, normalization can be implemented to get a single curve for an array as added in Figure 7, too.

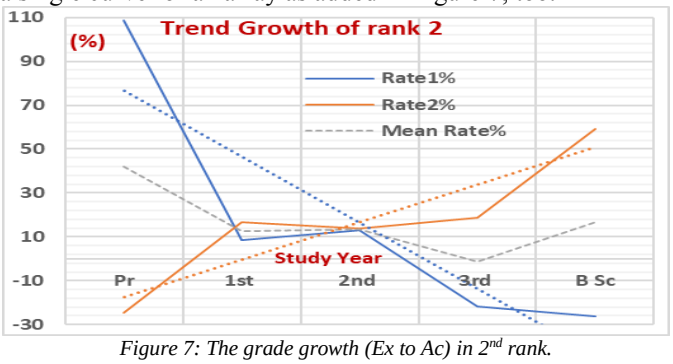

Figure 7: The grade growth (Ex to Ac) in 2nd rank.

The normalization will be taken for specified management to reduce the computational effort and time with a simple pattern for clarification. Otherwise, the linear system for trend analysis is simply relative to others such as logarithmic, exponential, polynomial, power, and moving average. If the dependency is activated for the trend as an easy form, the normalization will be positively an accurate way of understanding the heart of growth in general. A trend summary for specialties refers to the specialty for graduation grades as abstracted in Figure 8.

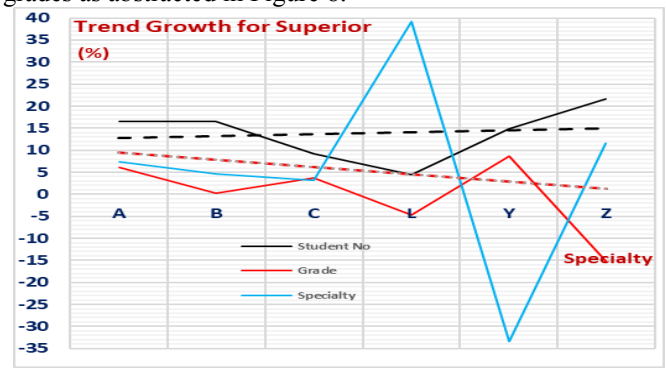

Figure 8: The superior growth according to three perpendicular axes (specialty, grades, populations).

The trend growth of general graduation numbers per specialty is calculated as presented in Figure 9.

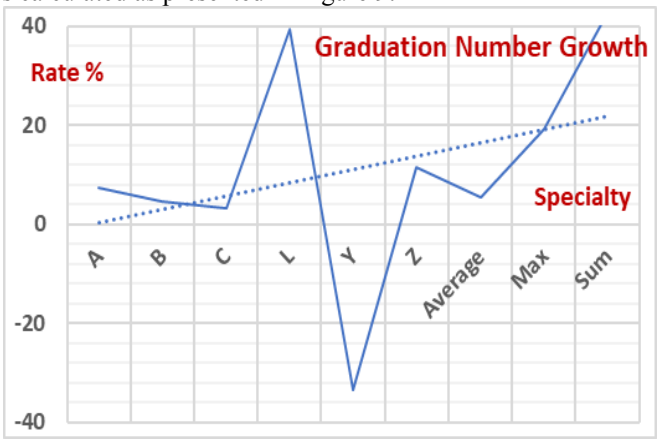

Figure 9: The superior growth graduation.

The graduation growth indicates an approximate constant growth for the basic three specialties although it clarifies a sharp increase for the specialty L. Contrary, a great drop has been recorded for the specialty Y. The reason may be referred to the labor market characteristics where the civil engineering is gone forward due to the structure building as a growing up profit-market. The growth trend of graduation for a growth rate of all grades in the model is dropped in Figure 10.

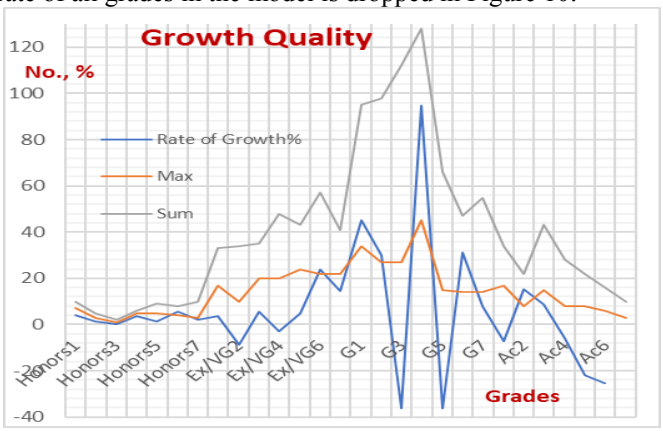

Figure 10: The model pattern for growth rate of all grades.

Figure 11 presents the growth of the integrity degree for the model (H, Ex, VG) with a growth average for these degrees in the model of 4.199% in general.

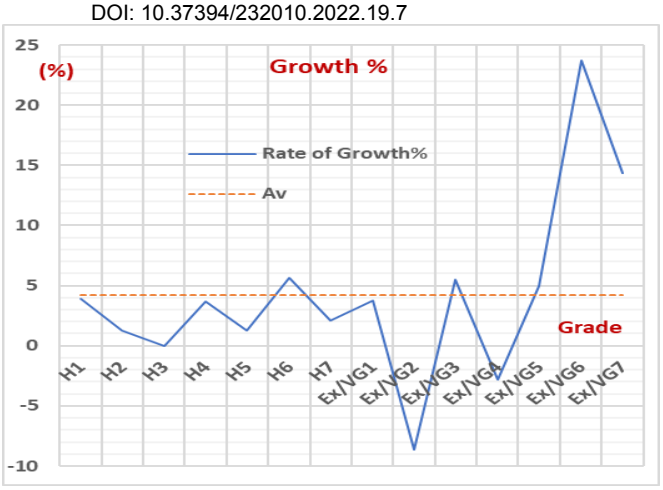

Figure 11: The growth rate for B Sc superior grades.

This means that the indicated degrees are sequentially increased in the rate of 4.199%. It can be tailored for the honor degree only as 2.571% but it is raised for the grades of EX and VG as 5.842%. The last increase (for grades EX, VG) represents a ratio of 2.272 relative to the honor degrees. This a normal ratio according to the statistical standard distribution function because the honor degree is a rarely gotten. However, the limits of luminous may be performed from the results of this work as plotted in Figure 12 where the maximum reading for each year is accounted.

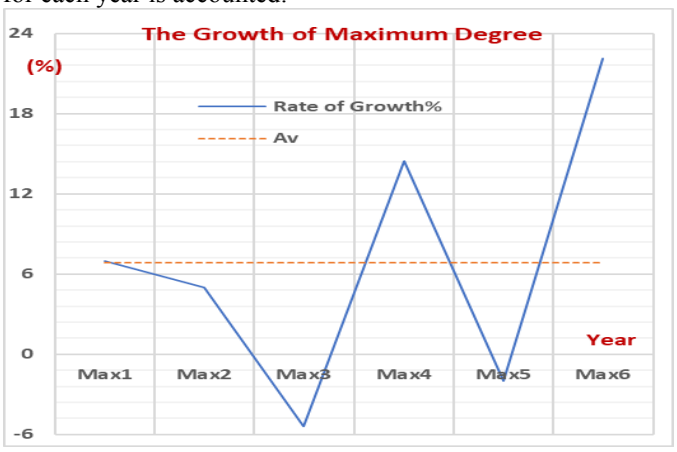

Figure 12: The maximum of B Sc superior grades.

This maximum degree has an annual growth of 6.868% (it is higher than the corresponding 4.199% for the static flow of grades honor, Ex, and VG together) which illuminates the higher growth of maximum than the average tumor for the graduated engineers. This notification is pointing to the impressing output for the studied model if the acting for arrogance level for the graduated students.

The growth trend of graduation normal grades of the model. The student distribution, of graduates in different specialties in the specific branches (A, B, C) of the Model, is given in Figure A1 in the Appendix. Contrary, the general graduation for all graduated students (H, Ex, VG, G, Ac) may clarify another conclusion as shown in Figure 13 for the trend of growth for students in the model.

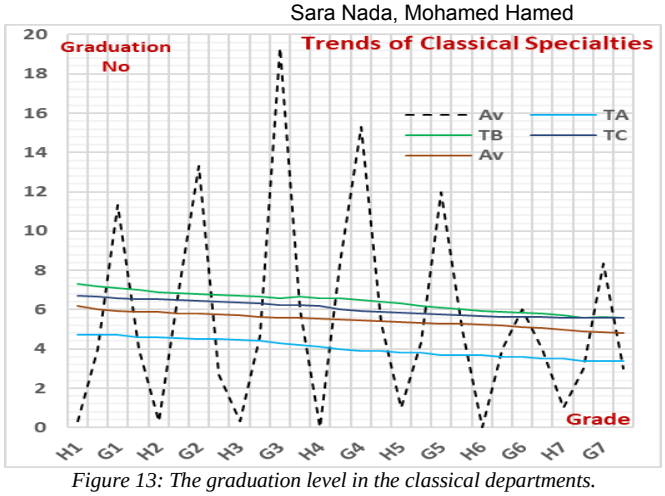

Figure 13: The graduation level in the classical departments.

It is seen from Figure 13 that the number of graduate students is slowly going down to declare about the beginning of specialty expiration in the labor market. This is a pattern internationally because it has appeared in most countries around.

5. Rank Evaluation

Excellency is vigorous and very necessary for the progress of nations since the Arab nation looks forward to joining the major industrialized countries. Therefore, the study of factors affecting excellency, especially in the field of human development, i.e., in the field of engineering and technical education is a target. Table A6 in the Appendix presents the model results of graduates of the 1st ranking where the number of courses is uneven for consecutive years within one discipline. Each subject includes various and unequal numbers of courses per year and therefore, it is important to focus on teaching basic sciences in intensive doses.

It is worth mentioning that the 1st rank in the preparatory band received an acceptable general estimate except for students going to specialization (l) and (e). The 1st rank in the other specialties was not superior at 1st and then excelled during the study and the 1st rank in specialization (l) was slightly higher than the normal level. he received the grade (good) in the preparatory band and remained at the same level until graduation. Thus, he is not considered superior but higher than his peers. The general level of estimates of the 1st in all departments is higher than in the 3rd year in addition to repeating the phenomenon of distinguishing.

The general grades of graduated students for all departments are collected in Table A7 in the Appendix for the years 3 and 4 during the model period. It is managed for the years of study (1st, 2nd, 3rd, B Sc) for graduates in the 1st rank.

5.1. First Rank Graduation

The global estimate acceptable for the 1st year has decreased from 5 in the 3rd year to 3 in the 4th year while the excellent estimate increased from 2 to 9 explaining and announcing the rise in the general level of students in the 4th year. It has already been determined that the quotas (A) and (L) have shown a good estimate and they are inconsistent with the rest of the distribution contrary to the logical distribution of estimates. If a clear fluctuation has appeared in the estimates of 1st for other disciplines, this will increase the importance of

the same distributions in the following year. The details of each year may be collected in Table 6 in the Appendix for the first rank in both the years 3 and 4 graduations during the model.

Referring to the total distribution of headquarters with an excellent estimate during the period of study, the 1st estimate appeared in all subjects except specialization (E) because its graduates did not reach it until the 6th year of the model. Therefore, the situation of (E) is stable due to the student demand, which is reflected in the labor market and its current reputation. Thus, the analysis of graduation for the 1st rank is required. The overall level of specialty E was higher than others and specialty B was close. It is somewhat lower than the student desire although other specialties swing at a similar level.

The distribution of courses among grades throughout the years of study for graduates in the 1st rank during the 4th year may be illustrated in Figure 14.

Figure proposed the characteristics of the first rank graduation in the form of both the sum of grades over the years of study (final) as well as the mean value for the obtained grades throughout the third and fourth years of the model. This dependency for the courses of each grade is achieved is plotted for the first rank during both the third and fourth years of the model.

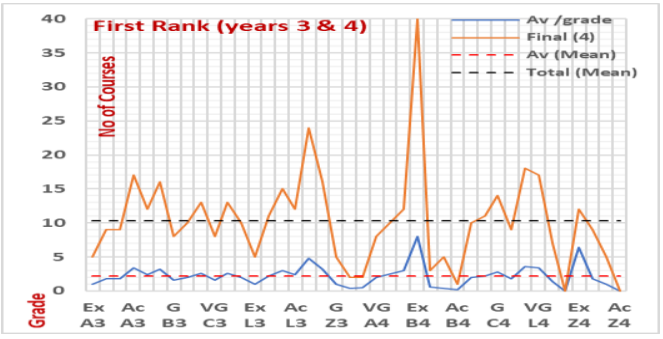

Figure 14: The performance of first rank graduation.

The results pointed to the average values for the number of courses of 2.19 and 10.325 corresponding to the mean value of both the average and the total number of courses (4th year) distribution, respectively. The pattern performance of first rank graduation (total courses) during the third and fourth years of the model are processed for trend analysis where the results (Figure 15).

Figure 15: The 1st rank graduation of (total courses) during 3rd, 4th years.

It is noticed that the third year has a maximum value of 53 for the third year while it is 51 in the fourth year with an increase of 3.77%. This means that the first rank in the third year has an exceptional position at 3.775% more than that in the fourth year. This is repeated for the average value as drawn in Figure 16 where the same conclusion is determined (3.775%). This value is shown in Figure 16 as the difference between both lines at the end of the graphs. The pattern of growth for the first rank has a trend that can be determined as delivered in Figure 16.

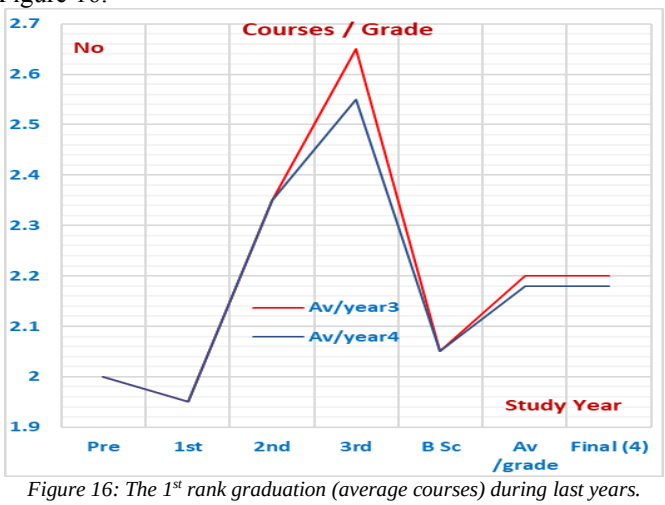

Figure 16: The 1st rank graduation (average courses) during last years.

5.2. Second Rank Graduation

The results of graduates of the 2nd ranking are listed in Figure A2 in the Appendix where the graduates of the 4th year of schooling came, in preparation for reaching sound statistical results. The results are based exclusively on the number of courses distributed among the success estimates in all disciplines. The distribution of general grades throughout the years of study (1st, 2nd, 3rd, B Sc) for graduates in the 2nd rank is collected in Table A8 in the Appendix for the years 4 and 5. It is noticed from the contents of it should be noticed that there are no honor graduates in the 2nd rank in this year (3rd) reached the estimates although the arrival of students from the institutes of preparation of technicians to the 2nd rank among graduates (coming from the general education) has appeared.

Figure A2 contains the number of grades as distributed over the years of study for the second rank in the 4th year of the model. The distribution of courses among grades throughout the years of study for graduates in the 2nd has been listed in Table A8 in the Appendix. Figure 17 shows the absolute trend dependency on the distribution sequence for the grades for first and second ranks according to the years of study in the 4th year of the model. Also, it contains the average value of the dependency besides the direction of growth for the future prediction.

For clarification, the absolute trend dependency on the distribution sequence for the grades for the second rank in the 4th year of the model has been repeated for another arrangement as outlined in Figure 17 where two different curves are viewed. The mean values are 16.953 and 2.651 for both conditions so a modification may correct this difference. This will be corrected if the mathematical orthogonalizing is implemented. The characteristic of a trend slope contains the relative style so that the normalization concept may be an urgent need for mathematical normalization processing. Thus, the transformation into the normalization system to find out a

more real state. The graduation grades for the second rank in both the fourth and fifth years of the model are listed in Table A8 in the Appendix. Figure 18 plots the number of grades% as distributed on the years of study for the second rank in the model 5th year.

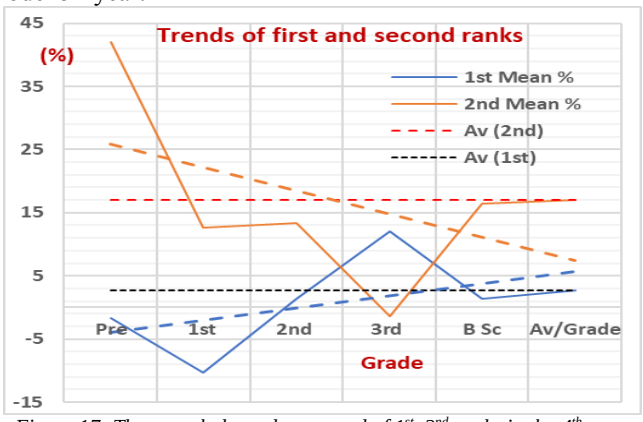

Figure 17: The growth dependency trend of 1st, 2nd ranks in the 4th year.

It is remarked that the honor degree appeared again this year within two specialties where one is a traditional department. Also, the second honor has appeared for the newly created specialty in response to the technological advancement around the world. The final distribution for the graduation in the second rank is printed in Figure 18 for the year 5 in the model.

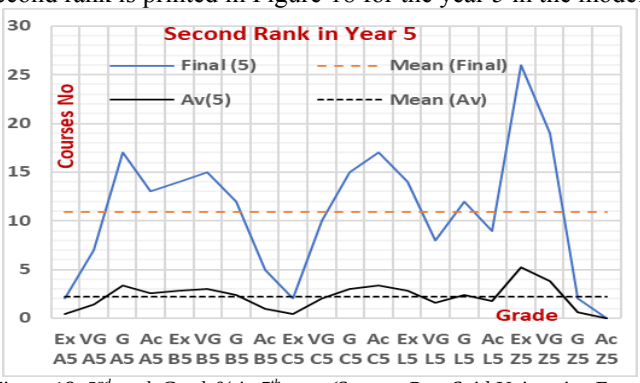

Figure 18: 2nd rank Grade% in 5th year (Source: Port Said University, Egypt)

Some received an acceptable estimate of courses and sometimes reached 16 out of 44 courses (36%) which indicate a marked decrease in the general level of graduation at the 2nd level. This percentage became 65% for a graduate in the 4th and 5th years as described in Table A8 in the Appendix when this graduate failed in the 2nd rank. Moreover, details can be scheduled for the estimation of courses for graduates in the 2nd place during the 5th year as seen in Table A8 in the Appendix. The trend of grades for the second rank in the fifth year of the model may be calculated as given in Figure 19 where the data are normalized as explained.

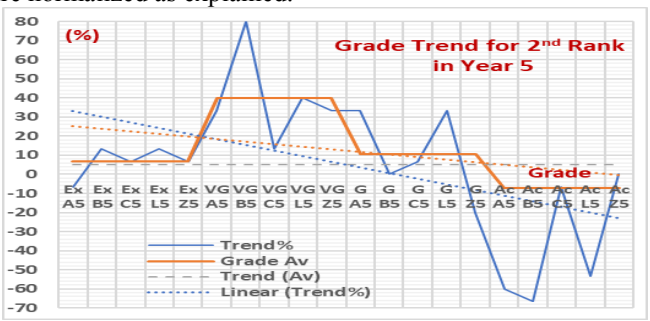

Figure 19: The distributed grades for 2nd - 5th year.

It is remarked that the values of grade trend are 6.667, 40, 10.666, -7.3334% for grades Ex, VG, G, Ac, respectively. The negative value of the trend means that this grade is going down but here it is slowly reducing. Sequentially, the optimal condition for the grade trend for the second rank can be obtained within the corresponding second differentiation for the results if the trend of these results is accounted. The general trend may be directed down in the same frequency (slop) which is 100% but the grade function (according to the sequence of grades given) is slower.

The distribution of courses for graduated students at the 2nd rank during the 6th and 7th years of the model is determined. Also, the model analysis provides some graduates in 2nd place with a good general estimate, which is an abnormal phenomenon. It occurs in the 5th year of the model, and it was not repeated in the following two years. Many courses appeared with an acceptable estimate for a few of them where there were two in both 6th and 7th years. It is worth mentioning that this is done since the readings in the research are scientifically treated to be free of impurities because of emergency circumstances. It is also noted that there is an expert fluctuation in the level of the graduate superior in the 2nd order although the oscillation limits of graduates have appeared in the 2nd order as reflected in the trend performance of Figure 19 above. The extent of change between the maximum limits and the micro-end of the graduates is estimated as shown in the 2nd rank during the model period and the drawing gives the total oscillation at these ends to all estimates.

5.3. Third Rank Graduation

Statistically, the middle picture on the model in question the graduate in the 3rd order, especially, could be reached since the results came in large evidence between graduates of 1st and 2nd order. So, the cases of graduates in this 3rd order may be considered where Figure 20 came with an inventory of the results for the estimates boiled over the years 3 to 7 of the model duration under study. The results have also been scheduled in Table A9 in the Appendix for each discipline, showing better stability than graduates of the 2nd place. The results are confirmed in Figure 20, where the oscillation is displayed at the bone and small ends of the specialisms combined.

The previous results ensure that graduates of the 3rd place have shown a good estimate overall as a reason for a stop going forward in the next rank and therefore, graduates should not be considered in the 4th position. Thus, the average readings will depend on the graduates in the first three positions: 1st, 2nd, and 3rd order. So, the numbers of courses (and averages) distributed among the estimates throughout the years of analysis (3-7) for graduates in the 3rd rank of all specialties are plotted in Figure 20 per each year during the years (3-7), separately.

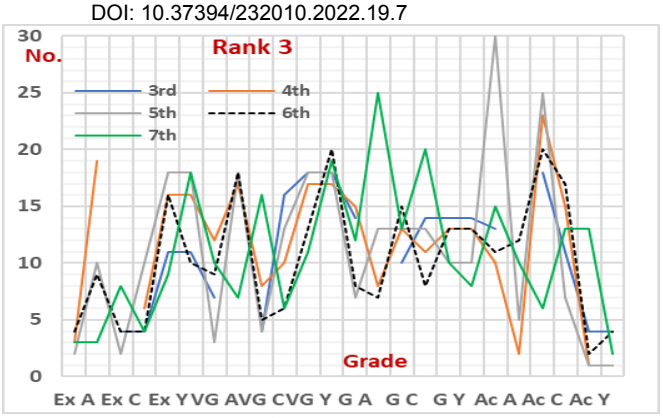

Figure 20: The numbers of courses distributed among the estimates throughout the years of study for graduates in the 3rd order of all disciplines.

Figure 21 presents the averages for various cases for the rank 3 where it is obtained for each grade for each specialty, for the duration of 5 years, (Av) is generally deduced. Also, the average of each grade per all specialties together, for the duration of 5 years, (Av_{Degree}) is defined too. Then, the exact average for all grades together in the duration is found as a single average value {Av (Av)} of 10.910 for all courses on all grades is accounted. On the other side, the total number of courses in each specialty/grade (Av_{model} = 46.292) is found.

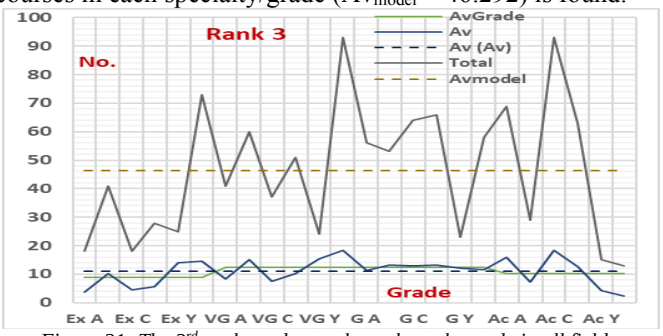

Figure 21: The 3rd rank graduates throughout the study in all fields.

The trend analysis for these values is processed as drawn in Figure 22 for the duration of 4 years (4-7). The trend of average value per grade (Av/Grade) after normalization becomes 9.6551724 while the general average (Av) is 12.4137931 for the superior in rank 3. On the other hand, graduates in the 3rd order have been limited but they came comprehensive to the cases of graduates in the 2nd order as abstracted in Table A10 in the Appendix. The outstanding for all departments from the 3rd year until the end term in the model (i.e., the 7th year) may be analyzed if it is exclusively clear for the excellency in 1st, 2nd, and 3rd order within the model. The process facilitates reaching the real average value for subjects and factors affecting the educational process as well as the extent of its impact on excellency in engineering education, particularly.

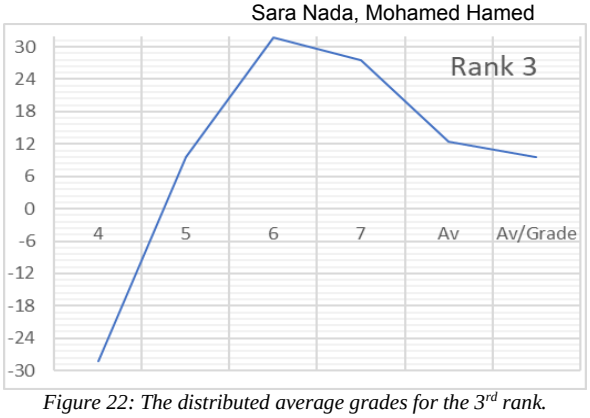

Figure 22: The distributed average grades for the 3rd rank.

The average graduation may be determined totally for the rank 3 during the last 5 years as shown in Figure 23. The results are printed in the percentage scale for each grade separately. The luminous grade of Ex occupied the top although it dropped in the 6th year, then elevated again.

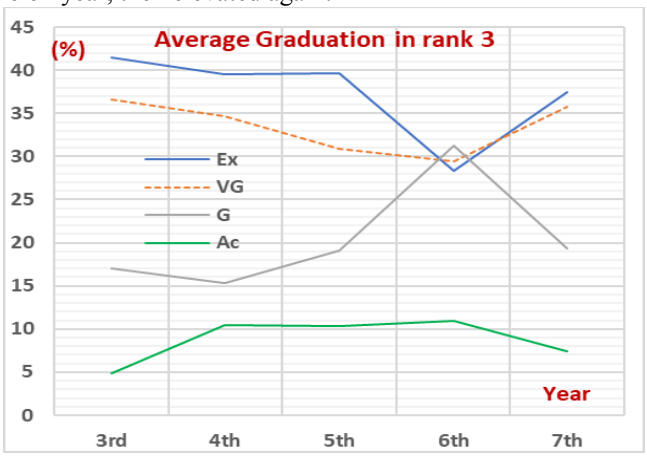

Figure 23: The percentage average graduation in rank 3.

Referring to Figure 23, the lowest grade of Ac (rank 3) comes at the minimum percentage during the model period while both the vivid highest grades are close at the top of all readings. This points to a superior level (rank 3) because the sum of the highest grades (Ex and VG) is about 75% of graduation. Thus, the ratio of superior graduates to the normal (rank 3) takes the value of 3 times. It is a surpassing generation to be continued due to the concentration of basic sciences through courses in different fields. This may be illustrated in Figure 24 since the overall graduation of rank 3 is plotted in a single curve. It is seen that the ratio is above three times as said roughly from the above Figure 23.

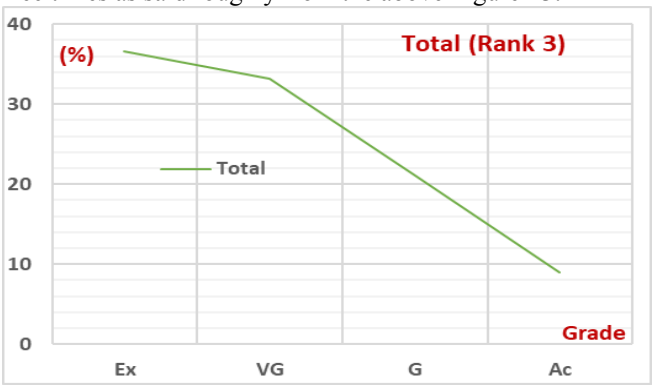

Figure 24: The overall graduation (rank 3).

6. Balance of excellency

It is important to find the average value of excellency represented in the study of outstanding graduated students in their 1st, 2nd and 3rd order to reach the goal of the research, which is an objective scientific view for the future of technical education in the Arab world. Additionally, this may lead to finding possible ways to raise the level of outstanding graduates in Arab universities.

Fundamentally, a comparison between different readings and their analysis is necessary, as shown in Figure 25 for total readings in the 100th accounting system of 3rd ranked graduates according to previous processing to highlight the sensitive places in the educational system, if possible.

In this way, Figure 25 has scheduled the total distribution of obtained estimates for graduates of 1st and 2nd ranks, while the corresponding percentage distributions came in Figure 25, for 1st, 2nd, and 3rd ranking among the outstanding. An increase in the reading of courses for an excellent estimate of both 1st and 2nd ranks is remarked, but contrary for graduates of the 3rd ranking, while the excellence of graduates of 1st and 2nd ranking is increased and confirmed the low level of graduates in the 3rd order. It may have the effect of going to other transactions that may need to be thoroughly studied in the future.

Previous observations lead to the importance of finding the overall average of each outstanding student in respective orders in a medium-term where the average centenary distribution of courses received by graduates in the 1st, 2nd, and 3rd orders is evaluated. Sequentially, this led to a marked decline in the level of courses obtained by the average superior in the 3rd order to some extent so that the courses are at an excellent estimate lower than those with an acceptable or even a good estimate.

This indicates a sharp decline in the average level of the 3rd order while a bright rise on the other side of the graduates for 1st and 2nd ranking is found but stressing that the average superior in the 2nd order is better even for the graduate of 1st ranking itself. It is superior according to the rules in force to reconsider the method of evaluation. Specifying that it is likely to be a perception in form of the estimated ranking, which appeared because of the honorary degree. Therefore, if this is canceled, it would have been natural to see the students in 1st place more than others with an excellent rating at a higher percentage. Thus, the phenomenon of surpassing for 1st and 2nd graduated ranks may disappear. The percentage distribution of courses to average outstanding graduate for the three first excellent of 1st, 2nd, 3rd rating refereeing to the Ex-grade (reference) in Figure 26.

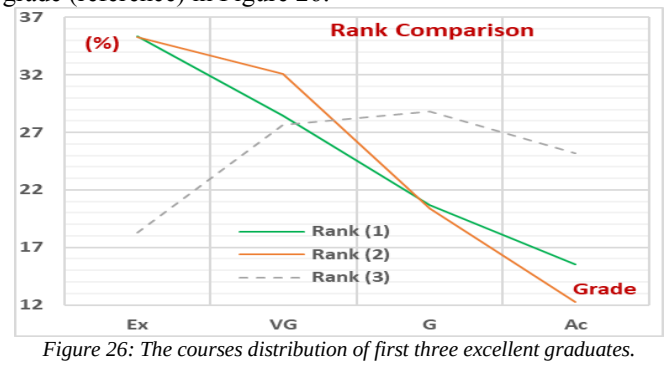

Figure 26: The courses distribution of first three excellent graduates.

Also, the percentage value for the total superior grade distribution on the grades is plotted in Figure 27.

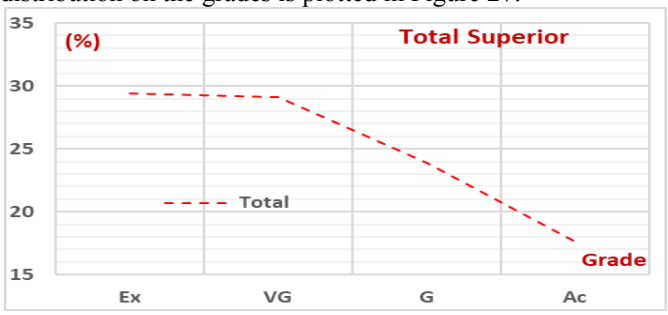

Figure 27: The percentage distribution of total superior grades.

The level of outstanding graduate students is determined for 1st, 2nd, and 3rd orders, the number of courses with an excellent rating is the most ever, but the presence of courses with an acceptable rating has become significant to form the arithmetic average, indicating a decrease in the outstanding student level in the chosen model. Also, there is an impressive factor that appeared through the analysis since it reacted in an emergency and caused a system malfunction to be found and received from the readings given. So, the percentage of the assessment courses' presence was calculated (Ex, VG, G, Ac) for each arrangement as seen in the contents of Figure 27. Figure 27 shows the average total of the three outstanding graduates where the percentage of excellent assessment courses for 3rd-place is the lowest ever.

It is likely to be the imbalance in the evaluation level and method of the exam, which produced fake readings that are not real. The regional workshop on the implementation of the joint recommendations of UNESCO and the International Labor Organization in the field of technical and vocational education for training in Arab countries. It stressed the importance of sharing and developing experiences in various technical and training fields and others for qualifying both educational and training institutions to play active roles within the framework of specialized networks.

7. Discussion

Statically, an abnormal reading means unusual conditions and consequently, it may be taken off. However, the investigation of the mean level of surpassing will be significant to identify parameters that can raise the level of superior students. The overall results for the given model in a percentage system, totally for all fields together to give an exact indication for the graduated student in the global form relative to all fields.

Since 1st graduated rank induces some oscillations, the study of the 2nd position may cover this vacillation to send the analysis to the stability in the readings of superior students. The results show a drop in the level of graduation as the courses of grade (Ac) occupy 36%. Also, the general grade (G) appeared indicating a great oscillation as appeared. The 3rd position may have a stable characteristic creating a constant performance.

The deduced results point to the necessity for investigation of the overall mean value of the brilliant level of students in 1st three positions together. The percentage distribution of courses in different grades causes a great drop in the level of courses (in the 3rd rank) while it rises others. This enforces to review of the concept of examinations and the type of grade evaluation. The impurities remarked that the honor degree

may be canceled to give the required aim of excellency graduation to widespread of the superior graduating. The honor cancelation may be encouraged because the courses of grade (Ex) have always the maximum. If the number of courses with grade (Ac) becomes higher, a great effect on other grades will be induced.

Globally, engineering specialties vary from the widespread to rare areas or even to secret closed types, while traditional subjects (mechanical, architectural, civil, electrical, and others). Additionally, rare specialties include space engineering for example, but the secret types contain military fields and some advanced divisions around. The analysis proves that:

1- Studying basic sciences in technical education curricula is an influential factor.

2- Women with superior abilities may exceed experts and be approved in the current research.

3- Gradual addition of specializations is an important principle for technical excellence.

4- Studying general technical departments leads to creativity and high efficiency.

Otherwise, some of the traditional engineering subjects have become obsolete and need either a sharp development or change, as these specialties generally depend on several axes, introducing:

1- The integration is widely essentially for the scientific renaissance of a country and the raising of the intellectual and scientific level of citizens besides specialists, which gives some of these specialists the opportunity in the broader by competition to old types.

2- It is important to be updated with the labor market.

3- Establishing innovative specialties with adaptation to the universal new types as a tumor strategy of engineering education as the current specialty of computers, information technology, or engineering software, space engineering, etc.

4- Heterogeneity in Specialization is a target for any country in the universe to be the brilliant one even if it is poor. Occasionally, the content purification of engineering education must be considered periodically. This may differ in specialization because of the permanent scientific revolution that appears every day.

The method of current distribution for traditional fields should be turned on 90º or 180º according to the future pattern in the field. This is a filtration style to get the best. Mathematically, this means that the present specialties are distributed along the x-axis in the Cartesian coordinates. The modernization would install a new distribution along the y-axis instead (divisions, courses). Sometimes, a new specialty can be collected from all traditional specialties or some or most of them according to the circumstances, within a unified framework to appear in the form of a modern or new, required in the labor market.

Thus, this will offer many advantages and positives as:

1- Supporting engineering dialogue within engineering committees in all fields.

2- Setting different criteria in the same commodity.

3- Establishment of better solutions.

4- Raising the executive level of a site.

5- Globally, raising the student's level is a target if the knowledge level of a student is low. Consequentially, this area indicates the importance of the student as a future leader in his specialization, which pays attention to his intellectual and mental construction as well as qualification for future work. This adds a lot and blocks all obstacles, available in many locations in the 3rd world (developing countries) even if they are few. Really, this goal can arrive through some foundations as:

1- Getting students to join teamwork.

2- Training the student on the rules of reports writing.

3- Enable the student to have group discussion systems, as in the case of the graduation project, and this idea must even be extended to be applied in some courses recently in general.

4- Expanding the method of approved hours.

5- Student teaching the self-reliant in research and exploration.

Otherwise, the specific classification of courses is done in three steps as follows:

In the first step, the basic courses should be concentrated in the first two years of study with intensive basic applied sciences besides a few general engineering courses.

In the second step, a condensed study of general engineering specialization with some of the courses of the exact fine specialization to be started in the middle year.

The last step is followed by the courses of the careful specialization focused on last year, as well as the research activity. Positively, this offers two points:

1- Emptying the last semester of courses and allocating it to study the graduation project only besides field visits to prepare the project efficiently and successfully.

2- The exchange of students in the last semester between Arab universities and institutes either bilaterally or reciprocally is depending on the agreement between countries or internally.

This will contribute a significant raise in graduation efficiency to the benefits of the national economy as a good product, depending on the scientific foundation of an Arab nation. The student training is important to raise the engineering abilities and the apparent executive work in different locations during visits.

8. Recommendation

From the current analysis, it can be concluded the following recommendations:

1- The participation of industry experts in supervision with professors for the design of courses and practical curricula such as laboratories and workshops.

2- The raise training level so that the graduate does not need long-term training after graduation.

3- The updating of courses to combine theory and practical experience from field locations with the possibility of joint teaching (practically and theoretically) between industry and faculties.

4- Student graduation projects should be linked to the industry and support cooperation between scientific bodies and industry experts to engage with supervision and discussion.

5- Increasing the intensity of students visits in the last semester.

6- Permanently linked committees between faculties and industrial bodies to raise the connectivity level.

7- Regular seminars between both faculties and industry.

8- Periodical training programs for engineers in factories.

9- Curriculum purifying in a dynamic and continuous manner.

The most important factors for vivid graduation to raising the education level can be summarized in:

1- Providing new advanced laboratories instead.

2- Good cooperation between universities to develop: student skills, curriculum strength, and continuous training (summer programs and graduation projects).

3- Developing the professors (and members) on modern facilities of online education, especially with the appearance of the COVID-19 Pandemic to the establishment of a conscious generation supported by the strong scientific argument that returns to social progress.

4- Raising the faculty members to student ratio for best supervision. The national problem is the rate of rising of the country's population, reflecting an increase in students number each year. Therefore, the educational process should be developed to move forward quickly.

9. Conclusion

From the current investigation and the deduced results, it can be directly concluded that:

1- The current tremendous technological tumor in all fields should be accelerated.

2-The honor degree must be canceled.

3- The collected yearly grades during study (except the preparatory year) should be considered as a general grade for graduation.

4- The necessity for increasing the hours of basic sciences in the courses is a fact.

5- The engineer must be capable and aware to implement the modern frameworks and creative applications.

6- Bolding the graduated students for competition in the real market to be armed by the tools of technology and innovated communications.

7- The number of brilliant students can be simply increased through the continuous updating for the curriculums.

8- The examination strategy must be modified to facilitate the innovation ability.

9- Keeping up with the updated requirements of labor market.

10- Involving industry officials to share in the management of educational institutes.

11- Opening industrial sites to train students under the joint supervision of scientists and industry experts.

Appendix

Table A1: The history of students in higher education in Libya.

Year	Rise Rate %	Year	Rise Rate %
75/76	1.5	92/93	8.5
80/81	2.1	93/94	9.94
84/85	2.67	95/96	14.02
89/90	4.05		

(Source: Ministry of Higher Education, Libya)

Table A2: The graduate growth of engineering education (number) in Egypt.

Year	Engineering	Electronic	Tech	Art	Petroleum	Planning
71/70	3911					
72/71	3907					
73/72	3442					
74/73	3910					
75/74	3863					
76/75	4236	2006	291	774	175	
77/76	4674	2112	330	887	197	
78/77	5039	2314	411	984	202	
79/78	5792	2221	384	989	184	
80/79	6839	2241	371	989	178	
81/80	5884	2471	257	945	182	
82/81	5813	2217	252	878	131	
83/82	6005	2125	253	749	85	38
84/83	5893	1954	251	772	80	46
85/84	6502	1687	254	799	81	53
86/85	6501	1619	259	786	67	72
87/86	6330	1645	226	859	79	50
88/87	5934	1455	309	994	66	50
89/88	5645	1631	280	867	71	56
90/89	5417	1376	356	883	69	52
91/90	5826	1037	325	966	65	67
92/91	5103	1142		951	78	50
93/92	4944	809		1013	93	42
94/93	4597	662		1034	87	57
95/94	3906	632		990	93	27
96/95	4215	856		1064	94	59

(Source: Central Agency for General Mobilization and Statistics in Egypt)

Table A3: Female enrolled in bachelor's and post in Saudi universities.

Degree (AH)	1405	1410	1415	1420	Annual Growth%
Female students enrolled in university colleges	17.640	23.724	63.233	126.802	
Annual growth rate for female students%	46.3	6.9	33.3	20.1	
Master's degree in Saudi Universities	522	736	1256	1575	14.4
Master of girl's colleges	287	231	362	613	7.6
Ph.D. at Saudi Universities	59	149	199	154	10.7
Ph.D. in girls' colleges	90	258	275	362	20.1
Total	988	1374	2092	2704	11.9

(Source: Ministry of Economy and Planning, 2003, p. 109)

Table A4: Symbols of different graduate estimates.

grade	Value %	symbol
Honor	≥(VG) in all years except preparatory	H
Excellent	85 -100	Ex
Very Good	75 - 85	VG
Good	65 - 75	G
Acceptable	50 - 65	Ac

(Source: Port Said University, Egypt)

Table A5. The classification of courses on fields of study

Courses	1st	2nd	3rd	BSc	Sum
Basic Sc. A	3	1	1	0	5
Basic Sc. B	2	1	1	0	4
Basic Sc. C	3	1	1	0	5
Basic Sc. D	3	1	1	0	5
Basic Sc. E	3	1	1	0	5
Basic Sc. F	3	1	2	2	8
Field Eng. A	2	6	6	6	20
General Eng. A	2	2	3	0	7
General Eng. B	2	2	2	1	7
General Eng. C	1	3	4	0	8
General Eng. D	2	4	2	1	9
General Eng. E	2	0	2	0	4
General Eng. F	0	0	0	0	0
Field Eng. B	5	6	8	8	27
Field Eng. C	3	6	6	8	23
Field Eng. D	1	4	7	8	20
Field Eng. E	4	9	8	9	30
Field Eng. F	5	7	8	7	27

(Source: Port Said University, Egypt)

Table A6: 1st rank distribution in years (3-7) for graduates.

Branch	3rd	4th	5th	6th	7th
A	VG	VG	G	VG	Ex + H
B	VG + H	Ex + H	VG + H	VG	VG + H
C	VG	VG	VG	VG	
L	G	Ex + H	VG + H	VG	VG + H
Z	VG + H	Ex + H	Ex + H	VG + H	Ex + H
Y	VG + H	Ex + H	Ex + H	Ex + H	Ex + H

(Source: Port Said University, Egypt)

Table A7: The 1st rank distribution in years (1st, 2nd, 3rd, B Sc) for graduates.

Item	Pr	1st	2nd	3rd	B Sc
A_3	Ac	Ac	G	G	VG
B_3	Ac	VG	VG	VG	VG + H
C_3	Ac	G	VG	VG	VG
L_3	G	G	Ac	VG	G
Z_3	Ex	Ex	Ex	VG	VG + H
A_4	+	Ac	G	G	VG
B_4	VG	Ex	Ex	Ex	Ex + H
C_4	Ac	G	Ac	VG	VG
L_4	VG	VG	VG	VG	Ex + H
Z_4	Ex	Ex	Ex	VG	Ex + H

(Source: Port Said University, Egypt)

Table A8: 2nd rank graduates in last years (Source: Port Said Uni., Egypt)

Grade	Pre	1st	2nd	3rd	B Sc	Final (4)
Final A4	Ac	G	Ac	Ac	VG	
Final B4	VG	VG	Ex	Ex	Ex	Ex + H
Final C4	Ac	G	G	G	VG	
Final L4	G	G	VG	VG	VG	
Final Z4	VG	VG	VG	VG	VG	Ex + H
Final A5	Ac	G	Ac	G	G	
Final B5		VG	VG	VG	VG	VG+ H
Final C5	Ac	G	G	G	G	
Final L5	G	G	VG	VG	VG	
Final Z5	Ex	VG	Ex	VG	Ex	Ex + H

Table A9: The graduation of the 3rd rank.

Grade	3rd	4th	5th	6th	7th
Final A	VG	VG	G	VG	VG
Final B	Ac	Ex+H	VG+ H	VG	G
Final C	VG	G	G	VG	VG
Final L	G	VG	VG	VG	VG
Final Y	VG	Ex+H	Ex+ H	VG+ H	Ex+ H
Final z	VG	Ex+H	Ex+ H	VG+ H	VG+H

(Source: Port Said University, Egypt)

Table A10: The graduation grades for the second rank in the model third year.

discipline	1st	2nd	3rd	B Sc
A	Ac	G	VG	VG
B	Ac	VG	Ex	VG
C	G	G	G	VG
L	G	G	G	G
Z	VG	VG	G	VG

(Source: Port Said University, Egypt)

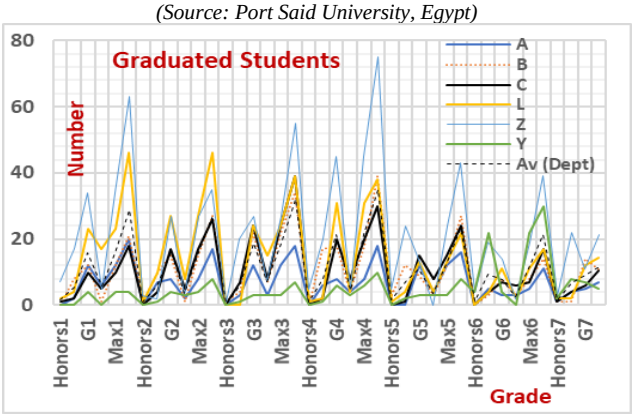

Figure A1: The input populations. (Source: Port Said University)

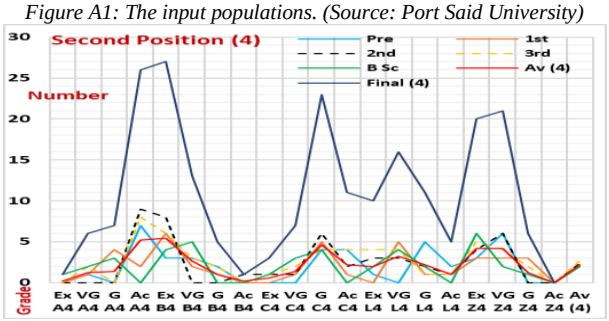

Figure A2: The number of grades as distributed on the years of study for the second rank in the 4th year of the model. (Source: Port Said University, Egypt)

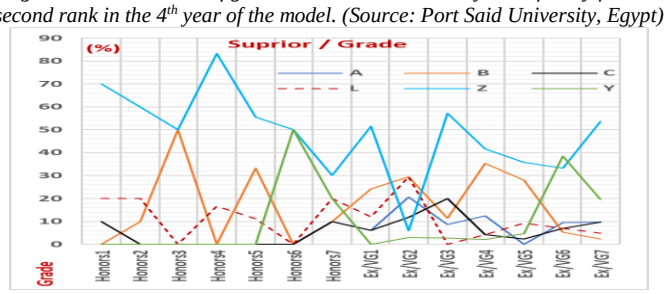

Figure A3: The history of brilliant graduation per graduates in different specialties in the specific model. (Source: Port Said University, Egypt)

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