ProfitWise

news and views

**Resource utilization among black
small business owners in Detroit:**
Results from a questionnaire

ProfitWise
news and views

Profitwise News and Views welcomes article proposals and comments from bankers, community organizations, and other readers. It is mailed (either electronically or via U.S. mail) at no charge to state member banks, financial holding companies, bank holding companies, government agencies, nonprofit organizations, academics, and community and economic development professionals.

You may submit comments or proposals, or request a subscription by writing to:

Profitwise News and Views
Community Development and Policy Studies
Federal Reserve Bank of Chicago
230 South LaSalle Street
Chicago, IL 60604-1413

or request at CDPS-PUBS@chi.frb.org

The material in *Profitwise News and Views* is not necessarily endorsed by and does not necessarily represent views of the Board of Governors of the Federal Reserve System or the Federal Reserve Bank of Chicago.

©2014 Federal Reserve Bank of Chicago

Profitwise News and Views articles may be reproduced in whole or in part, provided the articles are not reproduced or distributed for commercial gain and provided the source is appropriately credited. Prior written permission must be obtained for any other reproduction, distribution, republication, or creation of derivative works of *Profitwise News and Views* articles. To request permission, please e-mail or write to the address indicated above.

Special Edition 2014

In this special edition of *Profitwise News and Views,* CDPS senior business economists Maude Toussaint-Comeau and Robin Newberger present findings from a poll of black small business owners in metropolitan Detroit, who were identified through metro area business chambers targeted to minority entrepreneurs. The survey seeks primarily to gauge resource needs, and the perceived value and degree of access to formal and informal networks designed to assist business owners. Given a relatively small sample size of approximately 55 respondents, the findings do not represent sentiments of black business owners broadly speaking. However, some distinctions between newer and older businesses, as well as businesses in the city versus suburban communities, may inform the priorities of technical assistance providers, business incubators, and lenders.

The Federal Reserve Bank of Chicago

The Federal Reserve Bank of Chicago and its branch in Detroit serve the Seventh Federal Reserve District, which encompasses southern Wisconsin, Iowa, northern Illinois, northern Indiana, and southern Michigan. As a part of the Federal Reserve System, the Bank participates in setting national monetary policy, supervising banks and bank holding companies, and providing check processing and other services to depository institutions.

Resource utilization among black small business owners in Detroit: *Results from a questionnaire*

by Maude Toussaint-Comeau and Robin Newberger

One of the most important ways for small businesses to access capital is through connections to resource networks. Business networks are the set of arrangements and information platforms that business owners use to increase exposure and sales, gain knowledge of their markets, develop financial management skills, and familiarize themselves with sources of financing. Networks can also connect people to other service providers, such as nonprofit organizations and professionals that support business owners through technical and financial training, referrals, legal services and procurement opportunities. For example, the Small Business Administration (SBA) supports intermediaries such as Small Business Development Centers, SCORE (Service Corps of Retired Executives), and other resource partners that help potential business owners develop business plans and understand where to get the appropriate capital for their businesses. Resource networks may also involve coordinated actions between businesses and the communities in which they operate, such as initiatives whereby business owners support programs like crime prevention, clean-up, and beautification that improve the local business environment. In addition, networks may involve business-to-business linkages facilitated by local institutions or developed though business contacts.

In many ways, the city of Detroit is a resource-rich place. By one count, thousands of programs exist to connect small business owners to legal, financial, managerial and marketing expertise, as well as to formal and alternative financing sources. A number of foundations, local planners, and nonprofits are investing in strategies to support knowledge sharing and referrals between institutions that provide such services to small businesses. Since 2008, an important part of this vision has involved the creation of a three-and-a-half mile 'innovation corridor' of entrepreneurial services (between the Downtown area and the Woodward Corridor in Midtown) to promote synergies between business development intermediaries. The network includes organizations that provide training to business owners, those that produce ideas and intellectual property, and those that fund small businesses. By providing a roadmap to the services offered in the community, the goal is to help entrepreneurs better understand the services and capital available to them.

In spite of these opportunities, black business owners in Detroit report having relatively less access to resources and information than other minority groups. In a survey by New Detroit of minority-owned businesses in Southeast Michigan, business owners report that one of the most important impediments

to their business is the lack of networks (ranking it as important as financing and macroeconomic issues).[1] It is unclear whether the lack of networks expressed by minority business owners is due to a lack of knowledge and information about what is available, inadequate supply of resources, or some other reason.

As part of the Federal Reserve Bank of Chicago's Detroit Small Business initiative, the Community Development and Policy Studies division (CDPS) developed a brief questionnaire, which sought to illuminate some of the issues involved in accessing business networks and local resources. The questionnaire aimed at identifying which community resource networks or relationships business owners use; how business owners participate in these networks; and any barriers they face to utilizing networks. In what follows, we conduct a brief analysis of the reported resource needs of businesses, the perceived benefits and barriers of getting access to these resources, and how these responses relate to various characteristics of the businesses. (The polling questionnaire is included in appendix A.)

Fifty-five business owners from Detroit and surrounding areas answered the poll. Close to 90 percent of them reported their race as black. More than 50 percent of the businesses were located in the city of Detroit. There was an equal mix of male and female owners among the respondents. More than half of the businesses had existed for fewer than five years, a third were home based, and more than 80 percent had revenue of $100,000 or less. Hence the poll captures responses from some small and nascent businesses for whom access to networks and local resources might be the most relevant. The most prevalent industries in which the businesses fell were professional, retail, and food services. The majority of the business owners had a college education (see table 1).

The analysis below makes use of exploratory factor analysis to organize the polling responses. Rather than showing response rates for each possible answer, factor analysis clusters the items that respondents choose around unobserved "invisible" factors in a way that focuses attention on a smaller number of items, and reveals connections between

Figure 1. Needs scoring analysis for business owners

Below median · Median · Above median
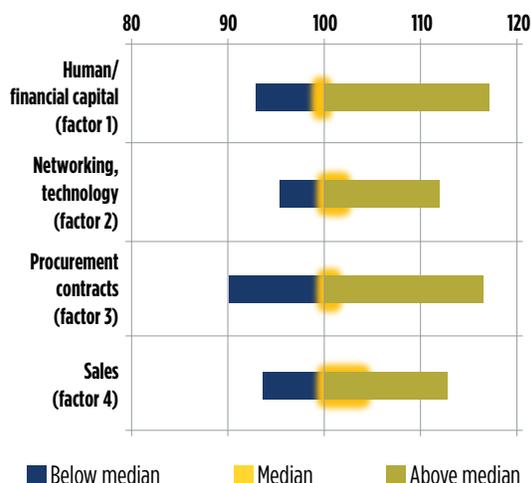
Figure 2. Most important needs of business by years in business

10 years or more · 6 to 9 years · 5 years or less
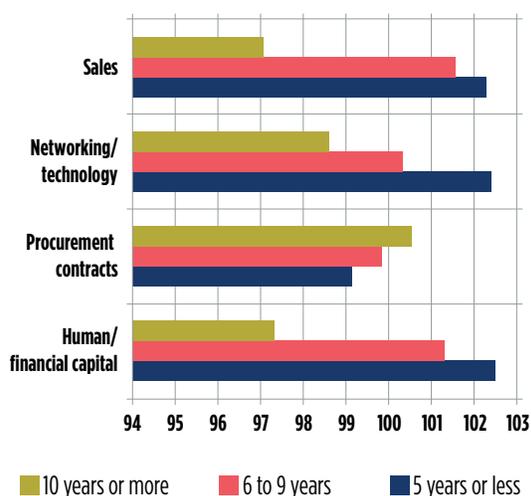
seemingly distinct choices. In this particular poll, the clustering of answers gives insight into the main resource needs of respondents in the sample, how various needs connect to one another, and how different sub-groups of the sample have comparable and contrasting resource needs. The findings from the poll are expressed in terms of calculated scores for each respondent in the sample, indicating the extent to which the resources need answered by each

Table 1. Descriptive statistics of business owners in the CDPS Resource Networks Poll

	All respondents		City of Detroit	
Number of years in current business	**Number**	**Percent**	**Number**	**Percent**
Less than 5 years	31	56.4	12	40
5 To 9 years	11	20	8	26.7
Over 10 years	13	23.6	10	33.3
Average	51	5.5	27	6.7
City of Detroit				
No	25	45.45		
Yes	30	54.55		
Age of business owner				
18-24	1	1.9	0	0
25-34	4	7.4	3	10.4
35-44	12	22.2	5	17.2
45-54	17	31.5	7	24.1
55 and over	20	37.0	14	48.3
Race/ethnicity				
Black	47	88.9	28	100
White	1	1.9	0	0
Asian	3	5.7	0	0
Other	2	3.8	0	0
Hispanic	1	1.9	0	0
Gender				
Male	30	54.6	15	50
Education of owner				
Less than high school	0	0	0	0
High school or equivalent	3	5.5	1	3.3
Some college	15	27.3	12	40
4 Years of college +	37	67.3	17	56.7

respondent as being the most important relate to each of the main factor groupings.[2] (See appendix B for a more detailed explanation of the methodology.)

Resource needs of businesses

We identify four main categories of resource needs based on the list of 11 items listed in the questionnaire. Figure 1 reports the median value of the index score for the whole sample of respondents, as well as the range of values (around the mean, set at 100), obtained by respondents. We label the first factor category "human and financial capital needs," because it includes the identified needs of capital, supplier credit, human resources, and training and technical assistance, as well as the safety of the neighborhood in which the business is located. According to the analysis, each of these items represents an important need for business owners, with calculated scores ranging from 93 to 117 among those surveyed (relative to a mean scaled to 100 for the sample under analysis).

Table 1. Descriptive statistics of business owners in the CDPS Resource Networks Poll (continued)

Business characteristic	All respondents		City of Detroit	
	Number	Percent	Number	Percent
Home based	31	56.4	12	40
Sole proprietor	16	29.6	7	24.1
Franchise	3	5.6	1	3.5
Partnership	19	18.5	3	10.3
Incorporated	22	40.7	12	41.4
Business with employees	22	40	15	50
Revenue categories				
Less than 100,000	42	82.35	23	85.2
100,000 – 999,999	3	5.9	1	3.7
1 million – 3 million	5	9.8	3	11.1
Over 3 million	1	2.0	0	0
Industry				
Professional	18	32.7	9	30
Food services	5	9.1	3	10
Retail	8	14.6	5	16.7
Service	11	20	7	23.3
Other	13	24	6	20

Note: Some categories have missing values

Figure 3. Most important needs by location of business

Legend: City of Detroit (red), Surrounding areas (blue)
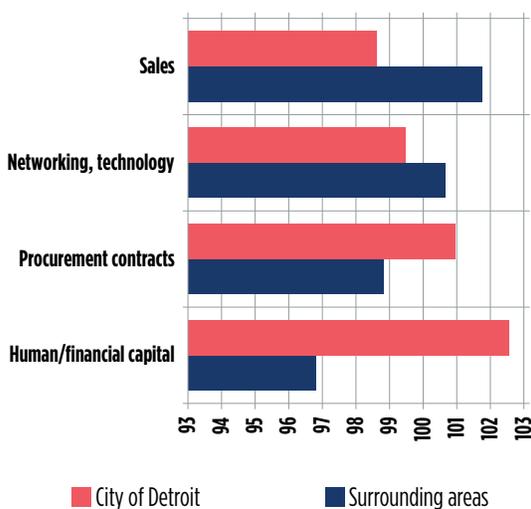
Networking ("relationships that help build the business") and technology also come in as important from the respondents' perspectives, and comprise the second most important needs category, with individuals scoring between 95 and 112 under this indicator. "Procurement contracts" is a third category of need for businesses, with individuals getting scores ranging from 90 to 116. Business owners who report a need for procurement contracts tended to view that as an isolated concern. Sales come in as the fourth most important need, with individual business owners showing a score ranging from 93 to 113.

More detailed characteristics of the businesses, such as the age and the location (in or not in Detroit) provide further insight into resource needs. Business owners with less than 10 years in business have higher need scores compared to those with more mature businesses, particularly with respect to human/financial capital, networking/technology, and sales (figure 2). This characteristic is particularly true for those in business less than five years. The exception

Figure 4. Most important needs of business by industry

Legend:
- Networking/technology
- Procurement
- Human/financial capital
- Sales
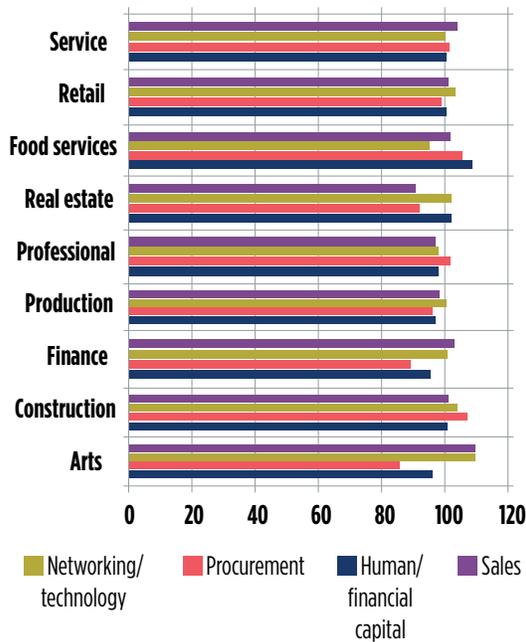
Figure 5. Resources used scoring analysis

Legend:
- Below median
- Median
- Above median
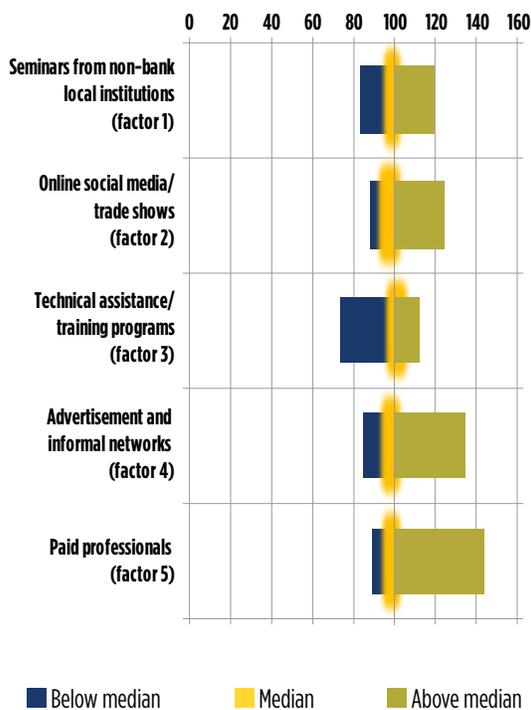
is for procurement contract needs. Business owners who have been in business for 10 years or more indicate more of a need for procurement opportunities compared to those in younger businesses. In addition, age of the business is correlated with sales volume and the phase and/or structure of the business (e.g., home based). Home-based businesses and those with lower sales volume tend to declare their biggest needs to be human/financial capital, networks/technology, and sales, as opposed to procurement contracts (figures not included).

In terms of businesses located within Detroit versus outside of the city, Detroit-based business owners, on average, reveal a greater need for human/financial capital (a category that includes neighborhood safety), as well as a greater need for procurement contracts, compared to those in surrounding areas. The networking/technology category and the sales category rank as higher concerns for the average business owner in areas surrounding the city (figure 3).[3]

Figure 4 shows additional differences that can be observed by industry and needs of businesses. Sales are a priority for those in service businesses. Those in food service businesses tend to prioritize human/financial capital (including the safety of the neighborhood in which the business is located), as well as procurement contracts and sales. For those in construction, procurement contracts constitute the single most important concern. Business owners in the arts and entertainment sector are mainly concerned with sales and relationship networks.

Sources of information for business owners

The questionnaire also asked business owners to identify where they receive information about resources for their businesses. Out of 18 choices given, the factor analysis grouped responses into five categories (figure 5). The first grouping (factor 1) is comprised of what we call "seminars from non-bank institutions." These encompass seminars sponsored by the SBA, philanthropic associations, and local and state government agencies, as well as the use of directories/online resources that target ethnic or minority businesses. As figure 5 shows, the smaller deviation of respondent index scores around the mean for the first category (non-bank seminars) suggests that the typical poll respondent is likely to use local

seminars and social media/trade shows as sources of information for their businesses. The second category of information resources consists of social media and expos/business festivals and trade shows. The third category consists of technical assistance providers and training programs. The fourth is information from general advertising and informal sources (friends and family), and the fifth is paid professionals. Other possible sources of information listed in the questionnaire, such as bank seminars, business incubators, courses at community colleges, and service clubs, are not significant resources for this particular group of black business owners.

Differences in resources used reflect distinct characteristics of the businesses. Owners of new businesses (five years or less) are less likely to have availed themselves of any kind of resources compared to owners of more mature businesses (figure 6). By contrast, owners that have been in business more than five years are more likely to attend seminars and use the services of professionals, such as lawyers and accountants.

In terms of location, business owners in the city of Detroit report going to non-bank seminars, and using targeted ethnic advertisement and friends/family as resources to get and share information about their businesses (figure 7). Business owners operating outside of Detroit, which in this poll tend to be owners with more schooling and with higher-revenue businesses, report using technical assistance providers and professional services as resources to get and share information.

Reported benefits and barriers to information and resources

Finally, the questionnaire asked business owners to identify the perceived benefits of using the information sources they use, as well as the barriers they face to getting access to these resources. Of the 12 items listed as potential benefits, the factor analysis grouped the answers into three categories (figure not shown). The first category (factor 1) consists of benefits that relate to building knowledge related to capital access – including relationships with financial institutions, information about alternative financing sources, assistance with developing a business
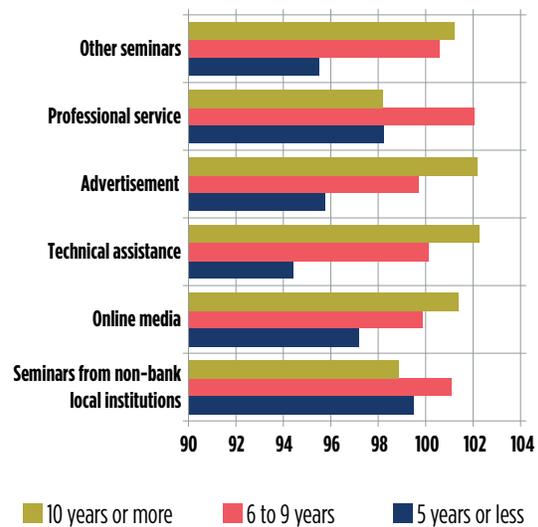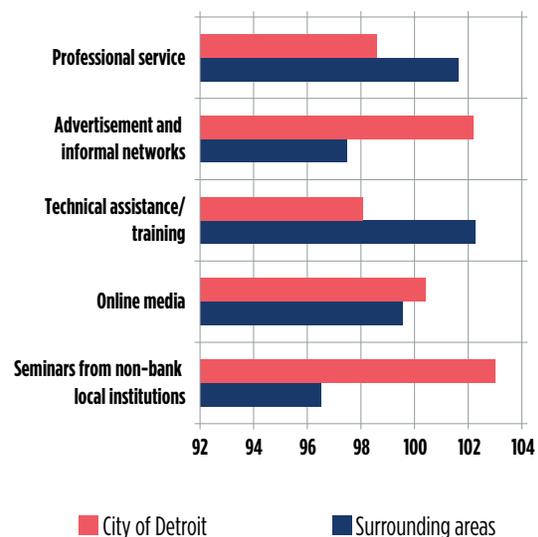
Figure 6. Resources used by years in business

■ 10 years or more   ■ 6 to 9 years   ■ 5 years or less

Figure 7. Resources used and the location of business


■ City of Detroit   ■ Surrounding areas

plan, advice on marketing, and help with creating financial statements. The second grouping (factor 2) consists of benefits that relate to developing key contacts – including socializing with other business people, learning about new customers or suppliers, and gaining access to private and public leaders. The

Figure 8. Most important benefits for using local resources by years in business

	10 years or more	6 to 9 years	5 years or less
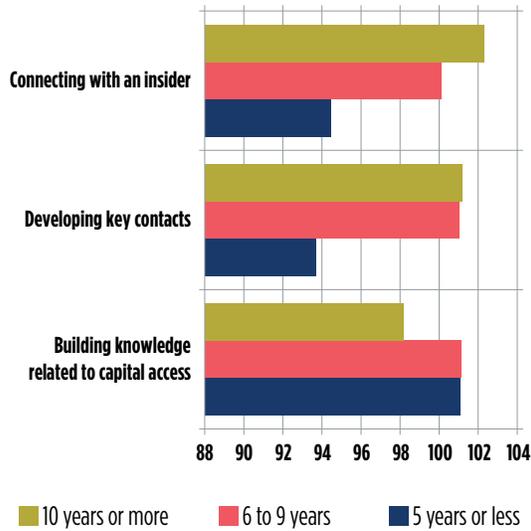
Figure 9. Most important benefits of using local resources and location of business

	City of Detroit	Surrounding areas
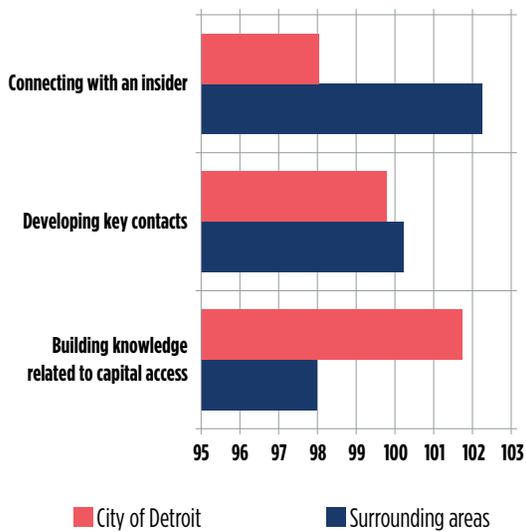
third most important grouping (factor 3) consists of a category we label "connecting with an insider" – including getting matched with a business mentor and getting help competing for supplier contracts.

The perceived benefits of particular resources vary according to characteristics of the businesses. Owners of younger firms (less than 10 years) view knowledge related to capital access as being the most important benefit to be had from using local business resources. In contrast, owners of more established businesses view key contacts and connecting with insiders as the most important benefits of using local resources (figure 8).

Owners of businesses in the city of Detroit also score the benefits of knowledge related to capital access high (figure 9). Business owners outside of Detroit score the benefits of connecting with a mentor or competing for procurement contracts higher.

With respect to barriers, respondents were asked to choose among a list of 13 possible barriers to accessing information and resources for their businesses. Five category groupings result from the responses. The most important issue that surfaces relates to people not knowing what training opportunities are available (figure 10). The responses that comprise this category include unfamiliarity with resources for networking, as well as unfamiliarity with resources for technical assistance and training. The second most important barrier relates to resources not being adequate for business owners. The responses that make up this category indicate that the places used for funding assistance are not seen as effectively connecting business owners to capital; the places used for training are not seen as providing information to help the business; and that there are not enough opportunities to network. The third most important barrier category relates to the cost of training. The items in this category include technical assistance/training being too costly, and the perception that networking does not connect the business owner to people who can help with the business. Fourth is the sense that the available resources are inconvenient. This category indicates the business hours and locations of training and technical assistance are inconvenient. The final barrier category relates to limited access to alternative sources of capital. Items included in this category are a lack of support from

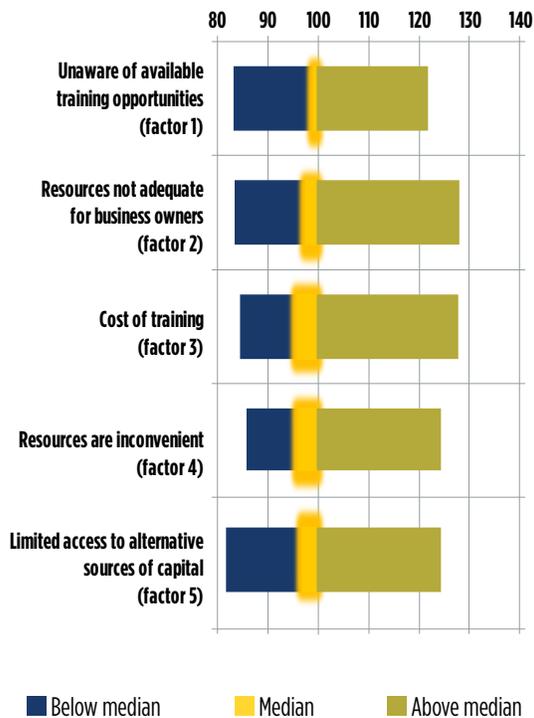## Figure 10. Barriers to using local resources

Legend: ■ Below median ■ Median ■ Above median

Figure 11. Barriers to using local resources by years in business

Legend: ■ 10 years or more ■ 6 to 9 years ■ 5 years or less
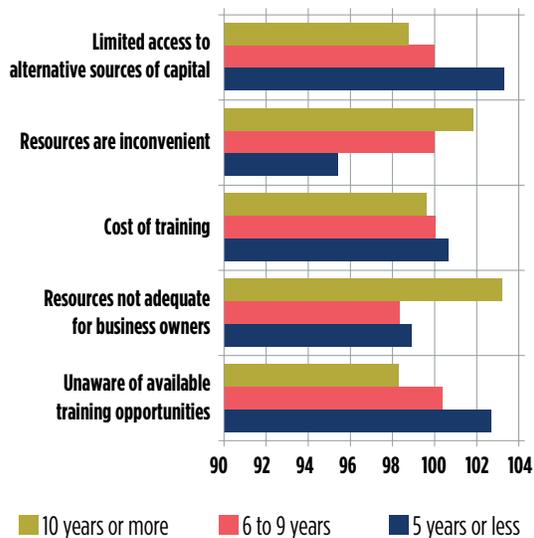
Figure 12. Barriers to using local resources and location of business

Legend: ■ City of Detroit ■ Surrounding areas
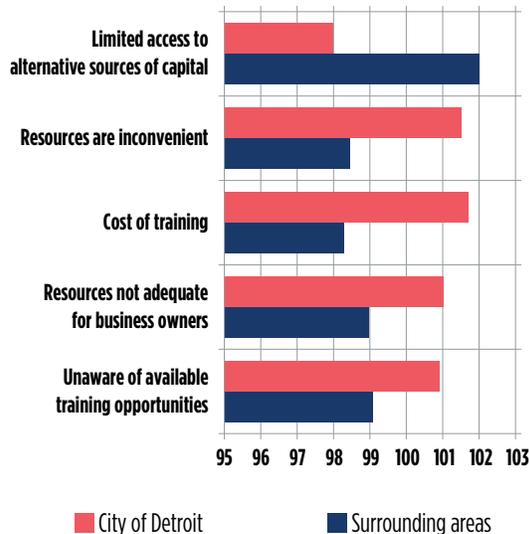
family and friends, as well as little knowledge about appropriate sources of capital. Potential other barriers listed in the questionnaire, namely, that banks and other financing sources are not proximate to the business, or that there are too few opportunities to network, were not identified as significant barriers by the business owners surveyed.

To the extent that barriers are experienced, the nature of barriers varies by business tenure. New business owners tend to report that they do not know what is available and lack family support (figure 11). More mature businesses feel that some of the resources available do not really connect them with funding sources and more opportunities for their business, and/or networking does not connect them to people who can help them with their businesses. In some instances, according to those same business owners, training and technical assistance is too costly.

Business owners in the city of Detroit tend to identify with more types of barriers than those in surrounding areas. The exception relates to limited access to alternative sources of capital. Business owners outside the city of Detroit tended to identify this as a stronger barrier (figure 12).

Conclusion and implications

The CDPS poll reflects the views of business owners who are members of Detroit area chambers of commerce, and as such, have demonstrated an interest in better connecting to local resources. It is not meant to be a scientifically designed sample, and therefore we do not claim to represent the view of black business owners in Detroit. Overall, we find four main groupings of resource needs among the businesses surveyed. They include, in order of importance, human and financial capital (grouped with neighborhood safety), networking (relationships that help build business), procurement, and sales. These findings suggest that a priority for local intermediaries may be to focus on efforts that affect access to capital and credit, as well as training and technical assistance for black business owners.

The analysis reveals some potentially meaningful distinctions between the resource needs of younger versus more established businesses, as well as business owners who operate inside versus outside of the city of Detroit. Younger businesses express higher needs scores overall, even though they are less likely to use any kind of resources compared to older businesses, and are less likely to know what resources are available. More established businesses express a greater interest in identifying procurement opportunities, but report that providers of business assistance do not necessarily connect businesses to appropriate capital or relevant information. Detroit-based business owners express a greater need for human/financial capital including neighborhood safety, and identify the most important benefits using resources as getting more knowledgeable about capital access. For business owners outside of Detroit, the most important benefits of using resources relate to establishing key business contacts like mentors and people who know about procurement opportunities.

An additional set of findings from the factor analysis relate to the nature of the category groupings themselves. The factor analysis technique groups responses that have a relatively high correlation to one another into "factor" categories. Thus the category with the highest needs score, what we call "human and financial capital needs" in this analysis for example, is made up of a variety of correlated responses that includes capital, training

and technical assistance, and neighborhood safety. To be sure, the construction of each category is somewhat subjective, insofar as the analyst can limit the number of categories generated by the program or use different correlation cut-offs to determine which items are highlighted in a given category. But fundamentally, what this method of analysis conveys is that many of the resource needs of small businesses go together. Either the needs items themselves are of a similar nature from the perspective of a business owner, or a business owner with one type of resource need is likely to have another type of resource need, as well. Viewing responses in terms of needs categories makes a case for multi-prong strategies to connect small business owners with resources, and strategies that address several resource needs at a time, as promising ways to address the needs of small and nascent black business owners in the Detroit area.

Notes

1. See http://www.newdetroit.org/docs/ee/mbnsr.pdf.

2. The analysis takes "resource needs" to be those which respondents said were the most important needs for their businesses. The questionnaire also asked them to identify if those same items constitute somewhat a need or not a need at all. The present analysis considers only the most important needs. If a person marked an item as most important, the resource need response was assigned a "1"; otherwise the response was assigned a "0".

3. The lower sales score for business owners in Detroit echoes findings from previous conversations with business owners in Detroit, who suggested that while the overall business landscape may be stressed in the city, this may offer some businesses relatively more opportunities to sell due to less competition in close proximity.

Appendix A. CDPS Resource Networks Poll

General information

1) What is the name of your business?

2) What is the primary location of your business?

ZIP code:	Neighborhood (e.g., Midtown, East Jefferson, etc.):

3) In what year did you become the owner of your current business?

4) What products or services does your business provide (e.g., retail, auto parts, accounting services, etc.)?

5) About what percent of your customers live or work near the neighborhood where your business is located?   %

6) What is your age?

( ) 18 – 24	( ) 25 – 34	( ) 35 – 44	( ) 45 – 54	( ) 55 and over

7) What is your race?

( ) Black	( ) White	( ) Asian	( ) Other

8) Are you of Hispanic origin?

( ) Yes	( ) No

9) What is your gender?

( ) Male	( ) Female

10) Is your business any of the following? Check all that apply.

( ) Home based	( ) A franchise	( ) Sole proprietorship	( ) Partnership	( ) Incorporated

11) Does your business have employees other than you (and your business partners)?

( ) Yes	( ) No

12) What is your level of education?

( ) Less than high school	( ) Some college	( ) High school or GED	( ) Four years of college or more

13) Roughly, what are your business' annual sales?

( ) Less than $100,000	( ) $100,000 – $999,999	( ) $1,000,000 – $3,000,000	( ) Over $3,000,000

14) What are the most important needs of your business?

	Very important	Less important	Not a current need
Sales			
Marketing			
Technology			
Procurement contracts			
Safety and security of neighborhood where business is located			
Supplier credit			
Human resources			
Capital			
Networking (building relationships that will help my business)			
Technical assistance/training (writing a business plan, preparing financial statements, etc.)			
Support from family and friends			
Other (please explain):			

Appendix A. CDPS Resource Networks Poll (continued)

Resource networks for businesses

15) Have you used any of these resources in the past 12 months to share and receive information for your business?		
Chambers of commerce or trade associations	Yes	No
Service clubs (Rotary, etc.)	Yes	No
Online social media	Yes	No
Expos, business festivals, trade shows	Yes	No
Directories/online resources that target ethnic or minority businesses	Yes	No
General advertising	Yes	No
Technical assistance/training programs	Yes	No
Courses at community colleges/universities	Yes	No
Business incubators	Yes	No
Paid professionals (accountant, lawyer, etc.)	Yes	No
Informal networks (friends, family, neighbors)	Yes	No
I have used no resources to get or share information	Yes	No
16) Have you gone to any activities or seminars in the past 12 months to share and receive information for your business, sponsored by any the following organizations?		
Banks or credit unions	Yes	No
Small Business Administration (SBA)	Yes	No
Faith-based or nonprofit organizations	Yes	No
Philanthropic institutions or corporations	Yes	No
Local or state government agencies	Yes	No
Unknown	Yes	No
17) In general, what have been the most important benefits of using local business resources? Check all that apply.	
---	---
No benefits	( )
Networking/Relationship Building	
To help me meet and socialize with other business people	( )
To provide me with new customers or suppliers	( )
To enable me to gain access to private and public leaders	( )
To match me with a business mentor	( )
Capital/Business Funding	
To develop relationships with banks and other financial institutions	( )
To help me compete for minority supplier contracts	( )
To get and use information on alternative sources of capital for my business (nonprofit lenders, crowd funding, etc.)	( )
Training/Technical Assistance	
To develop a business plan	( )
To get advice on marketing	( )
To create and understand my financial statements	( )
To get legal advice	( )
Other (please explain):	

18) What do you consider to be the barriers to using local resources for your business? Check all that apply.	
No barriers	( )
Networking/Relationship Building	
Not enough opportunities to network	( )
Networking does not connect me to people who can help my business	( )
I don't know what is available	( )
Lack of support from family or friends	( )
Capital/Business Funding	
Places I go to for assistance do not connect me to the funding needed for my business	( )
Banks and other financing sources are not located in the vicinity of my business	( )
I don't know about appropriate sources of capital for my business	( )
Technical Assistance/Training	
Information is not useful to help me start or expand my business	( )
I don't know what training is available	( )
Inconvenient locations	( )
Inconvenient times	( )
Too costly	( )
Other (please explain):	

Appendix B. Note on the factor analysis methodology in the analysis

Factor analysis is a statistical technique that is often used in the social sciences for reducing the amount of data that is required to be analyzed. This type of exploratory method (as is the case for the simpler principal component method) is appropriate when observed variables are correlated. It organizes a data set into a smaller number of variables by describing linear combination of the variables that contain most of the information expressed by respondents. This allows for a more concise (and, one hopes, meaningful) interpretation.

The analysis reports factor scores (which we then rescale to have a mean of 100), which are developed through a four-step process, summarized as follows:

In the first step we run the factor analysis. The factor analysis assumes a multiple linear regression model that gives the relationship between the latent (unobservable factors) and the observed (manifest variables).

This can be expressed as follows:

$$x_1 = \lambda_{11} f_1 + \cdots + \lambda_{1k} f_k + u_1$$
$$x_2 = \lambda_{21} f_1 + \cdots + \lambda_{2k} f_k + u_2$$
$$\vdots = \vdots$$
$$x_p = \lambda_{p1} f_1 + \cdots + \lambda_{pk} f_k + u_p$$

where

$x = (x_1, \ldots, x_p)'$ are the observed variables (random)

$f = (f_1, \ldots, f_k)'$ are the common factors (random)

$u = (u_1, \ldots, u_p)'$ are specific factors (random)

λ_{ij} are factor loadings (constants)

There are two ways to estimate the model. We use *principal factor analysis* (as opposed to maximum likelihood estimation). The principal factor analysis procedure involves the estimation of the correlation matrix; it estimates communalities of the variables using the square of the multiple correlation coefficient, or the largest correlation coefficient between the *ith* variables.

Table A. Factor loadings for question on most important needs of businesses

	Factor 1	Factor 2	Factor 3	Factor 4	Uniqueness
Sales				0.8467	0.2279
Technology		0.7422			0.3307
Networking		0.823			0.2776
Procurement contracts			0.8471		0.277
Safety	0.6972				0.407
Supplier credit	0.7533				0.3703
Human resources	0.6542				0.4994
Capital	0.5614				0.5104
Technical assistance	0.6148				0.5272
Family support	0.6906				0.3225

In the second step, we proceed to conduct a factor rotation. In factor rotation we look for a matrix, such that the factor loadings can be more easily interpreted than the original factor loadings. For this analysis we opt to use an orthogonal rotation (VARIMAX) method, which restricts the factors to be uncorrelated (an oblique rotation would allow the factors to be correlated). The orthogonal rotation is more convenient in the sense that the interpretation is straightforward—the factor loadings represent correlations between the factors and the observed variables. Note that this is a subjective process. In essence, this process is subject to our discretion in rotating the factors until we find an interpretation that we believe makes the most sense. The factor rotation does not change the overall structure of a solution. It only changes how the solution is described, and finds the simplest description.

To illustrate with the results of our survey, the polling questionnaire lists 11 items that could form the "most important needs" for business owners. We can view the idea of "need" as latent or unobservable variables, and we have the observed variables as expressed in the answers to the questions. From there, we run the factor analysis model. The factor analysis takes the responses (variables) and creates clusters or groupings of these items around a latent (unobserved) factor. The factor analysis assigns a "factor load" between 0 and 1 to each response (observed variable), indicating which of the variables are more or less relevant to explain a particular latent (resource-need) factor.

We then rotate the factor. Upon our discretion, we impose a restriction to the factor rotation to limit the rotation to items whose factor loading is at least 0.6. Table A shows the resulting rotated factor in this second step. (This step also reports the "uniqueness" number of the variables, an important indicator that indicates whether the variables are in fact relevant. A number of less than 0.6 indicates relevance.)

The factor loadings (above) represent correlations between the factors and the observed variables. Table A shows that the first set of factor of needs are correlated or defined positively by human resources, capital, supplier credit, technical assistance, and family support resources. Also, the safety and security of neighborhoods where businesses are located loads positively under the first grouping. The items that load positively to form the second set factor grouping include networking (building relationships that will help businesses) and technology. Procurement stands on its own as the third factor, perhaps signaling that respondents tend to view this category as a separate issue. Sales form the fourth factor. (Marketing would have been under the fourth factor as well, but its correlation with factor 4 was slightly less than 0.6, so this variable is not reported.)

Thus far in the analysis we considered the factor scores to be *random*. This is appropriate when we think of different samples consisting of different individuals, and we are interested in the general structure. However we are also interested in the responses of specific groups of individuals (e.g., businesses in the city of Detroit

vs. outside city the of Detroit; those who have been in business less than five years vs. those with more mature businesses, etc.). As such, we want to know the extent to which factors (or resource needs) compare and contrast for different individuals or group of individuals (we want the factors to be *deterministic*).

We proceed to a third step to estimate and predict *factor scores* (not factor loadings, which are correlation numbers that explain how much an observed variable fits under a factor grouping). The calculation of factor scores is fairly complex, and is similar to a regression technique of using maximum likelihood estimation that sets the derivative of a variable (factor) with respect to another variable (*x*) equal to zero. The standard procedure is to use the Bartlett method to estimate/predict those factor scores. This gives an estimated score to each factor, f_i', to the *ith* individual, assuming known (observed) variables x_i, given factor loading, f_i. The deterministic factor scores (Bartlett's method) estimation is thus given as follows:

If we rewrite the factor analysis model in short:

$x = \Lambda f + u$

Where, Λ is a p x k matrix containing the λ_{ij}'s

Assume normality, and suppose that Λ and φ *(the covariance of u) are known.*

Denoting the factor scores for th*e ith* individual by f_i.

Then x_i given f_i is normally distributed with mean Λf_i and covariance matrix φ.

Hence, the log likelihood for one observation x_i is given by

$-\frac{1}{2}\log|2\pi\varphi| -\frac{1}{2}(x_i - \Lambda f_i)'\varphi^{-1}(x_i - \Lambda f_i)$.

Setting the derivative with respect to f_i equal to zero gives f_i', *t*he estimated or predicted factor score for the *ith* individual, as follows:

$f_i' = (\Lambda'\varphi^{-1}\Lambda)^{-1}\Lambda'\varphi^{-1}x_i$.

As a final step, we create indices out of these "factor scores" by rescaling them to have a mean of 100 and standard deviation of 10, which make the scores more interpretable and comparable. The median and range values of those index factor scores are reported throughout the analysis.

Biographies

Maude Toussaint-Comeau is a senior business economist in the Community Development and Policy Studies division at the Federal Reserve Bank of Chicago.

Robin Newberger is a senior business economist in the Community Development and Policy Studies division at the Federal Reserve Bank of Chicago.

FEDERAL RESERVE SYSTEM COMMUNITY DEVELOPMENT RESEARCH CONFERENCE

ECONOMIC MOBILITY RESEARCH & IDEAS ON STRENGTHENING FAMILIES, COMMUNITIES & THE ECONOMY

APRIL 2-3, 2015

Call for Papers

The Community Affairs Officers of the Federal Reserve System invite paper submissions for the ninth biennial Federal Reserve System Community Development Research Conference, a unique event that aims to bridge the gap between research, policy and practice on key issues facing the country. High-quality and emerging research is presented in a dialogue with policy-makers and community practitioners who can utilize the lessons gleaned from research. The 2015 conference seeks to inform a robust public conversation about economic mobility.

April 2-3, 2015 | Washington, D.C.

Learn more about the conference and submit your paper/abstract here:
www.stlouisfed.org/economicmobility2015

FEDERAL RESERVE BANK
OF CHICAGO

Published by the Community Development and Policy Studies Division

PO BOX 834
CHICAGO, IL 60690-0834

RETURN SERVICE REQUESTED

Attention:
Executive Officers
Board of Directors
CRA Officers
Community Lenders
Community Representatives