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From academic research to marketing practice: Exploring the marketing science value chain[☆]

John H. Roberts^{a,*}, Ujwal Kayande^b, Stefan Stremersch^{c,d}

^a London Business School and Australian National University, Canberra, Australia

^b Melbourne Business School, Melbourne, Australia

^c Erasmus School of Economics, Erasmus University Rotterdam, The Netherlands

^d IESE Business School, University of Navarra, Barcelona, Spain

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ABSTRACT

We aim to investigate the impact of marketing science articles and tools on the practice of marketing. This impact may be direct (e.g., an academic article may be adapted to solve a practical problem) or indirect (e.g., its contents may be incorporated into practitioners' tools, which then influence marketing decision making). We use the term "marketing science value chain" to describe these diffusion steps, and survey marketing managers, marketing science intermediaries (practicing marketing analysts), and marketing academics to calibrate the value chain. In our sample, we find that (1) the impact of marketing science is perceived to be largest on decisions such as the management of brands, pricing, new products, product portfolios, and customer/market selection, and (2) tools such as segmentation, survey-based choice models, marketing mix models, and pre-test market models have the largest impact on marketing decisions. Exemplary papers from 1982 to 2003 that achieved *dual* – academic and practice – impact are Guadagni and Little (1983) and Green and Srinivasan (1990). Overall, our results are encouraging. First, we find that the impact of marketing science has been largest on marketing decision areas that are important to practice. Second, we find moderate alignment between academic impact and practice impact. Third, we identify antecedents of practice impact among dual impact marketing science papers. Fourth, we discover more recent trends and initiatives in the period 2004–2012, such as the increased importance of big data and the rise of digital and mobile communication, using the marketing science value chain as an organizing framework.

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1. Introduction

Does marketing science research affect marketing practice? Which decisions have marketing science articles supported? To which tools has marketing science contributed? Which marketing science articles have had dual impact on both science and practice? These are key questions that we address in this paper. We define *marketing science* as the development and use of quantifiable concepts and quantitative tools to understand marketplace behavior and the effect of marketing activity upon it. From this definition, one would consider it reasonable for marketing scientists to seek impact on marketing practice, i.e., seek relevance.

However, marketing scientists have recently rekindled the age-old debate on rigor versus relevance. On the one hand, marketing science

has been very successful in attracting scholars from other fields such as economics, statistics, econometrics and psychology. This inflow of talented scientists from other fields has clearly added to the rigor of marketing science and has allowed the development of new techniques. On the other hand, a number of academic scholars have recently called for more emphasis to be placed on the application of marketing science to industry problems, rather than rigor per se (e.g., Lehmann, McAlister, & Staelin, 2011; Lilien, 2011; Reibstein, Day, & Wind, 2009). Such application may also show positive returns to firms. Germann, Lilien, and Rangaswamy (2013) find that increasing analytics deployment by firms leads to an improvement in their return on assets.

Despite the importance of this debate for our field and the strong interest in the drivers of academic impact (e.g., see Stremersch & Verhoef, 2005; Stremersch, Verniers, & Verhoef, 2007), empirical examination of the impact of marketing science on practice is rare. Valuable exceptions are Bucklin and Gupta (1999), Cattin and Wittink (1982), Wittink and Cattin (1989), and Wittink, Vriens, and Burhenne (1994). However, their application areas were narrow. Wittink and his colleagues studied the commercial use of conjoint analysis in North America and Europe, while Bucklin and Gupta studied the usage of scanner data and the models that scholars have developed to analyze them. Other scholars

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* Corresponding author.
E-mail addresses: jhroberts@london.edu (J.H. Roberts), U.Kayande@mbs.edu (U. Kayande), stremersch@ese.eur.nl (S. Stremersch).

have conceptually reviewed the impact of marketing science and prescribed areas in which marketing science might have an impact in the future. In a special issue of the *International Journal of Research in Marketing*, Leeflang and Wittink (2000) summarized the areas in which marketing science has been used to inform management decisions. Roberts (2000) acknowledged the breadth of marketing science applications, but lamented the depth of penetration of marketing science (i.e., the proportion of management decisions informed by marketing science models). Lilien, Roberts, and Shankar (2013) take an applications-based approach to best practice. However, there has been no broad systematic investigation of which marketing science articles and tools have been applied, the decisions that these concepts and tools have informed, and the perceptions of different stakeholders of the usefulness of marketing science in informing decisions. We aim to address this void.

We develop the concept of the *marketing science value chain*, which captures the diffusion of insights from academic articles in a direct (e.g., from article to practice) or indirect (e.g., from article to marketing science tool to practice) manner. We survey the primary agents in this value chain – marketing managers, marketing science intermediaries (marketing analysts), and marketing academics – to calibrate the practice impact of marketing science in all its facets.

2. Methodology

2.1. The framework: The marketing science value chain

An important step in our methodology is a conceptualization of the marketing science value chain. Our representation of this chain, illustrated in Fig. 1, depicts activities (full arrows) by which marketing science is translated from academic knowledge to practical tools, and

thence to marketing action, as well as the participants involved in the chain.

First, new knowledge (marketing science *articles*) is developed, often but not always, by marketing academics.¹ Second, knowledge conversion occurs when new knowledge in articles is adapted and integrated into practical *tools and approaches*, often but again not always, by marketing intermediaries, such as market research agencies (e.g. ACNielsen or GfK), marketing and strategy consultancies (e.g., McKinsey or Bain), specialist niche marketing consulting firms (e.g. Advanis or Simon-Kucher Partners), or the marketing science division of a marketing organization (e.g. Novartis or General Mills). Third, knowledge application occurs when marketing managers implement marketing science knowledge via practical tools to make *marketing decisions*.

While we contend in Fig. 1 that marketing intermediaries play a critical role in the diffusion process, we allow for a direct path as well (dis-intermediation). For example, marketing academics may work directly with marketing managers to have their tools adopted (marketing science push) or a firm's internal analysts may actively seek out solutions to address the firm's specific problems (marketing science pull). Alternatively, the locus of conceptual innovation may fall further down the value chain (user innovation). Moreover, diffusion may occur through routes other than through intermediaries (for example, via specialist books such as Lilien, Kotler, & Moorthy, 1992; Wierenga & van Bruggen, 2000, and Lilien, Rangaswamy, & De Bruyn, 2007 or general texts such as Kotler & Keller, 2012). In other words, the “direct” influence in Fig. 1 may include a number of further sub-stages that we do not explicitly identify or calibrate.

2.2. The elements: Decisions, tools and articles

In Fig. 1, we identify three core elements in the marketing science value chain: decisions, tools, and articles. Selection of stimuli in each of these elements is a critical part of our methodology, especially considering the scope of our study. Not only have thousands of marketing articles been published across many journals, but marketing managers make decisions to solve marketing problems in a wide variety of areas (pricing, promotions, sales force management, etc.), using a considerable range of marketing science tools (segmentation tools, choice models, etc.) to assist in that decision making. To make our calibration practically feasible, we decided to limit the three sets of stimuli to 12 decision areas, 12 marketing science tools, and 20 marketing science articles. We decided on these limits iteratively, by trading off the need for a comprehensive classification of the decisions, tools, and articles against the time required for respondents to react to the stimuli. In Section 3.5 we discuss the dynamics of these three elements.

2.2.1. Decisions

Marketing decisions refer to the choice of management actions regarding any part of the firm's marketing activity. To categorize marketing decisions, we followed a four-step procedure. First, we examined subject areas used at the major marketing journals and in leading marketing management textbooks. Second, we integrated and synthesized these lists to create an exhaustive inventory. Third, we aggregated the different decision areas into higher order categories, to create a manageable number. Finally, we tested our list with practicing managers and the Executive Committee of the Marketing Science Institute, and refined it based on their feedback. Our final list of marketing decision areas is:

1. *Brand management*: Developing, positioning and managing existing brands.

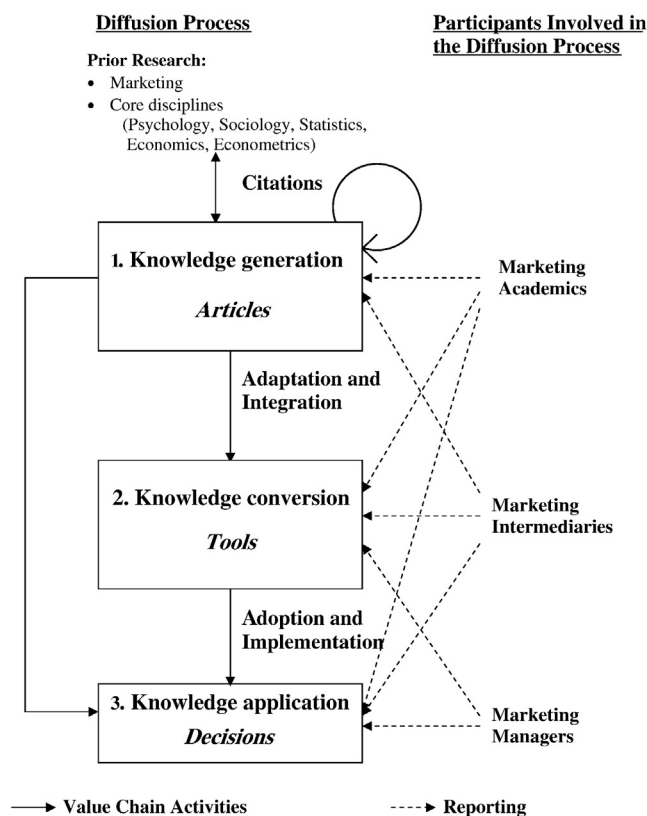


Fig. 1. The marketing science value chain.

¹ For example, a study of *Marketing Science* over the period 1982–2003 shows that of 1072 article authors, 1001 of them were academics (93.4%) Authors with multiple articles are counted as many times as they have (co-)authored an article.

2. *New product/service management*: New product development, management and diffusion.
3. *Marketing strategy*: Product line, multi-product and portfolio strategies.
4. *Advertising management*: Advertising spending, planning and design.
5. *Promotion management*: Promotion decisions.
6. *Pricing management*: Pricing decisions.
7. *Sales force management*: Sales force size, allocation, and compensation decisions.
8. *Channel management*: Channel strategy, design, and monitoring.
9. *Customer/market selection*: Targeting decisions.
10. *Relationship management*: Customer value assessment and maximization, acquisition, retention, and relationship management.
11. *Managing marketing investments*: Organizing for higher returns and internal marketing.
12. *Service/product quality management*: Any aspect of quality management.

2.2.2. Tools

Tools are approaches and methodologies that can be used to support marketing decisions. To categorize marketing science tools, we followed a procedure similar to the one used for decision areas (using marketing research and marketing analysis texts). Our list of tools is:

1. *Segmentation tools*: latent class segmentation, cluster analysis, etc.
2. *Perceptual mapping*: multidimensional scaling, factor analysis, etc.
3. *Survey-based choice models*: conjoint analysis, discrete choice, etc.
4. *Panel-based choice models*: choice models, stochastic models, etc.
5. *Pre-test market models*: ASSESSOR, durable pre-testing, etc.
6. *New product models*: diffusion models, dynamic models, etc.
7. *Aggregate marketing response models*: marketing mix models, etc.
8. *Sales force allocation models*: Call planning models, etc.
9. *Customer satisfaction models*: Models of service quality, satisfaction, etc.
10. *Game theory models*: Models of competition, channel structure, etc.
11. *Customer lifetime value models*: Loyalty and direct marketing models, etc.
12. *Marketing metrics*: Accounting models, internal rate of return, etc.

2.2.3. Articles

We selected candidate articles for the twenty marketing science articles by applying four filters. First, we filter the journals and time period from which to sample. Second, we select 200 articles in the sampled journals and time period, which have made the highest academic impact, measured by age-adjusted citations. Third, we reduce the list of 200 to 100, by weighing impact with the likelihood to which an article represents marketing science. Fourth, we reduce the list of 100 high-impact marketing articles to the 20 articles that marketing intermediaries rated as most impactful on marketing practice. Next, we explain this procedure in greater detail.

For the first filter, our aim was to achieve a good representation of major marketing journals, which we based on prior scientometric work in marketing (Stremersch et al., 2007). We excluded the *Journal of Consumer Research (JCR)* as it is not an outlet that typically publishes marketing science articles. We added *Management Science*, because it consistently features in the *Financial Times* Top 45, for example, and has a marketing section. This step thus led us to the following selection of journals: *International Journal of Research in Marketing (IJRM)*, *Journal of Marketing (JM)*, *Journal of Marketing Research (JMR)*, *Management Science (MGS)* and *Marketing Science (MKS)*.

Next, we assessed how long the journals were covered in the Social Science Citation Index. Young journals need time to mature and become academically and practically impactful, which may make them less suited for our goals, even if they are a top journal. *IJRM* is the youngest top journal in the set and was not included in the Social Science Citation

index until 1997. Therefore, in 2006, it was very unlikely for *IJRM* articles from the period 1997–2003 to have amassed enough citations to be among the top 200 age-adjusted cited articles and be included in our further analytical steps. Later analyses on an expanded sample that included *IJRM* showed this assessment to be accurate. The most highly ranked *IJRM* article was Geyskens, Steenkamp, and Kumar (1998) at rank 255. We selected the period 1982–2003 as observation window. We chose the start year of our data to coincide with the launch of *Marketing Science* in 1982. We chose the end year of 2003 to allow articles at least 2 full years for their impact to materialize (this is common in citation studies, see Stremersch et al., 2007).

Second, we rank-ordered the resultant 5556 articles on their academic importance, as measured by age-adjusted citations (see Stremersch et al., 2007 for a similar procedure). As citations show a time trend, we first de-trended our measure by regressing the number of citations of an article i ($CITE_i$) on the number of quarters (Q_i) that have passed between publication and the quarter in which we gathered the citations and its square (Q_i^2), including a constant (across all articles). We conducted this study in the 3rd quarter of 2006 and, thus, we obtained the stock of citations that were in ISI databases, in that quarter.

As $CITE_i$ shows over-dispersion, we specified a negative binomial count model and optimized with quadratic hill climbing. As expected, our results indicated an inverted U-shaped time trend (the estimated coefficients for Q_i and Q_i^2 were 0.07 and $-4.76E-04$ respectively, both significant at $p < 0.001$; $R^2 = 0.035$). We obtain standardized residuals from the model, denoted by $CITERESID_i$, which can be regarded as a time-corrected citation measure of academic impact. We retained the top 200 articles ranked on this academic impact measure.

Third, we examined the *MGS* articles in this top 200 and excluded the 71 articles that did not consider a marketing subject, because they could not possibly be “marketing” science. Next, we calculated the extent to which each of the 129 remaining marketing articles is a marketing “science” article. We found the task of defining marketing “science” difficult. After many discussions with experts, we came to the following working definition: “Marketing science is the development and use of quantifiable concepts and quantitative tools to understand marketplace behavior and the effect of marketing activity upon it.”²

To determine whether a specific article satisfied this definition, we asked five pairs of two marketing science experts – members of the *Marketing Science* and *IJRM* Editorial Boards, and leading marketing intermediaries – to individually code 100 articles published in the four journals in a hold out sample published in 2004–2005,³ as marketing science articles, or not. The proportion of agreement between the raters was 0.77, which translated into a proportional reduction of loss (PRL) inter-rater reliability measure of 0.72 (Rust & Cooil, 1994), satisfactory for the exploratory nature of our research. We created a variable that took the value 1 if both raters agreed it was a marketing science article, 0 otherwise.

Next, we inventoried the number of equations to measure an article’s mathematical sophistication (also used by Stremersch & Verhoef, 2005), the methodologies an article uses, going from qualitative techniques to time series and analytical models, and the number of referenced articles in econometrics, statistics and mathematics. Step-wise logistic regression revealed two significant predictors: the number of equations and whether the methodology used factor and/or cluster analysis or not. The more equations an article contains, the higher the likelihood of it being considered a marketing science article. Articles that use factor or cluster analyses are generally less perceived as a

² This definition aligns closely to the definition of marketing analytics of Germann et al.’s (2013).

³ We selected 25 articles from each of the four journals. Article selection was random for *JM*, *JMR*, and *Marketing Science*. For *Management Science*, we inventoried 25 articles from 2004 to 2005 that were marketing-related. The list of 100 articles is provided in Web Appendix 1.1.

Table 1
The 100 academically most impactful papers in marketing science (ordered by practice impact, and then by academic impact; complete bibliography is available in the Web Appendix 3).

Rank	Authors, publication year	Cites total	CITERESID	PROBMKS	Academic impact: MKSIMPACT	Practice impact: INTIMPACT
1	Green and Srinivasan (1990)	292	4.34	0.47	2.04	4.22
2	Louviere and Woodworth (1983)	195	2.99	0.78	2.35	3.56
3	Aaker and Keller (1990)	170	2.21	0.45	1.00	3.50
4	Cattin and Wittink (1982)	152	2.48	0.45	1.12	3.25
5	Guadagni and Little (1983)	431	7.44	0.80	5.94	3.22
6	Mahajan et al. (1990)	268	3.82	0.87	3.31	3.11
7	Rust et al. (1995)	146	2.88	0.77	2.22	3.00
8	Hauser and Shugan (1983)	152	2.21	0.93	2.04	3.00
9	Fornell, Johnson, Anderson, Cha, and Bryant (1996)	136	3.29	0.45	1.48	3.00
10	Griffin and Hauser (1993)	166	2.62	0.47	1.23	2.89
11	Day (1994)	321	6.63	0.45	2.98	2.67
12	Punj and Stewart (1983)	263	4.40	0.47	2.07	2.67
13	Fornell (1992)	159	2.55	0.80	2.04	2.67
14	Vanheerde et al. (2003)	25	2.01	0.72	1.45	2.63
15	Hunt and Morgan (1995)	149	2.95	0.45	1.33	2.63
16	Anderson, Fornell, and Lehmann (1994)	217	4.18	0.65	2.73	2.44
17	Simonson and Tversky (1992)	213	3.37	0.53	1.80	2.38
18	Boulding et al. (1993)	250	4.23	0.42	1.79	2.38
19	Parasuraman, Zeithaml, and Berry (1985)	765	12.08	0.45	5.44	2.25
20	Keller (1993)	250	4.23	0.45	1.90	2.25
21	Yu & Cooper (1983)	192	3.13	0.47	1.47	2.25
22	Urban, Carter, Gaskin & Mucha (1986)	162	2.07	0.57	1.19	2.25
23	Carpenter & Nakamoto (1989)	157	1.97	0.55	1.09	2.22
24	Zeithaml, Berry & Parasuraman (1996)	191	2.65	0.45	1.19	2.13
25	Dickson & Sawyer (1990)	160	2.09	0.45	0.94	2.13
26	Zeithaml, Parasuraman & Berry (1985)	225	5.41	0.14	0.76	2.13
27	Joreskog & Sorbom (1982)	133	2.04	0.84	1.71	2.11
28	Day & Wensley (1988)	233	3.14	0.45	1.41	2.11
29	Thaler (1985)	532	8.31	0.53	4.43	2.00
30	Kamakura & Russell (1989)	242	3.37	0.84	2.81	2.00
31	Zeithaml (1988)	390	5.64	0.45	2.54	2.00
32	Bolton (1998)	85	2.31	0.69	1.59	2.00
33	Tversky & Simonson (1993)	121	1.90	0.78	1.49	2.00
34	Churchill & Surprenant (1982)	262	4.58	0.13	0.60	2.00
35	Fornell & Bookstein (1982)	210	3.20	0.49	1.57	1.89
36	Mittal & Kamakura (2001)	56	2.62	0.59	1.56	1.89
37	Srivastava, Shervani & Fahey (1998)	92	2.55	0.45	1.15	1.88
38	Churchill, Ford, Hartley & Walker (1985)	161	2.14	0.45	0.96	1.88
39	Gupta (1988)	206	2.72	0.74	2.01	1.75
40	Teas (1993)	135	2.18	0.65	1.42	1.75
41	Anderson & Sullivan (1993)	200	3.34	0.65	2.18	1.67
42	Gutman (1982)	157	2.65	0.45	1.19	1.67
43	Jaworski and Kohli (1993)	411	7.64	0.53	4.07	1.63
44	Slater & Narver (1994)	238	5.22	0.45	2.35	1.63
45	Mcguire, TW & Staelin (1983)	140	2.08	0.95	1.98	1.63
46	Parasuraman, Zeithaml & Berry (1994)	178	3.14	0.57	1.80	1.63
47	Mackenzie & Lutz (1989)	208	2.82	0.47	1.33	1.63
48	Robinson & Fornell (1985)	174	2.33	0.55	1.29	1.63
49	Bitner, Booms & Tetreault (1990)	183	2.76	0.45	1.24	1.63
50	Bolton & Lemon (1999)	62	2.00	0.61	1.23	1.63
51	Henard & Szymanski (2001)	42	2.08	0.49	1.02	1.63
52	Bitner (1990)	294	4.28	0.45	1.93	1.50
53	Perreault & Leigh (1989)	168	2.13	0.65	1.39	1.50
54	Ruekert & Walker (1987)	185	2.39	0.45	1.08	1.50
55	Mackenzie, Lutz & Belch (1986)	167	2.11	0.45	0.95	1.50
56	Alba, Lynch, Weitz, Janiszewski, Lutz, Sawyer & Wood (1997)	182	5.15	0.45	2.32	1.38
57	Webster (1992)	273	4.57	0.45	2.06	1.38
58	Haubl & Trifts (2000)	60	2.26	0.49	1.11	1.38
59	Bearden, Sharma & Teel (1982)	125	1.89	0.45	0.85	1.38
60	Han, Kim & Srivastava (1998)	97	3.12	0.16	0.51	1.33
61	Dwyer & Schurr & Oh (1987)	632	9.53	0.45	4.29	1.25
62	Lynch & Ariely (2000)	83	3.35	0.47	1.58	1.25
63	Pollay (1986)	157	1.99	0.45	0.89	1.25
64	Bitner (1992)	281	4.03	0.45	1.82	1.22
65	Cronin & Taylor (1992)	399	6.82	0.21	1.45	1.22
66	Oliver (1999)	81	2.64	0.45	1.19	1.22
67	Garbarino & Johnson (1999)	114	4.15	0.13	0.54	1.22
68	Crosby, Evans & Cowles (1990)	259	3.74	0.13	0.49	1.22
69	Cronin & Taylor (1994)	153	2.62	0.45	1.18	1.13
70	Rindfleisch & Heide (1997)	92	2.43	0.45	1.09	1.13
71	Kalwani & Narayandas (1995)	117	2.12	0.45	0.96	1.13
72	Ganesan (1994)	311	6.07	0.13	0.80	1.13
73	Doney & Cannon (1997)	218	6.05	0.13	0.79	1.13
74	Morgan and Hunt (1994)	690	14.52	0.45	6.54	1.00
75	Bakos (1997)	156	4.52	0.89	4.04	1.00

Table 1 (continued)

Rank	Authors, publication year	Cites total	CITERESID	PROBMKS	Academic impact: MKSIMPACKT	Practice impact: INTIMPACT
76	Narver & Slater (1990)	440	6.83	0.45	3.08	1.00
77	Anderson, Hakansson & Johanson (1994)	139	2.55	0.45	1.15	1.00
78	Deshpande, Farley & Webster (1993)	119	1.92	0.45	0.87	1.00
79	Kohli & Jaworski (1990)	442	6.73	0.45	3.03	0.89
80	Jeuland & Shugan (1983)	185	2.87	0.96	2.76	0.89
81	Gorn (1982)	170	2.99	0.45	1.35	0.89
82	Anderson & Coughlan (1987)	213	2.89	0.45	1.30	0.89
83	Phillips, Chang & Buzzell (1983)	166	2.57	0.45	1.16	0.89
84	Gaski (1984)	164	2.30	0.45	1.03	0.89
85	Novak, Hoffman & Yung (2000)	92	3.77	0.13	0.50	0.89
86	Lovelock (1983)	191	2.98	0.45	1.34	0.78
87	Solomon, Surprenant, Czepiel & Gutman (1985)	158	2.12	0.45	0.96	0.75
88	Anderson & Narus (1990)	442	6.67	0.13	0.88	0.75
89	Zirger & Maidique (1990)	150	1.93	0.45	0.87	0.67
90	Deshpande & Zaltman (1982)	248	4.19	0.13	0.55	0.67
91	Sinkula (1994)	152	2.60	0.45	1.17	0.63
92	Anderson & Weitz (1989)	185	2.39	0.45	1.08	0.63
93	Hirschman & Holbrook (1982)	234	4.12	0.45	1.86	0.56
94	Huber & McCann (1982)	133	2.10	0.67	1.41	0.56
95	Tse & Wilton (1988)	175	2.21	0.47	1.04	0.56
96	Anderson & Weitz (1992)	265	4.18	0.17	0.73	0.56
97	Hoffman & Novak (1996)	287	7.31	0.45	3.29	0.50
98	Slater & Narver (1995)	197	3.54	0.45	1.59	0.44
99	Ferrell & Gresham (1985)	290	4.27	0.45	1.92	0.33
100	Gerbing and Anderson (1988)	453	6.64	0.21	1.41	0.33

Notes:

1. In the case of ties in practice impact, we reverted to academic impact to determine which articles got into the top 20.
2. CITERESID is age-adjusted citation impact, measured by the residual from the negative binomial model with citations as the dependent variable and quarters since publication and its square as the independent variables.
3. PROBMKS is the probability that the article is a marketing science article, see Section 2.2.3 for details.
4. MKSIMPACKT = CITERESID \times PROBMKS.
5. INTIMPACT is awareness-adjusted impact, which is the average impact across all respondents assuming that the impact is 0 for articles of which the respondent is not aware.

marketing science article, probably because these are exploratory techniques. The fit of this model is reasonable; the hit rate was 75%, which compares favorably to chance (50.5%). We applied these model coefficients, calibrated on the out-of-sample 2004–2005 articles, to the 129 marketing articles identified earlier and retrieve an estimated probability that an article is marketing science, denoted as *PROBMKS_i*.

We then weighted the age-adjusted citation impact (*CITERESID_i*) by the likelihood of the article being marketing science (*PROBMKS_i*) to obtain our final measure of marketing science academic impact for each article (*MKSIMPACT_i*). We rank-ordered the 129 articles on this latter measure and selected the top 100 articles. We provide the full list of 100 articles and all metrics in Table 1. Complete references are included in Web appendix 1.3. Table 1 shows that our methodology leads to credible results, with substantial face validity. For instance, Guadagni and Little (1983) and Mahajan, Muller, and Bass (1990) are more likely to be regarded as being marketing science articles than Morgan and Hunt (1994) and Jaworski and Kohli (1993).

Because one of our goals is to survey academics and intermediaries on the impact on practice of individual marketing science articles, we needed to reduce the list of 100 articles to 20, to make the task manageable for our respondents. In the final reduction from 100 articles to 20, we wanted to account for practice impact and asked 34 marketing intermediaries to rate the practical impact of four randomized blocks of 25 articles. The respondents were from a larger pool of 54 intermediaries (63% response rate) who worked in marketing science intermediary roles in firms such as AC Nielsen, Mercer, GfK, and McKinsey. These intermediaries were specifically selected because (i) they had previously published papers in or were on the Editorial Board of *Marketing Science*, and/or (ii) were past or current members of the Practice Committee of *INFORMS ISMS*. We asked these 34 respondents if they were aware of each article and, if so, the impact on practice that they believed that it had had, using a 5-point verbally anchored scale (1 = no influence; 5 = extremely influential). We gave a score of 0 to those articles of

which the respondents were not aware, assuming that there could not be a direct impact if the respondent was not even aware of the article when prompted. We then calculated an average impact across all respondents for each article, calling it an awareness-adjusted practice impact score (denoted as *INTIMPACT*). Rank-ordering all 100 articles on *INTIMPACT* allowed us to select the 20 highest ranked articles, which we used in our large-scale survey of academics and intermediaries. We found no significant differences in the average awareness-adjusted practice impact score across the four groups of intermediaries.

We acknowledge that starting with a citation screen (as well as a screen in terms of journal outlet) may preclude consideration of some papers with high impact on practice, but low impact on scholarship. Our intention though was not to measure which were the marketing articles with the highest practice impact per se. Rather our intention was to identify marketing papers with high dual impact, including both academic and practice impact.

2.3. The participants: Managers, intermediaries and academics

We use samples from each participant population (managers, intermediaries, and academics) to inventory the impact of marketing science on marketing practice, along the marketing science value chain, described in Fig. 1. We do not expect marketing managers to be aware of many, if any, academic articles, even where those articles have been incorporated into the marketing science tools that they routinely use. Thus, marketing managers can inform us only on knowledge conversion (tools) and knowledge application (decisions). However, we also calibrate managers' perceived importance of different areas of marketing decision making.

2.3.1. Sample of managers

Our sample of senior marketing managers consisted of Marketing Science Institute and Institute for the Study of Business Markets

(ISBM) members and company contacts. Both institutes graciously emailed a request from us to their members. In total, we solicited survey participation from 477 managers, of whom 94 (20%)⁴ provided usable responses. While this group comes from a well-defined population, it almost certainly has a bias towards greater sophistication. This sophistication is likely to introduce an upward bias in the perceived impact of tools and their influence in different areas (the absolute impact of marketing science). However, there is no reason to believe that this bias will be very different for different tools and decision areas, meaning any bias in the relative effects will likely be considerably less.

2.3.2. Sample of intermediaries

We used four sources to create the sample of intermediaries. First, we examined all articles published by practitioner analysts in *Marketing Science* and included those authors in our sample. Second, we examined the editorial boards of our target journals and included any intermediaries on these boards. Third, the Marketing Science Institute contacted the marketing intermediaries among their members on our behalf. Finally, we surveyed marketing intermediaries attending the 2007 ISMS Marketing Science Practice Conference, held at the Wharton School. In total, we solicited participation from 93 intermediaries, of whom 34 (37%) participated in the main survey. 21 of these respondents worked at marketing and/or management consulting firms such as McKinsey, AC Nielsen, and Millward Brown, while 13 respondents worked in firms such as General Motors, IBM, and Campbell Soup.

2.3.3. Sample of academics

We defined the sampling frame of marketing academics to be academic marketing science members of the editorial boards of the target journals. We excluded the authors of the current paper from this sampling frame. To identify the “marketing science” members of those editorial boards, we used a peer review process, in which we asked ten marketing science experts to indicate whether they would classify members of these editorial boards (223 in total) as marketing scientists or not.⁵ Of the 223 editorial board members in total, 126 were classified as marketing scientists, of whom 84 (67%) ultimately responded to our survey.

2.4. The instruments: Surveys among participants

Our instruments are as follows (see Web Appendix 1.2 for details). The survey to managers measured: (1) the overall influence of each of the 12 tools on marketing practice; (2) the overall influence of marketing science on each of the 12 marketing decision areas; and (3) the importance of the 12 marketing decision areas to their company. The survey to intermediaries and academics measured: (1) the overall influence of the 20 marketing science articles on marketing practice; (2) the overall influence of the 12 tools on marketing practice; and (3) the overall influence of marketing science on the 12 marketing decision areas. We also collected respondent background data for each sample.

Additionally, we surveyed the authors of the top 20 dual impact articles to probe: (1) other scholars who influenced the development and execution of the article; (2) academic ideas underlying the article, including the important papers on which the article was built; (3) practitioner influence on the development and execution of the article; (4) the practical ideas underlying the article; (5) whether there was cooperation with practitioners when developing the article; (6) any diffusion efforts the authors undertook to diffuse their work to academics

⁴ The response rate for the MSI sample was 53% and for the ISBM sample (where the participant request was less personalized), it was 16%. Note that our email solicitation included a URL, which increases the likelihood of the email being classified by spam filters as spam and thus not reaching many members of our sample. As a result, the response rate we report is a lower bound. This comment applies to all three samples (managers, intermediaries, and academics).

⁵ The inter-rater reliability using a separate sub-sample was 0.90, sufficiently high to indicate that our classification procedure is reliable.

and practitioners; (7) the stage of their career in which they wrote the article; and (8) the reasons that may have made the article impactful. We summarize our data collection approach in Fig. 2.

3. Results

Moving up the value chain illustrated in Fig. 1, we present the results of our research in four stages: the relative impact of marketing science on different decision making areas (Section 3.1), the impact that different marketing science tools and approaches have had on marketing practice (Section 3.2), the impact of the twenty articles on marketing decisions and tools (Section 3.3), and the antecedents of “dual” (academic and practice) impact from a survey of the authors of 20 top articles (Section 3.4). In Section 3.5, we identify trends since 2004 in the application and use of marketing science.

3.1. Impact of marketing science on marketing decisions

To inventory the impact of marketing science on marketing decision areas, we first present the self-stated importance of each decision area by manager respondents. Next, we present the extent to which our respondents felt that marketing science had impacted each marketing decision area. We end with graphically presenting the alignment between impact of marketing science on and the importance of the decision areas.

3.1.1. Importance of decision areas

In Table 2, we report the self-stated importance of each of the decision areas to the company, classified by type of firm (B2B, B2C, both B2B and B2C, and total). Overall, pricing management is rated the most important (aggregated across types of firms), while promotion management is rated the least important. However, there are notable differences across B2B and B2C firms. Managers of B2B firms consider pricing management to be the most important decision area, followed by customer/market selection and product portfolio management. Managers of B2C firms consider brand management and new product management to be the most important decision areas.

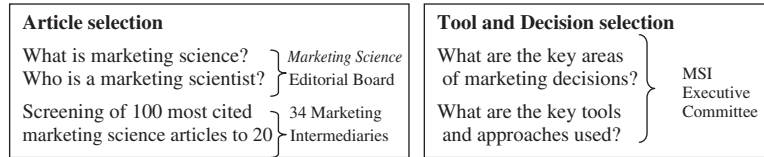
3.1.2. Impact of marketing science on decision areas

In Table 3, we present the perceived impact of marketing science on specific marketing decision areas, as perceived by academics (A), intermediaries (I), and managers (M). According to managers, marketing science has had the biggest impact on brand management decisions and pricing decisions (mean = 3.77 for both), and new product/service management and customer/market selection (mean = 3.66 for both). Academics feel that marketing science has made the biggest impact on brand management, new product/service management and promotion management. Intermediaries sense that marketing science has made the biggest impact on pricing management, promotion management, and new product/service management.

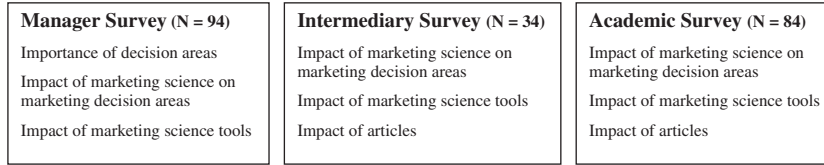
Interestingly, academics believe that marketing science had the biggest impact on promotion management among all decision areas (mean = 3.76), while managers consider that it had the smallest influence among all areas (mean = 3.14). For other areas, such as new product/service management, both seem to agree much more as to the relatively large extent to which marketing science has impacted such decisions (means = 3.70 and 3.66 respectively for academics and managers). Overall, Table 3 shows that while there is consensus between the academic and intermediary groups ($\rho_{AI} = 0.62$) and some moderate level of consensus between the intermediary and manager groups ($\rho_{IM} = 0.39$), there is much disagreement between academics and managers ($\rho_{AM} = 0.17$), pointing to the bridging role of marketing intermediaries.

In Table 3, we also present how managers perceived the impact of marketing science on different decision areas, split by type of firm. As expected, the results indicate some differences by type of firm. While

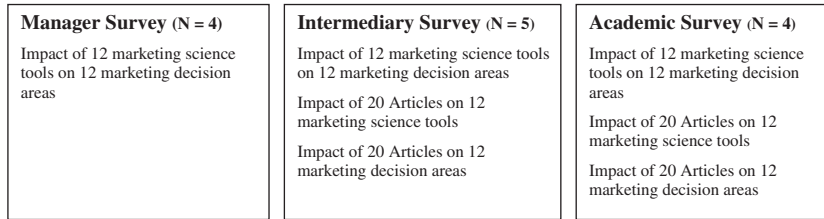
Stimuli



Main Questionnaire



Transition Matrices



Antecedents of impactful papers



Fig. 2. Overview of the primary data collection approach.

B2B managers perceive the biggest impact on pricing management, B2C managers perceive the impact to be largest on customer insight management. However, there is moderate consistency ($\rho_{B2B, B2C} = 0.45$).

3.1.3. Alignment between importance of decision areas and impact of marketing science

To examine whether the impact of marketing science on decision areas is aligned with the importance of the decision area to managers, we plot the importance against (managerial perceptions of) impact in Fig. 3. Considering the differences in importance as well as perceived impact across managers from different types of firms, we present the B2B and B2C plots separately. (We have not included the plots for firms that do both since these largely lie between the two).

Table 2

Average importance of decision areas according to managers in different types of firms (ordered per Table 3).

Decision areas	B2B (N = 59)	B2C (N = 10)	B2B & B2C (N = 25)	Total (N = 94)
Brand management	3.51	4.60	4.04	3.77
Pricing management	4.03	4.30	4.12	4.09
New product/service management	3.78	4.60	3.80	3.87
Customer/market selection	3.79	4.20	3.84	3.85
Product portfolio management	3.79	4.20	3.76	3.83
Customer insight management	3.16	4.20	3.80	3.45
Service/product quality management	3.57	3.80	3.52	3.58
Channel management	3.24	4.10	3.72	3.46
Relationship management	3.62	3.60	3.56	3.60
Salesforce management	3.62	4.30	3.60	3.69
Advertising management	2.69	3.90	3.24	2.97
Promotion management	2.68	4.00	3.12	2.95

Scale: 1: Of no importance. 5: Extremely important.

Both plots indicate that, by and large, the impact of marketing science is aligned with the perceived importance of the decision area. The most notable examples of under-performance are sales force management and service/product quality for both groups, relationship management for B2B, and advertising and channel management for B2C.

Table 3

Average impact of marketing science on decision areas (ordered by managers' perceptions; numbers represent average impact given awareness).

Decision areas	Academics	Intermediaries	Managers			
			All	B2B	B2C	B2B & B2C
Brand management	3.75	3.56	3.77	3.80	4.10	3.54
Pricing management	3.53	3.85	3.77	3.82	3.80	3.63
New product/service management	3.70	3.68	3.66	3.68	3.90	3.50
Customer/market selection ^b	3.24	3.58	3.66	3.70	3.60	3.58
Product portfolio management ^b	2.94	3.26	3.55	3.55	3.60	3.54
Customer insight management ^b	2.95	3.31	3.42	3.29	4.20	3.38
Service/product quality management	3.37	3.13	3.41	3.36	3.30	3.58
Channel management ^{b,c}	2.72	2.71	3.40	3.40	3.44	3.38
Relationship management	3.29	3.25	3.37	3.40	3.56	3.21
Sales force management ^{b,c}	3.43	2.80	3.26	3.29	3.44	3.13
Advertising management	3.22	3.47	3.15	2.93	3.40	3.54
Promotion management ^{b,c}	3.76	3.71	3.14	3.04	3.60	3.17
Average perceived impact	3.32	3.36	3.46	3.44	3.66	3.43

Scale: 1: No influence at all 5: Extremely influential.

^a Academics-intermediaries significantly different at $p < 0.05$.

^b Academics-managers significantly different at $p < 0.05$.

^c Intermediaries-managers significantly different at $p < 0.05$. Significance assessed with the Welch-Satterthwaite t -test.

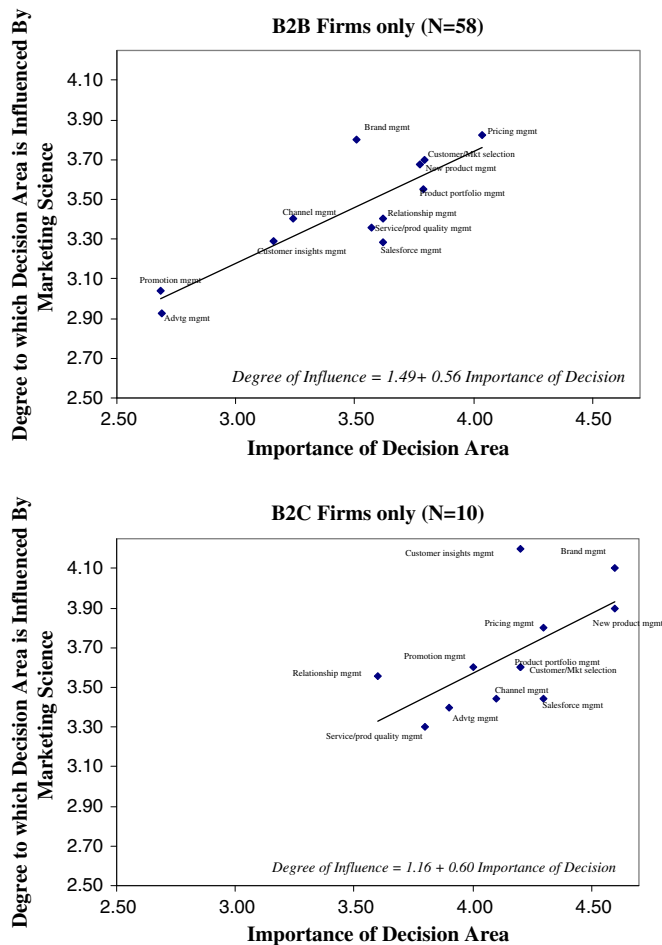


Fig. 3. Impact of marketing science versus importance of decision area (both according to managers).

3.2. Impact of marketing tools on marketing practice

Having gauged the decisions that are important to the firm and the extent to which marketing science has influenced them, we examine the tools that provide one route by which that influence is felt. In Table 4, we present the average impact of marketing science tools on marketing practice, as perceived by academics, intermediaries and managers. We also provide a split of manager perceptions, according to whether they are in a B2B, B2C, or both B2B and B2C firm.

According to managers, the top three marketing science tools and approaches are: (1) marketing segmentation tools (mean = 4.02), (2) marketing metrics (mean = 3.73), and (3) customer satisfaction models (mean = 3.59). While segmentation tools are also the number 1 pick of academics and intermediaries, opinions diverge on the other ones. Survey-based choice models (number 2 among intermediaries, mean = 4.15) and perceptual mapping techniques (number 2 among academics, mean = 3.99) had less of an impact on marketing practice, according to the marketing managers (means = 3.25 and 3.19 respectively for survey-based choice models and perceptual mapping techniques). Other tools that were consistently found to significantly impact practice are pre-test market models (number 3 or 4 in the three groups) and new product models (number 5 or 6 in the three groups). The different samples also consistently agree on the lack of practical impact of game theory models. The agreement between groups as to the impact of different tools is a lot stronger than the agreement we found on the impact of marketing science on the different decision areas: $\rho_{AI} = 0.80$, $\rho_{IM} = 0.70$, and $\rho_{AM} = 0.73$. Managers' average awareness of marketing science tools was close to 90%, which is

Table 4 Average impact of marketing science tools on marketing practice, according to academics, intermediaries, and managers (ordered by intermediaries' perceptions, numbers represent average impact given awareness).

Tools/approaches	Academics	Intermediaries	Managers			
			All	B2B	B2C	B2B & B2C
Segmentation tools ^c	4.29	4.44	4.02	4.00	4.30	3.96
Survey-based choice models ^{a,b,c}	3.71	4.15	3.25	3.06	3.50	3.58
Aggregate marketing mix models ^{a,b,c}	3.36	4.06	2.99	2.88	3.40	3.00
Pre-test market models ^{b,c}	3.93	3.94	3.38	2.98	4.30	3.71
Marketing metrics	3.54	3.77	3.73	3.72	3.67	3.76
New product models ^b	3.78	3.74	3.37	3.27	3.67	3.48
Customer life time value models ^{b,c}	3.84	3.63	3.07	3.18	2.70	3.00
Panel-based choice models ^{b,c}	3.76	3.58	2.82	2.73	3.11	2.87
Perceptual mapping ^{a,b}	3.99	3.53	3.19	3.14	3.80	3.04
Customer satisfaction model ^a	3.83	3.39	3.59	3.66	3.33	3.52
Sales force allocation models ^b	3.62	3.23	3.07	3.02	3.25	3.13
Game theory models	2.18	2.12	2.41	2.51	2.44	2.19
Average Perceived Impact	3.65	3.63	3.24	3.18	3.46	3.27

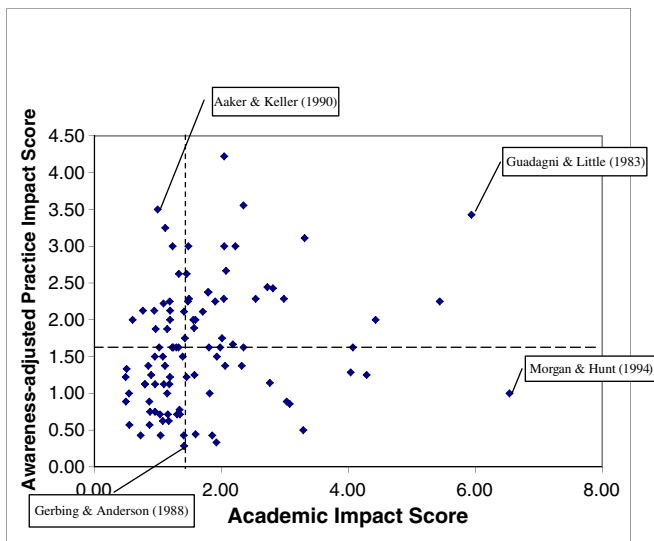
Scale: 1: No influence at all 5: Extremely influential.
^a Academics–intermediaries significantly different at $p < 0.05$.
^b Academics–managers significantly different at $p < 0.05$.
^c Intermediaries–managers significantly different at $p < 0.05$. Significance assessed with the Welch–Satterthwaite t -test.

encouraging. But again, we note that our sample is likely biased toward high levels of sophistication.

3.3. Impact of articles on marketing tools and directly on marketing practice

We continue to calibrate practice impact up the value chain in Fig. 1 by examining select marketing science articles and the effect that they have had both on marketing science tools and directly on marketing decision making. We first report results from our precalibration of the top 100 marketing science papers according to academic impact among marketing intermediaries, after which we report on the results from the complete survey of the authors of the top 20 marketing science papers with “dual” impact.

In Fig. 4, we plot the academic impact of the top 100 marketing science articles in Table 1 (MKSIMPACT) against the awareness-adjusted impact on practice as perceived by the 34 marketing intermediaries from the precalibration (INTIMPACT). Individual points may be identified by reference to Table 1. While there is a significant relationship between academic and practice impact, it is weak ($p = 0.19$). We find it more insightful to divide the graph into four quadrants, through a median split on both dimensions. Articles in the bottom left quadrant of Fig. 4 have not had a major impact on practice (e.g., Gerbing & Anderson, 1988), and are also below the median for these 100 articles on academic impact. (Note that all 100 candidates for inclusion fall in the top 5% of age-adjusted citation in the profession's top four quantitative journals.) The articles on the bottom right are primarily knowledge drivers – that is, articles that have had above-median academic impact (relative to the 100 papers in this pool), but have had below-median practice impact (e.g., Morgan & Hunt, 1994). The articles on the top left quadrant are practice drivers – articles that have had below-median academic impact among the top 100 pool, but have had above-median practice impact (e.g., Aaker & Keller, 1990). The top right quadrant consists of articles that have had dual impact, exceptional academic as well as practice impact (e.g., Guadagni & Little, 1983). The selection from top 100 on academic impact to top 20 on dual impact represent articles from both the top-left and the top-right quadrants in Fig. 4 (see Web Appendix 2.2 for articles by quadrant).



Notes:

1. Awareness adjusted practice impact score is *INTIMPACT* from Table 1. It is the average impact of the article assuming that the impact = 0 for articles of which respondents are not aware.
2. Academic Impact Score is *MKSIMPACT* from Table 1, which is the age-adjusted citation score, further adjusted by the probability of the paper being marketing science.

Fig. 4. Contrast of academic and practice impact of 100 selected articles. Notes: Awareness adjusted practice impact score is *INTIMPACT* from Table 1. It is the average impact of the article assuming that the impact = 0 for articles of which respondents are not aware. Academic Impact Score is *MKSIMPACT* from Table 1, which is the age-adjusted citation score, further adjusted by the probability of the paper being marketing science.

In Table 5, we present the results of asking our sample of intermediaries ($N = 34$) and academics ($N = 84$) to evaluate the practice impact of each of the 20 dual-impact articles we identified earlier. In this table, we present the impact score given awareness for each article⁶ as well as awareness-adjusted practice impact. Although we need to be careful in drawing very strong conclusions (given quite large standard deviations), Guadagni and Little (1983) and Green and Srinivasan (1990) show the highest impact on practice, both as perceived by academics (mean = 4.28 and 4.17 respectively) and intermediaries (mean = 4.17 and 3.97 respectively). Overall, the ranking across the two samples is quite consistent ($\rho_{AI} = 0.63$). Notable exceptions include Louviere and Woodworth (1983), Vanheerde, Gupta, and Wittink (2003), and Simonson and Tversky (1992), all of which intermediaries accredit a significantly higher impact on practice than academics, while only Fornell (1992) shows the opposite. Finally, there is a correlation of 0.65 between the practice impact of these 20 articles gauged from the pre-calibration sample of intermediaries and the calibration sample of intermediaries. (Respondents in the precalibration and calibration samples responded to different tasks, precluding any aggregation of data across samples).

Table 3 describes the impact that marketing science has had on different marketing decisions, and Tables 4 and 5 show the influence of different tools and articles, respectively. We also solicited the more detailed transition matrices of individual articles' impact on individual tools and decisions, and individual tools on individual decisions, from a sub-sample of our respondents. We include and discuss these transition matrices in the marketing science value chain in Web Appendix 2.1. Additionally, many respondents provided open ended comments (included as Web Appendix 2.2). Perhaps the most interesting aspect of those is the variety of "mental maps" with which managers, intermediaries and academics think about marketing science applications.

⁶ As before, although we also report conditional impact (impact given awareness), our awareness adjusted impact assumes that for an article to have impact a respondent must have awareness of it when prompted.

3.4. Antecedents of practice impact among dual impact marketing science articles

As described earlier in our methodology section, we surveyed the authors of the twenty dual-impact articles, shown in Table 5, to learn from their experiences that go beyond the obvious, or possibly deviate from some norms in our field. Participation in our survey of these author teams was 100% (by article). 17 out of the 20 papers had multiple authors. Of those 17, multiple authors in 9 cases responded to our survey. Unsurprisingly, many expected themes emerged from these responses; themes that have been previously identified in the academic and practitioner literature. They include advice from authors to look for gaps in the literature, to ensure a strong grounding in prior theory, to find interesting, unsolved problems that are important to managers, and to fuel the diffusion process, not relying on good ideas to automatically be adopted. Below we focus on the three most interesting new themes that emerged. In addition, Guadagni and Little (2008) share their recollection in a *Marketing Science* commentary, which they based on our survey to them.

3.4.1. Symbiosis with consulting

Many of the authors referred to the symbiosis of their research with consulting as a fertile ground for dual impact papers. Rick Staelin describing Boulding, Kalra, Staelin, and Zeithaml (1993) stated "This paper started with a "consulting" project for the School [Fuqua School of Business, Duke University] trying to improve the service quality of our teaching/delivery system." Jordan Louviere speaking of Louviere and Woodworth (1983) said "[The problem] came from a consulting project in Australia. I was asked by the Bureau of Transport Economics to help them forecast demand for Qantas flights on transpacific routes."

Many of the authors also (co-)founded professional services companies to commercialize their work. For example, Roland Rust mentioned forming a company to commercialize the approach of Rust, Zahorik, and Keiningham (1995). John Little attributes his logit model's practical success largely to the commercialized products based on it. Louviere worked with DRC to commercialize the method he had developed. MDS started selling Hauser and Shugan's (1983) Defender model. Hauser joined Bob Klein in founding Applied Marketing Science, Inc. to commercialize the "voice of the customer" methodology (Griffin & Hauser, 1993).

3.4.2. Going against the grain at the right time

A common topic in many responses was that they went against the grain at the right point in time. Times were either ripe for the radical innovation the authors introduced or the authors rode on a new technology wave that came to transform industry. About the former, Roland Rust nicely phrases it as follows: "We went against the grain, which meant that acceptance of our ideas ensured minds were changed." Peter Guadagni and John Little attribute part of the success of Guadagni and Little (1983) more to the latter, an impeccable sense of timing: "Much of the impact was due to its early use of data from UPC scanners."

This does not mean that dual impact author teams were not also firmly grounded in basic theory, despite going against the grain. For example, Peter Guadagni and John Little say: "Consumers make choices to maximize utility. This came from basic economic theory." In the same vein, John Hauser on Hauser and Shugan (1983) mentions: "There was the Brandaid model by John Little in which he used a multiplicative form for the effects of advertising and distribution. Coupled with Lancaster's model, this gave us an empirically-relevant, but analytically tractable model with which to study the problem." Indeed, it is of interest that the 20 top papers by practice impact in Table 1 contained an average of 12 equations and 54 references (compared to 5 and 37 respectively for articles ranked 21–100, $p < 0.05$).

3.4.3. Working with experience

A long track record of some of the authors and influencers seems to be an essential component of dual impact teams. All author teams have

Table 5
Average impact of marketing science articles on marketing practice (ranked by intermediaries' perceptions of impact).

Article	Intermediaries (I) (N = 34).					Academics (A) (N = 84).					Difference test in A-I impact
	Awareness (%)	Impact (Avg Aware)	Std. Error	Rank (impact)	Awareness-adjusted impact	Awareness (%)	Impact (Avg Aware)	Std. Error	Rank (impact)	Awareness-adjusted impact	
Guadagni and Little (1983)	85	4.17	0.19	1	3.56	98	4.28	0.11	1	4.18	0.50
Green and Srinivasan (1990)	85	3.97	0.18	2	3.38	96	4.17	0.10	2	4.02	1.02
Louviere and Woodworth (1983)	76	3.92	0.21	3	3.00	81	2.76	0.14	15	2.24	-4.60 ^a
Criffin and Hauser (1993)	74	3.64	0.22	4	2.68	94	3.32	0.12	6	3.12	-1.32
Keller (1993)	85	3.48	0.20	5	2.97	94	3.78	0.11	4	3.56	1.35
Cattin and Wittink (1982)	85	3.41	0.20	6	2.91	92	3.23	0.13	9	2.96	-0.75
Parasuraman et al. (1985)	65	3.41	0.25	7	2.21	94	3.87	0.11	3	3.64	1.69
Mahajan et al. (1990)	91	3.35	0.20	8	3.06	98	3.13	0.13	11	3.06	-0.93
Fornell et al. (1996)	76	3.27	0.20	9	2.5	90	3.63	0.12	5	3.29	1.59
Aaker and Keller (1990)	79	2.96	0.20	10	2.35	92	3.30	0.12	7	3.02	1.43
Vanheerde et al. (2003)	74	2.96	0.19	11	2.18	89	2.43	0.11	18	2.17	-2.46 ^b
Hauser and Shugan (1983)	74	2.92	0.24	12	2.15	93	3.03	0.12	14	2.81	0.40
Simonson and Tversky (1992)	71	2.88	0.22	13	2.03	87	2.27	0.13	19	1.98	-2.38 ^b
Rust et al. (1995)	71	2.83	0.19	14	2.00	92	3.12	0.12	12	2.86	1.28
Anderson et al. (1994)	59	2.75	0.22	15	1.62	92	3.10	0.11	13	2.85	1.46
Boulding et al. (1993)	68	2.74	0.16	16	1.85	82	2.74	0.14	16	2.25	0.00
Punj and Stewart (1983)	65	2.73	0.24	17	1.76	79	2.73	0.14	17	2.14	0.00
Day (1994)	65	2.68	0.27	18	1.74	86	3.19	0.12	10	2.74	1.71
Fornell (1992)	62	2.48	0.21	19	1.53	90	3.29	0.12	8	2.98	3.30 ^a
Hunt and Morgan (1995)	47	2.44	0.27	20	1.15	73	2.02	0.13	20	1.46	-1.39
Average across articles	73	3.15				90	3.17				

Notes:

1. Scale: 1: No influence at all to 5: Extremely influential.

2. ^a $p < 0.01$, ^b $p < 0.05$, using the Welch-Satterthwaite t -test to test for differences in impact given awareness across academic and intermediary samples.

3. Awareness-adjusted impact is equal to awareness proportion multiplied by impact given awareness. Awareness-adjusted impact assumes that the impact of an article is 0 if the respondent is not aware of the article. Correlation between the two measures is 0.94 for intermediaries and 0.99 for academics.

at least one scholar with an academic career of over 15 years before co-authoring the paper (with the exception of Keller, 1993 article). The most senior author in 14 of the top 20 papers by practice impact in Table 1 held a named chair, in contrast to 23 out of the remaining 80 high academic impact articles ($p < 0.01$). It appears that significant academic experience is close to a prerequisite to writing an article that has large dual impact. In addition, industry experience may help. Authors who responded to our survey also had an average 6.75 years of experience in industry.

Authors frequently mentioned close liaison with industry. Eight out of 20 teams worked with practitioners on developing at least part of their ideas. Many other sources are mentioned on the practitioner side, both at intermediaries and marketing companies. Top sources are the Marketing Science Institute (mentioned by 5 author teams out of 20) as a source of inspiration. As individual practitioners, these authors mention people such as Bob Klein, Steve Gaskin, Richard M. Johnson, and Steve Cohen (3 or more mentions).

Academic colleagues with an influence are mainly scholars' co-authors, colleagues from the same department, or scholars on whose work authors built. Within the marketing profession, Glen Urban and Al Silk received three or more mentions. John Hauser notes on Hauser and Shugan (1983): "There were many influences. Chief was the Assessor model by Silk and Urban, which was a pre-test market model to predict the shares of new products. However, for every innovator, there were many defenders. We wanted to know what was the best defensive strategy." Authors also cite inspiration from well-known scholars outside their own field. Scholars mentioned in that category are Doug Carroll, Dan McFadden, Albert Hirschman, Herman Wold, and Frank Andrews (2 or more mentions).

3.5. Trends since 2004

It is useful to examine changes in the environment in the past nine years and to use our findings to consider likely trends in the impact of marketing science. To do that, we return to the marketing science value chain and examine separately changes to the decisions managers

make, the tools that they use, and the articles that have driven the development of those tools.

3.5.1. Trends in management decisions

Clearly, a number of environmental changes have affected the way in which managers need to relate to their marketplaces. These include a greater availability of addressable data (i.e. big data) and the rise of digital and mobile communications, both in terms of access to markets and communications between consumers (such as social networks). To formalize our examination of these trends, we assessed the changing content of marketing management textbooks. We examined marketing management texts rather than cutting edge methodology books because, at this stage of the marketing science value chain, it is the overall managerial decision making environment we wish to study. An examination of sales lists at amazon.com shows that Kotler/Kotler and Keller's Marketing Management (in its various guises) dominates this market. For example, on February 23, 2013 "A Framework for Marketing Management" (5th edition) was 6632 on the best seller list with the closest non-Kotler competitor coming in at 56,620. Therefore, we looked at the evolution of this text over time: before the beginning of our study (1980), four years into our study (1988), at the end of our study (2003), and most recently (2012). The results are included as Web Appendix 3.1. We note the rising importance of branding, customer management and integrated marketing over this time.

Because textbooks may be backward looking, we also examined trends in the Marketing Science Institute's Research Priorities which are, themselves, derived from surveys among academics and their members, who are all senior managers (Web Appendix 3.2). As expected, we see more recent topics in this list such as understanding mobile marketing opportunities, the role of social networks, and the harnessing of "big data." The survey of our authors would suggest that these environmental shifts in possibility and priority bring with them the opportunity to go against the grain at the right time. An obvious analogy is John Little's view that his adoption of logit modeling was a direct result of the availability of vast quantities of panel scanner data which enabled a new, less aggregate way of modeling response to changes in the marketing mix.

3.5.2. Trends in tools available

Clearly, many changes have occurred in the statistical tools available to the industry marketing analyst (and marketing intermediary) since 2004. Kluwer's Series in Quantitative Marketing, edited by Josh Eliashberg, provides an excellent resource describing advances in many of the tools available. Many of these are driven by the availability of vast amounts of customer data and with them, the rise of data mining (see Humby, Hunt, & Phillips, 2008 for an example). Much of this work is being conducted by information systems groups rather than marketers. As well as models that account for observed heterogeneity, models that account for unobserved heterogeneity are also gaining traction. Lilien (2011) speaks to the relative success of models that may be implemented by automatic algorithm, rather than as a managerial decision aid, which is an interesting distinction.

To gain a more systematic view of trends in the tools being used in industry, we examined the programs of the American Marketing Association's Advanced Research Techniques (ART) Forum from 2002 to 2013. The ART Forum is an annual meeting of academics, intermediaries, and practicing managers which discusses new and emerging marketing science techniques, as well as conducting tutorials in newly established ones. A summary of these programs is included as Web Appendix 3.3. We observe that a number of 12 types of tool we identified continue to be important over the following nine years (including discrete choice conjoint analysis, customer lifetime value models, and segmentation techniques). Second, we notice the introduction of new sets of tools, of which the most important are social media and network analysis methods from 2010 to 2013, including viral models, recommendation systems, and user generated content. Also of growing importance are text mining methods (2012) and agent-based modeling (2008 and 2012). Finally, many of the tools that we have described have undergone substantial development and enhancement. Primary among those are the areas of survey based and panel based choice models. The Bayesian treatment of heterogeneity (from 2002 onwards), introduction of new measurement bases such as MaxDiff, and data augmentation techniques stand out. In a rare study of the prevalence of marketing science tool usage, Orme (2013) notes fourteen major trends over the past ten years in the use of Sawtooth software (probably the leader in conjoint/choice analysis software). Primary among those are the mainstreaming of Hierarchical Bayes, the decline of ratings based conjoint, the emergence of MaxDiff scaling, and new applications/methods such as menu based choice, optimization, and adaptive designs.

3.5.3. Trends in marketing science articles

We undertook an examination of the papers published in *IJRM*, *JM*, *JMR*, *MGS*, and *MKS* for the period 2004 to 2010. We included *IJRM* given the more recent time period of study and its recognized importance as a top academic journal (Pieters, Baumgartner, Vermunt, & Bijmolt, 1999). We obtain a *CITERESID* (see Section 2.2.3) on each of the journals separately (given that we search for recent trends, they may pop up in one journal specifically). In this model, we used the number of quarters to December, 2010 as a measure of age of the article. Next, we have ranked *CITERESID* per journal and provide the top 10 per journal in Table 6. Note that we validated that the inclusion of *IJRM* was appropriate by estimating *CITERESID* also on the full sample of all articles jointly and found *IJRM* had 2 representatives in the top 50 (3 in top 100), marking the gradual maturation of *IJRM* as the youngest member of top journals in marketing.

A content-analysis of the 50 papers in Table 6 indicates that the topics of research that have been cited the most are word of mouth and social networks and relationship marketing/management.

In the absence of a formal survey of the impact of marketing science articles since 2004, one way to gain some feel for those that have affected the tools that intermediaries (academics and managers) use to address marketing decisions is to look at those articles that have been mentioned in patents. Because such citations are likely to indicate an article providing the foundation of new tools, we undertook a search using

Google Patents for mentions of articles in our target journals in patents issued by the US Patents and Trade Office (USPTO). To allow comparability with our sample period of 1983 to 2003, we also looked historically at that period as well. The results are included as Web Appendix 3.4. Marketing papers from the five target journals received a total of 1317 citations from patents issued by the USPTO. The first paper to receive a patent citation was published in the *Journal of Marketing* in 1940. The data indicate a significantly increasing trend of marketing papers being cited in patents. Almost half of the citations (625) to historical marketing papers published in the five target journals have come from patents issued since 2004. Marketing papers published since 2004 have attracted 39 of those 625 citations. The 39 patent citations were obtained by a total of 27 papers published since 2004 in *IJRM* (2 papers), *JM* (2), *JMR* (5), *MGS* (5), and *MKS* (13). Papers on the following topics received more than one citation: pricing and promotions (10), movies (4), online behavior models (4), retail assortment models (3), customer lifetime value models (2), conjoint (2), forecasting (2), innovation (2), and social networks (2).

One interesting trend is the level of engagement of marketing intermediaries and managers in the knowledge generation process. In 1983 (the beginning of our sample period), approximately half of the participants at the ISMS Marketing Science Conference held at the University of Southern California came from industry. By 2012, only 37 out of 930 attendees (4%) were from industry. However, general conferences have been replaced by specialized conferences such the biennial ISMS Practice Conference. Similarly, the Gary Lilien ISMS-MSI Practice Prize has maintained industry connections with our top journals in terms of authors. The proportion of industry authors of *Marketing Science* articles fell from 7% in the period 1983 to 2003 to 5% between 2004 and 2012. However, 35 of these 68 industry authors from 2004 to 2012 were a part of Practice Prize Finalist papers, showing the important role special events can have in stemming the disconnect between academic researchers in marketing and those who have to use their research.

3.5.4. Other marketing science trends

A number of other trends emerged in the development and application of marketing science over the past nine years. First, it has become more international at all levels of the value chain. In terms of managerial decision making, globalization has become a major driver of change. In terms of tools, at the American Marketing Association Advanced Research Techniques Forum, the ratio of North American academic presenters to those from other continents went from 15/1 in 2003 to 22/6 in 2008 and 19/6 in 2013. At the other end of the value chain, the number of authors publishing from outside North America in the top marketing journals is increasing. Looking at the authorship profile of the top 100 articles (by age-adjusted citation impact) published in the five top journals from 2004 to 2010, we find that 22% of the authors of papers from 2004 to 2007 were from non-US locations, while this number increased from 11% in 2004 to 33% in 2010. (See Stremersch & Verhoef, 2005 for evidence of globalization of authorship on the same sample of journals, but including all articles between 1964 and 2002, not merely the top cited articles). Also special fora that aim to bridge the gap between academics and practitioners can enable globalization. 11 of the 25 finalists of the Lilien ISMS-MSI Practice Prize Competition since its inception have come from outside North America (seven from Europe, three from Australia, and one from the Asia Pacific region). Entries from Europe have won the prize four out of the seven times.

4. Discussion

4.1. Summary

We have calibrated the relative impact of marketing science research on practice, using our marketing science value chain as a central framework. It is reassuring to see that the impact of marketing science on marketing decisions has been largely felt in areas that are of the greatest importance to the firm (see Fig. 3). Moreover, the managers

Table 6
Top 10 Articles from 2004 to 2012, listed by journal in order of age-adjusted citations.

Articles by journal	Total citations	Age-adjusted impact	Topic
<i>International Journal of Research in Marketing</i>			
Reinartz, Haenlein & Henseler (2009)	40	7.31	Research methodology/SEM
Peres, Muller & Mahajan (2010)	26	5.70	Diffusion/innovation
Dholakia, Bagozzi & Pearo (2004)	169	5.53	Social networks
Burgess, Steenkamp (2006)	71	3.91	Emerging markets
Bagozzi & Dholakia (2006)	83	3.61	Social networks
Street & Burgess & Louviere (2005)	83	3.31	Research methodology/choice
Goldenberg, Libai & Muller (2010)	18	3.19	Network externalities
Du, Bhattacharya & Sen (2007)	47	3.15	Corporate Social Responsibility (CSR)
Verhoef, Neslin & Vroomen (2007)	51	3.14	Multichannel shoppers
De Bruyn & Lilien (2008)	30	2.80	Word of Mouth (WOM)
<i>Journal of Marketing</i>			
Vargo & Lusch (2004)	1029	10.47	Marketing theory
Schau, Muniz & Arnould (2009)	82	5.37	Customer communities
Palmatier, Dant, Grewal & Evans (2006)	215	4.61	Relationship Mktg & Mgmt
Trusov, Bucklin & Pauwels (2009)	72	4.59	WOM/networks
Kozinets, de Valck, Wojnicki & Wilner (2010)	40	2.82	WOM/networks
Luo & Bhattacharya (2006)	146	2.78	CSR
Tuli, Kohli & Bharadwaj (2007)	110	2.73	Mass customization
Brakus, Schmitt & Zarantonello (2009)	55	2.70	Brand
Palmatier, Dant & Grewal (2007)	94	2.49	Relationship Mktg & Mgmt
Rust, Lemon & Zeithaml (2004)	310	2.39	Customer equity
<i>Journal of Marketing Research</i>			
Chevalier & Mayzlin (2006)	284	10.05	WOM
Bergkvist & Rossiter (2007)	200	8.14	Research methodology/survey research
Gupta, Lehmann & Stuart (2004)	187	6.03	Customer equity
Mazar, Amir & Ariely (2008)	91	6.02	Behavioral theory
Reinartz, Krafft & Hoyer (2004)	190	5.78	Relationship Mktg & Mgmt
Srinivasan & Hanssens (2009)	64	5.24	Metrics and firm value
Rindfleisch, Malter, Ganesan & Moorman (2008)	81	4.13	Research methodology/survey research
Trusov, Bodapati & Bucklin (2010)	21	2.95	Social networks
Nair, Manchanda & Bhatia (2010)	18	2.77	Social networks
Petrin & Train (2010)	25	2.52	Research methodology/choice
<i>Marketing Science</i>			
Fiebig, Keane, Louviere & Wasi (2010)	46	8.13	Research methodology/choice
Godes & Mayzlin (2009)	54	7.36	WOM
Keller & Lehmann (2006)	128	7.18	Brand
Hauser, Tellis & Griffin (2006)	122	6.80	Diffusion/innovation
Godes & Mayzlin (2004)	224	5.81	WOM/networks
Gupta & Zeithaml (2006)	90	4.76	Metrics and firm value
Rust & Chung (2006)	79	4.06	Relationship Mktg & Mgmt
Zhang (2010)	23	3.39	Learning
Van den Bulte & Joshi (2007)	52	2.97	Social networks/innovation
Eliashberg, Elberse & Leenders (2006)	61	2.91	Movies
<i>Management Science</i>			
Ghose & Yang (2009)	41	6.55	Search
Cachon & Swinney (2009)	37	3.92	Pricing
Chen & Xie (2008)	54	3.36	WOM/social networks
Su (2007)	75	3.26	Pricing
Franke, Schreier & Kaiser (2010)	19	3.04	Mass customization
Rahmandad & Sterman (2008)	44	2.83	Diffusion/innovation
Atasu, Sarvary & Van Wassenhove (2008)	32	2.41	Remanufacturing
Fleder & Hosanagar (2009)	23	2.33	Recommender systems
Forman, Ghose & Goldfarb (2009)	27	2.27	Online marketing
Grewal, Lilien & Mallapragada (2006)	72	2.04	Social networks

Note: Age-adjusted impact is estimated as the residual from a journal-specific negative binomial model relating number of citations to the age of the article (as measured by the number of quarters to December, 2012). The model includes linear and squared age terms to capture the non-linear time trend of citations.

in our sample are aware of the marketing science tools available to them, and there is a correlation between managers, academics, and intermediaries on the perception of the impact of those tools. Marketing science articles that have influenced practice come in a wide range of flavors. Some articles do not include empirical work (e.g., Hauser and Shugan's Defender model), while others use only laboratory data (e.g., Aaker and Keller's brand extension work). The survey among authors of top dual impact articles provides excellent pointers as to what it takes to write a top-journal article that achieves high academic and practice impact: symbiosis with consulting, going against the grain at the right time, and working with experience. Examining

more recent developments in our field since 2004, we were able to document the rise of digitization, mobile communications, and social networking, as well as further globalization of academia and the important role of special fora. We now discuss implications of our research for academia and practice, limitations of our research, and ideas for future research in this area.

4.2. Implications for academia

Many marketing science academics may not see impacting practice as their primary goal, letting the practice impact occur as a by-product

at best. A goal of practical impact might even be seen as counterproductive from the perspective of academic impact, distracting researchers from their primary mission and potentially compromising the rigor and integrity with which a problem is studied. Our study points to several counterarguments as to why the two goals may not necessarily be in conflict. First, practical problems may provide inspiration for new breakthroughs as old tools are found inappropriate to solve them (e.g., Louviere & Woodworth, 1983). Second, practical problems lure academics away from the ivory tower, in which they may be held captive by dominant paradigms.

Scholars who seek high practical impact may want to focus their research on decisions that are of greater importance to firms. In Table 2, we identified such areas to be pricing management, new product management, customer and market selection, and product portfolio management. While scholars may very well choose their research area using other inputs as well, we are able to offer scholars general advice on the challenging road to practical impact, from surveying top 20 dual impact authors. Research in symbiosis with consulting may prove to be a fertile ground for dual impact papers. The right timing in tackling the problem and the willingness to go against the grain seem crucial as well. Too early and radical a new idea may not find acceptance yet, too late and a colleague may beat the researcher to the punch. That dual impact papers require a strong grounding both in marketing science and practice, may explain why we find a disproportionate number of highly experienced scholars in our 20 top dual impact papers.

4.3. Implications for practice

Research in marketing science has relevance to many marketing decisions. At least that is what we find from the practitioners we surveyed. Even though our samples may be biased towards the sophisticated end of practice, our results are encouraging. Intermediaries consider segmentation tools and survey-based choice models to be most influential relative to other tools. Intermediaries find individual articles, such as Guadagni and Little (1983), Green and Srinivasan (1990), and Louviere and Woodworth (1983) to be very influential on practice.

Our paper provides a good primer on marketing science for marketing practitioners. It reviews an impressive body of top marketing science articles with dual impact. Therefore, it provides a guide to marketing science research for (i) marketing practitioners with an interest in discovering new areas or (ii) young market research professionals. This paper can help them discover for which decisions or tools it is useful to turn to marketing science research, as well as which specific articles provide potentially useful insights and tools to which they should be exposed.

4.4. Limitations and future research

In undertaking any research with as many dimensions as in our study, researchers must make a number of choices and assumptions. Our primary motivation in designing our research was to have a methodology that was objective and verifiable. To do so, we set up criteria upon which to design our study, carefully evaluating those criteria and obtaining input from a variety of knowledgeable sources at each stage of the research. Yet, we understand that other scholars may have approached the study differently and/or identified other study design criteria. Some significant limitations of our research include the following:

- *Citations as a screening mechanism.* We are acutely aware of the irony of starting to measure impact on practice with a list ranked by academic impact (i.e., citations). We tried to minimize this effect by including a pre-calibration stage. At worst, however, we can claim to have gauged the practice impact of the population of highly cited marketing science articles (what we call dual impact).
- *Biased sample.* The use of MSI and ISBM led to practitioner samples that were likely skewed towards greater sophistication. While this likely skew might improve the reliability of responses (and the

response rate), we believe that it could introduce considerable bias. We have attempted to address this by focusing largely on *relative* rather than absolute effects.

- *Alternative knowledge diffusion routes.* Textbooks, magazines and newspapers represent important, alternate ways by which new marketing knowledge diffuses. Similarly, organizations such as ACNielsen, Sawtooth, and Advanis are responsible for knowledge generation that may not always begin in journal articles. Because we are not claiming a complete catalog of the sources and transition nodes of marketing science knowledge diffusion, this is less of a problem.
- We focus on success and that brings with it a number of benefits, as well as being easier to observe. However, the lack of a control sample of “failures” means that we cannot discriminate between that which works and that which does not (though we can, to some extent, examine correlates of drivers of the degree of success).

Having taken the first step in an effort to calibrate the effect of marketing science on marketing practice, we find ourselves faced with a number of interesting but unanswered questions. These include the possibility of a more comprehensive mapping and measures built up from marketing practice, rather than down from journal articles. In terms of a more comprehensive mapping, it would be useful to consider other knowledge vehicles (e.g., textbooks, magazines and newspapers), routes (e.g., user knowledge generation and seminars), and participants (e.g., specialist training educators). More representative samples would allow inferences to be drawn about absolute impact rather than just relative impact. Finally, the unit of analysis we used is that of articles published in the period 1982–2003. Had it been scholars or over a longer timeframe, other researchers may have been more strongly represented.

The measure of relative rather than absolute impact raises another issue; that of market penetration of marketing science knowledge and tools (e.g., Roberts, 2000). Marketing science tools and the articles on which they are based may be used in a wide variety of marketing decision making situations (i.e., the opportunity set is large). A more appropriate benchmark might perhaps be, “Of all the situations to which these tools could have provided insight, in what per cent are the tools actually being applied?” Our sense is that the number is low. If this is indeed the case, it is presumably hard for us to argue that the marketing science tools currently in the market are in any way “standard” approaches to marketing and the measurement of its effect. We could contrast this penetration to that of approaches taught in other management disciplines, such as accounting and finance, for example.

Overall, we hope that we have identified the basis for a continued and richer study of the marketing science value chain.

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We have conducted many secondary analyses in the context of this project, which we do not report in the interest of brevity. Please contact the first author should you have an interest in obtaining supplementary materials.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.ijresmar.2013.07.006>.

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