The vital few meet the trivial many: unexpected use patterns in a monographs collection

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Purposes: To test three related hypotheses about monographs circulation at academic health sciences libraries: (1) Juran's "Vital Few" Principle, sometimes incorrectly referred to as the "Pareto Principle"; (2) most (>30%) new monographs will not circulate within four years; and, (3) Trueswell's 20/80 rule concerning intensity of monographs circulation. Methods: Retrospective circulation study conducted at a major academic health sciences library in November 1997 on monographs acquired during 1993, utilizing an online review file. Results: Unexpectedly, most monographs (84%) had circulated at least once in the four years following acquisition. Combining circulation and in-house data revealed that 90.7% of the monographs acquired in 1993 had been used at least once. Small percentages of these monographs produced disproportionately high circulation levels. Conclusion: Monographs circulation rates confirm Juran's Vital Few principle. Most monographs circulated at least once in contrast to results reported by the Pittsburgh Study or other studies reported by Hardesty and Fenske. The results do not comply with Trueswell's 20/80 ratio rule. Further research needs to investigate the effects of low students to books ratios and problem-based learning (PBL) curricula upon monographs utilization.

INTRODUCTION

Joseph Juran has frequently observed that the "vital few" of any population or group often exert disproportionately larger effect than the "trivial many" in the same population or group [1]. Juran offers many examples to illustrate this principle. In hotel management, he notes that meeting planners often are responsible for booking far more rooms than individual travelers [2]. More generally, "some workers persistently outperform others" and "a small difference in methods . . . produces a big difference in performance" [3]. In medicine, he has noted that drug doses either administered at the wrong time or in incorrect amounts account for the majority of all hospital medication errors [4]. Although managers now often refer to this widely applicable principle as "The Pareto Principle" [5], Juran has documented how (partly through his own error [6]) that this principle was never articulated by the Italian economist Vilfredo Pareto [7]. This principle also has been commonly called the "20/80 Rule" or inversely as the "80/20 Rule" because it has been postulated that 20% of a population or group can explain 80% of an effect, such as productivity.

Derivations of Juran's concept of the vital few and the trivial many apparently diffused into the collection development literature beginning in 1969 with the publication of Richard Trueswell's article "Some behavioral patterns of library users: the 80/20 Rule" [8]. Trueswell, an industrial engineer like Juran, argued that approximately 20% of any library's collection could generate 80% of its overall circulation. Trueswell did not credit Juran with this principle. He did, however, vaguely cite Fleming and Kilgour's 1964 *Bulletin of the Medical Library Association* article to support his argument [9]. Trueswell also attempted to graph data from Fleming and Kilgour who had reported that 28% of the journal titles at two academic health sciences libraries accounted for 80% of the overall journal use.

The Pittsburgh Study tracked monographs acquired during 1969 over a five-year period, finding that only 60% of these 36,892 books circulated at least one time [10]. Hardesty's study that tracked monographs usage from 1973 over a five-year period at DePauw Univer-

sity (sometimes referred to as the "Son of Pitt Study") appeared to replicate Trueswell's findings and the Pittsburgh Study. Hardesty studied the use performance of books purchased during a six-month period for five years after acquisition. He found that only 63% of the books acquired during that six-month time period had circulated one or more times after a five-year observation period. Hardesty also reported that, in general, "80 percent of the total circulation was accounted for by 30 percent of the books" [11]. Most recently, Fenske has reported that only 58% of the monographs at an academic health sciences library circulated during a twenty-seven month period [12].

Fenske did not generalize beyond her results. Trueswell, the Pittsburgh Study investigators, and Hardesty speculated that low use reflecting a disproportionate monographs circulation ratio such as the 20/80 pattern may represent a larger management principle or even a natural law. Trueswell referred to this pattern as the 80/20 rule or the 75/25 rule. Hardesty extended the scope of his results to speculate:

> There may be even a natural law (similar to the 80/20 rule), given these factors that, no matter the library budget or number of volumes acquired, some 30 to 40 percent of them will remain uncirculated (and probably unused) [13].

This article reports on a retrospective study of monographs collection usage at a major academic health sciences library. The results from this study are employed to test three related hypotheses: (1) Juran's principle that a Vital Few account for a disproportionate effect when compared to the Trivial Many can be applied to monographs circulation; (2) many (more than 30%) monographs never circulate; and, (3) Trueswell's 20/80 rule that indicates that about 20% of a monographs collection will produce roughly 80% of monographs usage.

METHODS

The author personally examined 1,414 individual records during November 1997 in an online review file of items that had been added to the collection between January 1 and December 31, 1993. Each individual record contained separate cumulative measures for each time that item had been checked out, used at a copy machine, or left at a study space such as a table or carrel during the four-year period since acquisition. The library systems/project coordinator, who had created the review file, sorted the records sequentially by number of checkouts. This sorting enabled the author conveniently to examine groupings of items with zero, one, or more checkouts. Creation of a review file and engaging in this tedious methodology became necessary when standardized reports in the library's Innopac circulation system could not exclude records that otherwise would have introduced bias into the study.

The library has moved many dated or superseded reference books to the Monographs Collection. The library has retained these older reference books for historical or legal reasons (e.g., old drug information or standards of practice sources sometimes prove useful in malpractice suits). Many of the superseded reference books might also provide backup copies in case the current edition disappears. These reference books served different functions than do the monographs. They also were not part of the circulating Monographs Collection during the full four years of the study. Therefore, the author had to identify and exclude these former reference books from the study to avoid introducing bias into the study. The author also had to exclude a few books that formerly had been in other noncirculating collections such as those in the Consumer Reference Collection. The author also excluded six series records not linked to (item) circulation records.

The author also had to identify and exclude donated gift books published prior to 1989 that had been added to the Monographs Collection during 1993. These books, five or more years old, were intended to serve a historical function rather than functions normally reserved for recently-purchased monographs. For example, during the past decade the author has aggressively collected gifts of older editions of currently-recognized textbooks in order to strengthen the historical perspective to a relatively "young" health sciences center library collection comprised mainly of books from the 1980s and 1990s. These methods created a basis for a more accurate comparison between the Pittsburgh Study and those studies reported by Hardesty and Fenske by focusing upon monographs acquired within a limited time period.

Finally, the author had to determine why some books experienced zero recorded circulation when item records for all new books normally reflect at least one checkout to the new bookshelf. Although some new books may have been placed on the new bookshelf, individual records indicated that the circulation desk must not have checked out these books to the new book shelf. The author already had identified most zero uses when identifying reference books that do not circulate and older gift books because staff check out neither category of book to the new book shelf. The author then examined items with only one checkout to investigate whether or not these single uses might include legitimate checkouts to actual customers. The presence of customer codes in the checkout field confirmed that some of these one-time checkout items had never been checked out to the new bookshelf. Once the author had completed this file-cleaning process, he could determine that 213 items actually had never been checked out.

Once the author tallied all checkout totals, he sub-

tracted one (−1) checkout per item to account for the possibility that one recorded checkout could be attributed to circulation to the new book shelf. As noted above with the author's examination of zero and single checkout items, however, this calculation was based upon a very conservative assumption. An individual item record only provided the customer code for the most recent checkout so the author had no means to adjust for this conservative assumption in the cases of any monographs with more than two checkouts.

The author determined that 1,306 of the records were eligible for this retrospective study. The author also conservatively calculated that these items added to the collection during 1993 accounted for a total 7,426 checkouts as of November 1997. While this methodology certainly was physically easier than the manual methods employed by Hardesty or Fenske due to the presence of an online system, the process involved far more tedium than the author had anticipated. This time element should be factored into any plans for comparable studies in the future.

RESULTS

The monographs collection experienced higher than expected levels of checkouts during the period of this retrospective study. At least 84% (n = 1,093) of the 1,306 items in this study, which had been added to the monographs collection during 1993, had been checked out within four years. An additional 9.34% (n = 91) of those items never checked out still experienced internal use. Thus, 90.7% of the items added to the monographs collection during 1993 were checked out or otherwise utilized within the building at least once.

The author was curious to understand why 213 items were never checked out during the four-year study period as a means possibly to adjust collection development priorities. Unfortunately, no meaningful subject pattern could be gleaned from the analysis, although highly technical monographs with narrow subject scopes tended to predominate within the zero use category. The author did notice that 38 Government Printing Office (GPO) items received through the GPO depository program and 29 World Health Organization (WHO) items received through a global subscription represented 31.5% of those items in the study that were never checked out. The author also noticed, though, that other GPO and WHO items added to the collection in 1993 had experienced heavy use over the same four-year retrospective study period. These findings affirm the criticisms concerning the questionable cost-effectiveness [14, 15] and the inflexibility [16] of depository or global subscriptions programs.

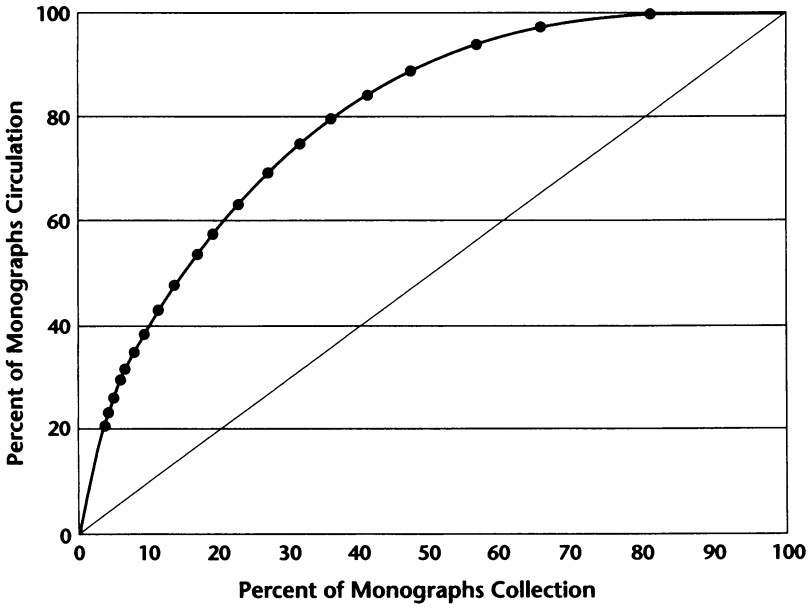
Table 1 offers a breakdown of the intensity or frequency of circulations per number of 1993 items in the Monographs Collection. Column 3 in Table 1 provides percentages of the overall 1993 monographs linked to frequency of use. Column 5 presents percentages for overall circulation at frequency intervals that can be linked to corresponding percentages of the collection. Thus, 3.5% of the collection generated nearly 20% of the 1993 monographs that circulated over a four-year period. Similarly, Table 1 illustrates how 5% of the 1993 acquisitions accounted for 26% of the circulation, 19.5% generated 58% of the circulation, and how 57% produced 94% of the circulation.

Table 1
Distribution of 1993 monographs usage

Number of checkouts	Items	Percentage of total monographs	Total checkouts per # items	Percent of total checkouts
0	213	100.0%	0	
1	227	83.69	227	100.0%
2	119	66.31	238	96.94
3	123	57.197	369	93.74
4	81	47.78	324	88.77
5	69	41.58	345	84.41
6	57	36.29	342	79.76
7	61	31.93	427	75.15
8	56	27.26	448	69.40
9	46	22.97	414	63.37
10	30	19.45	300	57.80
11	42	17.15	462	53.76
12	30	13.94	360	47.54
13	26	11.64	338	42.69
14	19	9.65	266	38.14
15	16	8.19	240	34.55
16	10	6.968	160	31.32
17	14	6.20	238	29.17
18	12	5.13	216	25.96
19	6	4.21	171	23.05
20	4	3.75	80	20.75
21+	45	3.446%	1,461	19.67%
Totals	1,306 monogrs		7,426 circs	

Figure 1 presents a modified Lorenz Curve [17] to depict graphically the relationship of the percentage of the total 1993 acquisitions to percentages of the circulation of these 1993 monographs for a four-year period. A Lorenz Curve depicts a straight line between the lower left-hand corner and the upper right-hand corner when a perfectly equal proportional relationship occurs between the variables (in this case, collection and circulation). A perfectly equal proportion in this case would be for 20% of the 1993 acquisitions to generate 20% of the circulation, 40% generating 40% of the circulation, and 80% generating 80% of the overall circulation. The curve in a Lorenz Curve displays the degree of proportional inequality between variables, whether they be income distribution (its original purpose) or frequency of circulation across items in the 1993 acquisitions. As a point of contrast, both Hardesty's article and the Pittsburgh Study suggest steeper curves that deviate further from the diagonal, or equality, line.

Figure 1
Monographs circulation plotted as a modified Lorenz Curve



DISCUSSION

This retrospective study confirms previous observations that a certain vital few monographs in a collection will experience disproportionately heavy circulation demand. Conversely, other remaining monographs will experience only moderate levels of circulation or no circulation at all. The results presented on Table 1 validate Juran's observations. Second, this retrospective study does reveal that a majority of monographs (84%) acquired in 1993 had circulated within four years of acquisition in contrast to the results reported by Trueswell, the Pittsburgh Study, Hardesty, and Fenske. Third, frequency of circulation patterns observed among 1993 acquisitions calls into question the applicability of Trueswell's 20/80 rule regarding the inevitability of this approximate ratio when analyzing monographs usage. In contrast, the results reported on Table 1 indicate that 20% of the 1993 monographs in the collection are responsible instead for about 58% of overall use of monographs acquired in 1993. Table 1 also reveals that 36% of the 1993 acquisitions account for nearly 80% of their circulation.

Burrell observed in his statistical critique of both Trueswell's article and of the Pittsburgh Study that the 20/80 rule has become "entrenched in the bibliometric literature" [18]. Burrell tested the 20/80 rule with usage data compiled from several other libraries, and discovered that "between 43% and 58% of the circulating collection are required to account for 80% of the borrowings." Sargent utilized a study conducted at the University of Wisconsin–Oshkosh to call into question Trueswell's sampling methods, the 20/80 rule, and even the notion that most acquisitions never circulate [19]. Trueswell responded to Sargent's critique by suggesting he had been misunderstood on specific points, but failed to defend his 20/80 rule in the course of his rebuttal [20]. One cannot help but be struck by the enduring popularity of Trueswell's 20/80 rule, regardless of the criticism and debate subsequent to his 1969 article.

The author reviewed numerous writings by Juran on the Vital Few Principle but was unable to find a single instance in which he directly links his Vital Few Principle to the 20/80 ratio postulated by Trueswell. Only once, in fact, did the author find an instance in which Juran even mentioned a 20/80 ratio. This mention occurred, as do numerous other ratios that Juran mentioned, simply to illustrate his Vital Few Principle. Juran's principle appears to have been quantified into the 20/80 rule, instead, by one of his enthusiastic admirers. Trueswell appeared to have been influenced by this derivative notion when he postulated the 20/80 rule for collections usage, and this might account for Trueswell never citing Juran's works.

Juran initially may have created some confusion by referring to his Vital Few concept as the "Pareto Principle." In fact, Pareto's contribution to economics had been in the areas of income inequality [21] and for the Pareto Optimality for resource allocation between public sector and private sector production in a mixed economy [22]. Juran further confused the issue during

the 1950s by referring to the Lorenz Curve for measuring the concentration of wealth [23] as the "Pareto Curve" whereas Pareto's curves were completely different. The curves graphed by Trueswell, the Pittsburgh Study investigators, and Hardesty depicting monographs usage actually resembled derivations of Lorenz Curves. The Lorenz Curves depicted by these authors have far steeper slopes compared to the Lorenz Curve depicted in Figure 1. Juran corrected his earlier incorrect citations to Pareto's ideas [24] and his incorrect attribution to Pareto that belonged rightly with Lorenz [25].

Juran expressed astonishment with the exponential popularity of associating the so-called Pareto Principle with his own Vital Few Principle following his earlier, incorrect attribution. Apparently, the misnamed Pareto Principle attribution for his Vital Few Principle took on a life of its own in the management world in spite of Juran's earnest efforts later to correct the record. Juran furthermore rephrased his principle in 1992 as "The vital few and the *useful* (in which he substituted the word "useful" for the previous word "trivial") many" [26] after forty years. This change in phraseology suggested that Juran had always meant for his principle to serve as an approach to analyzing organizational problems or for setting priorities as noted in his 1964 work [27] rather than recommending that one should ignore "the many" customers, a subtle distinction apparently lost by some commentators in the library literature on collections use.

Many librarians today still can recall the Pittsburgh Study's findings that large numbers of monographs in a collection will never circulate. Many librarians, however, do not recall that the Pittsburgh Study unleashed a remarkable firestorm of criticism following its release. Schad found fault with the assumptions and data collection methods employed by the Pittsburgh Study [28]. The faculty at the University of Pittsburgh published a detailed rebuttal to the Pittsburgh Study suggesting, due to methodological errors, that 71.3% of the monographs acquired in 1969 had actually been used [29]. Voigt criticized the focus upon undergraduate user behavior of checking out books rather than graduate student or faculty behavior of simply consulting library collections [30]. Massman expressed concern that the Pittsburgh Study would be misused by administrators to cut library collections budgets without ever considering the limitations of the study coupled to an ignorance of how research libraries operate [31]. Perhaps surprisingly, Trueswell did not side completely with the Pittsburgh Study and even seemed to back away from his 20/80 rule, although he still asserted that significant percentages of monographs never circulate while other monographs experience intense usage [32]. Hardesty's results were criticized implicitly by the critical reviews of the Pittsburgh Study. Consequently, studies from other types of libraries that describe large percentages of monographs collections that are never used or even subject to the 20/80 rule, might be seriously flawed.

Most of what health sciences librarians presently believe to be happening with their monographs collections may be based upon studies of questionable applicability because these have been conducted on collections at other types of libraries. A literature review has produced few recent studies on monographic usage in health sciences libraries. While Fenske's finding that 58% of recently-acquired monographs have never been used would appear to confirm similar results from studies at other types of libraries, drawing such a conclusion would be unwise. Fenske repeatedly stresses her surprise with her "startling" results. Fenske based her surprise upon her previous experiences at other health sciences libraries, and speculates that the unique situation of her collection in Urbana probably explains her unexpected results [33].

Bowden's dissertation on monographs holdings and circulation at four academic health sciences libraries serves as a noteworthy model of inter-institutional research. This study involved different hypotheses, methods, and dates of publication (1980–1992) for monographs circulation [34]. Due to the size and diversity of practices at each of the four libraries, Bowden's study could not control for variables such as the inclusion of reference or reserve books or the lengths of time that specific monographs had been in their collections due to cataloging time lags [35]. Yet, Bowden reported some results that converge with the findings of this study at the University of New Mexico (UNM). First, Bowden's results refuted Trueswell's 20/80 rule for frequency of monographs acquired at the four libraries during the years 1980 to 1992 [36]. Bowden also noted that anywhere from 79% to 86% of the monographs at three of the four academic health sciences libraries monographs did circulate [37]. Third, Bowden's results also confirmed Juran's Vital Few principle, although she did not refer to her findings in the context of Juran's ideas.

Further studies on monograph usage in health sciences libraries may validate this study at UNM by demonstrating that monograph collections in health sciences libraries indeed experience heavier use within a few years of acquisition than other types of libraries. This would call into question the applicability of other types of libraries' usage patterns in understanding monographs use in health sciences libraries. A 1990 use study by Britten of a general subject academic library has confirmed Trueswell's 20/80 rule for overall library circulations, but then has discovered that monographs in two specialties deviate from the 20/80 rule by having the highest and fourth-highest levels of circulation. Britten has determined that 40% of the pediatrics and 34.5% of the obstetrics/gynecology monographs produced 80% of the circulation activity in

these Library of Congress classifications [38]. Britten's results hint that health sciences libraries monographs usage simply may not comply with Trueswell's 20/80 rule, the Pittsburgh Study, or Hardesty's results. Table 1 suggests that a similar percentage of 1993 acquisitions at UNM account for about 80% of the circulation. Other than Fenske and Bowden's noteworthy works, the existence of few recent studies of monographs usage in health sciences libraries suggests the need for further inquiry.

ALTERNATIVE EXPLANATIONS

There may be alternative explanations for the results reported here that do not necessarily refute previous research reported by Trueswell, the Pittsburgh Study, Hardesty, or Fenske. For example, perhaps something unusual about the setting of this study at UNM may explain a deviation from an otherwise standard result for monographs collection use. Perhaps the ratio of monographs to students at UNM has been so disadvantageous compared to other institutions that high use of a relatively small number of books would be inevitable. In 1997, there were 1,450 students and 625 full-time faculty members at the UNM Health Sciences Center, while in 1993, the library acquired 1,306 monographs, producing a ratio of students to books of 0.9 and a ratio of customers (students and faculty combined) to books of 0.63. The Pittsburgh Study reported that 22,385 students and 2,153 faculty shared 36,892 books acquired in 1969, producing a students to books ratio of 1.65 and an overall customers to books ratio of 1.5. Hardesty reported having 2,400 students who were expected to share 3,808 (twice the six-month acquisitions of 1,904) books acquired annually, producing a students to books ratio of 1.59. Fenske's sketchy data suggests that 425 students and 39 faculty members were expected to share an estimated 1,167 books acquired per year, producing an overall students to books ratio of 2.75 and an overall customer to books ratio of 2.5.

These ratios suggest that the ratio of monographs acquired per year to customers may be a meaningful variable for explaining what percentages of a monograph collection circulate. These comparative ratios suggest that the low customers to books ratio at UNM might explain the higher proportion of the 1993 monographs that circulated. It should be noted, though, that Bowden suggests an opposite relationship of the customers to books ratio to circulation when she states "a library that minimizes investment in new materials will be used less" [39]. Anecdotal accounts from libraries serving academic centers in the Third World suggest that when customer to books ratios become too disadvantageous, customer dissatisfaction levels rise as customers perceive these libraries as unreliable sources of information. Evidently, more research needs to be pursued on this ratio as a possible causal variable.

The introduction of problem-based learning (PBL) curricula in several of the academic programs served by the UNM Health Sciences Center Library in recent years might also offer an explanation for the apparently unexpected intense usage of the monographs collection. Rankin has reported that "a greater proportion of PBL students use the library more frequently and for longer periods of time than do students at conventional schools" leading students to compete for the same collection resources [40]. Marshall, Fitzgerald, Busby, and Heaton have reported similar findings of increased library use by students enrolled in PBL curricula [41]. In this connection, Brazier and Conroy have discovered that medical students who borrow monographs most heavily outperform their classmates [42]. Another study at UNM examining reserve books and media circulation suggests that the PBL curriculum at the School of Medicine has increased demand for those types of library materials [43].

Cassell makes the case that contemporary physicians need to read books to practice effectively amidst an abundance of information that "is available everywhere you look or listen, it pours out at us from every crack and cranny." He adds, "With new kinds of knowledge making their debut in medicine, the problem is no longer merely absorbing an ocean of facts but rather figuring out how the new knowledge fits with the old" [44]. Although Cassell's prescription might be heeded, the author has found no evidence that practicing or faculty physician checkouts are responsible for the high percentage of circulating monographs at UNM. The author attempts to send faculty members new book notices for titles in their areas of expertise or interest, but he can make no claim that this practice could account for the results reported in this article. In the absence of any other plausible explanations, perhaps some still unidentified factor relating to the particular circumstances of this library in this particular state bears responsibility for these results that seem to be at odds with other studies. A former territorial period governor of the state once observed that "Every calculation based on experience elsewhere fails in New Mexico" [45].

The implications of this study for this specific library are mixed. On the one hand, this study optimistically suggests that a team effort by many on the library's faculty and staff, coupled to wise monograph selections, have produced unexpectedly high monographs collection circulation. On the other hand, such high use levels may mask customer dissatisfaction with the library's collections. As Richards and Eakin have noted, this kind of data based upon "circulation typically reflects only successes and does not record user or collection failures" [46]. Drawbacks of circulation studies also include a lack of correlation with

what actually circulates and the perceived quality of the content of those monographs; continued ignorance of whether customers are actually satisfied with what they check out; and past usage patterns have limited relevance to predicting future patterns. These drawbacks pose additional challenges to monographs selection [47]. Book availability research by Kantor [48] and Rashid [49] suggests that heavily-circulating collections may serve as a major source of customer dissatisfaction with a library because many desired books are not available when sought. Therefore, intense monographs collection use at this library may be cause for concern, perhaps alarm, rather than as a reason to believe that the library has been performing well.

CONCLUSION

The author determined that 84% of new monographs acquired during calendar year 1993 had been checked out by the end of calendar year 1997. In-house usage data, combined with external circulations, revealed that 90.7% of the new monographs acquired during 1993 had been used within four years of acquisition. The high percentage of the 1993 acquisitions that actually circulated at UNM offers a contrast to the Pittsburgh Study or studies by Hardesty and Fenske.

Table 1 and Figure 1 reveal that a small percentage of the 1993 acquisitions account for disproportionately large amounts of 1993 monographs circulation. These findings confirm Juran's Vital Few Principle, sometimes mistakenly called the Pareto Principle [50]. Table 1 and Figure 1 do not confirm Trueswell's 20/80 rule. Overall, the results suggest that a larger percentage of the monographs collection circulated than predicted by studies at other types of libraries. The observed small customers to books ratio at UNM indicates the need for further investigation into this possible causal variable. The presence of PBL curricula in some academic programs served by this library also suggests another area of investigation.

Only a multi-center, retrospective study involving diverse customer populations, but otherwise similar data collection methods and analyses, will begin to resolve this controversy. Bowden's dissertation offers a general model and provides an inventory of expected challenges for large-scale collections studies. An ambitious study of this magnitude will require major grant funding. Yet, considering the actual or the potential size of the annual investment of academic health sciences libraries into their monographs collections, such a study seems worth the effort. In the meantime, academic health sciences librarians would be wise to assume that large percentages of their acquisitions just may be perceived by customers to be worthy of circulation.

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