Spreadsheets in Education (eJSiE)

Volume 10 | Issue 2 Article 4

January 2018

Using Spreadsheets to Facilitate Committee Discussions and to Assist Committee Decisions in an Academic Setting: A Case Study

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Abstract
This paper is a case study on using spreadsheet tools to reduce the reliance on various manual tasks for committee work in an academic setting. Four types of tasks are covered. One of them is to establish collective preference rankings of candidates; it pertains to various committees. The remaining types are for graduate admissions. The coverage includes conversions of alternative test scores as achieved by individual applicants, a special case of university quality assessments, and record keeping in a rolling admission process. It is hoped that this paper can serve as a catalyst to generate interests among readers in exploring innovative ways to use spreadsheet tools in their own work settings.

Keywords
committee decisions, case study

Cover Page Footnote
The author wishes to thank John Baker for suggesting this case study and the anonymous reviewers for valuable comments and suggestions.

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1 Introduction

In response to the sustained popularity of Microsoft Excel^{TM} in the business world, increasingly more business schools are providing Excel trainings for students.[1] At my school, for example, there are currently three elective courses in Excel-based financial modeling at different levels of technical sophistication, as well as some Excel workshops for students who have not taken such credit courses. Excel has also been incorporated into several finance courses at undergraduate and graduate levels, in the form of Excel-based exercises, assignments, or projects.[2]

A parallel development at my school is that uses of Excel for non-teaching activities have also increased. A notable example is that, for several years now, faculty have been asked to submit also an Excel file containing itemized details of each reimbursement request, as part of a routine process. Further, some documents in the portable document format (PDF) distributed to faculty for information/feedback or for discussions in forthcoming meetings are Excel-based originally.

From the vantage point of non-administrative faculty members, other notable examples where Excel tools are utilized are in committee settings. This paper is a case study, which draws on my observations of how faculty colleagues have used computer software, including Excel and other spreadsheet tools, to facilitate committee discussions and to assist committee decisions over the years. It also draws on my recent experience with using Excel in various committee settings. The committees involved include those at department, faculty/school, and university levels.

Faculty participation in committee work is crucial for many decisions in an academic institution under the system of collegial governance. Regardless of whether the committees involved are standing committees for performing assigned work on an ongoing basis or are *ad hoc* committees for some specific one-time tasks, and whether committee members are appointed by

[1] Hereafter, whenever the name Excel is mentioned, its trademark is implicitly recognized.

[2] Textbooks or reference books suitable for the above-mentioned Excel-based financial modeling courses include, for example, Benninga (2014), Holden (2015), and Sengupta (2009). In a resource book for Excel users from various academic disciplines, Gips (2017) uses a problem-solving approach to cover in detail the skills involved.

the administration or are elected by their peers, each committee's voting members are expected to make independent and informed decisions. Any differences in how individual committees operate notwithstanding, each committee decision in a collegial environment is still based on the collective decision of its voting members.

Relevant documents for use in committee discussions and subsequent decisions, as prepared by the corresponding committee chairs and/or the administrative staff involved, are usually distributed to committee members in advance. The advance distributions of documents are either in compliance with the academic institution's regulations on committee work or for facilitating an informed and efficient decision process. If preliminary views on alternative proposals are deemed necessary, committee members may be asked to indicate their preference rankings or yes/no responses, so that the individual results can be tallied for timely distributions to the committee involved. Excel files are well suited for collecting, aggregating, and documenting such data. However, the use of Excel does not always result in fewer in-person meetings or better committee decisions. Rather, it is intended to assist the committees involved in identifying divergent preliminary views, if any, among their members and to facilitate more focused discussions in a collegial environment.

As explained below, although this paper is based on how Excel has been used in committee settings at my university, the tasks involved are expected to be relevant to some other academic institutions as well. Accordingly, this paper is organized into separate sections according to the tasks involved, rather than the committees involved. A reason for doing so is to avoid unnecessary repetitions in the descriptions of some common tasks for individual committees. Further, some committees at my university may not exist in other academic institutions and, even if they do, may be structured very differently. A task-based approach will make it more convenient for readers to assess whether any of the tasks described in this paper are relatable to their own work and, if so, whether the Excel files involved can be adopted for their work settings.

Section 2 is about committee rankings of candidates. The candidates under consideration can be for awards, research grants, scholarships/bursaries, admissions to low-enrolment programs such as Ph.D. programs, faculty/staff hiring, or administrative appointments. The materials involved are also applicable to preference rankings of any proposals or initiatives for committee consideration, academic or otherwise. For example, a committee can be tasked to evaluate

different approaches to curriculum changes; a different committee can be tasked to evaluate competing proposals to improve the current faculty/staff reward system. Thus, implicitly, the use of the term *candidate* in Section 2 includes *proposal* and *initiative* too.

The key Excel function here is RANK. Although this function is well-known to many Excel users, the novelty of Section 2 is in its attention to some nuances in the aggregation of the individual rankings by committee members. As explained in Section 2, such nuances are crucial in the process to reach the corresponding consensus preference rankings. How committee decisions are related to the literature on consensus preference rankings are also covered there. Notice that, although Section 2 pertains to committee work under the system of collegial governance, its applicability need not be confined to such committee settings. In other governance systems where formal and/or informal inputs from various constituents are still sought as part of the decision process, what is covered here will also be relevant to each of the multi-member advisory bodies involved.

Sections 3-5 are all about graduate admissions. Graduate admissions normally require the collaboration between an academic unit, which makes admission recommendations, and the School of Graduate Studies (or its equivalent), which oversees all graduate programs of the academic institution. The School of Graduate Studies has the responsibility to ensure that all applicants recommended for admissions by each academic unit satisfy the admission requirements. These sections cover some specific tasks, which can either be performed by an administrative staff or by some committee members, depending on the administrative structure of the academic unit involved.

The focus of Section 3 is on conversions of some standardized test scores. Specifically, two types of scores are considered here; the first type pertains to verbal and quantitative reasoning skills of all applicants, and the second type pertains to English language proficiency of international applicants only. Regarding the first type of scores, as indicated in Byrne (2014a), 85% of M.B.A. programs have offered their applicants the option of submitting either General GRE (Graduate Record Examination) or GMAT (Graduate Management Admission Test) scores, according to a survey in 2014, up from 24% in 2009. For Finance Ph.D. and MFIN (Master of Finance) admissions at my school, the same option is also available. Thus, for consistent assessments of the application files by the corresponding admission committees, conversions between GRE and GMAT scores are often necessary.

Regarding the second type of scores, international applicants to graduate programs are usually required to provide evidence of their English language proficiency, in terms of some standardized test scores. Many tests are currently available. Well-known examples include TOEFL (Test of English as a Foreign Language), IELTS (International English Language Testing System), PTE Academic (Pearson Test of English Academic), and MELAB (Michigan English Language Assessment Battery). For graduate admissions at my school, international applicants can submit either TOEFL or IELTS scores.

Each language test has four components, including reading, listening, speaking, and writing. The practice at my school is that no admissible international applicants can have their TOEFL or IELTS scores below certain levels. Normally, international applicants who fail to satisfy the language requirements have already been screened by the administrative staff. Thus, their application files are seldom brought forward to the corresponding admission committees for further considerations. Any conversions between satisfactory TOEFL and IELTS scores, if deemed necessary, tend to be for admissions to low-enrolment programs, such as Ph.D. programs, in order to maintain consistency in preference rankings of international applicants.

Graduate admission committees such as those at my school do not have direct access to the same computational resources that are available to the School of Graduate Studies. Thus, from the standpoint of such committees, it is unimportant whether the School of Graduate Studies routinely performs GRE-GMAT and TOEFL-IELTS conversions for all applicants or compares the submitted GRE, GMAT, TOEFL, and IELTS scores against the corresponding lowest acceptable levels from the checklist of admission requirements, only when needed. Such committees, which are responsible for making admission recommendations, still have to perform GRE-GMAT and TOEFL-IELTS conversions on their own.

To convert given GRE scores to their GMAT equivalents is straightforward. Currently, besides the usual online conversions, an Excel file that can perform as many as 55 individual conversions is available for download from Educational Testing Service (also known as ETS, which provides GRE, TOEFL, and various other tests).[3] However, as this Excel file is not intended to be revised by users, it cannot be used to convert directly given GMAT scores to their GRE equivalents. Such conversions, if needed, remains a manual task that requires the use of some conversion tables.

[3]The electronic link is https://www.ets.org/gre/institutions/about/mba/comparison_tool.

The conversions of given GMAT scores to their GRE equivalents are relevant to admission committees of graduate programs that prefer the latter test, although both tests are considered acceptable. For example, GRE is preferred for applications to the M.Sc. program in real estate economics and finance at the London School of Economics and Political Science. Likewise, GRE is preferred for applications to Ph.D. programs in finance and in business and psychology at the University of Chicago's Booth School of Business.[4]

Although conversions from GRE to GMAT can be performed with the help of the above-mentioned ETS resources, the GRE-GMAT conversions for both directions have been set up in a self-contained Excel file accompanying this paper. The idea is to use the Excel function VLOOKUP or to nest the Excel functions INDEX and MATCH to read the conversion tables involved. Excel-based conversions — whether they are between GMAT and GRE or between TOEFL and IELTS — once set up properly, are very convenient to use. The convenience not only is in performing the conversions involved, but also is in having the converted scores automatically recorded in the same file that summarizes the relevant information of the individual applications for facilitating the committee decisions.

Notice that an implicit assumption for performing the above conversions, without subsequently revising (upward or downward) the admission standards for the converted scores, is that GRE and GMAT, as well as TOEFL and IELTS, are considered to be equally effective for graduate admission purposes. However, comparisons of the effectiveness of any standardized tests — whether it is GRE versus GMAT or TOEFL versus IELTS — are beyond the scope of this paper. Interested readers are referred to, for example, Nilsson (1995) for a comparison between GRE and GMAT, as well as Weir (2005) for validation of language testing.

Section 4 considers a special case pertaining to graduate admissions; it describes an Excel-based approach to improve the efficiency in assessing the quality of Chinese academic institutions, from which some applicants to a graduate program have received, or will have received, their undergraduate degrees. As reported by Okahana (2017), China is the top sender of international applications to U.S. graduate programs; it accounted for 38% of all international applications and 36% of all first-time international enrollment in Fall 2016. Likewise, as reported by Statistics Canada in October 2016, China is the top source country of international

[4]The corresponding electronic links are http://www.lse.ac.uk/study-at-lse/Graduate/Prospective-students/Entry-requirements/GRE-and-GMAT and https://www.chicagobooth.edu/programs/phd/admissions.

students; Chinese students accounted for 25.5% and 16.4% of all master-level and doctoral-level international students in Canada, respectively, for the academic year 2013-14.[5] Thus, this special case is relevant to those academic institutions where students originally from China represent high proportions of international applicants to their graduate programs.

According to the Webometrics website, there are currently 2,310 academic institutions for higher education in China.[6] This being a large number, it is inevitable that many of them are not widely known outside China. To assess the educational quality of each lesser-known academic institution, members of the graduate admission committee involved often have to retrieve and analyze relevant information from its websites, as well as using online resources such as Academic Ranking of World Universities, QS World University Rankings, and Times Higher Education World University Rankings, among others.[7] Case-by-case assessments can be very time-consuming, especially when assessing for the first time application files involving any lesser-known academic institutions. To complicate matters, the idea of university rankings as proxies for overall quality has many critics; see, for example, the edited book by Shin, Toutkoushian, and Teichler (2011) for a recent analysis of some of the contentious issues involved.

The Excel-based approach in Section 4 is intended to bypass the use of available university rankings as proxies for overall quality; instead, it draws on the official categorization of academic institutions in China, as the first step in the process of assessing each institution's educational quality. Specifically, there are nine elite academic institutions, collectively known as the C9 League. The C9 League is a subset of the 39 top academic institutions sponsored by Project 985 in China; they are collectively known as Project 985 Universities. The latter group of academic institutions, in turn, is part of at least 117 academic institutions that have met certain quality standards. They are collectively known as Project 211 Universities.[8]

Excel can be used to place each Chinese academic institution, as retrieved from the individual application files, into the following four categories: C9, Project 985, Project 211, and Others. Technically, the task involved can be performed either by using the Excel function VLOOKUP or

[5] The electronic link is http://www.statcan.gc.ca/pub/81-599-x/81-599-x2016011-eng.htm.

[6] The electronic link is http://www.webometrics.info/en/Asia/China%20.

[7] The corresponding electronic links are https://en.wikipedia.org/wiki/Academic_Ranking_of_World_Universities, https://en.wikipedia.org /wiki/QS_World_University_Rankings, and https://en.wikipedia.org /wiki/Times_Higher_Education_World_University_Rankings.

[8] See, for example, https://en.wikipedia.org /wiki/C9_League and http://www.uky.edu/international/ 211_985 for some brief descriptions.

by nesting the Excel functions INDEX and MATCH to read the same conversion table. Notice that membership in C9 implies also memberships in both Project 985 and Project 211. Likewise, membership in Project 985 implies membership in Project 211 as well. As memberships in the first three categories can serve as quality indicators, it is often those academic institutions in the fourth category that will require further assessments by committee members.

Section 5 pertains to a rolling admission process, in which batches of application files are assessed successively, based on a set of predetermined admission criteria, until the enrolment target is reached or expected to be reached. The process is suited for course-based graduate programs such as MFIN at my school, but not suited for Ph.D. programs, which require also good matches of research interests between admissible applicants and their potential thesis supervisors, in addition to various other admission requirements. Essentially, in a rolling admission process, what Excel does is to keep track of the admission recommendations by the committee members, the committee decisions, and the response to admission offers by the admitted applicants, as well as some essential summary statistics. Excel functions COUNTIF and COUNTA are useful for counting various items in the records.

The above idea of using Excel for record keeping is applicable to some other committee settings too. For example, as reported online by Byrne (2014b), there is a scholarship committee of the admissions group at the University of Toronto's Rotman School of Management, which awards entrance scholarships to deserving M.B.A. applicants. The committee meets several times, soon after each application deadline over the admission cycle of an academic year. The meetings are to assess the individual application files successively, based on some predetermined award criteria, and to determine the dollar amount for each successful candidate. Like the above-mentioned rolling admission process, the process of awarding entrance scholarships also requires some form of record keeping. Excel-based records are suitable for keeping the committee members involved fully informed of the specifics of the committee decisions, as well as the subsequent response to each scholarship offer, until the budgeted scholarship funds for the academic year have been fully utilized.

Finally, Section 6 provides some concluding remarks. There are three Excel files to accompany this paper; they cover the six displayed worksheets (as individual figures) in this paper. The original versions of such files were among those that I prepared in recent years, in response to the evolving demand for them by the committees involved. Whether an individual file in

its entirety or only some relevant results from it were provided to other committee members depended on the committees involved.

Various changes have been made to the original Excel files, primarily by adding user-friendly features and by making the worksheets involved ready for display with artificial data. Any displayed worksheet whose original version has not been implemented for actual committee work will be indicated as such. Further, no Excel files prepared by other committee members or by the administrative staff involved are included here.

2 Ranking Candidates

For faculty members serving on any scholarship/bursary/award committees, low-enrollment admission committees, faculty/staff recruitment committees, or administrative appointment committees in their academic institutions, a common task is to rank the candidates considered. If there are significant differences in the preference rankings by the individual committee members, consensus or even compromise will have to be sought. To illustrate how some Excel tools can be used to facilitate committee discussions and to assist committee decisions later in this section, let us start with a simple case where each of the p voting members of a committee is to rank the n candidates considered independently, by assigning the individual ranks as $1, 2, \ldots, n$, with 1 being the most preferred, 2 being the second most preferred, and so on. Suppose for now that no two candidates can be assigned the same rank by each committee member.

Alternatively, the n candidates can also be assigned n distinct scores by each committee member, with a score of n indicating the most preferred, a score of $n-1$ indicating the second most preferred, and so on. For this alternative scoring method, the least preferred candidate receives a score of 1. The Borda count — which is attributed to Jean-Charles de Borda (1733-1799) — is the oldest and also the simplest approach to aggregate the individual preference rankings to reach a group decision. The group rankings are based on the aggregate score that each candidate receives from all voters. The Borda method is applicable to either scoring method here, because changing the assigned scores from $n, n-1, \ldots, 2, 1$ to $1, 2, \ldots, n-1, n$ does not alter the intended order of preferences.

Black (1976) has provided a partial justification for the Borda count. The justification is partial, as the Borda method is susceptible to strategic voting by the individual voters.

As asserted by the Gibbard-Satterthwaite Theorem (Gibbard 1973, Satterthwaite 1975), all reasonable voting procedures for three or more alternatives (for $n \geq 3$) can be manipulated. Saari (1990) has shown that, among all positional voting procedures, where each alternative is assigned a specific number of points according to its position relative to other alternatives, the Borda method is least susceptible to voter manipulations if there are exactly three alternatives to consider.

Using the concept of distance between rankings, Cook and Seiford (1978, 1982) have formulated analytically the group decision as a linear assignment problem. Cook and Kress (1985) have also introduced an intensity measure into the individual preference rankings. There are many publications on consensus rankings and decisions; see, for example, Cook (2006) for a review. In contrast to the Borda count for aggregating the individual preference rankings, all refined methods as reported in the literature are much more sophisticated. For committees where members are unfamiliar with the technical intricacies of any refined methods, group ranking results based on the Borda count can still serve as a good starting point for subsequent discussions in meetings.

Let us now return to the above-mentioned simple case where each of the p voting members of a committee is to rank the n candidates considered independently. For ease of exposition, let us stay with the scoring method where 1 is for the most preferred candidate, 2 is for the second most preferred candidate, and so on. Although committee members are advised, by the committee chair or the administrative staff involved, to rank all candidates, with no two candidates assigned the same rank, such advice is often not followed. Regarding a committee member's use of the same rank for two or more candidates, a common reason is that it is much easier to separate the candidates considered into a small number of groups than to indicate more detailed preferences, given the available information. Further, some committee members choose to rank only those candidates that are acceptable or marginally acceptable to them.

In either situation, the ranking data from the committee members involved will have to be converted into an acceptable form, without altering any of their preference rankings, before the ranking data from all committee members can be aggregated properly. The occurrences of the above situations are very common in committees that require many candidates to be ranked. Fortunately, the raw ranking data can easily be converted into acceptable data on a computer during committee meetings. Such conversions still retain the same idea underlying the Borda

count.

For an illustration, suppose that a five-member scholarship committee is to select four different students among 15 eligible students for four awards. Suppose also that a committee member has assigned the ranks of 1, 1, 3, and 3 to four of the 15 students, but has left the remaining 11 students unranked. It is implicit that the committee member considers the first two students equally deserving for the first two awards, the next two students equally deserving for the next two awards, and the remaining 11 students either equally acceptable (if any more awards are available) or equally unacceptable.[9] Accordingly, the committee member's preference rankings are equivalent to 1.5, 1.5, 3.5, 3.5, 10, 10, ..., 10. Such equivalent rankings are to be used for establishing the committee's collective preference rankings. Here, 1.5 is the average of the two highest ranks (1 and 2), 3.5 is the average of the next two ranks (3 and 4), and 10 is the average of the remaining 11 ranks $(5, 6, 7, \ldots, 15)$. What is crucial here is that, for the ranking data to be usable for aggregation, the sum of the individual ranks must be the same as the sum of 1, 2, 3, ..., 15, which is 120. The use of 1.5 twice, 3.5 twice, and 10 eleven times will ensure such an outcome.

Figure 1 extends the above example in Excel, by also using artificial data. Here, 15 candidates, labeled as A, B, C, ..., O, are competing for some scholarships, and the scholarship committee has five voting members, labeled as AA, BB, ..., EE. Among the five committee members, only EE has ranked all 15 candidates. Further, a unique rank has been assigned to each candidate, as shown in F5:F19. For EE, as no conversions of the raw ranking data are necessary, the corresponding equivalent rankings, as shown in F67:F81, are the same as those in F5:F19. For the remaining four committee members (AA, BB, CC, and DD), however, only some candidates have been ranked and equal ranks have also been assigned in some cases. Thus, the corresponding raw ranking data will have to be converted properly.

The formula for A2, =COUNTIF(A5:A64,"*"), is for counting the number of candidates considered. Thus, for a candidate to be included, the corresponding cell in column A must not be left blank. The formula for B2, which is =COUNT(B5:B64), has been pasted to B2:F2 for counting the number of candidates ranked by each committee member. The same idea as described earlier can be used to convert the raw ranking data into the corresponding equivalent

[9] The rankings in this example are just like those in an athletic competition where two gold medals are awarded for the tied first-place finish, and two bronze metals are awarded for the tied third-place finish.

	A	B	C	D	E	F	G	H	I	J
1	# Total	# Ranked	# Ranked	# Ranked	# Ranked	# Ranked				
2	15	8	7	10	9	15				
3										
4	Name	AA	BB	CC	DD	EE				
5	A	4	7		3	4				
6	B	3		7	1	3				
7	C			6		14				
8	D	1	5	7	1	1				
9	E			9		13				
10	F	6	1	2	4	6				
11	G	5	3	5	3	5				
12	H	1	4	4	2	2				
13	I	2		3	2	9				
14	J	5		1	5	7				
15	K					10				
16	L		6			8				
17	M				6	11				
18	N		2			12				
19	O			10		15				
20										
21										
64										
65										
66	Name	AA	BB	CC	DD	EE	Average	Rank	Median	Rank
67	A	5	7	13	5.5	4	6.9	8	5.5	6
68	B	4	11.5	7.5	1.5	3	5.5	5	4	4
69	C	12	11.5	6	12.5	14	11.2	11	12	12.5
70	D	1.5	5	7.5	1.5	1	3.3	2	1.5	1
71	E	12	11.5	9	12.5	13	11.6	13	12	12.5
72	F	8	1	2	7	6	4.8	3	6	7
73	G	6.5	3	5	5.5	5	5	4	5	5
74	H	1.5	4	4	3.5	2	3	1	3.5	2.5
75	I	3	11.5	3	3.5	9	6	6	3.5	2.5
76	J	6.5	11.5	1	8	7	6.8	7	7	8
77	K	12	11.5	13	12.5	10	11.8	14	12	12.5
78	L	12	6	13	12.5	8	10.3	9.5	12	12.5
79	M	12	11.5	13	9	11	11.3	12	11.5	9
80	N	12	2	13	12.5	12	10.3	9.5	12	12.5
81	O	12	11.5	10	12.5	15	12.2	15	12	12.5
82										

Figure 1 Individual and Collective Preference Rankings of Candidates

preference rankings. Once the raw ranking data have been converted, to compute the average and median ranks is straightforward.

The Excel worksheet for Figure 1 has been set up to accommodate as many as 60 candidates for committee use. For convenience in displaying the preference rankings, rows 22-63, which are blank in the example, are hidden. The formula for B67, =IF($A5="","",IF(B5="",B$2+($A$2-B$2+1)/2, RANK(B5,B$5:B$64,1)+(B$2+1-RANK(B5,B$5:B$64,0)-RANK(B5,B$5:B$64,1))/2)), has been pasted to B67:F126. For computing the average rank for each candidate, the formula for G67 is =IF(A67="","",AVERAGE(B67:F67)); it has been pasted to G67:G126. Likewise, for computing the median rank for each candidate, the formula for I67 is =IF(A67="","", MEDIAN (B67:F67)); it has been pasted in I67:I126. Finally, to rank the averages and the medians, the formulas for H67, =IF(G67="","",RANK(G67,G$67:G$126,1)+(COUNT(G$67:G$126)+1-RANK(G67,G$67:G$126,0)-RANK(G67,G$67:G$126,1))/2), has been pasted to H67:H126 and J67:J126.

The way the Excel function RANK is used for each of the cells in B67:F126, H67:H126, and J67:J126 requires an explanation. The function has three arguments. If the third argument is 0 or omitted, the function returns a rank that is based on sorting of the numbers involved in a descending order; if the third argument is a nonzero number, the corresponding sorting will be in an ascending order instead. By sorting the same set of numbers both ways, we can use the two ranking results to determine how many times a specific number has repeated itself. This information will allow us to assign ranks to tied numbers accordingly.

To illustrate, the nine ranked candidates by committee member DD in the example, when sorted in an ascending order, is 1, 1, 2, 2, 3, 3, 4, 5, and 6. The function RANK, if used to rank this set of numbers in an ascending order, the number 3 will receive a rank of 5, because its first appearance is in the fifth position. However, as the number 3 appears twice and it occupies the fifth and sixth positions, the rank for each 3 ought to be the average of 5 and 6, which is 5.5. That is, there ought to be a 0.5 additive correction factor for the result from the function RANK. To find this correction factor automatically, we simply rank the same set of numbers in a descending order to obtain 6, 5, 4, 3, 3, 2, 2, 1, and 1. The number 3 will receive a rank of 4, because its first appearance is in the fourth position. The sum of the two alternative ranks, which is $5 + 4 = 9$, is the same of the total number of ranked candidates, confirming that the number 3 appears twice, that the additive correction factor is 0.5, and that the correct rank of

the number 3 in an ascending order is $5 + 0.5 = 5.5$.

A simple formula for computing the additive correction factor is $(n + 1 - r_d - r_a)/2$. Here, n is the total number of ranked candidates, r_d and r_a are the outputs of the function RANK for a given ranked candidate when all ranked candidates are sorted in descending and ascending orders, respectively.[10] The additive correction factor for the number 3 is therefore $(9 + 1 - 4 - 5)/2 = 0.5$. To illustrate that this formula is indeed correct, suppose that the second 2 in the same set of nine numbers in an ascending order is a 3 instead; that is, the same set of numbers now becomes 1, 1, 2, 3, 3, 3, 4, 5, and 6. In this revised case, the number 3 appears three times, in the fourth, fifth, and sixth positions. As the average of ranks 4, 5, and 6 is 5, which is $4 + 1$, the additive correction factor for rank 4 (in an ascending order) is 1. When the same formula is used, as $n = 9$, $r_d = 4$, and $r_a = 4$, the result is $(n + 1 - r_d - r_a)/2 = (9 + 1 - 4 - 4)/2 = 1$, as expected. The formula in each of the cells in B67:F126, H67:H126, and J67:J126 — which uses the function RANK to accommodate tied ranks by sorting each given set of numbers in ascending and descending orders — is based on the same idea.

Notice that, although the example has been set up for five committee members, other committee sizes can easily be accommodated by adding or deleting columns between column B and column F. If any columns are added, the formula for B67 will have to be pasted again to the blank cells in the expanded block, which was B67:F126 before the expansion. If there are more than 60 candidates to be considered, additional rows between row 5 and row 64 will have to be inserted, and such additions will also require the formula for the original B67 to be pasted to more cells, which was originally B67:F126.

An implicit condition for the worksheet corresponding to Figure 1 to work as intended is that none of the candidates considered are deemed totally unacceptable and are objected outright by any committee members. Complications can arise if some candidates are highly ranked by most committee members, but are also strongly objected by some others. In such a situation, to reach a collective decision by the committee often requires some lengthy discussions during committee meetings.

From a technical standpoint, to accommodate objections to any of the candidates considered requires only a few changes to the above worksheet. To illustrate the changes involved, suppose

[10] This formula for correcting tied ranks is available from Microsoft online support. The electronic link is https://support.office.com/en-us/article/RANK-function-6a2fc49d-1831-4a03-9d8c-c279cf99f723.

that the five-member committee in the same example in Figure 1 has agreed to remove, from further considerations, any candidate who is rejected by two or more committee members. Provided that no committee member is initially aware of how the individual candidates are ranked by other committee members, each committee member will still provide to the administrative staff involved the usual preference rankings, as well as an explicit indication of any rejected candidates. For technical convenience, suppose that none of the rejected candidates are to receive any explicit rankings.

The modified worksheet, which has yet to be implemented in actual committee work, is shown in Figure 2. There are two extra rows (row 3 and row 4) to indicate the number of candidates rejected by each of the five committee members. The highest number of rejections that each candidate can have to avoid automatic removal from the admission process is specified in H4. For this example, given the committee decision, the number in H4 has been preset at 1. This preset number can change, at the discretion of the committee.

While the numbers in row 2 are produced in an analogous manner as the corresponding numbers in Figure 1, the five numbers in B4:F4 are produced by using the Excel function COUNTIF. Specifically, the formula in B4, =COUNTIF(B7:B66,"*"), has been pasted to B4:F4. For each committee member, some candidates are ranked and the remaining candidates are either unranked or rejected. The only exception is committee member EE, who neither leaves any candidates unranked nor rejects any of them. The raw preference rankings are shown in B7:F21, along with the total number of rejections from individual committee members displayed in G7:G21.

For the purpose of data conversion, the ranked candidates are treated as having higher ranks than the unranked candidates. In turn, the unranked candidates are treated as having higher ranks than the rejected candidates. The converted preference rankings, which are required to satisfy the condition that the sum of the ranks be equal to the sum of 1, 2, 3, . . . , 15 (which is 120), are displayed in B69:F83. The formula for B69, =IF($A7="","",IF(B7="",B$2+($A$2-B$4-B$2+1)/2,IF(TYPE(B7)= 2,$A$2-B$4 + (B$4+1)/2, RANK(B7, B$7:B$66,1) + (B$2+1 - RANK (B7,B$7:B$66,0) - RANK (B7,B$7:B$66,1))/2))), has been pasted in B69:F128.

Notice that, if the Excel function TYPE in the above formula has 2 as its output, the cell involved contains text. Notice also that the text provided by each committee member to indicate the rejection of a candidate is flexible. In this example, as candidates E, L, and O

	A	B	C	D	E	F	G	H	I	J
1	# Total	# Ranked	# Ranked	# Ranked	# Ranked	# Ranked				
2	15	8	7	10	9	15				
3		#Rejected	#Rejected	#Rejected	#Rejected	#Rejected		# Rej Tolerated		
4		3	3	2	3	0		1		
5										
6	Name	AA	BB	CC	DD	EE	# Reject			
7	A	4	7	no	3	4	1			
8	B	3	No	7	1	3	1			
9	C			6		14	0			
10	D	1	5	7	1	1	0			
11	E	N		9	Reject	13	2			
12	F	6	1	2	4	6	0			
13	G	5	3	5	3	5	0			
14	H	1	4	4	2	2	0			
15	I	2		3	2	9	0			
16	J	5		1	5	7	0			
17	K		No			10	1			
18	L	N	6		Reject	8	2			
19	M			no	6	11	1			
20	N		2		Reject	12	1			
21	O	N	No	10		15	2			
22										
66										
67										
68	Name	AA	BB	CC	DD	EE	Average	Rank	Median	Rank
69	A	5	7	14.5	5.5	4	7.2	8	5.5	6
70	B	4	14	7.5	1.5	3	6	6	4	4
71	C	10.5	10	6	11	14	10.3	10	10.5	9.5
72	D	1.5	5	7.5	1.5	1	3.3	2	1.5	1
73	E	14	10	9	14	13				
74	F	8	1	2	7	6	4.8	3	6	7
75	G	6.5	3	5	5.5	5	5	4	5	5
76	H	1.5	4	4	3.5	2	3	1	3.5	2.5
77	I	3	10	3	3.5	9	5.7	5	3.5	2.5
78	J	6.5	10	1	8	7	6.5	7	7	8
79	K	10.5	14	12	11	10	11.5	12	11	11
80	L	14	6	12	14	8				
81	M	10.5	10	14.5	9	11	11	11	10.5	9.5
82	N	10.5	2	12	14	12	10.1	9	12	12
83	O	14	14	10	11	15				

Figure 2 Individual and Collective Preference Rankings of Candidates with Rejections Indicated

have received two rejections from individual members of the committee, they are excluded from further considerations.

The formulas in G69 and I69, which are =IF(A69="","",IF(G7>$H$4,"", AVERAGE(B69:F69))) and =IF(A69="", "", IF(G7>$H$4,"",MEDIAN(B69:F69))), are for computing average and median ranks, respectively, for candidate A. The two formulas have been pasted to G69:G128 and I69:I128, respectively. Finally, to rank the averages and the medians, the formula for H69, =IF(G69="", "", RANK(G69,G$69:G$128,1)+(COUNT(G$69:G$128)+1-RANK(G69,G$69:G$128,0)-RANK (G69,G$69:G$128,1))/2), has been pasted to H69:H128 and J69:J128.

3 Converting Test Scores

The current version of GMAT has four components, including verbal reasoning (GMAT V), quantitative reasoning (GMAT Q), analytical writing, and integrated reasoning, as well as a total score based on the first two components. Instead, the current version of General GRE has only three components; absent from it are integrated reasoning and a total score based on the first two components. The performance of each applicant in the individual GMAT or General GRE components is important for admission considerations. So is the GMAT score that each admitted applicant has achieved.

When aggregated to produce the summary statistics, the average and the range of the individual total GMAT scores of admitted applicants are often used both internally and externally as a quality indicator of the graduate business program involved. This practical relevance necessitates the conversion of each pair of GRE verbal reasoning score (GRE V) and GRE quantitative reasoning score (GRE Q) into a predicted GMAT score. This task is in addition to converting GRE V and GRE Q to GMAT V and GMAT Q, respectively.

To set up an Excel file for GRE-GMAT conversions starts with a conversion table, which is available online from primary or secondary sources.[11] Both GRE V and GRE Q are in the range of 130 to 170 in increments of 1. A complete 42×42 table — where column 1 and row 1 are for

[11] The electronic link to ETS is http://www.ets.org/s/gre/flash/bschool/comparison/17302/170/. Secondary sources include, for example, PrepScholar, which can be accessed online via https://www.prepscholar.com/gre/blog/gre-to-gmat-conversion-charts/ or http://www.prepscholar.com/gre/blog/wp-content/uploads/sites/3/2016/10/gre-to-gmat-conversion.pdf.

displaying the full sets of 41 GRE V scores and 41 GRE Q scores, respectively — has 41×41 entries of GMAT scores, corresponding to all combinations of the two GRE component scores. The full range of GMAT scores is from 200 to 800 in increments of 10. Two additional 41×2 tables, which capture the correspondence between GRE V and GMAT V and between GRE Q and GMAT Q, can be constructed from the conversion results that the 42×42 table provides. To construct each 41×2 table, all that is required is to record the GMAT component scores (which are outputs of the 42×42 table) corresponding to the successive GRE component scores of $130, 131, 132, \ldots, 170$. Once the three tables are stored in an Excel worksheet, the GRE-GMAT conversions can be performed efficiently by using some of Excel's convenient features.

In essence, to deduce a total GMAT score for a given pair of GRE V and GRE Q scores, the Excel functions INDEX and MATCH are nested for finding a match, by going through the 42×42 table in B3:AQ44. Given that the full table is available in an Excel file accompanying this paper, only some selected cells there are displayed in Figure 3. Similar partial displays are for the remaining two conversion tables in AS4:AT44 and AU4:AV44 too. Further, as the three conversion tables and the individual conversion outputs were originally stored in different worksheets of the same Excel file, they are combined for display in Figure 3.

The GRE and GMAT scores as displayed in Figure 3 are all artificial data. Take, for example, the conversion as performed for Applicant A in row 69. This applicant's GRE V and GRE Q have been entered manually as 164 and 167, respectively, as shown in B69:C69. The converted GMAT score in D69, 740, is as expected, according to the entry in the table intersecting row 10 (where GRE V is 164) and column F (where GRE Q is 167), which is F10. The formula for D69, =IF(A69="","",IF(OR(B69="",C69=""),"", IFERROR(INDEX(GRE_GMAT!$C$4:$AQ$44, MATCH (B69, GRE_GMAT!$B$4:$B$44,0),MATCH(C69,GRE_GMAT!$C$3:$AQ$3,0)), "Input Errors! Try Again"))), has been pasted to D69:D168, for as many as 100 conversions.

To avoid the appearance of errors in D69:D168 while the GRE scores are being entered, the nested Excel functions INDEX and MATCH will perform the intended task only when both GRE component scores have been entered. The user will also be alerted for entering any erroneous GRE scores. Such features were absent in the original Excel files for the committee work. Notice that the name of the worksheet containing the conversion table, GRE_GMAT!, is explicitly mentioned in the formulas in D69:D168, although it may seem redundant to do so. The worksheet name is still kept, along with the fixed location of the conversion table in

	A	B	C	D	E	F	G	H	I	J	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
1	GRE GMAT Conversions																				
2																		GRE, GMAT			
3		V\Q	170	169	168	167	166	165	164	163		135	134	133	132	131	130	V		Q	
4		170	800	800	790	780	770	760	750	740		440	430	420	410	400	390	170	46	170	53
5		169	800	790	780	770	760	750	740	730		430	420	410	400	390	380	169	45	169	52
6		168	800	790	780	770	760	740	730	720		430	420	400	390	380	370	168	44	168	50
7		167	790	780	770	760	750	740	730	720		420	410	400	390	380	370	167	43	167	49
8		166	780	770	760	750	740	730	720	710		410	400	390	380	370	360	166	42	166	48
9		165	780	770	760	750	740	730	710	700		410	400	390	370	360	350	165	41	165	47
10		164	770	760	750	740	730	720	710	700		400	390	380	370	360	350	164	40	164	45
41		133	570	560	550	540	530	520	510	500		200	200	200	200	200	200	133	12	133	7
42		132	570	560	550	540	530	510	500	490		200	200	200	200	200	200	132	11	132	6
43		131	560	550	540	530	520	510	500	490		200	200	200	200	200	200	131	10	131	4
44		130	560	540	530	520	510	500	490	480		200	200	200	200	200	200	130	9	130	3
45																				169	51
46																				165	46
47																				160	40
48																				156	35
49																				152	30
50																				148	25
51																				144	20
52																				140	15
53																				136	10
54																				132	5
55																					
63	Write Applicant Names and Corresponding V and Q Scores in Shaded Cells Below:																				
64																					
65	GRE to GMAT Conversions										GMAT to GRE Conversions										
66																					
67		GRE			GMAT				GMAT			GMAT			GRE						
68	Nam	V	Q						V	Q	Nam	V	Q		V		V		Q		Q
69	A	164	167	740					40	49	AA	35	51		159		158		169		168
70	B		163								BB	9.5			Errors						
71	C	166									CC	33	46		156				165		164
72	D	159	171	Input Errors! Try Again							DD	43	39		167				159		
73	E	167	159	670					43	39	EE	61			Errors						
74	F										FF		65						Errors		
75	G	151	150	480					28	28	GG	40	49		164				167		
76	H	162	163	680					38	44	HH	25	47		148		147		165		
77	I										II	45	7.2		169				Errors		
78											JJ	15	39		137		136		159		

Figure 3 GRE-GMAT Conversions

the worksheet, because the user can paste any of the rows starting from row 69 to any other worksheets, without risking technical complications.

Considered next are the conversions of GRE V and GRE Q to GMAT V and GMAT Q, respectively. The formulas for I69:J69, which pertain to Applicant A in row 69, are =IF(TYPE(D69)=1,INDEX(GRE_GMAT!$AT$4:$AT$44,MATCH(B69,GRE_GMAT!$AS$4:$AS$44,-1)),"") and =IF(TYPE(D69)=1,INDEX(GRE_GMAT!$AV$4:$AV$44,MATCH(C69,GRE_GMAT!$AU$4:$AU$44,-1)),""). They are for reading the conversion tables in GRE_GMAT!$AS$4:$AT$44 and GRE_GMAT!$AU$4:$AV$44. The displayed GMAT V and GMAT Q scores in I69:J69 are 40 and 49, as confirmed by GRE_GMAT!AS10:AT10 and GRE_GMAT!AU7:AV7, respectively. The two formulas have been pasted to I69:J168, for as many as 100 conversions. Notice that, unless a GMAT score has already been obtained, the conversions of GRE V and GRE Q to GMAT V and GMAT Q will not be performed.

For the conversions of GMAT V and GMAT Q to GRE V and GRE Q, respectively, there are three technical issues to resolve. First, although the full range of GMAT component scores is $0-60$, the full ranges of both GRE V and GRE Q scores, which are $130-170$, correspond to $9-46$ for GMAT V and $3-53$ for GMAT Q. This issue can be resolved by simply assigning the maximum GRE V (GRE Q) score of 170 for any valid GMAT V (GMAT Q) score above 46 (53), and the minimum GRE V (GRE Q) score of 130 for any valid GMAT V (GMAT Q) score below 9 (3).

Second, due to rounding (to obtain whole numbers only), a GMAT V score sometimes corresponds to two adjacent GRE V scores. For example, as the GRE V score of either 158 or 159 corresponds to a GMAT V score of 35 due to rounding, the conversion in the opposite direction will inevitably result in two adjacent GRE V scores. This issue can be resolved by retrieving the higher GRE V score from the conversion table in GRE_ GMAT!$AS$4:$AT$44 for display in one cell, and showing also the lower GRE V score in a nearby cell in the same row, whenever the situation arises. In Figure 3, where the given GMAT V score of 35 for Applicant AA is recorded in AM69, the corresponding GRE V scores of 159 and 158 are displayed in AP69 and AR69, respectively.

The formula in AP69, =IF(AM69="","", IF(OR(INT(AM69)<>AM69, AM69<0,AM69>60), "Errors",IF(AM69>46, 170, IF(AM69<9,130, IFERROR(INDEX(GRE_GMAT!$AS$4:$AS $44,MATCH (AM69,GRE_GMAT!$AT$4:$AT$44,0)),"Errors"))))), which reads the conversion

table in GRE_GMAT!$AS$4:$AS$44, returns a GRE V score of 159, as displayed. The formula in AR69, =IF(AM69=35,AP69-1,IF(AM69=25,AP69-1,IF(AM69=15,AP69-1,""))), which checks whether the given GMAT V score corresponds to two adjacent GRE V scores and, if so, the lower GRE V score will be displayed. For the given GMAT V score of 35, the formula in AR69 returns a GRE V score of 158, as expected. The cells AP69:AR69 have been pasted to AP168:AR168, for as many as 100 conversions. Notice that, in case of input errors, the conversions will not be performed and that, in case of a one-to-one correspondence between GMAT V and GRE V scores, the cell for showing the lower GRE V score will be left blank.

Third, also due to rounding, some GMAT Q scores are absent from the conversion table; 35, 40, 46, and 51 in GMAT Q are some of such occasions and, for example, as the GMAT Q scores of 50 and 52 correspond to the GRE Q scores of 168 and 169, respectively, the missing GMAT Q score of 51 must correspond to a GRE Q score between 168 and 169. To resolve this issue requires the conversion table in GRE_GMAT!$AU$4:$AV$44 to be expanded, by appending it with all missing GMAT Q scores in the range of $3-53$, so that a similar approach to resolve the second issue above can also be applied here. The expanded conversion table is in GRE_GMAT!$AU$4:$AV$54.

The formula in AT69, =IF(AN69="","",IF(OR(INT(AN69)<>AN69,AN69<0,AN69>60), "Errors",IF(AN69>53, 170, IF(AN69<3, 130, IFERROR(INDEX(GRE_GMAT!$AU$4:$AU $54, MATCH(AN69,GRE_GMAT!$AV$4:$AV$54,0)),"Errors"))))), reads the conversion table in GRE_GMAT!$AU$4:$AV$54 to returns the GRE Q score corresponding to the given GMAT Q score in AN69 or the higher of two adjacent GRE Q scores, as the case may be. For the given GMAT Q score of 51, the formula returns a GRE Q score of 169. As the GMAT Q score of 51 is among the several cases where there are two adjacent GRE Q scores, the formula in AV69, =IF(OR(AT69="", AT69="Errors", AN69=60, AN69=55, AN69=50, AN69=45, AN69=0),"", IF(AN69=51,AT69-1,IF(AN69=46,AT69-1,IF(MOD(AN69,5)=0,AT69-1,"")))), returns the lower GRE Q score of 168 as expected. The cells in AT69:AV69 have been pasted to AT69:AV168, for as many as 100 conversions. Just like the GMAT V and GRE V conversions as described earlier, in case of input errors, the conversions will not be performed and that, in case of a one-to-one correspondence between GMAT Q and GRE Q scores, the cell for showing the lower GRE Q score will be left blank.

The Excel-based conversions from GMAT V and GMAT Q to GRE V and GRE Q, respec-

tively, as described above, have yet to be implemented in committee settings at my school. So far, any of such conversions, if deemed necessary, have been performed manually with the help of some conversion tables. However, as Excel-based conversions, once set up properly, are easy to implement, it is included in this paper, in order to complement the available online resources for the task, which are still confined to conversions from GRE to GMAT only.

We now turn our attention to the English language requirements for graduate admission considerations. As indicated in the introductory section, both TOEFL and IELTS have four test components, including reading, listening, speaking, and writing. While internet-based TOEFL uses a 0 to 30 scale in increments of 1 for each component, with the total being in a 0 to 120 scale, also in increments of 1, IELTS uses a 9-band scale for each component and for the total score, from 0 to 9, where both full and half points are assigned. Conversion tables from TOEFL to IELTS are available online.[12] The entire set of five conversion tables, covering the four components and the total score, are duplicated in A1:S13 of the Excel worksheet as displayed in Figure 4.

Take, for example, the conversion table for the reading component, where the online version covers the corresponding ranges of TOEFL and IELTS scores in A3:A12 and C3:C12. Each range of TOEFL scores has been presented in B3:B12 as the lowest score in the range, so that the Excel function VLOOKUP can be used directly for B3:C12 to find the corresponding IELTS score for each TOEFL score provided. The formula for C22, =IF($A22="","",IF(B22="","", IF(TYPE(B22)=2, "Not a Number", IF(OR(B22>30,B22<0), "Out of Range", IF(B22<>INT (B22),"Integer Required",VLOOKUP(B22,B$3:C$13,2,1))))))), uses the function VLOOKUP to produce a 7 for the TOEFL score of 24 provided by the user. The formula has been pasted to C22:C71, so that as many as 50 conversions can be performed. Notice that the formula here has been revised from the original version for committee work — which used the function VLOOKUP in the simplest way — to include some user-friendly features, such as alerting the user about any potential errors.

The same formula has also been pasted to G22:G71, K22:K71, and O22:O71, so that conversions for the remaining three components can be performed as well. The formula for R22, =IF(A22="","",IF(COUNTA(B22,F22,J22,N22)<4,"",B22+F22+J22+N22)), computes the total TOEFL score based on the component scores that are entered manually in B22, F22, J22,

[12] See, for example, https://www.ets.org/toefl/institutions/scores/compare/.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Reading				Listening				Speaking				Writing				Total		
2	TOEFL		IELTS		TOEFL		IELTS		TOEFL		IELTS		TOEFL		IELTS		TOEFL		IELTS
3	0-2	0	0-4		0-2	0	0-4		0-11	0	0-4		0-11	0	0-4		0-31	0	0-4
4	3	3	4.5		3	3	4.5		12-13	12	4.5		12-13	12	4.5		32-34	32	4.5
5	4-7	4	5		4-6	4	5		14-15	14	5		14-17	14	5		35-45	35	5
6	8-12	8	5.5		7-11	7	5.5		16-17	16	5.5		18-20	18	5.5		46-59	46	5.5
7	13-18	13	6		12-19	12	6		18-19	18	6		21-23	21	6		60-78	60	6
8	19-23	19	6.5		20-23	20	6.5		20-22	20	6.5		24-26	24	6.5		79-93	79	6.5
9	24-26	24	7		24-26	24	7		23	23	7		27-28	27	7		94-101	94	7
10	27-28	27	7.5		27	27	7.5		24-25	24	7.5		29	29	7.5		102-109	102	7.5
11	29	29	8-8.5		28	28	8		26-27	26	8		30	30	8-9		110-114	110	8
12	30	30	9		29	29	8.5		28-29	28	8.5						115-117	115	8.5
13					30	30	9		30	30	9						118-120	118	9
14																			
15	https://www.ets.org/toefl/institutions/scores/compare/																		
16																			
17	Write Applicant Names and Corresponding TOEFL Scores in Shaded Cells Below:																		
18																			
19		Reading			Listening				Speaking				Writing				Total		
20	Name	TOEFL	IELTS		TOEFL	IELTS			TOEFL	IELTS			TOEFL	IELTS			TOEFL	TOEFL	IELTS
21																			
22	A	24	7		24	7			22	6.5			23	6			93	93	6.5
23	B	27	7.5		28.9	Integer Required													
24	C	28	7.5		26	7			31	Out of Range									
25	D	28	7.5		23	6.5			23	7			26	6.5			99	100	Errors
26	E	19	6.5		26	7			28	8.5			22	6			95	95	7
27	F	ten	Not a Number						29.3	Integer Required									
28	G	31	Out of Range										26.6	Integer Required					
29	H	29.5	Integer Required																
30	I	25	7																
31	J	2	0-4																
32	K	1	0-4																
33	L	17	6																
34	M	3	4.5																
35	N	29	8-8.5		27	7.5			26	8			27	7			109	109	7.5
36	O																		
37	P																		
38	Q																		
39	R																		
40	S																		
41																			

Figure 4 TOEFL-IELTS Conversions

and N22 by the user. The same formula has been pasted to R22:R71. The formula for S22, =IF($A22="","",IF(R22="","",IF(Q22=R22,VLOOKUP(R22,R$3:S$13,2,1),"Errors"))), which performs the conversion for the total score, is pasted to S22:S71. If any of the computed total TOEFL scores in R22:R71 differs from the corresponding manually entered scores in Q22:Q71, the user will be alerted as well. As an illustration, the bottom half of Figure 4, starting from row 22, shows the conversions of some artificial TOEFL scores, including warnings of data-entry errors.

Notice that what Figure 4 shows is just an example that illustrates how Excel can be used to convert the scores between two language tests. For other pairs of language tests, as long as the corresponding conversion tables are available, the Excel function VLOOKUP can be used in a similar way to perform the conversions. For example, a conversion table from IELTS to TOEFL and PTE Academic, which is provided online by Overseas Consultants based in India, can be used to convert total IELTS scores to either total TOEFL scores or total PTE scores.[13] Just like what has been illustrated in Figure 4, Excel-based conversions, once set up properly, are very convenient to use.

4 Categorizing Universities: A Special Case

A challenge for graduate admission committees is often in assessing the quality of some lesser known academic institutions that are attended by some international applicants. The tasks for such assessments, though time-consuming, are necessary. While serving on two graduate admission committees in recent years, I encountered in the individual application files quite a few academic institutions that required extensive online search for information about their quality.

The example in this section is a special case; it illustrates how Excel can be used to reduce a committee's reliance on some manual tasks. Specifically, it draws on the official classifications of academic institutions in China, according to the levels of governmental support for them. Given that admissions for higher education in China are primarily based on performance in common entrance examinations, the competitions among applicants to gain admissions to C9, Project 985, and Project 211 academic institutions (as described in the introductory section) are

[13] The corresponding electronic link is https://www.mentoroverseas.com/training/score-comparison/.

highly intensive. As memberships in these three categories of academic institutions can serve as reliable quality indicators, it is only the remaining academic institutions that require further assessments, if deemed necessary. Thus, the Excel example in this section is expected to be of interest to readers whose work involves graduate admissions of applicants with undergraduate degrees from China.

To implement an Excel-based approach for the above classifications, a formidable challenge is that the names of some institutions, as retrieved from the individual application files, do not always match exactly any of those on the official C9, Project 985, and Project 211 lists. Take, for example, Huazhong Agricultural University, which is a Project 211 academic institution. This is one of the two English translations of the official Chinese name; the other translation is Central China Agricultural University. In application files, common acronyms for this university include HAU and HZAU. Abbreviations of the university name is often the use of "Agri" or "Agri." for "Agricultural", as well as "Univ" or "Univ." for "University".

Given the existing variants, abbreviations, and acronyms in the translated names of various Chinese academic institutions, direct applications of Excel functions such as VLOOKUP, INDEX, and MATCH to look for matches in the official C9, Project 985, and Project 211 lists often resulted in some institutions erroneously identified as belonging to the fourth category (Others) in earlier attempts. With the official lists augmented, on an ongoing basis, to include any missing variants, abbreviations, or acronyms, the likelihood of misclassifications has reduced drastically. Redundant spaces before, after, or between words in a name are responsible for some misclassifications too; however, such cases can easily be eliminated by using the Excel function TRIM, which removes all redundant spaces in the text.

For the purpose of performing Excel-based classifications, the C9, Project 985, and Project 211 lists have been merged into a 2-column table, showing the names of the individual academic institutions, in an alphabetical order, and the corresponding categories. Figure 5, which displays only the beginning and the end of the list in A1:B540, also displays some of the lookup results, starting from row 545. Two alternative methods are provided. The formula for B545, =IF(A545="","", IFERROR(VLOOKUP(TRIM(A545), UnivGroups!$A$2:$B$540,2,FALSE), "Others")), uses the Excel function VLOOKUP. The formula for C545, =IF(A545="", "", IFERROR (INDEX (UnivGroups!$B$2: $B$540, MATCH (TRIM (A545), UnivGroups!$A$2: $A$540,0)), "Others")), nests the Excel functions INDEX and MATCH instead.

	A	B	C
1	**ACADEMIC INSTITUTIONS**	**C9/Proj 985/Proj 211**	
2	Anhui Univ	Project 211	
3	Anhui Univ.	Project 211	
4	Anhui University	Project 211	
5	Beihang Univ	Project 985	
6	Beihang Univ.	Project 985	
7	Beihang University	Project 985	
8	Beijing Foreign Studies Univ	Project 211	
9	Beijing Foreign Studies Univ.	Project 211	
10	Beijing Foreign Studies University	Project 211	
11	Beijing Forestry Univ	Project 211	
12	Beijing Forestry Univ.	Project 211	
13	Beijing Forestry University	Project 211	
14	Beijing Inst of Tech	Project 985	
15	Beijing Inst. of Tech.	Project 985	
16	Beijing Institute of Technology	Project 985	
529	Zhejiang Univ	C9	
530	Zhejiang Univ.	C9	
531	Zhejiang University	C9	
532	Zhengzhou Univ	Project 211	
533	Zhengzhou Univ.	Project 211	
534	Zhengzhou University	Project 211	
535	Zhongnan Univ of Econ & Law	Project 211	
536	Zhongnan Univ of Econ and Law	Project 211	
537	Zhongnan Univ. of Econ. & Law	Project 211	
538	Zhongnan Univ. of Econ. and Law	Project 211	
539	Zhongnan University of Economics and Law	Project 211	
540	ZUEL	Project 211	
541			
542	Enter Names of Academic Institutions in Shaded Cells Below:		
543		VLOOKUP	MATCH
544	**ACADEMIC INSTITUTIONS**	**C9/Proj 985/Proj 211**	
545	Peking university	C9	C9
546	Huazhong University of Science and Technology	Project 985	Project 985
547	ECUST	Project 211	Project 211
548	zuel	Project 211	Project 211
549	National University of Defense Technology	Project 985	Project 985
550	Ningbo University	Others	Others
551	HIT	C9	C9
552			
553			

Figure 5 Classification of Chinese Academic Institutions Based on Memberships of C9/Project 985/Project 211 or Others

These two formulas have been pasted to B545:C594. The name of the worksheet containing the table of the merged C9, Project 985, and Project 211 lists, UnivGroups!, is explicitly indicated, so that the part of the worksheet starting from row 542 can be pasted to any other worksheet with risking technical complications. Once the name of an academic institution has been entered to any of the shaded cells in A545:A594, the corresponding category will be displayed in columns B and C of the same row.

Notice that the names used for the lookup are not case sensitive and that redundant spaces in a name are acceptable. For example, the acronym " zuel " in A548, which has leading and trailing spaces, is equivalent to the acronym ZUEL, which is in A540, the final entry of the table. The latter acronym is for Zhongnan University of Economics and Law, in A539. Four common abbreviated names of this university are also included to the table, in A535:A538. Notice also that any data-entry errors in A545:A594 will result in the display of the word Others for the corresponding academic institution, under either lookup method. Thus, whenever such a result appears, it may be necessary to check manually whether the name belongs to the official C9, Project 985, and Project 211 lists. Further online search for information about the quality of the academic institution involved may be necessary.

5 Record Keeping in a Rolling Admission Process

If a rolling admission process is adopted, the committee members involved will assess the individual application files, when available, by following a set of admission criteria. Given the importance of consistency in admission decisions over an extended period of time, good record keeping is necessary. Excel is particularly suitable for summarizing key information in each application file. The summary typically includes previous school and program names along with some quality indicators, academic performance in terms of overall grade point averages and selected course grades, GRE or GMAT scores, TOEFL or IELTS scores if applicable, special achievements, and selected comments in reference letters, as well as remarks from individual committee members. It also includes the recommendations by the individual committee members and the committee decisions on the individual application files, as well as some interim post-admission data.

Figure 6 shows the part of the above-mentioned summary pertaining to the admission results.

	A	B	C	D	E	F	G	H	I	J	K	L
1	# Members		# Members Needed for					# Y	# Accept	# Decline	# No Resp	# Errors
2		5	Info	1	Y,N, and H		3	18	9	7	4	2
3												
4	(I, Additional Information Required; Y, Yes; N, No; H, Hold)											
5	File #	Name	AA	BB	CC	DD	EE	Decision	Accept	Decline	No Resp	Check
6	1	**	n	H	N	n	N	N				
7	2	**										
8	3	**	h	Y	y	n	h	H				
9	4	**	y		N	n	N	N				
10	5	**	n	y	Y	h	y	Y	A			
11	6	**										
12	7	**	n	N		n	N	N				
13	8	**	n		n	n	N	N				
14	9	**	n		i	n	N	I				
15	10	**	Y		H	Y	Y	Y		D		
16	11	**	y		Y	h	Y	Y	A			
17	12	**										
18	13	**	Y		H	H	Y					
19	14	**	Y	N	Y	Y	Y	Y		d		
20	15	**										
21	16	**	Y			Y	Y	Y	a			
22	17	**	Y	H		Y	Y	Y		D		
23	18	**	Y	n	N	Y	Y	Y	A			
24	19	**	I	I				I				
25	20	**	Y	H	N	n	h	H				
26	21	**	y	H		Y	Y	Y	A			
27	22	**	Y		Y	Y	Y	Y		D		
28	23	**	y	y		y	i	I				
29	24	**	N	y	N	Y	Y	Y	a			
30	25	**	y	N	Y	n	n	N				
31	26	**	Y	N		Y	Y	Y			nr	
32	27	**	I	N	h	Y	Y	I				
33	28	**	N		Y	y	Y	Y	A			
34	29	**	Y			y						
35	30	**	y			y	Y	Y	A			
36	31	**	Y		n	y	Y	Y			NR	
37	32	**	Y	N	N	y	Y	Y		d		
38	33	**	N	Y	H	n	n	N			NR	Not Y
39	34	**	Y		H	y	Y	Y		D		
40	35	**	Y	h	n	y	Y	Y	a			
41	36	**	y	Y	y	y	h	Y		d	nr	A/D/NR?

Figure 6 Record Keeping in a Rolling Admission Process

The worksheet has been set up for a five-member committee, with its members labeled as AA, BB, CC, DD, and EE, and for as many as 200 application files. Upon the completion in the assessment of an application file, each committee member uses I, Y, N, or H (in either upper or lower case) to indicate his/her recommendations. If additional information is still required, the indicator is I. If the recommendation is to admit the applicant, the indicator is Y (for Yes); if the recommendation is not to admit the applicant, the indicator is N (for No) instead. If the committee member is undecided at the time, the indicator is H (for Hold).

The committee decision is displayed in H6:H205. The formula in H6, =IF(COUNTIF(C6:G6, "I")>=D$2, "I", IF(COUNTIF(C6:G6,"Y")>=G$2, "Y", IF(COUNTIF(C6:G6,"N")>=G$2, "N", IF(COUNTIF(C6:G6,"H")>=G$2, "H", IF(COUNTA(C6:G6)<B$2,"","H"))))), which is for the committee decision on application file #1, has been pasted in H6:H205. The worksheet has been set up in such a way that, if any of the committee members asks for additional information (as specified in D2), the committee decision is I. For each of Y, N, and H, if three committee members have the same recommendation (as specified in G2), it is also the committee decision. Otherwise, the corresponding cell in H6:H205 is either left blank or indicated as H, depending on whether all committee members have provided their recommendations. (See, for example, H18 and H25.)

As the data in the worksheet starting from row 6 can easily be sorted for each of the I, Y, N, and H cases to be grouped together, the committee members can readily see which of the I and H cases still require further attention. For the Y cases, admission offers will be made to the successful applicants. Those who accept and decline the admission offers are indicated as A in I6:I205 and D in J6:J205, respectively. Those who do not respond after their deadlines are indicated as NR (for No Response) in K6:K205. As the indicators in I6:K205 are entered manually, the corresponding cells in L6:L205 will check for data-entry errors. The formula for L6, =IF(H6="Y", IF(COUNTA(I6:K6)>1, "A/D/NR?",""), IF(OR(I6<>"",J6<>"",K6<>""), "Not Y","")), has been pasted to L6:L205. (See L38 and L41 for two examples of data-entry errors.)

The interim totals of the Y, A, D, and NR cases are displayed in H2:K2. The corresponding formulas are =COUNTIF(H6:H205,"Y"), =COUNTA(I6:I205), =COUNTA(J6:J205), and =COUNTA(K6:K205). The number of data-entry errors is shown in L2. The corresponding formula is =COUNTA(L6:L205)-COUNTIF(L6:L205,""). In actual committee work, such er-

rors would have been corrected immediately. In Figure 6, because of such errors (which are intentional for the illustrative purpose here), the interim totals of the A, D, and NR cases as displayed in I2:K2 are erroneous as well. Once the corresponding data-entry errors are corrected, the displays in I2:K2 will be valid.

6 Concluding Remarks

As a case study on using Excel to facilitate committee discussions and to assist committee decisions in an academic setting, this paper has described several specific tasks for which some Excel functions are well suited. One of such tasks, which is relevant for many committees, is to establish collective rankings of the candidates considered, by aggregating the preference rankings from individual committee members. If there are many candidates to be ranked, such as 20 or more in some committee settings, a common challenge for committee members is to assign unique ranks to the individual candidates, so that the preference ranking data provided can be ready for aggregation. As committee members often have concerns about the validity of some arbitrarily assigned unique ranks, the process to reach the collective rankings of successful candidates tend to involve lengthy discussions in meetings.

The Excel worksheets for use in Section 2 are results of continuing efforts, so far, in response to the above challenge. Interestingly, the same worksheets can accommodate situations where committee members are asked instead to place the candidates considered in a small number of categories, codified by 1, 2, 3, and so on as quality indicators. The numbers of candidates in the individual categories need not be the same. Likewise, the numbers of categories used by the individual committee members can vary too. Given its versatility, this alternative approach is potentially suitable for adoption by committees that consider large numbers of candidates. Initial screenings of the received application files to fill faculty or staff positions are good examples for using this alternative approach.

From a technical standpoint, the task of ranking candidates in various committee settings, as described in Section 2, requires primarily the use of the Excel function RANK. The remaining sections of this paper all pertain to graduate admissions. As different tasks are involved, so are the corresponding Excel functions. The conversions between GRE and GMAT, which are covered in Section 3, require the nesting of the Excel functions INDEX and MATCH to read

some conversion tables. In contrast, TOEFL-IELTS conversion, which is also covered in the same section, are simpler from a technical standpoint; the task involves the use of the Excel function VLOOKUP.

Similar to GRE-GMAT and TOEFL-IELTS conversions, the Excel-based classifications of Chinese academic institutions in Section 4 have been performed by either using the Excel function VLOOKUP or nesting the Excel functions INDEX and MATCH. A challenge in placing these academic institutions in different categories — according to their memberships in the C9, Project 985, and Project 211 groups or elsewhere as quality indicators — is in matching the school names retrieved from the individual application files and the official lists of the first three groups. Although considerable efforts have been made to include as many variants of the individual school names as possible, erroneous mismatches are still possible. If the school names retrieved from an application file fails to match any of the names in the official C9, Project 985, and Project 211 lists, a manual inspection will have to follow, in order to ascertain the validity of the mismatch. Thus, further revisions of the C9, Project 985, and Project 211 lists to include additional variants of school names, for reducing erroneous Excel-based mismatches in the future, will still be worthwhile.

Record keeping in a rolling admission process, as covered in Section 5, is pertinent to an academic unit (within a larger academic institution) that follows a decentralized admission process, especially in the admission decisions. Good practice in record keeping will give the admission committee involved a clear picture of the progress towards achieving the enrolment target, given the admission criteria. On the technical side, Excel functions COUNTIF and COUNTA for counting items are essential for the tasks involved.

I have made considerable efforts to use only familiar Excel tools for the various tasks involved in committee work. However, no attempts have been made to provide detailed written instructions for any new users of the corresponding Excel files. Thus, advanced Excel features such as data validation, which are useful for alerting the user about data-entry errors, have not been included in the Excel files for Sections 3 and 5, in order to avoid potential technical complications when such files are revised by others. Instead, any warnings for data-entry errors, if deemed necessary, have been incorporated into the cell formulas involved.

This paper, which covers only the committee work that I have participated in during recent years as a non-administrative faculty member, is inevitably limited in its scope. Such limitations

notwithstanding, I hope that the various Excel-based tasks here are relatable to the experience of its readers. I also hope that this paper can serve as a catalyst to generate interests among readers in exploring innovative ways to use spreadsheet tools in their own work settings.

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