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Developing an overall ranking of 79 marketing journals: An introduction of PRINQUAL to marketing

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ABSTRACT

The PRINQUAL (PRINcipal components of QUALitative data) procedure transforms original variables linearly or nonlinearly and optimizes the properties of the transformed variables' covariance or correlation matrix. During the transformation procedure, PRINQUAL also imputes missing values measured at all levels of measurement. Although the application of PRINQUAL is endless in marketing, it is virtually unknown to marketing researchers. This study introduces PRINQUAL to marketing by demonstrating its capability, which produces a composite ranking of marketing journals across a variety of studies that used different ways of rankings and ranked a different set of journals. The application PRINQUAL integrates 13 studies and produces overall rankings of 79 marketing journals.

The PRINQUAL (PRINcipal components of QUALitative data) procedure, available in SAS (SAS Institute, 2004) as the most popular implementation of principal component analysis accompanied by optimal scaling, transforms original variables linearly or nonlinearly and optimizes the properties of the transformed variables' covariance or correlation matrix. Simply put, as a collection of optimal scaling procedures, it transforms variables and reduces their number for other data analyses such as regression analysis and cluster analysis. After optimal transformation, it conducts ordinary principal components analysis for quantitative data as well as qualitative data. During the transformation procedure, it also imputes missing values measured at all levels of scale (i.e., nominal, ordinal, interval, ratio, or mixed). PRINQUAL shows a great advantage particularly in dealing with qualitative missing data. In addition, it displays data in multiple dimensions using multidimensional unfolding algorithms (SAS Institute, 2008).

Although virtually unknown to marketing researchers (Dadzie et al., 2002 for an exception), PRINQUAL has been found very useful for many important problems in a variety of disciplines. Examples include imputing missing data in a neuropsychological study of relatives of schizophrenic patients (Faraone et al., 1995); estimating missing values for internal preference mapping (Hedderley and Wakeling, 1995) and for ranking the working partners in the communication network (Beyers and Dierickx, 1998); transforming the original rankings of information sources to obtain the maximum variance (White and Jacobs, 1998); estimating the number of the sexual partners for nonrespondents in a large national survey (Kupek, 1999); testing the true levels of measurement in political election data (Jacoby, 1999); taking account of the important morphognostic features in an ethnic anthropology study (Vonderach, 2006); examining the cross-cultural measure equivalence of core marketing constructs (Dadzie et al., 2002); plotting an internal preference map of cheddar cheese profile characteristics (Young et al., 2004); deriving quantitative variables from categorical data in education (Parra and Yano, 2005); extracting more information from ordinal-scaled variables in ecology (Vaughan and Ormerod, 2005); and synthesizing a variety of nursing activities into one latent variable (Sermeus et al., 2008).

The application of PRINQUAL is endless wherever multiple sources or judges rank the objects entirely or selectively and by the same or different levels of measurement. For example, the method can be useful in computing overall preference or quality ranks of brands, firms, stores, sports players, movies, schools, peers, employees, and strategic alternatives as evaluated by multiple judges or in various sources. PRINQUAL is a more powerful tool in imputing missing values than any other statistical method particularly when data are of ordinal or nominal scale because it is flexible to the type of scale.

In summary, PRINQUAL has the following major advantages over ordinary linear principal component analysis (de Leeuw, 2006; Kuhfeld, 1990; Linting et al., 2007a). First, it can preprocess data, transforming variables prior to other analyses. The type of scale covers any mix of metric and nonmetric measures (nominal, ordinal, interval and ratio). This enables a researcher to incorporate multiple sources or variables which have used very different

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measurement levels to one another. Second, it has a great ability in imputing missing data, which makes it possible to utilize an observation with many missing values and accordingly increase the number of data observations that can be used for analysis. Third, as an optimal scaling technique (converting nominal and ordinal variables to interval variables), it transforms data nonlinearly (and linearly) in direction to maximize the covariance or correlation aspects of variables. Fourth, as principal component analysis method, it reduces the number of variables for other subsequent statistics such as regression analysis and cluster analysis.

The purpose of this study is introduce PRINQUAL to marketing by demonstrating its capability, which produces a composite ordering of marketing journals across a variety of rankings studies, especially in a situation where studies used different ways of rankings and where some journals were not graded in all studies. Any rankings study has its own set of journals which could be different from other studies. Therefore, "missing" or incomplete rankings are inevitable when one attempts to integrate multiple studies.

1. The PRINQUAL procedure

PRINQUAL has three major algorithms of data transformation: the maximum total variance algorithm (MTV), the minimum generalized variance (MGV), and the maximum average correlation method (MAC) (for details, see Perreault and Young, 1980). All three methods optimize some properties of the correlation or covariance matrix of the variables, producing new, transformed scores for the observations of the original variables.

The MTV (Kuhfeld et al., 1985; Young, 1981; Young et al., 1978) maximizes the total variance of the first r principal components among the variables by iteratively conducting Hotelling's (1933) ordinary principal components model until obtaining convergence. The ordinary principal components analysis hypothesizes that Z is composed of the following two parts: $Z = X\hat{F}$, where Z is an $m \times n$ matrix of m observations or subjects on n variables, X is an $m \times r$ matrix of m principal component scores on r principal components, and F is an $n \times r$ matrix of n loadings of the manifest variables on the r principal components.

The solution to the identification problem is that $\hat{X}X/m = I$ (identity) and $\hat{F}F = D$ (diagonal). Conventionally, Z is solved by minimizing $\theta = tr(Z - Z\hat{})'(Z - Z\hat{})$ for a selected number of principal components where tr stands for trace. Thus, minimizing θ is the same as maximizing the total variance of Z accounted for since θ indicates the unexplained variance of Z. This process creates a scalar summary on how well the new predicted matrix explains than original variance–covariance matrix.

The MGV method has the following fit criterion θ equation: $\theta = |(Z - Z\hat{})'(Z - Z\hat{})|$. To solve this equation, MGV alternates multiple regression and optimal scaling equations for each variable. Each variable becomes the dependent variable while all other variables become independent variables. This process achieves the minimal generalized variance by transforming each variable so that a linear combination of the remaining variables can explain the focal variables sufficiently (Kuhfeld et al., 1985).

The MAC iterates a constrained multiple regression model to maximize the equally weighted average of the elements of the correlation matrix (Kuhfeld et al., 1986). This method transforms each variable to approach the average of the remaining variables. The MAC algorithm is very similar to the MGV one, except for a minor difference in its fit function. This method is appropriate with variables positively correlated to one another and with the use of no monotonic transformation.

PRINQUAL has two major families of fit functions for data transformation. The first family is a group of nonoptimal transformations that mechanically replace the original variables with new nonoptimal, nonlinear transformation. Specific functions include inverse trigonometric sine, exponential, logarithm, logit, power, and ranks. The second family is a group of optimal transformations that iteratively derive optimal transformation that fits the specified model. Examples of functions are linear, monotonic with ties, monotonic without ties, B-spline (i.e., a smooth line in contrast to a straight line), and optimal scoring transformations.

It should ne noted that there are other software options equivalent to PRINQUAL. Examples include HOMALS in the R contributed packages and nonlinear PCA in the Guttman–Lingoes programs (de Leeuw, 2006). However, CATPCA of the SPSS Categories is the most commonly used commercial package along with PRINQUAL (see Linting et al., 2007a for algorithms and, 2007b for applications).

2. Journal rankings

Journal rankings are important for several reasons. First, journal publications are a primary measure for scholarly performance (DuBois and Reeb, 2000; Guidry et al., 2004). Therefore, researchers use journal rankings to figure out top-quality publication outlets in order to "enhance the visibility and impact of their research", through which they want to gain "prestige, rank promotion, tenure, and pay increases" (Baumgartner and Pieters, 2003, p. 123). Accordingly, the rankings are used as a very suitable measure of research performance evaluations for chairpersons and committees (Baumgartner and Pieters, 2003; Hult et al., 1997; Zinkhan, 2004) and a means of explicit publication targets and publication strategies (van Fleet et al., 2000). Departments often use the rankings to classify journals to A, B, and C categories as an objective standard for recruitment, promotion, and performance evaluations. Second, similarly, institutions and journal editors use rankings as "a means to promote their accomplishments to both higher-level administrators and outside audiences" (Zinkhan and Leigh, 1999) and to differentiate themselves (Polonsky and Whitelaw, 2006). Third, libraries and electronic databases use journal rankings to determine which journals to purchase and index, respectively (Rogers, 2001).

However, there could be problems with overall journal rankings. First, any rankings study could be susceptible to rater bias resulting from the rater's familiarity with the journal, area of expertise, publishing record, geographic location, affiliation with the journal, and the type of university that evaluates the journal (Bauerly and Johnson, 2005; Hult et al., 1997; Polonsky et al., 1999; Theoharakis and Hirst, 2002). For example, raters show an inherent tendency to evaluate methodological, research, or older journals more favorably than applied, pedagogical, or younger journals (Hawkins et al., 1973; Jobber and Simpson, 1988; Polonsky et al., 1999). Second, leading journals easily reach a consensus in ranking across studies, but lower-ranked journals outside the "A" group are often omitted in ranking and seem to be influenced by a range of institutional and individual factors (Polonsky and Whitelaw, 2006). Third, journals show discrepancies in many aspects. For example, some journals focus on development of basic research whereas others focus on applied or pedagogical research. Some journals serve broad areas of interest whereas others serve a certain area. Some journals target academic researchers whereas others target practitioners. Some journals deal with a certain geographic region whereas others deal with all countries.

In summary, development of fair overall journal rankings requires integration of multiple rankings studies to minimize the impact of missions, audiences, ranking developers, areas, and geographic markets embedded in any particular journal-rankings study (Hult et al., 1997; Polonsky et al., 1999; Polonsky and Whitelaw, 2006). In an effort of integrating multiple rankings studies of different characteristics, this task inevitably faces two major, difficult methodological challenges: first, many missing data (as each

rankings study has a different set of journals) and, second, different types of measurement (as some studies use ratings or ratio scales while others use ordinal categories).

In this context, PRINQUAL must be a proper method to overcome those two challenges because it deals with all levels of measurement, imputes missing values, and reduces multiple variables (here, ranking scores of the journals in individual studies) into one principal component (that is, overall ranking scores integrating those in individual studies).

Although the purpose of this study is to demonstrate the usefulness of PRINQUAL, some readers might wonder if we need another new study on marketing rankings. However, note that the number of marketing and, broadly, business journals does not remain the same; instead, the number increases. On this trend, Svensson et al. (2007) write, "In the field of marketing, the number of academic journals has continuously increased during recent decades, and Cabell has listed more than 550 journals that publish contributions in this discipline. One reason for the plethora of marketing journals is that each journal positions itself within certain sub-disciplines or sub-areas of the wider subject area (Baumgartner and Pieters, 2003; Malhotra, 1999)." As marketing scholars have to deal with ever-increasing and overwhelmingly large numbers of journals, the journal rankings need to be updated on the regular basis. This is, of course, necessary for new journals rather than well-established ones, whose rankings are believed to show great stability.

3. Data analysis and results

Fig. 1 summarizes the steps of data analysis showing how PRINQUAL was applied to development of overall rankings of marketing journals.

3.1. Sample

This study analyzed 13 rankings studies (see their brief information in Table 1). Except for the classic 1997 study by Hult, Neese, and Bashaw, all studies were fewer than five years old. Each study ranked from 20 to 61 journals and 41 journals on average. The analyzed studies showed a good spectrum of diversity. First, five studies were academic journal publications, whereas eight studies were rankings that business schools were using for their internal use or that business faculty agreed upon in a survey. Second, the studies showed a geographic diversity as their rankings originated from the whole world as well as individual countries, including the US, the UK, Australia, New Zealand, Germany,

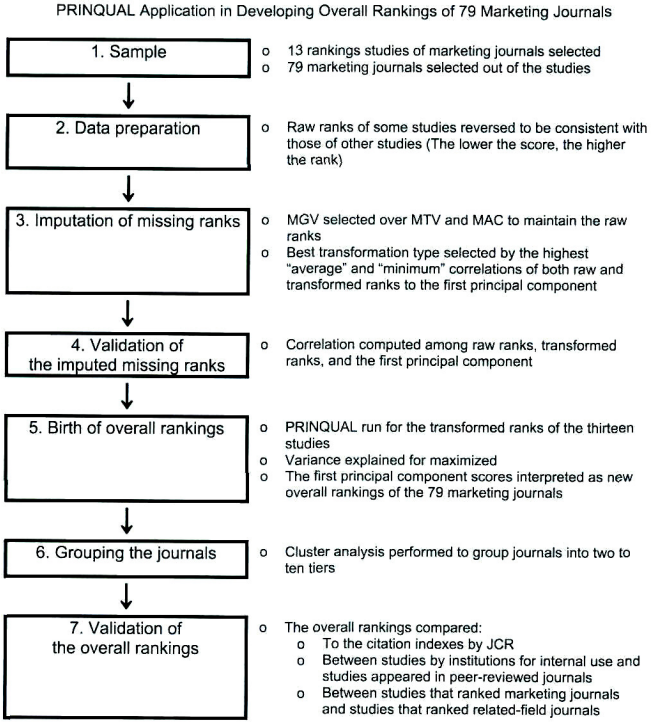

Fig. 1. PRINQUAL application in developing overall rankings of 79 marketing journals.

Table 1
A summary of 13 studies of marketing journal rankings.

	Study	Ranking method	Journals ranked	Marketing ratio[e] (%)	Source
1	JME97	Full rankings	40	73.2	Hult, G. Tomas, M., Neese, W. T., & Bashaw, R. E. (1997). Faculty perceptions of marketing journals. Journal of Marketing Education, 19 (1), 37–52
2	ML02	Full rankings[c]	40	67.5	Theoharakis, V., & Hirst, A. (2002). Perceptual differences of marketing journals: A worldwide perspective. Marketing Letters, 13 (4), 389–402
3	Aston03[a]	5 Categories (4 to 1)[d]	34	97.1	Aston University (2003) based on a large survey of opinions of academics of the Midlands universities
4	JM03	Full rankings	50	75.5	Baumgartner, H., & Pieters, R (2003). The structural influence of marketing journals: A citation analysis of the discipline and its sub-areas over time. Journal of Marketing, 67 (April), 123–139
5	UQ03[a]	5 Categories (1 to 5)	56	96.4	University of Queensland (2003) based on a mega-database (over 2000 titles) of ratings and rakings from over 120 sources
6	Warwck03[b]	4 Categories (4 to 1)	32	96.9	Warwick Business School (2003)
7	AMJ04	Full rankings	60	95.0	Mort, G. S. M, McColl-Kennedy, J. R., Kiel, G, & Soutar, G. N. (2004). Perceptions of marketing journals by senior academics in Australia and New Zealand. Australasian Marketing Journal, 12 (2), 51–61
8	BBS04[b]	4 Categories (4 to 1)	48	95.8	Bristol Business School, University of the West of England (2004)
9	CRL04	Full rankings	49	75.5	Joswick, K. E., Bauerly, R. J., & Johnson, D. T. (2004). Assessing marketing literature: A study of the readings assigned in doctoral seminars in marketing. College & Research Libraries, 65 (5), 384–398
10	Imperl04[b]	4 Categories (4 to 1)	32	96.9	Imperial College, London (2004)
11	VHB04	10 Point scale (10 to 1)	61	95.1	Association of Professors of Management in German-speaking countries (2004) based on a highly interactive and individualized survey of 651 professors and researchers in Germany, Austria, and Switzerland
12	CRA05[a]	4 Categories (4 to 1)	25	95.8	Cranfield University School of Management (July 2005) based on a large number of internal and external sources, including journal impact factors
13	ESS05[a]	5 Categories (0 to 2)	20	95.0	ESSEC Business School, Paris (2005) based on a committee of seven ESSEC professors with outstanding performance in research

[a] The rankings were reported in *Journal Quality List*, November 13, 2005, compiled by A. Harzing, University of Melbourne, Australia.
[b] The rankings were reported in Bristol Business School, University of the West of England, January 2005, complied by C. Harvey and H. Morris.
[c] Worldwide rankings were used.
[d] The highest to lowest category of journal quality.
[e] The ratio of marketing-focused journals among the ranked journals.

Switzerland, and Austria. Third, they hired various methods, such as journal impact factors, faculty surveys, and doctoral seminar syllabi analyses to develop journal rankings.

Table 2 reports the list and ranking scores of the journals organized in the order of the frequency that a journal appeared in the studies. The 13 studies ranked 94 journals overall, but this study analyzed the 79 journals that appeared in at least two studies. Out of the 79 journals, eleven journals appeared in all 13 studies, whereas eight ones appeared in two studies only. The journals covered mainly the marketing field, but a few came from related business fields as marketing researchers often published in those journals.

3.2. Data preparation

To achieve consistency in ranking scores across studies, the raw scores were reversed in six studies of Aston03, Warwck03, BBS04, Imperl04, VHB04, and CRA05, whose raw scores went in opposite directions of other studies. As a result, a lower score consistently meant a higher rank in every study. Then the PRINQUAL procedure available in SAS version 9 (SAS Institute, 2004) was conducted.

3.3. Imputation of missing ranks

The 13 studies did not rank all journals or the same number of journals. Thus, the very first task was to estimate the missing ranks of the journals unranked in all studies. For this task, the MGV transformation method was selected rather than MTV or MAC because the missing rank of a journal could be estimated more accurately when it was defined in linear combinations of the remaining rankings studies. Unlike MTV or MAC, the MGV algorithm prevents dramatic alterations of the original ranks, which is desirable for a rankings study. One principal component solution was conducted because all journals should be ranked in one hierarchy, and the overall ranking should be the single underlying factor across studies.

Then, 12 different transformation types were performed one by one to see which type would produce the best result. All transformation types seemed to show a very similar performance because every type is designed not to break severely the similarities between raw and transformed rankings by being loyal to the objectives of the algorithm specific to the type. However, two criteria were used to select the best type. First, the average correlation of both raw and transformed ranks with the principal component should be high so that the maximum variance can be obtained. Second, the minimum correlation of both raw and transformed ranks with the principal component should be high so that a suitable amount of variance for every study can be explained by the principal component. Table 3 shows how well the first principal component resulted from PRINQUAL correlates to the raw ranks and the transformed ranks for each transformation type. After careful comparisons, the monotonic, ties preserved transformation was selected as it best satisfied the two criteria mentioned above.

This monotonic transformation preserves the original order of the nonmissing ranks when estimating the values of the missing ranks iteratively. Preserving ranks is important and necessary so that the ranking made by each study remains intact. While monotonic transformation preserves the nonmissing ranks, it gives room at the same time to the estimated missing ranks to fit in between the nonmissing ranks whose order is not altered.

3.4. Validation of the imputed missing ranks

The monotonic transformations of ranking scores are plotted for each rankings study in Fig. 2. In each plot, the horizontal axis

Table 2
The list and rankings of the 79 journals selected for analysis.

COUNT[a]	JME97	ML02	Aston03	JM03	UQ03	Warwck03	AMJ04	BBS04	CRL04	Imperl04	VHB04	CAR05	ESS05	Journal title
13	30	14	3	17	3	3	11	3	21	3	6.9	3	2	European Journal of Marketing
13	20	21	3	10	3	3	16	3	18	3	5.6	3	2	Industrial Marketing Management
13	26	6	4	22	2	4	8	4	16	4	8.9	3	0	Int'l Journal of Res in Mktg
13	9	15	3	15	2	3	9	3	8	3	6.8	2	2	Journal of Advertising
13	10	13	3	11	2	3	13	3	7	3	7.5	2	1	Journal of Advertising Research
13	3	3	4	3	1	4	1	4	2	4	9.4	4	0	Journal of Consumer Research
13	1	2	4	1	1	4	2	4	3	4	9.5	4	0	Journal of Marketing
13	2	1	4	2	1	4	3	4	1	4	9.7	4	0	Journal of Marketing Research
13	4	8	4	9	2	4	4	4	10	4	8.4	3	1	Journal of Retailing
13	5	9	4	8	2	4	4	4	13	4	8.9	4	1	Journal of The Academy of Mktg Sci
13	6	4	4	7	1	4	4	4	4	4	9.7	4	1	Marketing Science
12	24	30	3	42	3	3	23	3	47	3	8.2	3	.	Journal of International Marketing
12	31	29	2	34	3	2	16	3	34	3	6.8	3	.	Journal of Marketing Management
12	34	11	4	25	2	4	10	4	14	4	8.2	.	1	Marketing Letters
11	36	.	2	39	4	2	45	2	42	2	6.3	1	.	Journal of Bus and Industrial Marketing
11	12	32	3	18	3	.	28	2	19	.	7.7	2	1	Journal of Pers Selling and Sales Mgmt
11	16	25	4	29	3	.	16	4	34	.	7.9	2	1	Psychology and Marketing
10	13	17	.	6	3	2	.	2	9	2	7.3	2	.	Advances in Consumer Research
10	37	.	1	45	4	1	54	1	47	1	4.6	.	.	Journal of Global Marketing
9	.	38	2	.	4	2	28	2	.	2	6.6	.	2	International Journal of Advertising
9	21	36	2	35	4	.	38	2	42	.	5.6	.	.	Journal of Consumer Marketing
9	.	.	.	36	4	2	45	2	37	2	7.4	.	1	Journal of Interactive Marketing
9	.	.	2	.	3	2	34	2	.	3	6.0	1	2	Journal of Product and Brand Management
9	25	37	2	31	3	.	34	2	25	.	6.7	.	.	Journal of Services Marketing
8	.	40	2	.	3	2	23	2	.	2	6.9	.	.	International Marketing Review
8	14	27	.	21	2	.	13	.	21	.	7.1	2	.	Journal of Public Policy and Marketing
8	.	.	3	.	3	3	19	3	.	3	7.3	2	.	Journal of Strategic Marketing
8	.	35	2	39	.	3	.	3	23	3	7.1	.	.	Journal of The Market Research Society
7	.	.	1	.	4	1	54	2	.	1	7.1	.	.	International Journal of Bank Marketing
7	8	12	.	12	2	.	11	.	12	.	.	2	.	Journal of Business Research
7	.	.	1	.	3	1	23	2	.	1	7.2	.	.	Journal of Consumer Behaviour
7	27	10	.	40	3	.	21	.	27	.	7.4	.	.	Journal of Consumer Psychology
7	28	.	.	48	4	.	42	2	47	.	6.3	.	.	Journal of Marketing Theory and Practice
7	.	.	1	49	4	.	58	3	42	.	7.0	.	.	Journal of Nonp and Public Sector Marketing
7	.	.	1	.	3	1	27	1	.	1	8.9	.	.	Marketing Theory
6	.	.	.	47	5	.	50	2	47	.	6.9	.	.	Journal of Business To Business Marketing
6	.	.	.	.	4	2	42	2	.	2	6.3	.	.	Journal of Marketing Communications
6	15	.	.	24	3	.	28	.	34	.	6.3	.	.	Journal of Marketing Education
6	.	34	.	.	2	.	13	.	.	.	8.4	2	2	Journal of Service Research
6	.	.	.	.	4	1	42	1	.	1	6.2	.	.	Marketing Intelligence and Planning
5	.	.	.	.	3	.	28	.	.	.	5.8	2	2	International Journal of Market Research
5	.	.	2	.	4	.	50	2	.	.	5.4	.	.	Journal of Euromarketing
5	32	.	.	33	.	.	45	.	37	.	6.2	.	.	Journal of Health Care Marketing
5	19	24	.	13	.	.	7	.	27	.	.	.	.	Journal of International Business Studies
5	.	.	1	.	3	.	19	2	.	.	6.9	.	.	Journal of Macromarketing
5	35	19	.	16	.	.	.	.	11	.	7.9	.	.	Journal of Product Innovation Management
5	.	.	1	41	.	.	45	1	47	.	.	.	.	Journal of Professional Service Marketing
5	.	.	.	.	5	1	.	1	.	1	6.4	.	.	Journal of Relationship Marketing
5	.	.	.	.	.	1	50	2	.	2	5.7	.	.	Journal of Targ Mea and Anal for Mktg
5	38	.	.	28	4	.	45	.	23	.	.	.	.	Marketing Management
4	29	.	.	27	.	.	.	.	29	.	6.7	.	.	AMA Proceedings
4	23	33	.	20	.	.	.	.	37	.	.	.	.	Business Horizons
4	22	22	.	19	.	.	.	.	32	.	.	.	.	California Management Review
4	34	26	.	37	.	.	.	.	30	.	.	.	.	Decision Sciences
4	7	7	.	4	.	.	.	.	6	.	.	.	.	Harvard Business Review
4	.	.	.	.	3	.	34	1	.	.	5.1	.	.	Journal of Brand Management
4	18	20	.	26	.	.	.	.	16	.	.	.	.	Journal of Business
4	.	.	.	30	3	.	.	.	29	.	7.1	.	.	Journal of Consumer Affairs

(continued on next page)

Table 2 (*continued*)

COUNT[a]	JME97	ML02	Aston03	JM03	UQ03	Warwck03	AMJ04	BBS04	CRL04	Imperl04	VHB04	CAR05	ESS05	Journal title
4	.	.	.	.	.	1	67	1	.	1	.	.	.	Journal of Database Marketing
4	.	.	.	.	.	1	.	1	.	1	3.7	.	.	Journal of Financial Services Marketing
4	.	.	.	.	5	.	54	2	.	.	7.4	.	.	Journal of Int'l Mktg and Mktg Research
4	.	39	.	.	4	.	28	.	.	.	5.7	.	.	Journal of Market Focused Management
4	.	.	2	.	4	.	.	1	.	.	6.9	.	.	Journal of Marketing Channels
4	11	5	.	5	.	.	.	.	5	.	.	.	.	Management Science
4	41	.	.	46	.	.	64	.	42	.	.	.	.	Marketing Education Review
4	17	18	.	14	.	.	.	.	17	.	.	.	.	Sloan Management Review
3	.	.	.	.	4	.	.	.	.	.	5.5	1	.	Int'l J. of Rettail and Distri Mgmt
3	39	.	.	23	.	.	.	.	32	.	.	.	.	Journal of Business Ethics
3	40	.	.	44	.	.	.	.	47	.	.	.	.	Journal of Business Logistics
3	.	.	.	43	.	.	.	.	39	.	6.6	.	.	Journal of Consumer Policy
3	.	.	.	.	3	.	28	.	.	.	6.4	.	.	Journal of Retand Consumer Services
2	.	.	.	.	3	.	34	.	.	.	.	.	.	Australasian Marketing Journal
2	.	.	.	.	5	.	58	.	.	.	.	.	.	Australian Journal of Market Research
2	.	.	3	.	.	.	.	3	.	.	.	.	.	Int'l Journal of Electronic Commerce
2	.	.	.	.	.	.	.	1	.	.	7.5	.	.	J. of Con Sat Dissat and Compl Behavior
2	.	.	.	32	.	.	.	.	24	.	.	.	.	Journal of Economic Psychology
2	.	.	.	.	4	.	58	.	.	.	.	.	.	Journal of Int'l Consumer Marketing
2	.	.	.	.	.	.	58	.	.	.	6.2	.	.	Journal of Travel and Tourism Marketing
2	.	.	.	.	2	.	.	.	.	.	.	.	1	Public Opinion Quarterly

[a] The number of studies where the journal was ranked.

indicates the raw ranking scores and the vertical axis indicates their transformed scores. As each plot shows, raw scores were monotonically transformed in a direction to maximize the fit of the data to the principal component model. Therefore, the Spearman correlation between the raw and transformed ranks for each rankings study ranged from 0.99 to 1.00. In addition, Fig. 3 shows a consistent monotonic relationship between the raw ranks and the first principal component, which would contain new overall rankings integrating the 13 studies. The raw scores of the journal rankings had a correlation of 0.81 on average with the first principal component. Note that Figs. 1 and 2 do not yet include missing ranks due to dealing with raw, rather than transformed, ranks. With all missing ranks of the 79 journals estimated and imputed, Fig. 4 exhibits the monotonic relationship between the transformed ranks and the first principal component, whose correlation was 0.80 on average. All three figures clearly demonstrate that the raw ranks, the transformed ranks, and the first principal component are highly correlated to one another.

3.5. Birth of overall rankings

In Table 4, the iteration history of the MGV monotonic, ties reserved transformation that finds out the estimates of the missing values shows that algorithm converged at the seventh iteration, meaning the variance explained for by the first principal component did not increase further. Table 4 also shows that the variance accounted for increased from an initial 77% to 100%, which was a 23% increase. The 77% variance represents the proportion of variance explained by an ordinary principal component analysis of the untransformed data for the first principal component. The transformation markedly increased the variance explained for by optimally transforming the nonmissing and missing ranks of each journal. As a result, the first principal component became substantive enough to describe the rankings of the journals of the 13 studies.

In summary, the MGV monotonic, ties reserved transformation, selected as the best method of all other alternative ones, found out the estimates for missing rankings for each study over 79 journals in the way to maximize the variance accounted for. Then, the principal component analysis was performed for the transformed data over 13 studies to generate the principal component score for the first dimension. One component alone explained the very high portion of the variance, which means the single component, which obviously should be labeled as overall rankings, was the most dominant theme across the 13 studies. Table 5 reports the resultant rankings based on the score of first principal component of each journal.

Table 5 shows the composite ranking of the 79 journals integrating the 13 rankings studies. The score of the second column in the table is the standardized principal component score. It indicates the relative strength of each journal, meaning the lower the score the higher the rank. According to the table, *the Journal of Marketing*, *the Journal of Marketing Research*, and *the Journal of Consumer Research* make the top three journals, with a negligible difference from one to the other. *The Marketing Science* is ranked fourth with a little difference from the top three but with a noticeable difference from the next-ranked journals. *The Journal of the Academy of Marketing Science*, *the Journal of Retailing*, and *the International Journal of Research in Marketing* make the next solid group a little apart from *the Marketing Science*. However, those top seven journals seem significantly higher in score than all the rest of the journals.

3.6. Grouping the journals

Schools often group journals into a prefixed number of category tiers for convenience, such as A, B, and C journals for a three-tier classification. Journals in the same tier are considered generally equivalent in quality. However, just how many journals should belong to each tier could be arbitrary from school to school. The

Table 3
Correlation of the raw and transformed ranks to the first principal component by the PRINQUAL transformation type for 13 marketing journal rankings studies.

Study	Transformation types											
	1	2	3	4	5	6	7	8	9	10	11	12
Correlation between the raw ranks and the first principal component												
JME97	0.76	0.64	0.64	0.75	0.77	0.85	0.77	0.74	0.75	0.71	0.75	0.73
ML02	0.89	0.77	0.77	0.95	0.90	0.93	0.90	0.84	0.89	0.82	0.87	0.83
Aston03	0.90	0.92	0.92	0.73	0.91	0.81	0.91	0.85	0.89	0.87	0.88	0.86
JM03	0.82	0.71	0.71	0.86	0.84	0.86	0.84	0.78	0.82	0.79	0.81	0.79
UQ03	0.85	0.75	0.75	0.75	0.87	0.85	0.87	0.83	0.86	0.82	0.84	0.83
Warwck03	0.93	0.95	0.95	0.94	0.94	0.91	0.84	0.88	0.92	0.90	0.91	0.90
AMJ04	0.81	0.73	0.73	0.61	0.84	0.81	0.94	0.75	0.80	0.76	0.79	0.77
BBS04	0.86	0.86	0.86	0.84	0.87	0.86	0.84	0.81	0.85	0.82	0.84	0.83
CRL04	0.85	0.75	0.75	0.75	0.87	0.85	0.87	0.81	0.85	0.83	0.84	0.83
Imperl04	0.91	0.94	0.94	0.94	0.91	0.91	0.91	0.86	0.89	0.87	0.88	0.88
VHB04	0.78	0.61	0.61	0.61	0.78	0.78	0.78	0.77	0.79	0.77	0.80	0.76
CRA05	0.88	0.84	0.84	0.84	0.89	0.88	0.89	0.86	0.88	0.87	0.87	0.87
ESS05	0.76	0.72	0.72	0.72	0.72	0.76	0.72	0.78	0.74	0.78	0.75	0.77
Average	0.85	0.78	0.78	0.79	0.85	0.85	0.85	0.81	0.84	0.82	0.83	0.82
Maximum	0.93	0.95	0.95	0.95	0.94	0.93	0.94	0.88	0.92	0.90	0.91	0.90
Minimum	0.76	0.61	0.61	0.61	0.72	0.76	0.72	0.74	0.74	0.71	0.75	0.73
Correlation between the transformed ranks and the first principal component												
JME97	0.74	0.68	0.68	0.68	0.69	0.74	0.69	0.81	0.71	0.82	0.70	0.80
ML02	0.84	0.45	0.45	0.45	0.90	0.84	0.90	0.87	0.90	0.81	0.94	0.87
Aston03	0.90	0.81	0.81	0.81	0.90	0.90	0.90	0.89	0.92	0.78	0.91	0.93
JM03	0.72	0.15	0.15	0.15	0.77	0.72	0.77	0.74	0.76	0.73	0.73	0.74
UQ03	0.83	0.58	0.58	0.58	0.88	0.83	0.88	0.86	0.88	0.78	0.90	0.80
Warwck03	0.83	0.88	0.88	0.88	0.84	0.83	0.84	0.82	0.84	0.81	0.83	0.82
AMJ04	0.82	0.24	0.24	0.24	0.79	0.82	0.79	0.82	0.85	0.73	0.90	0.74
BBS04	0.80	0.80	0.80	0.80	0.83	0.80	0.83	0.85	0.87	0.79	0.86	0.80
CRL04	0.79	0.40	0.40	0.40	0.81	0.79	0.81	0.80	0.80	0.76	0.78	0.76
Imperl04	0.81	0.83	0.83	0.83	0.80	0.81	0.80	0.80	0.81	0.79	0.81	0.79
VHB04	0.72	0.35	0.35	0.35	0.73	0.72	0.73	0.87	0.80	0.74	0.87	0.73
CRA05	0.70	0.82	0.82	0.82	0.70	0.70	0.70	0.71	0.73	0.61	0.73	0.62
ESS05	0.64	0.53	0.53	0.53	0.35	0.64	0.35	0.61	0.38	0.52	0.46	0.52
Average	0.78	0.58	0.58	0.58	0.77	0.78	0.77	0.80	0.79	0.74	0.80	0.76
Maximum	0.90	0.88	0.88	0.88	0.90	0.90	0.90	0.89	0.92	0.82	0.94	0.93
Minimum	0.64	0.15	0.15	0.15	0.35	0.64	0.35	0.61	0.38	0.52	0.46	0.52

Transformation types: 1 = inverse trigonometric sine transformation; 2 = exponential transformation; 3 = logarithm transformation; 4 = logit transformation; 5 = transformation that raises variables to specified power; 6 = transformation to ranks; 7 = linear transformation; 8 = monotonic, ties preserved transformation; 9 = monotonic B-spline transformation; 10 = optimal scoring transformation; 11 = B-spline transformation; 12 = monotonic, ties not preserved transformation.

important question is how to group journals to maximize within-group homogeneity and between-group heterogeneity. The best method for that purpose is cluster analysis. Cluster analysis was conducted for the 79 journals in order to see how the journals could be divided from the statistical perspective. The data used were the transformed ranking scores of the 13 studies. Imagine data set with 79 rows and 13 columns. Based on the transformed ranking scores, cluster analysis was performed for the 79 journals in order to see how the journals could be divided from the statistical perspective. Table 6 summarizes the results of 2- to 10-cluster solutions, whose *F*-value ranged from 187.24 to 512.99, all of which were significant at the 0.0001 level.

Two major findings are as follows. First, top tiers consist of fewer journals, whereas low tiers consist of more journals because top journals distinguish themselves drastically from the large number of the subsequent journals. For example, when journals are categorized into three tiers only, the first tier should consist of the top seven journals rather than one-third of the journals, the second tier should consist of 30 journals, and the third tier, 42 journals. The quality of the top seven journals exceeds that of all other journals. Likewise, the first tier in the five-cluster solution consists of three journals only. Second, some journals tend to make a firm cohort across multiple cluster solutions, although the exact grouping depends on the solution. For example, *the Journal of Marketing*, *the Journal of Marketing Research*, and *the Journal of Consumer Research* make "the" premier marketing journals holding together. The middle group of journals starting from *the Journal of International Business Studies* (ranked 15th) to *the Journal of Marketing Management* (37th) and the bottom one starting from *the Journal of Targeting Measurement and Analysis for Marketing* (66th) to *the Journal of Global Marketing* (79th) make a strong cohort each across solutions.

3.7. Validation of the overall rankings

To validate the usefulness of the generated new overall rankings reported in Table 5, they were compared with other sources of ranking information. First, the comparison was made against *Journal Citation Reports*® (*JCR*®) by Thomson Scientific. JCR evaluates the quality of a journal based on the frequency of citations rather than judges' subjective evaluations. In particular, three JCR indices were selected for comparison: the journal impact factor, the immediacy index, and the cited half-life. Thomson Scientific defines each index as follows:

> The *journal impact factor* is the average number of times articles from the journal published in the past two years have been cited in the JCR year. The impact factor is calculated by dividing the number of citations in the science citation index by the total number of articles published in the two previous years. An impact factor of 1.0 means that, on average, the articles published one or two year ago have been cited one time.

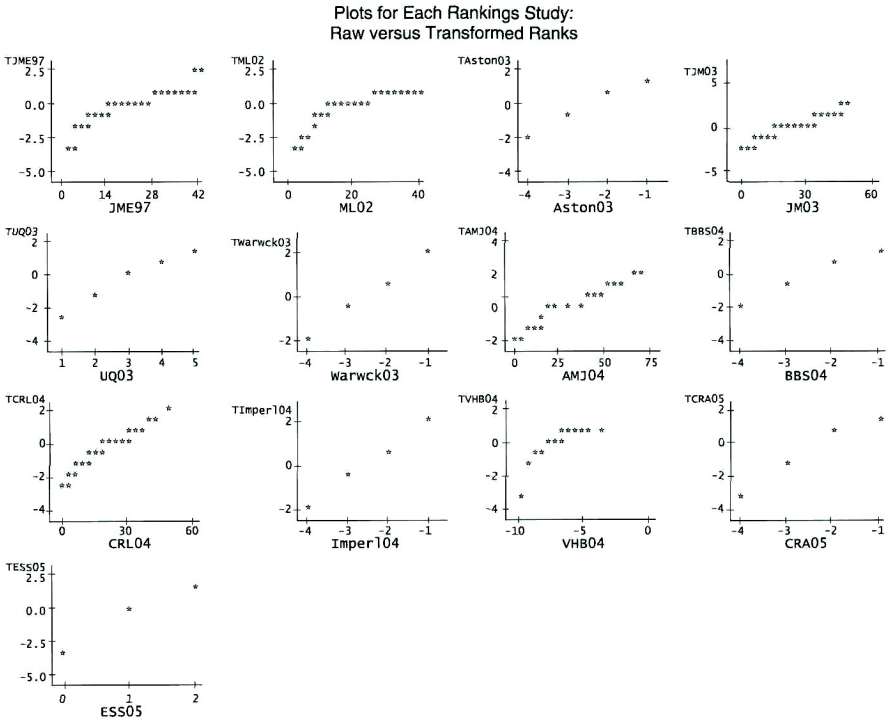

Fig. 2. Plots for each rankings study: raw versus transformed ranks.

The *immediacy index* is the average number of times an article is cited in the year it is published. The journal immediacy index indicates how quickly articles in a journal are cited. The immediacy index is calculated by dividing the number of citations to articles published in a given year by the number of articles published in that year.

The *cited half-life* is the median age of articles cited by the journal in the JCR year. For example, in JCR 2003, the journal Food Biotechnology has a cited half-life of 9.0. That means that 50% of all articles cited by articles in Food Biotechnology in 2003 were published between 1995 and 2003.

The correlation of overall journal rankings to JCR's journal impact factor, immediacy index, and cited half-life were highly significant: 0.58 ($p < 0.001$, $n = 31$), 0.54 ($p < 0.01$, $n = 30$), and 0.46 ($p < 0.01$, $n = 30$), respectively. Note that the sample size reduced from 79 to 31 or 30 because JCR evaluates an only selective number of journals. The result shows that the higher the journal's ranking, the greater the journal impact factor the higher the immediacy index and the longer the cited half-life. It clearly matches an expectation that an article from a high-ranked journal must be more cited, immediately used, and longer circulated.

Second, the overall rankings of this study were compared with those of the ERA rankings. The ERA refers to the Excellence in Research for Australia (ERA) initiative that the Australian Research Council (ARC) has ranked 19,000 unique peer-reviewed journals into four tiers (A*, A, B and C) on the basis of the overall quality that each has for a particular discipline. The ERA rankings are very valuable and relevant to Australia and New Zealand scholars and have a great potential to influence the rest of the world thanks to their comprehensive scope. Out of 79 journals of this study, 70 journals appeared in the July 2008 ERA rankings. For comparisons, appropriate numbers were assigned to the four ERA tiers: first, 1, 2, 3, and 4 in order and second, 0.5, 1, 2, and 3. The correlation of the rankings of this study to those of the ERA was 0.61 and 0.60 ($p < 0.0001$, $n = 70$) in each numbering way. The result demonstrates that the global consensus of rankings is consistent with the local rankings of Australia. This consistency might have been achieved as the ARC referenced, and tried to integrate, rankings of other regions and credible sources.

Here is one more validation of the overall rankings. A variety of rankings studies were included in this study to demonstrate, first, the versatility of the PRINQUAL methodology that produces overall rankings by overcoming missing values and different ranking methods, but some readers might be concerned with heavy reliance on internal institutional rankings. However, one can assume reasonable convergence in rankings between institutions and journal articles. In this study, some rankings studies were conducted by

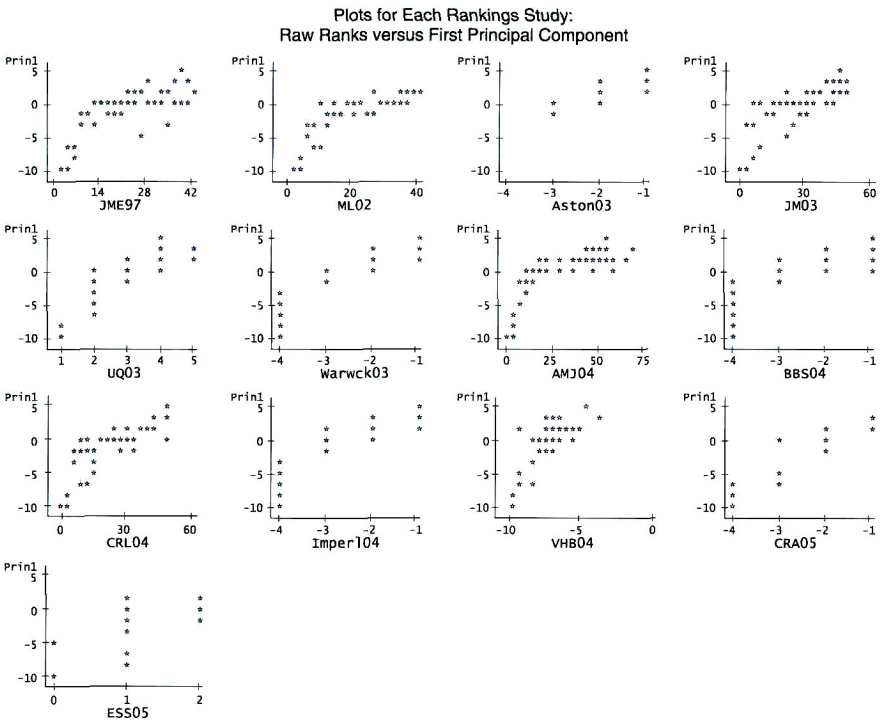

Fig. 3. Plots for each rankings study: raw ranks versus first principal component.

institutions, mainly for their internal uses (Aston03, UQ03, Warwck03, BBS04, Imperl04, CRA05, and ESS05), whereas other studies were shown in peer-reviewed academic journals (JME97, ML02, JM03, AMJ04, CRL04, and VHB04). When overall rankings were computed separately for each group of those two types of studies, however, the two groups showed correlation of 0.67 ($p < 0.0001$), which illustrates that the rankings by institutions are highly comparable to those shown in journals. Such a high similarity might result from similar scholarly standards that institutions use in determining the rankings.

In addition, some studies ranked only marketing-focused journals, whereas others ranked all journals publishing marketing research articles. However, in this study it was assumed that the relative rank of any particular journal does not change either in a study of marketing-focused journals or in a study of all journals. To test this assumption, first, the 13 studies were divided into two groups: marketing-focused studies and all journals studies. The latter's members were JME97, ML02, JM03, and CRL04 as the ratio of marketing-focused journals was less than 75%, as reported in Table 1, whereas the former's members included all the remaining nine studies, 95% or more of whose ranked journals consisted of marketing-focused journals. Then, PRINQUAL was conducted for each group of studies, producing two sets of new journal rankings. Then, correlation of the overall journal rankings between two groups was computed, which was 0.64 ($p < 0.0001$) for the 79 journals. This highly significant correlation supports the assumption and resolves the question on the consistency of journal rankings, especially on those lower-ranked journals outside the top ones: so-called B or C publications (e.g., Hawes and Keillor, 2002; Polonsky and Whitelaw, 2006). It is a great relief that the rank of journals, top or not, remains consistent across rankings studies of different purposes.

4. Discussion

This study attempted to introduce PRINQUAL to marketing by demonstrating its usefulness, particularly by solving two methodological problems in ranking the marketing journals based on multiple sources: first, estimate the missing ranks of the marketing journals not shown in every rankings study and second, make composite ranks of marketing journals that integrate the 13 rankings studies. The PRINQUAL procedure solved the problems successfully. Specifically, it transformed the original journal ranks and imputed the missing ranks to account for the entire variance of the transformed ranks by just one principal component after six iterations. The results showed that missing ranks were estimated without changing the order of the original nonmissing ranks and

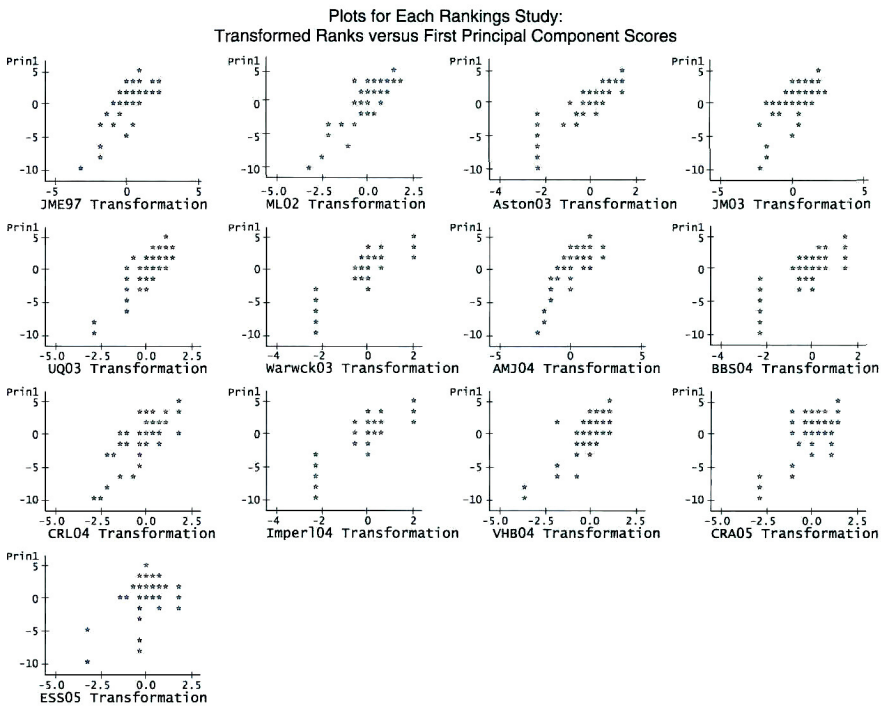

Fig. 4. Plots for each rankings study: transformed ranks versus first principal component scores.

Table 4
PRINQUAL MGV algorithm iteration history for monotonic, ties reserved transformation.

Iteration number	Average change	Maximum change	Average *R*-square	Criterion change	Note
1	0.25711	2.07413	0.77020		
2	0.02519	0.36179	0.99220	0.22200	
3	0.00713	0.17803	0.99895	0.00675	
4	0.00173	0.04959	0.99982	0.00086	
5	0.00018	0.01208	1.00000	0.00018	
6	0.00002	0.00132	1.00000	0.00000	
7	0.00000	0.00014	1.00000	0.00000	Converged

Algorithm converged.

that the composite ranks were quite consistent with the original nonmissing ranks across studies. There are a lot of multivariate imputation methods of missing data, but not all methods handle qualitative data or produce equally reasonable results. However, the advantage of PRINQUAL over other methods is that it can deal with any mix of measurements (quantitative and qualitative; particularly excellent for qualitative data) and that its results are reliable and reasonable. In summary, as demonstrated in the rankings analysis, the contribution of PRINQUAL to marketing would be its versatility to impute qualitative missing data and transform to optimize the properties of the covariance matrix so that data can be analyzed by other normal statistics.

The resulting composite ranking of the 79 marketing journals can serve the purpose of evaluating marketing faculty research quality for three major reasons. First, it ranks more journals than any other rankings study because the list of journals is quite inclusive. Second, it is comprehensive by integrating 13 latest and diverse rankings studies, and it is global, not limited to one geographic region only, such as America, Europe, or Asia. Third, it is versatile. Whenever a new rankings study appears, it can readily integrate the new study by the PRINQUAL method to develop a new composite ranking.

The current study contributes in three ways. First, PRINQUAL is introduced and validated as a very useful method of marketing as

Table 5
New overall rankings of 79 marketing journals.

Rank	Score[a]	Journal
1	−9.97167	Journal of Marketing
2	−9.95932	Journal of Marketing Research
3	−9.94450	Journal of Consumer Research
4	−8.42279	Marketing Science
5	−6.44169	Journal of The Academy of Marketing Science
6	−5.85261	Journal of Retailing
7	−5.59250	International Journal of Research in Marketing
8	−3.21858	Marketing Letters
9	−3.18177	Management Science
10	−2.54070	Harvard Business Review
11	−1.99010	Journal of Advertising Research
12	−1.80071	Journal of Advertising
13	−1.75568	Journal of Business Research
14	−1.40888	Psychology and Marketing
15	−0.92421	Journal of International Business Studies
16	−0.83584	Journal of Business
17	−0.80387	European Journal of Marketing
18	−0.71869	Sloan Management Review
19	−0.69314	Industrial Marketing Management
20	−0.63349	Journal of Consumer Psychology
21	−0.60441	Advances in Consumer Research
22	−0.52823	Journal of Strategic Marketing
23	−0.41643	Public Opinion Quarterly
24	−0.28235	International Journal of Electronic Commerce
25	−0.19797	Journal of International Marketing
26	−0.16136	Australasian Marketing Journal
27	0.07485	Journal of Product Innovation Management
28	0.11236	Journal of Personal Selling and Sales Management
29	0.13510	California Management Review
30	0.13823	Journal of Economic Psychology
31	0.14165	Journal of Public Policy and Marketing
32	0.18434	Journal of Service Research
33	0.26604	Journal of Consumer Affairs
34	0.28414	Journal of Retailing and Consumer Services
35	0.43279	Journal of Business Ethics
36	0.44329	Journal of Consumer Satisfaction Dissatisfaction and Complaining Behavior
37	0.44931	Journal of Marketing Management
38	0.58658	Journal of Marketing Education
39	0.61954	Journal of The Market Research Society
40	0.72947	Marketing Management
41	0.73900	Journal of Travel and Tourism Marketing
42	0.75892	AMA Proceedings
43	0.91981	Journal of Brand Management
44	0.96944	Decision Sciences
45	0.98520	Journal of International Consumer Marketing
46	0.98621	Business Horizons
47	1.08217	Marketing Theory
48	1.19858	Journal of Market Focused Management
49	1.21928	Journal of Marketing Channels
50	1.23112	Journal of International Marketing and Marketing Research
51	1.27731	International Journal of Retail and Distribution Management
52	1.29159	International Marketing Review
53	1.30056	Journal of Macromarketing
54	1.42408	Journal of Services Marketing
55	1.42430	International Journal of Market Research
56	1.44311	Australian Journal of Market Research
57	1.48487	Journal of Health Care Marketing
58	1.58257	Journal of Euromarketing
59	1.59445	Journal of Marketing Communications
60	1.60188	International Journal of Advertising
61	1.61947	Journal of Consumer Policy
62	1.69454	Journal of Product and Brand Management
63	1.91397	Journal of Interactive Marketing
64	1.93856	Journal of Consumer Marketing
65	2.01934	Journal of Consumer Behaviour
66	2.15346	Journal of Targeting Measurement and Analysis for Marketing
67	2.24141	Marketing Education Review
68	2.41478	Journal of Nonprofit and Public Sector Marketing
69	2.51601	International Journal of Bank Marketing
70	2.64992	Journal of Marketing Theory and Practice
71	2.66949	Journal of Professional Service Marketing
72	2.73127	Journal of Financial Services Marketing
73	2.80419	Marketing Intelligence and Planning
74	2.80550	Journal of Database Marketing
75	2.87474	Journal of Business and Industrial Marketing
76	3.10282	Journal of Business to Business Marketing
77	3.35186	Journal of Relationship Marketing
78	3.45244	Journal of Business Logistics
79	4.81557	Journal of Global Marketing

[a] The first dimension's score by the principal component analysis on the transformed data over 13 studies.

demonstrated in integrating journal rankings across studies. Second, readers can logically get the idea that this new method can be applied to any situation that needs to integrate multi-method and multi-evaluator rankings or ratings of various marketing situations such as salesperson or retail store performance, segment market attractiveness, new product idea screening, and advertisement. Third, the study updates the rankings of marketing journals. Updated rankings are always needed as new journals come out and some existing journals improve themselves.

On the other hand, limitations of this study should be recognized. First, it might be possible that this study provides a somewhat misleading aggregation of studies that were done with different objectives, at different points of time, and by authors with various institutional affiliations with different strategic research priorities. Submitting these data to the PRINQUAL procedure does not remove the qualitative limitations of the original sources. Second, the outcome rankings are *global, ignoring* the subfields of marketing. Disaggregate rankings, which examine subfields, might be more insightful and have more perspective than global rankings across subfields. Third, the study did not elaborate the seriousness of missing data and different kinds of scales used in different rankings studies. A future study needs to examine what the characteristics of these problems are, how big a problem they are, and what controversy may exist over the ranking of marketing journals. Fourth, how the new method, PRINQUAL, compares to existing methods and why, beyond the technical differences, its results provide deeper insight than past rankings should be investigated. Regardless of the interesting features of a new method, there is a certain burden of proof that has to be met. Fifth, the study focused on technical solutions, but a future study needs to provide a stronger description of the conceptual model underlying rankings. For example, future research needs to investigate the impact of qualitative features, such as ranking methods, type of raters and respondents, sub-field orientation, size of sub-field catered to, and type of institutions. Such a meta-analysis will be useful to explain ranking variations across the studies.

There are a few more suggestions for future research, particularly, on marketing journal rankings. First, the quality of a journal *changes over* time, but its change would be captured slowly when old rankings studies are all integrated with new ones. This study used rankings studies of less than the five years except one study, but the latest ones among them might convey the current ranks of journals more accurately.

Second, ranking studies tend to give a higher rank to pure theoretical and methodological journals (Lehmann, 2005). Therefore, problem-solving and narrowly defined specialized journals have little chance to be ranked high. This may hinder area specializations and implementation orientations of researchers. As a result, academia may be separated from industries and their research may accordingly lose relevance and significance to practitioners.

Third, the rankings made by institutions might have depended on not only the objective quality of journals but also the institutions' strategic research priorities and their unique internal

Table 6
Cluster analysis results for 79 marketing journals: 2- to 10-cluster solutions.

Rank	Clusters									Journal
	2	3	4	5	6	7	8	9	10	
1	1	1	1	1	1	1	1	1	1	J. of Marketing
2	1	1	1	1	1	1	1	1	1	J. of Marketing Research
3	1	1	1	1	1	1	1	1	1	J. of Consumer Research
4	1	1	1	2	2	2	2	2	2	Marketing Science
5	1	1	2	3	3	3	3	3	3	J. of The Academy of Marketing Science
6	1	1	2	3	3	3	3	4	4	J. of Retailing
7	1	1	2	3	3	3	3	4	4	Int'l J. of Research in Marketing
8	1	2	3	3	4	4	4	5	5	Marketing Letters
9	1	2	3	3	4	4	4	5	5	Management Science
10	2	2	3	4	4	4	5	6	6	Harvard Business Review
11	2	2	3	4	4	4	5	6	6	J. of Advertising Research
12	2	2	3	4	4	4	5	6	6	J. of Advertising
13	2	2	3	4	4	4	5	6	6	J. of Business Research
14	2	2	3	4	4	4	5	6	6	Psychology and Marketing
15	2	2	3	4	4	5	6	7	7	J. of Int'l Business Studies
16	2	2	3	4	4	5	6	7	7	J. of Business
17	2	2	3	4	4	5	6	7	7	European J. of Marketing
18	2	2	3	4	4	5	6	7	7	Sloan Management Review
19	2	2	3	4	4	5	6	7	7	Industrial Marketing Management
20	2	2	3	4	4	5	6	7	7	J. of Consumer Psychology
21	2	2	3	4	4	5	6	7	7	Advances in Consumer Research
22	2	2	3	4	4	5	6	7	7	*J. of Strategic Marketing*
23	2	2	3	4	4	5	6	7	7	Public Opinion Quarterly
24	2	2	3	4	4	5	6	7	7	Int'l J. of Electronic Commerce
25	2	2	3	4	4	5	6	7	7	J. of Int'l Marketing
26	2	2	3	4	4	5	6	7	7	Australasian Marketing Journal
27	2	2	3	4	5	5	6	7	8	J. of Product Innovation Management
28	2	2	3	4	5	5	6	7	8	J. of Personal Selling and Sales Management
29	2	2	3	4	5	5	6	7	8	California Management Review
30	2	2	3	4	5	5	6	7	8	J. of Economic Psychology
31	2	2	3	4	5	5	6	7	8	J. of Public Policy and Marketing
32	2	2	3	4	5	5	6	7	8	J. of Service Research
33	2	2	3	4	5	5	6	7	8	J. of Consumer Affairs
34	2	2	3	4	5	5	6	7	8	J. of Retailing and Consumer Services
35	2	2	3	4	5	5	6	7	8	J. of Business Ethics
36	2	2	3	4	5	5	6	7	8	J. of Cons Sat. Dis. and Complaining Behavior
37	2	2	3	4	5	5	6	7	8	J. of Marketing Management
38	2	3	4	4	5	6	7	8	8	J. of Marketing Education
39	2	3	4	4	5	6	7	8	8	J. of The Market Research Society
40	2	3	4	4	5	6	7	8	8	Marketing Management
41	2	3	4	5	5	6	7	8	8	J. of Travel and Tourism Marketing
42	2	3	4	5	5	6	7	8	8	AMA Proceedings
43	2	3	4	5	5	6	7	8	8	J. of Brand Management
44	2	3	4	5	5	6	7	8	8	Decision Sciences
45	2	3	4	5	5	6	7	8	8	J. of Int'l Consumer Marketing
46	2	3	4	5	5	6	7	8	8	Business Horizons
47	2	3	4	5	5	6	7	8	9	Marketing Theory
48	2	3	4	5	5	6	7	8	9	J. of Market Focused Management
49	2	3	4	5	5	6	7	8	9	J. of Marketing Channels
50	2	3	4	5	5	6	7	8	9	J. of Int'l Marketing and Marketing Research
51	2	3	4	5	5	6	7	8	9	Int'l J. of Retail and Distribution Management
52	2	3	4	5	5	6	7	8	9	Int'l Marketing Review
53	2	3	4	5	5	6	7	8	9	J. of Macromarketing
54	2	3	4	5	5	6	7	8	9	J. of Services Marketing
55	2	3	4	5	5	6	7	8	9	Int'l J. of Market Research
56	2	3	4	5	5	6	7	8	9	Australian J. of Market Research
57	2	3	4	5	5	6	7	8	9	J. of Health Care Marketing
58	2	3	4	5	5	6	7	8	9	J. of Euromarketing
59	2	3	4	5	5	6	7	8	9	J. of Marketing Communications
60	2	3	4	5	5	6	7	8	9	Int'l J. of Advertising
61	2	3	4	5	5	6	7	8	9	J. of Consumer Policy
62	2	3	4	5	5	6	7	8	9	J. of Product and Brand Management
63	2	3	4	5	6	6	7	8	9	J. of Interactive Marketing
64	2	3	4	5	6	6	7	8	9	J. of Consumer Marketing
65	2	3	4	5	6	6	7	8	9	J. of Consumer Behaviour
66	2	3	4	5	6	7	8	9	9	J. of Targeting Meas. and Analy. for Marketing
67	2	3	4	5	6	7	8	9	9	Marketing Education Review
68	2	3	4	5	6	7	8	9	10	J. of Nonprofit and Public Sector Marketing
69	2	3	4	5	6	7	8	9	10	Int'l J. of Bank Marketing
70	2	3	4	5	6	7	8	9	10	J. of Marketing Theory and Practice
71	2	3	4	5	6	7	8	9	10	J. of Professional Service Marketing
72	2	3	4	5	6	7	8	9	10	J. of Financial Services Marketing
73	2	3	4	5	6	7	8	9	10	Marketing Intelligence and Planning
74	2	3	4	5	6	7	8	9	10	J. of Database Marketing

(*continued on next page*)

Table 6 (*continued*)

Rank	Clusters									Journal
	2	3	4	5	6	7	8	9	10	
75	2	3	4	5	6	7	8	9	10	J. of Business and Industrial Marketing
76	2	3	4	5	6	7	8	9	10	J. of Business to Business Marketing
77	2	3	4	5	6	7	8	9	10	J. of Relationship Marketing
78	2	3	4	5	6	7	8	9	10	J. of Business Logistics
79	2	3	4	5	6	7	8	9	10	J. of Global Marketing

F-Value = 187.24, 253.06, 229.36, 193.83, 276.28, 444.65, 463.91, 383.75, and 512.39, respectively, for 2- to 10-cluster solutions. Every solution was significant at 0.0001.

politics. For example, the institutions could have ranked higher the journals that matched their strategic research directions and fields in order to encourage faculty to publish in those journals. Consumer research-focused schools would have ranked consumer research journals higher, whereas methodology-focused schools would have favored methodological journals. In addition, influential senior faculty who exercised great decision-making power could have ranked the journals where they published more favorably than their proper ranks. This study had no way to detect the role of institutional strategy and politics. However, the effect of such factors could have been apparently reduced because institutional rankings were balanced with institution-free rankings studies published in academic journals.

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PRINQUAL algorithms

This section introduces the algorithms for the PRINQUAL Procedure, heavily citing the technical report that Kuhfeld (1990) wrote for SAS Institute. PRINQUAL is a data transformation procedure and original contributors to the algorithms include Kruskal and Shepard (1974), Young et al. (1978), and Winsberg and Ramsay (1983). PRINQUAL can estimate optimal scores for nonmetric variables, using a variety of transformation methods, all of which can impute missing data without constraint, with category constraints, or with order constraints (Young, 1981). A different method is recommended for different situations. Specifically, the OPSCORE transformation, which minimizes squared error, is applied to transforming nominal-scaled variables (Fisher, 1938). The MONOTONE transformation, which also minimize square error, is applied to ordinal-scaled variables, weakly preserving the order (possibly merging adjacent categories) (Kruskal, 1964). The LINEAR (linearly-transforming), SPLINE (nonlinearly transforming with spline), or MSPLINE (monotone spline) transformation is applied to interval- or ratio-scaled variables (de Boor, 1978; van Rijckeveorsel, 1982; Winsberg and Ramsay, 1980).

PRINQUAL extends the ordinary general linear model by providing optimal variable transformations that are iteratively derived using the method of alternating least-squares (Young, 1981). The alternating least-squares algorithm replaces a matrix with a vector and fits a linear model for many types of scales and any mixture of scale types. It iterates until convergence, alternating between the following two steps: (1) Finding least-squares estimates of the parameters of the model (given the current scoring of the data, that is, the current set of vectors) and (2) finding least-squares estimates of the scoring parameters (given the current set of model parameters).

An alternating least-squares optimal scaling algorithm estimates the parameters of the linear model. These parameters are used to create the predicted values or target for each variable that can be transformed. Each target minimizes squared error. Then, the algorithms try to estimate the vector that is a linear combination of the columns of the matrix, a matrix with more than one column in case of estimating missing values. Accordingly, the algorithms, which PRINQUAL use to produce the optimally scaled variable, require two vectors: the initial variable scaling vector **x** and the target vector **y**. For convenience, both **x** and **y** vectors are sorted on the values of **x**. The vectors are partitioned into missing and nonmissing parts $(\mathbf{x}_m', \mathbf{x}_n')'$ and $(\mathbf{y}_m', \mathbf{y}_n')'$.

Every ordinary missing value as well as every distinct nonmissing value forms a separate category. Once category membership is determined, category means are computed, which are Fisher's (1938) optimal scores. For example, for MONOTONE transformations, order constraints are imposed on the category means for the nonmissing partition by merging categories that are out of order.

The following exhibits PRINQUAL' three major method algorithms: MAC, MTV, and MGV. *The MAC method* (Kuhfeld et al., 1986) uses an iterated constrained multiple regression algorithm in an attempt to maximize the average of the elements of the correlation matrix. This method transforms each variable to be in a least-squares sense as similar to the average of the remaining variables as possible. It uses the following algorithm:

Input the data matrix **X**
Perform the nonoptimal transformations
Store a copy of **X** for use in optimal scaling
Perform missing value initialization
Scale the variables of **X** to mean zero and appropriate variance
Repeat for a maximum number of iterations or until convergence:
  Do for all variables:
  Select the *i*th variable as a criterion
  Approximate the criterion using the mean of the remaining variables
  Optimally scale the approximation and store in **x**
  Standardize **x** to mean zero and appropriate variance
  Replace the *i*th column of **X** with **x**
  End variable loop
  Evaluate change and output iteration convergence information
  End iteration loop
Perform the final standardization
Output the results.

The MTV method (Young et al., 1978) is based on the principal component model and attempts to maximize the sum of the first *r* eigenvalues of the covariance matrix. This method transforms variables to be in a least-squares sense as similar to linear

combinations of the r principal component score variables as possible, where r can be much smaller than the number of variables. This maximizes the total variance of the first r components (Kuhfeld et al., 1985). The method uses the following algorithm:

Input the data matrix **X**
Perform the nonoptimal transformations
Store a copy of **X** for use in optimal scaling
Perform missing value initialization
Scale the variables of **X** to mean zero and appropriate variance
Perform any necessary initializations
Repeat for a maximum number of iterations or until convergence:
  Compute **R**, the covariance matrix of **X**
  Compute **W**, the first r eigenvectors of **R**
  Approximate **X** with $\mathbf{XWW}'$
  Replace **X** with the optimally scaled variables of $\mathbf{XWW}'$
  Scale the variables of **x** to mean zero and appropriate variance
  Evaluate change and output iteration convergence information
  End iteration loop
Perform the final standardization
Output the results.

The MGV method (Kuhfeld et al., 1985) uses an iterated multiple regression algorithm in an attempt to minimize the determinant of the covariance matrix of the transformed variables. This method transforms each variable to be in a least-squares sense as similar to linear combinations of the remaining variables as possible. This locally minimizes the generalized variance of the transformed variables, the determinant of the covariance matrix, the volume of the parallelepiped defined by the transformed variables, and sphericity (Kuhfeld et al., 1985). The method uses the following algorithm:

Input the data matrix **X**
Perform the nonoptimal transformations
Store a copy of **X** for use in optimal scaling
Perform missing value initialization
Scale the variables of **X** to mean zero and appropriate variance
Perform any necessary initializations
Repeat for a maximum number of iterations or until convergence:
  Do for all variables:
  Select the *i*th variable as a criterion
  Select a full rank set of predictors from all other variables
  Approximate the criterion using regression
  Optimally scale the approximation and store in **x**
  Standardize **x** to mean zero and appropriate variance
  Replace the *i*th variable of **X** with **x**
  End variable loop
  Evaluate change and output iteration convergence information
  End iteration loop
Perform the final standardization
Output the results.

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