Using scorecards to routinely evaluate distribution facility locations

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Abstract

Purpose – The purpose of this paper is to present insights into one company's rationale for closing unproductive distribution facilities.

Design/methodology/approach – The reader is given background of the decision-making process behind transportation mode selection and distribution center selection, then on how these locations can gradually become obsolete. Uses a case study.

Findings – The paper gives examples of how one company identified their key performance indicators and applied them to the facility closure decision-making process.

Practical implications – Companies can create a rational, efficient and evenhanded approach to the closure of underperforming facilities. Using those same tools, managers can readily identify whether the root cause of good or bad performance stems from the market, or management.

Originality/value – Facility closure decisions are often prompted by the firm's need to reduce losses. This paper proposes using the company's key performance indicators to drive an on-going evaluation of each facility's performance. Using this approach, companies will be able to identify downward trends and their root causes, rather than making a series of trial and error attempts at fixing the problem.

Keywords Distribution systems, Performance measures, Balanced scorecard

Paper type Case study

Facility location and distribution

Companies are constantly looking for ways to maximize their footprints in the marketplace. From a distribution perspective, the organization's footprint is the geographic area where an acceptable service level can be provided at a competitive cost. What constitutes an acceptable service level is determined by the business.

Auto part distributors keep a large number of common parts in their stores, but they try to provide overnight delivery of special orders because mechanics and their customers are not willing to wait before going to a competitor. You might say that the store should keep more parts on hand or that distribution centers should be closer to the stores, but the cost of maintaining additional inventory at the store level or having additional distribution centers would make distribution costs less competitive.

A company considering the addition of manufacturing, distribution or retail facilities must evaluate the cost and service constraints of materials entering as well as leaving the proposed location. Additionally, the firm must evaluate the prospective facility's impact on the corporate network. A new distribution center might provide better service to customers, but could also reduce utilization of existing facilities while increasing the amount of on-hand inventories[1].

Change is a constant in business. Over time a company will experience changes in customers' demographics and expectations, operational competency, competitors,

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vendors, operating costs and regulations. All of these factors will frustrate the organization's attempts to put an optimal distribution network in place.

Figure 1 shows a simplistic before and after snapshot of distribution sites and their respective service areas based on sites selected using the center of gravity approach (Lambert and Stock, 1993). These sites can represent stores, warehouses or distribution centers while the surrounding circle represents the facility's service area. The ideal location for each distribution site is in the center of a service area. This allows the site to provide a predictable level of service in terms of distance and travel time while also allowing the site to balance operational capacity with neighboring facilities[2].

Over time, if demand shifts, our sites might look like those on the right side of Figure 1. A capacity imbalance has formed and the sites are no longer surrounded by customers.

Distribution network growth models

Distribution networks, while fashioned by cost and service constraints, are strongly influenced by their heritage.

There are three ways that distribution networks come into being.

Planned growth takes place when companies use a clean sheet approach to build their network. This model is usually seen when a company builds their network according to a business plan or theme. A best guess is made about where future customers will be, so properties are acquired using the template. Over time, assuming the plan was correct, changes in demand, volume, or the business occur, slowly eroding the network's efficiency.

Many companies build their networks through mergers and acquisitions. This is opportunistic growth that attempts to integrate the distribution networks of former competitors or complementary businesses into one. Often, the M&A architects take a purely financial view, and fail to deliver on the deal's promise because they do not to take integration of the distribution network into account. Human resources, systems, business process and equipment issues aside; the integrated firm will probably have few facilities that do not require some location compromises.

An overlay of original and added facilities will often show overlapping service areas in a market. For instance, an original distribution center 25 miles north of town and an

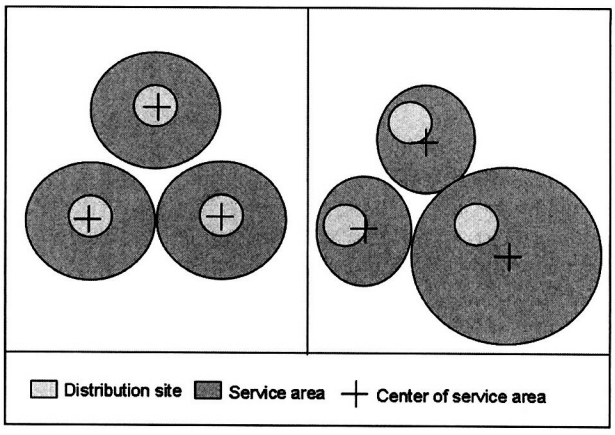

Figure 1.
Network efficiency decreases over time as the center of demand moves farther from the distribution point

added facility 25 miles south of town could create a dilemma for management. If neither facility is large enough to handle the combined throughput, no efficiencies are gained through leveraged infrastructure. In fact, the new market footprint might place the ideal facility location 10 miles east of town.

The organic growth model takes its cues from nature. Like plants and animals, some companies grow by following their food source. They follow markets that appear promising, and pull out of failing markets. Darwin's (1872) *Theory of Natural Selection* and Malthus's (1989) analysis of population growth provide allegorical insights on how markets emulate nature to efficiently direct the selection and elimination of a company's distribution centers over time.

Applying the organic growth model

While it is important to have an efficient method for developing a distribution network, it is also necessary to eliminate unproductive facilities along the way. As any serious gardener knows, pruning unproductive branches will allow the plant's resources to be redirected, resulting in a healthier plant with greater output.

The challenge many companies face is in quickly identifying a non-performing facility and understanding why it has failed to perform. Once this is done, the company can make a decision to resolve its problems or eliminate it from the network.

A company's distribution network is like a plant in other ways. Every type of business has adapted to its specific environment in order to survive. A company that ships coal by air will not survive long, but neither will a computer manufacturer that ships processor chips by rail. So it is important to measure the success or failure of each facility based on a carefully constructed set of criteria unique to the company and its business environment.

KPI development case study

A delivery company that has grown organically throughout the 48 contiguous states has developed a unique set of key performance indicators to help them evaluate the health of their 400 distribution facilities.

The profile of the company is:

- privately held;
- a period of 50 years in business;
- $1.5B annual revenues;
- aggressive growth objectives;
- route sales;
- about 400 distribution facilities; and
- average facility cost: $1MM.

Although the company had a method for rapidly locating and building new facilities, there was no process for evaluating and eliminating existing facilities. With sponsorship from the chief operating officer, a cross-functional team was assembled to determine the most effective method of identifying "sick" locations so a timely decision could be made to provide assistance or shut the operation down.

The facility scorecard team was made up of representatives from sales, marketing, operations, finance, and IT. Their methodology for development of a set of key performance indicators that could be used as a monthly evaluation tool is shown in Figure 2.

As in most organizations, consistent, reliable data was an important component in providing senior management with an effective decision-making tool. Fortunately, the team spent considerable time understanding the importance of each business driver and was able to assemble a list of data requirements. They found that much of the data

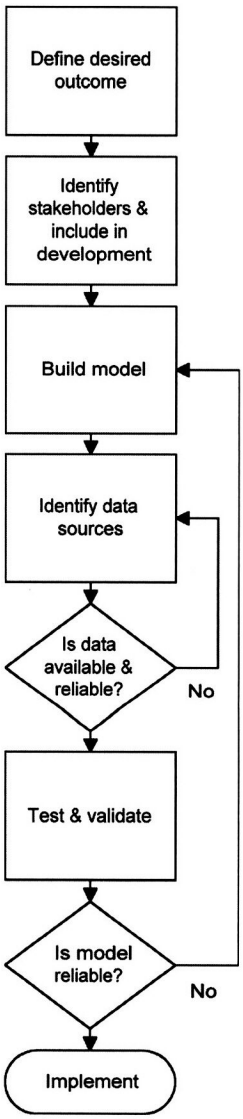

Figure 2.
Development process for the facility scorecard

was not available in one location, but could be derived from throughout the organization by using the company's enterprise resource planning (ERP)[3] system.

Geographic information systems (GIS)[4] data, which was not initially available on company systems, was obtained from commercial sources. It was merged with the facility scorecard database and updated as necessary.

The facility scorecard (Table I) used criteria based on common management objectives. Starting with asset utilization, cost containment, revenue enhancement, and customer retention as their primary concerns, the team decided to focus on just the first three categories since they were the most direct indicators of a facility's health.

Perhaps the biggest challenge to the team was removing unnecessary and redundant measurements. When working with a cross-functional team that can create a limitless number of metrics, it takes discipline and cooperation to agree to a few metrics that are truly key performance indicators of the business.

To get better control over their assets, the company developed an online property database of photographs, maps, property descriptions, storage attributes, assigned assets, and property acquisition data. The database also held property acquisition and book values along with current depreciation status.

The facility scorecard was envisioned as a monthly report to senior management for identifying the top and bottom performers in the company. All facilities were rank ordered and scored according to a point system based on ten of the scorecard's key performance indicators. A 100-point scale tied to KPI priorities was created to simplify analysis for the executives.

The executives in our case study identified ten key measurements that drove their business (Figure 3). They then determined the company's range of values for each area of performance. Creating a simple ten-point scale for each indicator, a facility could earn up to 100 points. Facilities that landed in the top 10 percent were studied to uncover the secret of their success, while the bottom 10 percent was further scrutinized through the use of the complete facility scorecard and probing discussions with the chief operating officer.

At first glance, the facility scorecard appears to be a management tool for increasing sales, but its primary purpose is to identify cases in which the market has shifted away from the facility. As the customers' distance from the facility increases, the cost of each additional sale also increases. Senior managers wanted to know whether each facility was providing an acceptable return on capital, so book value was provided as a

Sample performance indicators

Indicator	Mean
Sales per mile	0.75
Variable cost per mile	$1.75
Buying customers per route day	45
Market penetration (percent)	15
Return on capital (percent)	35
Sales per vehicle per route day	$2,200
Truck utilization (percent)	40
Closing ratio (percent)	70
Workers compensation claims	0.2/mo.
Customer longevity (retention)	36 mo.

Table I.
Performance metrics

Facility Scorecard				
Asset Utilization	**Value**	**Rank (1-400)**	**Average**	**High**
1. Customers within 20 mile radius (#)	4,064	120	4,622.87	16,120
2. Customer penetration (%)	6.80%	105	6.85%	23.32%
3. Facility lifecycle (book value-land value)($)	116,347.46	71	102,495.12	702,015.19
4. Order forecast accuracy (%)	97.20%	237	97.00%	98.10%
5. Fill rate (%)	98.7%	162	99.1%	99.70%
6. Unutilized capacity (slots)	2	120	3.51	18
7. Route vehicles (#)	13	134	15.62	38
8. Vehicle utilization (%)	74.77%	121	82.00%	101.83%
Cost Containment				
1. Average distance to customer (miles)	22.47	138	21.88	57.49
2. Distance to nearest facility (miles)	38	111	39.71	117
3. Sales per mile ($)	8.05	167	9.27	17.29
4. Variable vehicle cost per mile ($)	0.1466	179	0.2456	0.8707
5. Facility labor cost per sales dollar ($)	0.0629	60	0.0556	0.1284
6. Facility variable cost per sales dollar ($)	0.0182	117	0.0199	0.0612
7. Fixed cost less depreciation ($)	3,481.15	-	-	-
8. Distance to nearest city > 50k pop. (miles)	25	117	33.54	208
Revenue Enhancement				
1. Average daily vehicle Sales ($)	1,028.73	123	1,035.10	1,558.40
2. Customer count (#)	131,342	130	254,913	5,553,543

Figure 3.
Sample facility scorecard

starting point. If a facility's future was in jeopardy, managers were able to refer to the property database for additional information to aid in their decision.

To understand the facility scorecard, it is important to understand the company's basic distribution model. As the company experienced organic growth, distribution centers were added to the company's network at the center of a local market. To efficiently build sales routes out of each facility, managers tried to minimize driving time and maximize sales time. This was usually done by sequencing stops through a concentration of customers without allowing the route to double back on itself.

When a set of ideal routes were plotted on a map they took on the form of a flower with the distribution center in the middle. Routes departing from the distribution center appeared as flower petals, and routes that began from another point took a path that looked like a stem. Not surprisingly, using this approach, the distance traveled to begin a route is called "stem miles" (Figure 4). A well placed facility will reflect a high customer density as well as a low number of miles between customers, with few stem miles.

An indication that the facility is poorly placed is that petal routes appear elongated and blown in one direction. As customers are found farther from the distribution center, the model becomes even more distorted, usually adding a significant number of stem miles to each route. Because drivers spend so much time getting to their first stop and back from their last stop, their sales day is shorter and operating costs are higher.

Although the shape of a facility's routes might imply a case for relocation, it is important to look at the market before making a decision. In our case study, the company evaluated demographic and psychographic[5] data to determine the number of actual and potential customers within a 20 mile service area of each facility. If the number of potential customers is low, the problem is probably with the facility's

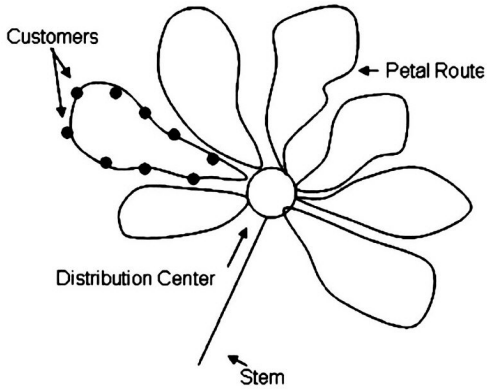

Figure 4.
Petal routes

location and not with salesmanship. On the other hand, a high number of potential customers in the service area might indicate that the operation should focus attention on sales processes rather than facility relocation.

When representatives of all the functional areas agreed to the facility scorecard criteria and definitions, senior management validated the model's results. Without exception, executives agreed with the scorecard's ranking. Because team members went to great length to make the key performance indicators stand on their own merit, the facility scorecard provided insights into root causes of poor performance. Without ambiguous information to cloud the decision-making process, senior management immediately adopted the facility scorecard into the distribution network rationalization process.

Application to other businesses

Although this case study uses the scorecard to evaluate route sales or services from distribution facilities, a retail scorecard could be developed for facilities that maintain sales records by customer. Using GIS to plot customer distance, frequency and quantity of purchases, geographic changes in the customer base could be identified. By constructing a company and industry specific set of key performance indicators, retail scorecards consisting of expanded and comparative data could be developed.

It is important to remember that markets are constantly changing while facilities remain in place until companies are compelled to make adjustments (Coyle *et al.*, 1996). A company that has catalogued its assets, can recognize business changes early, and make informed decisions before they become urgent, has a greater probability of making rational decisions benefiting the company's bottom line. As our case study managers discovered, once they had good operational visibility, reliable decision-support tools, and a tested facility evaluation methodology, financing their rapid growth objectives was greatly simplified.

Most companies could benefit from taking time to understand the mechanisms that cause successful outcomes in their business. Managers cannot manage by using more than a few metrics because at some point, the relationship between cause and effect is lost. So, by having the discipline to limit performance indicators to only a few metrics,

managers can readily build tools like the facility scorecard and improve their business analysis without creating the usual decision paralysis.

Notes

1. As warehouses are added to a distribution network, the average warehouse inventory decreases, but the total inventory increases.
2. The authors demonstrate a similar graphic consisting of lines of equal transportation costs, or *isodapanes*, surrounding a location.
3. ERP is a computer based system that facilitates the capture and sharing of organizational data. Using ERP, data re-entry is virtually eliminated, data integrity is improved, and timely access to business information is made possible throughout the organization. The organization's integrated business processes are used to configure the ERP system and align the organization's processes with information flow. When properly implemented, the ERP system will provide high quality, timely, business information tailored to each user's needs throughout the enterprise.
4. GIS use hardware and computer software to provide a graphic relationship between points on the earth's surface and data related to those points. These systems are generally used as modeling tools for decision support. Some common uses include displaying census data, market data, mapping agricultural conditions to crop yields, and planning cell phone tower coverage areas.
5. Psychographics is a marketing term that describes the segmentation of groups by personality attributes, values, attitudes, interests, or lifestyles.

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