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Manage What Matters:

The Pareto Principle, ABC Analysis and How to Manage by Exception

A Management Series White Paper Presented by Demand Solutions

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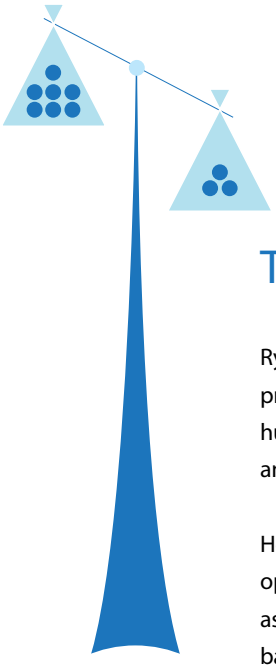
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The Law of the Vital Few

Ryan Howard, who plays first base for the Philadelphia Phillies, is a highly talented and richly rewarded professional baseball player. Howard's most pronounced skill is his ability to hit the ball farther than most humans, which is perhaps best demonstrated by the fact that he hit his first 200 home runs faster than any player in the history of baseball.

Howard's ability to hit the ball hard and very far – most typically to the right side of the stadium – induces opposing managers to alter the established "rules" of the game. Unless conditions of the game (such as runners on base) dictate otherwise, when Howard steps to the plate the second baseman typically backpedals into short right field, the shortstop jogs across the infield to play second base, and the third baseman abandons his normal position to cover for the shortstop.

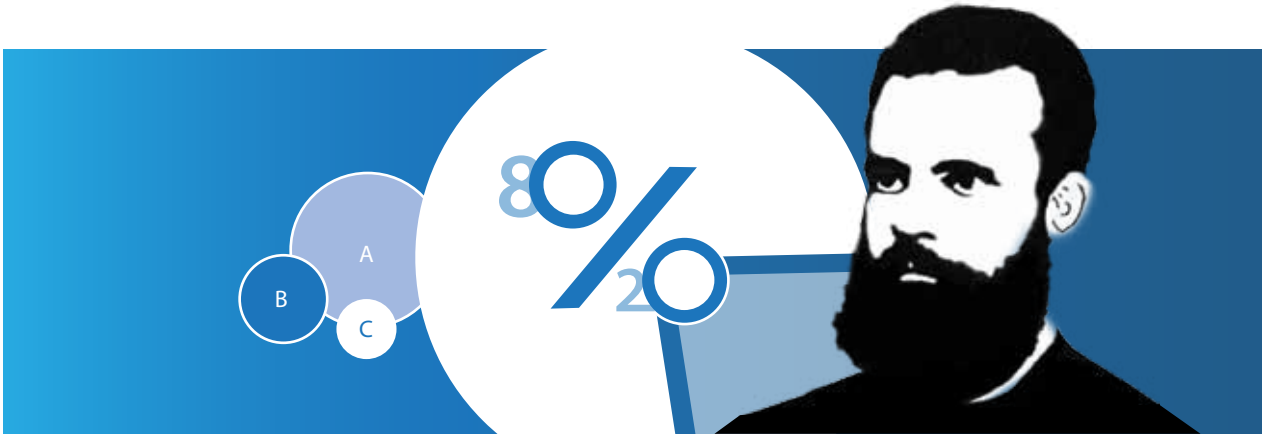
Managers respond in similar fashion to a very select group of players who share Howard's ability to change the game with one swing of the bat. Defensive positioning in baseball is typically a subtle thing, but when they face game-changing players, baseball managers tend to manage very differently.

A relatively small group of players (Ryan Howard, Albert Pujols and Prince Fielder are examples) merit these special tactics. Only a select few offer such dramatic potential to distort the game's results. In one very typical season, just 25 players (including the 3 listed above) smashed 31% of the 2,373 home runs that were hit by National League batsmen.

In all likelihood the term "the law of vital few" has never been uttered in a baseball clubhouse. But by applying exceptional measures for these exceptional players, baseball managers are applying this principle. They are literally managing by exception. They recognize that a relatively small group of players – the vital few - can have an oversized impact on the outcome of their games. They manage accordingly, and by doing so, improve their teams' chances of success.

The law of the vital few helps them manage what matters.

Vilfredo Pareto, Joseph Juran and the Pareto Principle



Vilfredo Pareto is fortunate that Joseph Juran was a such a modest man. (Actually it's Pareto's legacy that benefits; Pareto died in 1923).

The Pareto Principle, which is also known as the "80-20 rule" or the "law of the vital few," is the product of observations made by Pareto in 1906 and first popularized by Juran in the early 1950s.

An engineer by training, and an economist and sociologist by avocation, Pareto noted that 80% of the land in Italy was owned by 20% of the population. His observation that a small, vital percentage of any population will account for the majority of the observed results might have faded as a relatively insignificant chapter in his voluminous output, never to be attributed to him, if Juran hadn't brought this idea to life and to the attention of many.

Joseph Juran, like Pareto, was educated as an engineer. His *Quality Control Handbook*, which first appeared in 1951, is still regarded as *the* standard reference in the field, and Dr. Juran, who died in 2008 at the age of 103, is regarded as a pioneer and guiding light in the field of quality management. His obituary in the *New York Times* noted his role in the origin of widely practiced disciplines such as lean manufacturing and Six Sigma.

While writing a section on the "Maldistribution of Quality Losses" for the first edition of his *Handbook*, Juran sought a simpler, more memorable tag for this idea. Juran noted Pareto's observations on the unequal distribution of land-wealth in Italy. He also recalled an earlier proof of Pareto's distribution pattern in a study of executive salaries at General Motors. Juran was the first to invoke "Pareto's Principle," he was the principle's earliest and most enthusiastic promoter, and the name lives on as the accepted generic descriptor for the 80-20 rule.

Juran applied the 80-20 Principle much more broadly than Pareto (who had confined his observations to wealth, and, according to some stories, an observation that 80% of the peas in his garden were produced by 20% of his peapods). Since Juran was the first to identity the broad reality of "the vital few and the trivial many," it is commonly suggested that it would have been perfectly acceptable for him to apply the name "Juran's Principle."

Today, a Google search for "Vilfredo Pareto" yields 434,000 results. A search for "Joseph Juran" yields just 58,700. Dr. Juran's modesty prevailed and Pareto's legend continues to bloom.

Pareto's Principle in the Real World

There aren't many surprises when managers see their ***top-ranked products.*** What often is surprising, however, is just ***how dramatically sales are concentrated.***

If Vilfreo Pareto were alive today, he might note that 80% of the music that he listened to on his iPod represented just 20% of his iTunes downloads.

These concentrated packets of exception can be found in just about any aspect of life that can be quantified. Here are a few examples that we've either specifically compiled or researched:

- According to the FAA, 80% of all flight delays occur in 18% of the major airports in the U.S.
- A recent study of base-thievery in major league baseball reveals that 24% of the players account for 80% of all stolen bases.
- The U.S. Department of Health & Human Services' Agency for Healthcare Research and Quality reports that 20 percent of the population incurs 80 percent of total health-care expenses.
- U.S. Department of Justice studies show that approximately 80% of all crime is committed by approximately 20% of all criminals.
- A detailed analysis on the flatstats.co.uk website proves that 80% of horse races are won by 20% of the jockeys.

And then there are a number of imprecise and purely anecdotal – but logical – observations:

- 80% of the calories consumed in a day result from 20% of the items consumed.
- 80% of personal phone calls that you place are to 20% of the names in your address book.
- 80% of a company's growth will come from 20% of its products.

In 20+ years of working with thousands of companies, we've noted some typical patterns:

- 70-90% of a company's sales often come from 10-20% of its products.
- 70-90% of a company's sales often come from 10-35% of its customers.
- 70-90% of a company's total forecast error often comes from 5-25% of its products.

Even more impressive than any individual observation is the fact that the Pareto Principle is so consistent that it applies to just about any scale. If you were somehow able to eliminate 80% of the observations in any sample, the 80-20 rule would still apply to the remaining 20%.

What Do ABC Analysis and the 80-20 Rule Mean for Your Business?

Managing by exception is like managing the needles in a haystack. What's the best and quickest way to find the needles? ***Shrink the haystack and use a magnet.***

There's an inherent knowledge of the best selling products at just about every company we visit. Our team works with manufacturers, distributors and marketers of all sizes in every type of business. When we use our ABC Analysis tool to rank all products by sales volume and to assign ABC Codes to each item based on its relative ranking, there aren't many surprises when managers see the top-ranked products.

What often is surprising, however, is how dramatically sales are concentrated. "The 80-20 rule" is a commonly used phrase and a common expectation. But when managers see a clear presentation that 90 percent of their sales come from just 10 percent of their products (as is often the case), and that the bottom 50% of their products account for just 1% of their sales (ditto), that's when people start to sit up. That's when hearts begin to flutter and knees start to shake. That's when it begins to register that maybe you shouldn't manage all of your products the same way.

Rank	Count	Units	Cost	Revenues	Margin	% of Revenues	% of Items	Cume % of Revs
A	124	7,496,487	$29,656,881	$46,478,200	$16,397,425	80.13	15.76	80.13
B	142	1,394,569	$8,351,657	$8,646,300	$4,656,444	14.91	18.04	95.04
C	104	371,921	$2,581,189	$2,395,910	$1,473,541	3.98	13.21	99.01
D	417	92,508	$1,212,268	$573,500	$665,232	0.99	52.99	100.00
Total	787	9,355,485	$41,801,995	$58,093,910	$23,192,642		100.00	100.00

There is typically a general sense that a relatively small group of products account for a significant share of the sales volume. Likewise, you'll find ready acknowledgement that there are a number of laggards in most product portfolios. The objective recognition and presentation of those patterns is a key step in identifying the vital few products, channels, customers, business segments, etc. that are most worthy of a manager's attention.

Just as baseball managers adjust their strategy to deal with exceptional performers, successful business managers adapt their plans and tactics to optimize their performance.

In a vacuum, ABC Analysis is thought-provoking but relatively inconsequential. When you begin to apply exceptional strategies and policies to the stratified product segments that the process identifies, however, you'll begin to make an exceptional impact on each segment. Your top selling and most profitable products will receive the attention and treatment that they merit. As will your worst selling and least profitable products.

So, let's discuss how you can get started.

How to Execute the ABC Analysis Process

The specific application of the ABC policies outlined in this paper will vary a bit from business to business. Until we learn more about a company's specific environment and requirements, here's what we're inclined to recommend:

1. Select the most appropriate time period to rank.

Most companies begin by ranking their sales for the most recent 12 months. This provides an indisputable objective ranking of the company's products from the best selling to the lowest selling item over a reasonable period of time.

2. Specify a unit of measure.

If you sell a very limited product line in which you track all products in the same unit of measure, and if their costs and prices are reasonably similar, then it could make sense to run your ABC ranking in units. For most companies though, it's much more meaningful to rank your sales in dollars – either in extended revenue, cost or margin. Note that you will be running ABC Analysis in order to establish the relative value of each item to your business. Specify the unit of measure that best expresses each item's value.

We'll discuss this in more detail in the next section, but ideally we recommend that you run your ABC rankings multiple times in multiple units of measure. You might find it enlightening to compare a product's relative rankings in units, revenues, cost and margin.

3. Assign thresholds.

Here's where you tell the system your criteria for A-Items (and B-Items, and …). Our typical starting point is:

A-Items … the items that account for the top 80% of your volume.
B-Items … the items that account for the next 15% of your volume.
C-Items … the items that account for the next 4% of your volume.
D-Items … the items that account for the bottom 1% of your volume.

Some companies are more comfortable with 70% / 20% / 10% thresholds or other variations. There are no absolutely correct thresholds. One of the nice things about this process is that it's so easily adaptable.

4. Select the universe of items to rank.

Most companies begin by ranking all of the items that they sell. This is a logical and effective starting point, and it will probably be the most common basis for your ABC Analysis. Don't hesitate to branch out, however. ABC Analysis can be run against any slice of your business. Consider running an ABC Analysis just for the products that a key customer buys; or consider ranking manufactured items vs. purchased items. Rank your product families. Rank your customers. Let your imagination flow.

5. Execute the ABC Ranking Process.

Go for it. Run the process. Don't just keep a subjective ranking in your head. Let the system objectively rank your products and assign the appropriate ABC codes to each one.

How often should you update your ABC rankings and your ABC codes? As frequently as there are likely to be significant shifts in the relative rankings of your products. There's no magic answer. Here's some general guidance — once a week is too frequent. Once a year is OK. Once a quarter is probably just about right. You'll find (or we can help you find) the most appropriate interval for your business.

6. Analyze the results.

The results of ABC analyses will obviously differ by business. Here, though, are a few places to look for some potential Eureka discoveries:

- A-Items: What percentage of your total volume falls into the A-Item category? How many items comprise this category? Are there any surprises in the list of top-selling items? Are there any items that you expected to see in this group that did not appear? Do you have the appropriate levels of inventory to ensure an ongoing supply of these critical items?

- D-Items: What percentage of your total volume and total item count fall into the D-Item category? Don't be shocked if the bottom 35-50% of your items account for this bottom 1% of your sales. On how many of these items are you over-stocked? Are there any items in this group that you can do without?

- Top 10 items: It's not uncommon to find 2 or 3 surprises in the top 10 list. Are you missing any opportunities to promote these items more aggressively?

- How many items at the bottom of the list had zero sales? ABC analysis can also help with objective product line reconciliations.

7. Apply the results.

Ok, your top-selling and worst-selling products have been objectively identified. Let's move to our next section for some ideas on how to apply your results and to manage what matters.

How to Apply ABC Analysis to Manage What Matters

1. Vary your service-level targets by ABC Code.

No business intentionally runs out of product. It happens, but it's never by design. (OK … it's rarely by design). While you don't want to run out of inventory, you don't want to be overstocked either. The challenge is determine the optimal level of inventory.

A service level target helps ensure that you carry appropriate levels of inventory. While an across-the-board 100% in-stock level might be considered the Holy Grail, the inventory investment required to ensure that level of service will very likely be prohibitively expensive.

Consider a stratified service level strategy, with service levels varying by ABC Code. The specific levels will vary according to the competitive nature of your business and to what your company can afford. For starters consider:

- A-Items: 98% Service
- B-Items: 95% Service
- C-Items: 90% Service
- D-Items: 75% Service

2. Vary your inventory policies by ABC Code.

It's one thing to set service level targets. The next step is to translate these targets into optimal levels of Safety Stock or Safety Time. This paper is not intended to be a primer on Safety Stock calculations. Just know that the higher your service level target, the higher the inventory investment will be to ensure that you hit that target.

Don't treat all items with equal reverence or manage them with a single across-the-board inventory policy. Since your A-Items will most likely be the most critical items for your business, and you and your customers will have the highest service level expectations for those items, A-items will very likely justify the most significant inventory investment. At the other extreme, your C and D-Items are the least important items and you can probably afford the risk of periodic stock-outs on these items.

3. Vary forecast strategies by ABC Code.

ABC Analysis can be run against ***any slice of your business.***

Most forecasting systems use an auto-selection process in which the best formula for each item is automatically selected. Forecasts are simulated against actual historical demand and the formula with the lowest error – or the best fit – is then selected to forecast each item.

While this approach helps ensure that the optimal forecasting algorithm is applied for each item, the incorporation of different forecasting strategies by ABC Code adds an additional degree of intelligence to the forecasting process.

A-items typically are high-volume items, and as a result, they're often the easiest, most reliable items to forecast. Consider giving the system free rein with your A and B-Items. The system will almost always find a formula with a good fit for A-Items in particular. For C-Items, which might be quite a bit more erratic and unpredictable, you might want to use a limited set of formulas – perhaps a limited mix of moving average and exponential smoothing formulas. You might also want to apply growth factor limits on your C-Items. D-Items? You might want to consider not forecasting D-Items at all. Instead it might be more effective to simply maintain objectively-calculated and regularly-updated safety stocks for these "low & slow" items.

4. Run – and review – ABC Analysis in multiple units of measure.

Many businesses manage a mix of high-volume/low-value and high-value/low volume items. An item could be an A when ranked in units, and a C when ranked by revenue or margin. If your system and your process allows, rank your items in multiple units of measure – ideally in units, revenue, cost and margin.

Establish one of these units of measure (typically revenues, cost or margin) for your primary ABC ranking, but periodically review how your items are ranked in the alternate units of measure.

5. Manage more efficiently. Spend quality time with your A-Items.

Since time is a finite resource, why not dedicate the bulk of your schedule to the management of your company's most valuable products – i.e. your A-Items? These high-volume or high-value items are likely to be your company's game-changing products. These items will have the greatest impact on your company's revenues and bottom line, so focus on having the greatest impact on these items. Time spent analyzing their sales, forecasts, schedules and inventories will be time well invested. Rather than try to spread that time evenly across all items, try spending 80% of your time managing your A-Items.

We encourage you to analyze your A-items in detail. Study their sales trends. Review their forecasts against the perspective of those trends. Do you have adequate inventory? Is there a time-phased supply plan in place to ensure competitive service levels in the days, weeks and months ahead?

6. Add additional dimensions to your analysis by combining additional data with your ABC Codes.

> The Pareto Principle ***applies to just about any scale.*** If you were somehow able to eliminate 80% of the observations in any sample, the 80-20 rule would ***still apply to the remaining 20%.***

Managing by ABC Code is a great start on the path to managing by exception. But when you combine ABC Codes with another variable, you can more distinctly identify items that deserve your time and attention.

Here's a favorite example. When a forecasting system selects the best formula for each item, it does so on the basis of how accurately that formula was able to fit the item's historical demand pattern during a simulation process. That error – let's call it the "simulation error" – provides an indication of how forecastable each item is. If pressed for time, I'd want to review high value items that are difficult to forecast. With that in mind, I'd review A-Items with a simulation error of plus or minus 20%, then B-Items with a simulation error of plus or minus 35%, etc. Let the system call your attention to these potentially problematic items, and use your time effectively by fine-tuning the forecasts for these items.

Other examples would be to combine ABC code and weeks of supply in inventory, or to combine ABC code and margin rate. The key is to select and combine criteria that will readily identify meaningful exception items for your business.

7. Re-run ABC Analysis against a different universe of data.

In all likelihood, you will initially run ABC Analysis for every item in your company's product line. Another approach would be to run ABC Analysis for just the items that a key customer buys, or just the items within a specific product family or sales channel. Or, if you sell to a multitude of customers, use ABC Analysis to rank and stratify your customers, and then manage your customers accordingly. (Remember, in all likelihood, approximately 20% of your customers will account for 80% of your sales).

8. Run ABC Analysis for a specific season.

Many companies adapt their marketing plans to distinct seasons. Our apparel customers vary their assortments according to the seasons of the year. We work with hardware companies that market snow shovels in one season and garden rakes in another. A number of our pharmaceutical clients have different offerings for seasonally-timed maladies.

If your product mix varies considerably from one season to the next, consider updating your ABC codes within each season, and then apply the appropriate forecasting and inventory strategies.

9. Add XYZ Analysis to the mix.

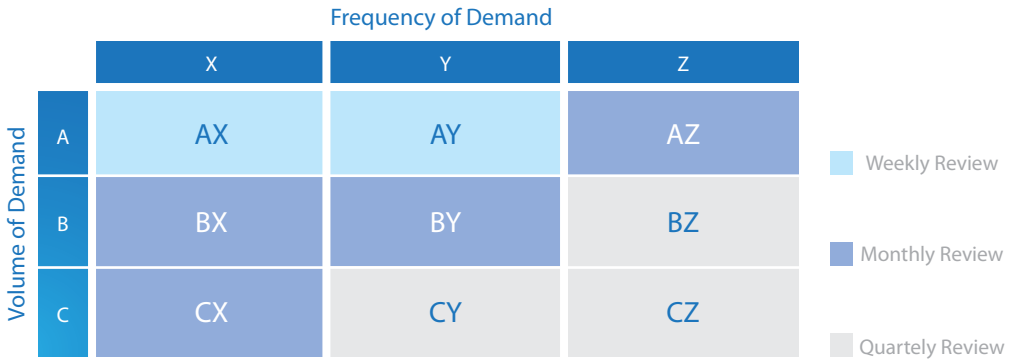
While ABC Analysis is used to rank and categorize items based on *volume* of demand, XYZ Analysis can be used to categorize items based on *frequency* of demand. This can be particularly applicable to businesses that manage spare parts or have a significant number of low-frequency and low-volume products. The challenge of forecasting items with irregular sales patterns is especially daunting. That challenge can be addressed in part by isolating those items and applying specific inventory and review policies, and applying the appropriate inventory replenishment policies.

Let's say you have two items that had sales of 12 units apiece in the past year. For item A, all 12 sold in one month. Item B was slower, but steadier with sales of 1 unit per month over that same period. Knowing that pattern, it would make sense to apply different sourcing and stocking rules for these two items. XYZ Analysis helps you identify these patterns.

The classifications that result from XYZ Analysis are sometimes referred to as Runners, Repeaters and Strangers.

Runners: Products that have had demand in at least 10 of the last 12 months.
Repeaters: Products that have had demand in at least 4 (and no more than 9) out of the last 12 months.
Strangers: Products that have had demand in 3 or fewer months out of the last 12 months.

If you incorporate XYX analysis into your categorizations and your analysis, incorporate a policy matrix into your review process.



10. Think upside down.

When you begin to apply exceptional strategies and policies, you'll begin to make an ***exceptional impact on each segment of your business.*** Your most profitable products will receive the attention and treatment that they merit. ***As will your least profitable products.***

Our previous discussion of how and why to vary inventory strategies by ABC Code was based on the logic that high volume and high value items (i.e. your A-items) justify higher service levels and, as a result, higher levels of inventory.

There is another school of thought that approaches inventory policies from a precisely opposite point of view.

This school holds that A-Items, as high volume items, are typically easier to forecast. Plus, companies tend to replenish their A-Items much more frequently than their C and D-Items. At the other extreme, C and D-Items are more difficult to forecast. Companies might not care to manufacture or source these items as frequently as they do their A-Items. And, since their volume is lower, companies can afford to invest in higher levels of safety stock on C and D-items.

Consider setting relatively low weeks of supply (or Safety Time) targets for your A-Items, and larger weeks of supply targets for your B-Items. If your system permits, periodically tweak those settings to gradually ratchet your inventory quantities to comfortably competitive levels.

ABC Code	Weeks of Supply
A	2.0
B	3.5
C	6.0
D	13.0

If you employ this "upside down" approach to safety stock (in the time-sensitive form of safety time), be certain to consider lead time as well. Safety stock should cover the variability of both demand and supply over time. Since the variability of both demand and supply are likely to increase for items with longer lead times, don't hesitate to ratchet these safety time settings accordingly.

If your system permits, experiment with a variety of safety time settings and review the impact of those policies on your projected inventory turns and stock outs. Keep at it until you achieve an acceptable impact on your projected inventory turns - as in the example below, in which projected turns increase slightly as a result of a change in inventory policies.

ABC Code	Current On Hand	Current Turns	Projected Turns	Stock Outs
A	2,671,697	8.3	9.7	1
B	911,428	5.7	6.2	7
C	451,599	2.4	2.7	23

Manage What Matters…Where to Begin

Exceptional managers – whether in baseball or business – will make the best use of their resources when they objectively identify unique opportunities for action.

The first step in the process is to identify your opportunities. Here's a table that shows the results of a typical ABC Analysis:

	Revenues	% of Total Revenue	Cume % of Total Revenue	# of Items	% of Total Items	Cume % of Total Items
A	$46,478,200	80.0%	80.0%	1,197	15.2%	15.2%
B	$8,646,300	14.9%	94.9%	1,457	18.5%	33.7%
C	$2,395,910	4.1%	99.0%	1,063	13.5%	47.2%
D	$573,500	1.0%	100.0%	4,159	52.8%	100.0%
=	$58,093,910			7,876		

Ask yourself how meaningful this simple summary of information will be to your business? How will it drive decisions about supply and inventory policies?

Start by filling in the table below. Then, apply a few of the ideas from the "How to Apply ABC Analysis to Manage What Matters" section of this paper. If you'd like our help, that's what we do.

	Revenues	% of Total Revenue	Cume % of Total Revenue	# of Items	% of Total Items	Cume % of Total Items
A						
B						
C						
D						
=						

About Demand Solutions

Managing by exception is like managing the needles in a haystack. What's the best and quickest way to find the needles? Shrink the haystack and use a magnet.

The Pareto Principle and the ABC Analysis process enable managers to identify and focus on concentrated packets of exception, and to make the most effective use of their time by managing what matters.

For 26 years, Demand Solutions has empowered companies of all sizes to reduce costs and increase profits through effective inventory management. Our solutions address the full spectrum of supply chain planning, including demand forecasting, sales force collaboration, inventory replenishment and optimization, sales and operations planning (S&OP), retail point-of-sale (POS) planning, and advanced planning and scheduling.

More than 2,000 companies in over 70 countries rely on Demand Solutions to manage what matters and to turn supply chain insight into competitive advantage.

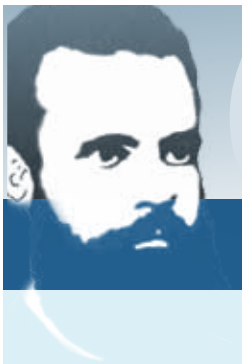
Learn more at www.demandsolutions.com

About the Author

Bill Whiteside was introduced to Demand Solutions in the late 80's when he implemented the software while serving as director of marketing for an ice cream manufacturer in Lancaster, PA. In December 1989, he made the ultimate product endorsement by founding Demand Solutions Northeast, which markets and supports Demand Solutions in the Northeast U.S. Prior to working with Demand Solutions, Bill's professional experience included 14 years of consumer goods marketing.

In his sales and support roles with Demand Solutions, Bill has worked with more than 300 companies across a diverse group of industries.

Bill is a graduate of the University of Notre Dame, a member of APICS, the IBF and the International Churchill Society.



A few *vital facts* about *Vilfredo Pareto*

Pareto was born in Paris (on July 15, 1848), although he was to spend most of his life in Italy.

His first job was as a civil engineer with the Rome Railway Company.

Pareto's great-great-great grandfather was awarded the title of Marchese in 1729. When his father died in 1882, Pareto refused the title, on the grounds that since it was not earned, it was of no interest to him.

The Pareto Principle (or the 80-20 rule) is little more than a footnote in most biographies of Pareto. He is more widely celebrated as an economist and a sociologist, and is renowned as "the father of mathematical economics."

One of Pareto's most controversial ideas was "the circulation of elites," which held that just as water seeks its own level, people will also settle in to the level of social status at which they naturally belong, no matter what their origins.

In 1889 Pareto married Allessandrina Bakunin, a spirited, penniless young Russian girl 12 years his junior.

In 1893 Pareto was hired as a lecturer in economics at the University of Lausanne in Switzerland. In his autobiography, Benito Mussolini claimed to have attended Pareto's lectures while a student in Lausanne.

In 1898, Pareto inherited a sizeable fortune from an uncle, and he purchased a grand house on Lake Geneva in the village of Celigny in Switzerland. Pareto amassed an enormous personal library and an enviable collection of wine.

In 1901, Pareto returned from a trip to Paris only to learn that Allessandrina had left him for their cook, absconding with many valuables. As an Italian citizen, Pareto could not divorce her (divorce was not legalized in Italy until 1974), and they remained legally married until just a few months before his death in 1923.

Shortly after his wife left in 1901, Pareto fell in love with Jane Regis, a Frenchwoman who was 30 years younger than he. They lived together for the rest of his life.

Vilfredo and Jane had 18 Angora cats in their home, which they named "Villa Angora."

Early in 1923, his health failing, Pareto became a citizen of the Free State of Fiume (which only existed between 1920 and 1924), where divorce was legal. He divorced Allessandrina, married Jane, and died just a few months later.



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