



# **The Role of Windows in Mainframe Modernization and Migration: Current Issues and Trends**

Custom Research Report—A MetricView White Paper

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# Contents

- Introduction..... 2
- Research Objectives and Overview ..... 4
- Survey Results ..... 5
  - Survey Segments ..... 6
  - Full Migration Segment: Summary of Results ..... 7
  - Modernization Segment: Summary of Results ..... 8
    - Modernizing with Windows Server..... 8
    - Modernization with Other Platforms..... 9
    - After Modernizing..... 10
  - Mainframe-Only Segment: Summary of Results ..... 10
    - Technological Hurdles ..... 11
    - Future Migration and Modernization Plans ..... 11
- Summary and Conclusions ..... 13
- Appendix ..... 14

## Introduction

Strong evidence suggests that the Windows Server® operating system, employing Microsoft® .NET technology, is the destination platform of choice for U.S. businesses that are migrating or modernizing mainframe workloads.<sup>1</sup> Of the businesses surveyed that have shut down the mainframe and migrated all legacy workloads to a new platform, **three out of every four** (78 percent) selected Windows Server as the primary platform to run the majority of their applications. And for the businesses surveyed that have substantially modernized their mainframe workloads, **two out of every three** (66 percent) have also chosen the Windows Server platform.

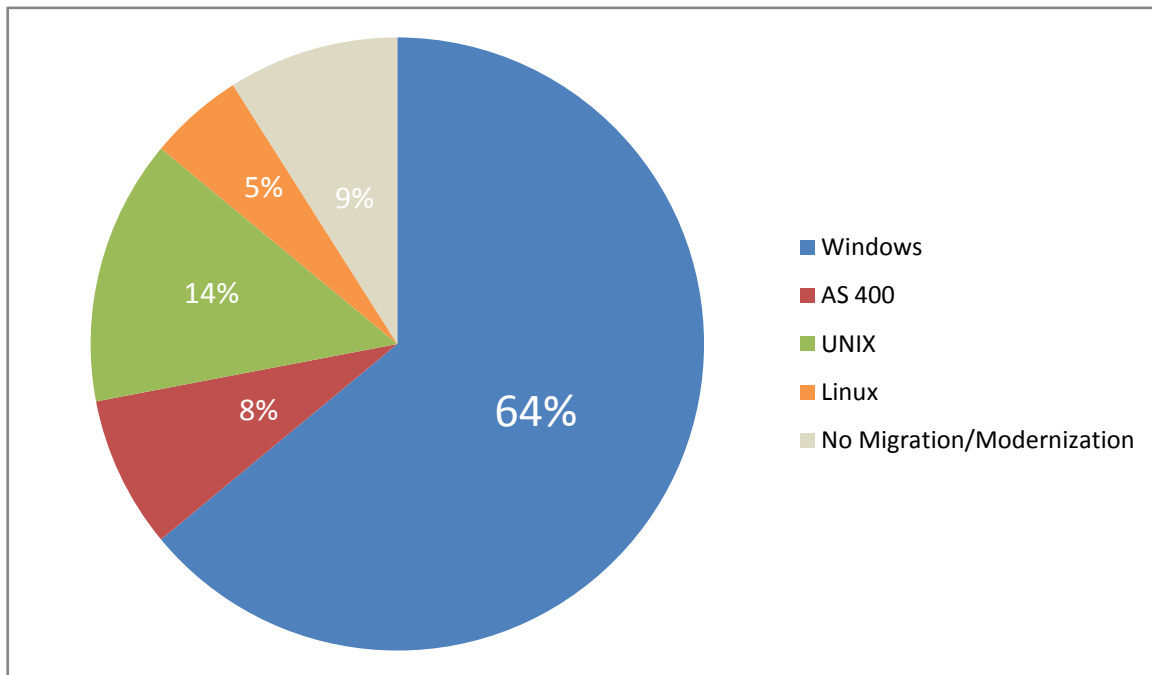


Figure 1. Selected platforms for migration or modernization from mainframes (combined percentage of survey sample).

Satisfaction ratings for Windows Server are very high among those companies that have either fully migrated to Windows Server or are relying on Windows Server for the majority of their mainframe modernization applications, with 28 percent of the migration segment and 20 percent of the modernization segment giving the highest rating possible (a rating of 7 on a 7-point Likert rating scale).

In his 2008 research note,<sup>2</sup> Dr. Mike Gilbert, of Legacy Directions, presented a rationale and several viable options for mainframe-dependent enterprise businesses to transfer some or all of their legacy applications to the Windows Server operating system. These options are designed to help companies escape from the “technology time capsule” of being locked into the costly dependency on millions of lines of platform-specific code—code that requires large teams of programmers who possess skill sets that are no longer in vogue. It is a well-known fact that those enterprise businesses that struggle to remain competitive by relying solely on outmoded mainframe legacy applications must spend as much as 80 percent of their enterprise software budgets on aligning the mainframe systems to current and future business requirements.

<sup>1</sup> “Mainframe Modernization and Migration to Windows,” Nigl, A. Revonet, May, 2008

<sup>2</sup> “Moving Mainframe Applications to Windows,” Gilbert, M. Legacy Directions, 2008

Research shows that companies are selecting Windows Server for two major reasons: cost savings and flexibility. Costs can be reduced by up to 50 percent when moving IT operations to an equivalent Windows Server platform. When surveyed directly, senior IT professionals have also reported enhanced performance, enabling them to improve key business processes without significant additional investment.<sup>3</sup>

For example, a study conducted by Cognizant showed that the Schwan Food Company saved more than U.S.\$1 million annually by migrating its custom business applications to the Microsoft .NET Framework. Schwan also increased processing speeds by 10 percent, with a total capacity increase of 30 percent. Overall productivity increased up to 60 percent following the migration to .NET.<sup>4</sup>

The results of a 2006 research study by Mercer Management Consulting found that Windows Server is the preferred choice when IT organizations migrate or modernize servers as part of a concerted effort to improve business processes, while at the same time attempting to lower total cost of ownership (TCO).<sup>5</sup>

In addition to TCO reduction and greater flexibility, an increased preference for Windows Server as the platform of choice in mainframe migration may be attributable in part to sociocultural factors. For example, in 2007 Gartner published an analyst report that indicated that a noticeable generational shift in IT programming skills is one of the primary factors resulting in a business decision to migrate legacy applications from the mainframe to a Windows Server platform. Recent IT grads are not likely to have proficient skills in Time Sharing Option (TSO) and Interactive System Productivity Facility (ISPF) programming and could not easily replace the skill sets of senior mainframe programmers who are now reaching retirement age.<sup>6</sup>

In the spring of this year (2008), the independent market research consulting organization Revonet conducted a comprehensive market research survey entitled the Mainframe MetricView Survey. It objectively assessed the key business drivers that framed decision-making concerning IBM zSeries mainframe migration and modernization. In addition, this study evaluated how a select group of senior IT professionals felt about the role of Windows Server in mainframe migration and modernization, as well as what their opinions were regarding the main obstacles to overcome when trying to execute a plan for migration or modernization. Revonet randomly selected technology business leaders from a list of over 2,000 U.S. businesses that were running legacy applications on zSeries mainframe systems. Revonet applied its proprietary market research tool, MetricView™, to conduct the research interviews and analyze the data. That research report is devoted to an analysis of the research findings and a discussion of the implications of these objectively derived research results.

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<sup>3</sup> EDP Weekly IT Monitor, April 12 2004.

<sup>4</sup> "Mainframe-to-Windows Migration Saves Frozen Food Producer More Than \$1 Million," Cognizant, 2006

<sup>5</sup> "Driving Lower TCO and Rapid ROI through Unix Migrations," Mercer Management Consulting, 2006

<sup>6</sup> "Impact of Generational IT Skill Shift on Legacy Applications," D. Vecchio, Gartner, 2007

## **Research Objectives and Overview**

Revonet launched the Mainframe MetricView Survey in March 2008. The primary project objectives were:

- Validate the previously reported information regarding zSeries mainframes, and scrub the available records when discrepancies in contact information and mainframe information were encountered.
- Identify instances where migration or modernization to Windows Server had already occurred or was in process.
- Identify issues and obstacles to mainframe modernization or migration that were encountered by companies when they considered Windows Server as the platform for modernization or migration.

Senior IT professionals (CIOs, CTOs, VPs of IT) were identified as possible respondents for the survey from a list of 2,529 U.S. companies that were confirmed as having a zSeries mainframe or equivalent. (This list represents approximately one third of all U.S. businesses still employing the zSeries.)<sup>7</sup>

During this research project, a total of 1,232 businesses were contacted (49 percent of the total records available) and a total of 77 in-depth interviews with senior IT professionals (primarily CIOs, CTOs, or directors of IT) were completed by the end of April 2008. Given the finite universe of known mainframe users, this sample size (albeit small by consumer market research standards) provides acceptable error tolerance (less than +/- 5 percent) when considered in light of the following formula for determination of statistically reliable samples with finite universes:<sup>8</sup>

$$n = z^2 (pq) / e^2 \times (\sqrt{N - n} / N - 1)$$

where: n = ideal sample size

$$z^2 = 1.96^2$$

N = known or estimated finite population universe

pq = 2500, a constant in the case of maximum response variability

e = 5 percent error (maximum error tolerated)

The MetricView research interviews involved a two-stage process:

1. The first stage involved the identification of businesses at which a Windows Server migration was taking place or was completed, or where a substantial number of mainframe workloads had been or were being modernized by moving them to a Windows Server platform (or a combination of both migration and modernization).
2. The second stage consisted of in-depth interviews with the IT business leaders, conducted by Revonet's chief scientist, to uncover additional details, challenges, and issues involved in the mainframe-to-Windows Server migration or modernization.

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<sup>7</sup> The survey was conducted with senior IT professionals who agreed to the interviews after being informed of the purpose of the study. The survey interviews were conducted by trained interviewers from Revonet's Sioux Falls, S.D. call center and lasted 10 minutes on average; no financial incentive was provided to respondents. A second, more in-depth interview was conducted by Dr. Nigl with respondents who were selected because of the complexity of the details regarding modernization or migration in the first phase of interviewing. All survey interviews were conducted based on the standards established by the American Market Research Association.

<sup>8</sup> *Marketing Research*, Burns, A & Bush, R. Prentice Hall, New Jersey, 1995.

# Survey Results

Over 90 percent of the 77 businesses that agreed to an in-depth interview during the second phase of the MetricView research project had completed a full migration from the mainframe or significantly modernized mainframe applications (primarily on a Windows Server platform). The breakdown is shown in Figure 2.

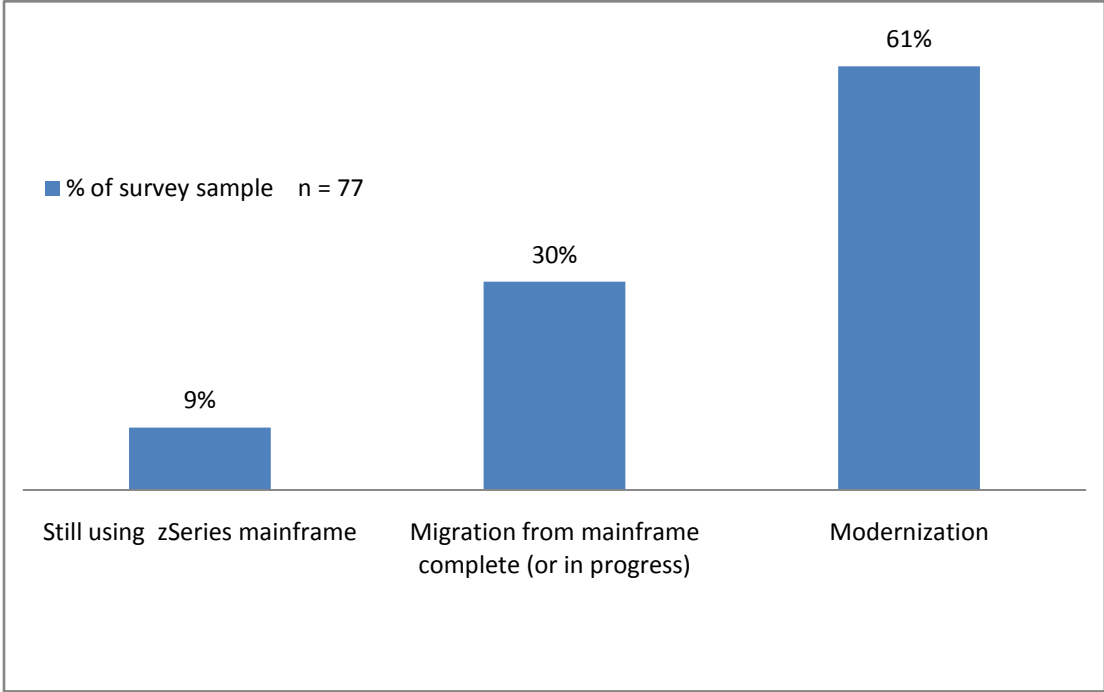


Figure 2. Distribution of zSeries usage in the total survey sample.

More than half of these businesses (49 of 77, or 64 percent) reported that they had already completed a mainframe-to-Windows Server migration or were in the process of completing it, or they had selected Windows Server as the primary platform for mainframe modernization (see Figure 3).

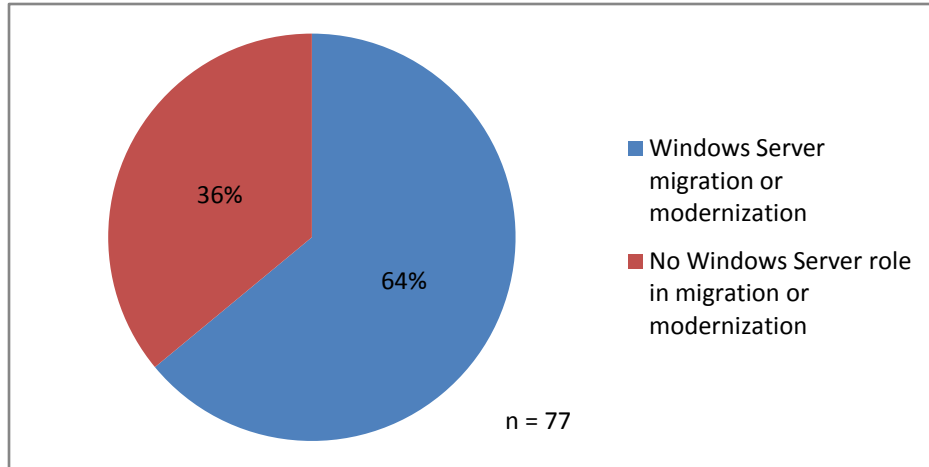


Figure 3. Proportion of businesses surveyed that employed a Windows Server solution for migration or modernization.

### Survey Segments

Three distinct segments were identified in the final MetricView sample of 77 U.S. businesses:

- **Full migration:** Companies that have completed a full migration to another platform (or are in the process of doing so).
- **Modernization:** Companies that have not fully migrated but have modernized a significant number of mainframe applications and workloads.
- **Mainframe-only:** Companies that continue to rely on the mainframe for legacy applications, with little or no modernization.

Table 1 shows the breakdown of key business demographics by these three segments, along with the average revenue and employee size for the entire universe.

**Table 1. Demographic Profile of Mainframe Migrations**

Survey Segment	Mean (avg) Revenue	Mean (avg) Employees
Full migration (n = 23)	\$1.58 billion	11,681
Modernization (n = 47)	\$4.05 billion	12,307
Mainframe-only (n = 7)	\$1.67 billion	4,403
Survey totals (n = 77)	\$3.11 billion	11,356
Survey DB universe (n = 2,529)	\$6.03 billion	2,403

Results for each of these segments are summarized in the next three sections.

## Full Migration Segment: Summary of Results

The 23 companies that completed a full migration from the mainframe are similar in revenue to those that continue to use the mainframe. However, the fully migrated companies have almost three times as many employees on average (11,681 versus 4,403). Despite these facts, no trends were identified on the basis of the industry verticals that are associated with companies in this segment. In summary, 78 percent of these businesses (18 of 23) have migrated to either a total or partial Windows Server solution, while only 22 percent of these migrations have involved Linux (see Table 2).

**Table 2. Platform Choices for Migrations**

Original Platform	Sample Size	Percent of Segment
Windows Server	n = 18	78 percent
IBM AS/400	n = 6	26 percent
Linux (or other open source)	n = 5	22 percent
Sun Solaris	n = 4	17 percent
HP – UX 11i (UNIX)	n = 2	9 percent
IBM AIX	n = 1	4 percent

Nearly half of the migrations (44 percent) occurred using packaged solutions. About one-fourth of all migrations (26 percent) were accomplished by rewriting programs (among the languages used were Microsoft Visual Basic®, Microsoft ASP.NET, COBOL, PowerBuilder, the Microsoft .NET Framework, and open-source Linux).

When this segment was asked the *proximate cause* that led to the final decision to migrate legacy applications from the mainframe, more than one-third of these respondents (39 percent) indicated that the decision grew out of fears that the mainframe lacked the “agility” to keep pace with the dynamic business requirements of a global economy. However, another 44 percent of this segment denied that “lack of mainframe agility” had anything to do with the final decision to migrate, and most of these respondents cited cost savings as the primary determinant. Another 17 percent indicated that lack of agility was part of the reason, but that factors such as cost predominated in the decision-making process.

The two biggest obstacles faced by these companies when considering whether to migrate from the mainframe were TCO concerns (29 percent) and workforce issues (29 percent). Regarding workforce issues, those respondents cited concerns that the entrenched mainframe workforce could not be trained properly, or that the process would be very costly.

Another 24 percent were concerned about possible losses or degradation of legacy data in the migration process, while 4 percent were concerned about the cost and other problems involved in converting mainframe-based programs to the Windows Server platform.

Of these 23 companies, three of them (13 percent) did not even consider Windows Server in the migration decision. When asked why, one respondent indicated that there was a huge concern that Windows Server was not stable or reliable enough; another voiced similar concerns and stated that they thought “Windows Server couldn’t handle the workload when they migrated;” the third respondent stated his belief that “UNIX was a more stable platform.”

When asked to rate their satisfaction with the migration outcome, most of the respondents in this segment gave positive ratings (86 percent gave a rating of 6 or higher on a 7-point scale); when one respondent was asked why he gave a neutral rating, he said “We used to be able to fix things on the mainframe in real time—now we have to depend on, and are at the mercy of, vendors.”

Linux was involved in 26 percent of all migrations, but only one company performed a Linux partition in IBM. In the remaining cases, the role of Linux was considered minor.

When asked to rate how likely it would be that they would consider Windows Server in the future for modernization solutions, 28 percent of this group rated the likelihood as very high (7), and only 6 percent rated it as somewhat low (a rating of 3 on the 7-point scale).

### **Modernization Segment: Summary of Results**

The 47 companies that have modernized many or most of the mainframe workloads differ from the mainframe-only and full mainframe migration segments in that their average annual revenue is almost three times as great (\$4.05 billion, as compared to \$1.67 billion for the mainframe-only segment and \$1.58 billion for the full migration segment). The companies in the modernization segment are similar to the full migration segment in average employee size (12,307 versus 11,861).

As with the migration segment, an examination of the industry verticals associated with the modernization segment does not show a definite trend, with these 47 businesses scattered across a wide variety of industry categories.

### **Modernizing with Windows Server**

Two-thirds of these businesses (31 of 47, or 66 percent) relied on the Windows Server platform for the majority of their modernization requirements. Former mainframe workloads that were modernized by these companies include customer and other legacy databases, retail banking operations, manufacturing logistics, customer relationship management (CRM), and payroll.

One-fifth (20 percent) of the 31 companies that adopted a Windows Server solution for workload modernization gave the highest satisfaction rating (7) for Windows Server. Only 4 of the 31 companies that rated Windows Server gave neutral or low satisfaction ratings.

The top two ratings (6 and 7) were given by more than two-thirds of these businesses (68 percent), which is a strong positive finding for Microsoft in this very competitive environment (see Figure 4).

*“We needed our workloads to run faster and be more versatile.”*

CIO, Food Processing Plant

*“Most of the third-party applications on the market today that we would be interested in require that we run on a Windows platform.”*

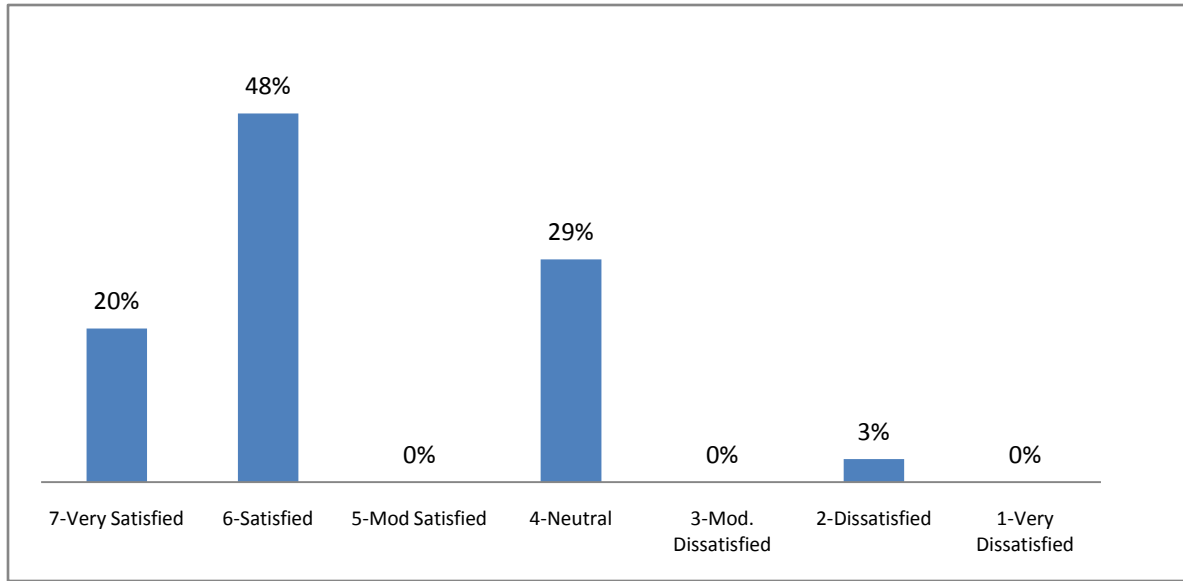
IT Director, Insurance company

*“Our mainframe is very old; we are moving to blade servers.”*

VP of IT, Manufacturing

*“Greater flexibility than we had with the mainframe; GUI interface that workers can easily use saves us money.”*

CIO, Manufacturing



**Figure 4. Satisfaction ratings from businesses that modernized using Windows Server.**

When it comes to the critical decisions involved in moving mainframe workloads onto new platforms, some of the factors underlying these decisions include the speed, functionality, and power requirements of new servers and software. Another important factor is the target return on investment (ROI) for each project, and the comparative cost benefits or savings involved in running applications on or off the mainframe. Some respondents emphasized that modernization decisions were based on selecting the best platform for a particular workload; in most cases, the best available “off-the-shelf” programs run on Windows Server, which is one of the main reasons that Windows Server was the modernization platform of choice.

For one company, the decision to modernize using Windows Server was made to satisfy the need for individual departments to have autonomy and control over their core applications without the need to “go back to the mainframe programmers over and over.”

### **Modernization with Other Platforms**

One company indicated that Windows Server was considered as the platform for modernizing the mainframe legacy workload but was rejected because “we did not feel Microsoft was secure nor stable enough.” Another company indicated that it decided on Oracle over Windows Server. However, these comments were in the minority, with most respondents expressing positive feelings regarding Windows Server having a role in modernization. In particular, these IT professionals cited the greater flexibility and increased functionality of modernizing on a Windows Server platform.

In marked contrast to the obvious support for the Windows Server platform among companies in this segment, Linux and other open-source solutions played a minor role or no role at all for the majority of companies (67 percent) that had modernized their mainframe workloads recently.

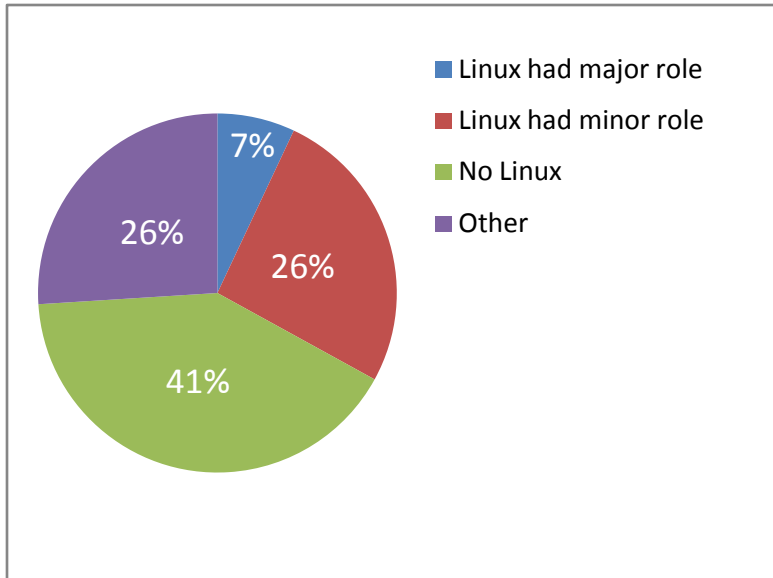


Figure 5. Role of Linux in mainframe modernization.

### After Modernizing

Although overall satisfaction with modernization is high, most companies that modernized are also considering shutting down the mainframe eventually.

When asked when or if they intend to migrate completely from the mainframe, 84 percent indicated that it was something being considered, but that there was no definite timeframe. Eleven percent of these companies indicated that they were planning full migration to the Windows Server platform, but 89 percent were not currently considering Windows Server in that way even if they were using a Windows Server solution for part of their modernization solution (see Table 3).

**Table 3. Post-Modernization Planning for Migration**

Response Category	Percent of Segment Answering
No definite timeframe	84 percent
Plan to migrate within 12 months	2 percent
Plan to migrate within next 2 to 3 years	9 percent
Plan to migrate in next 4 to 6 years	5 percent

### Mainframe-Only Segment: Summary of Results

Three of the seven companies that have chosen to remain with their mainframe systems (without migration or significant modernization) are in

*“We were able to match workloads to the best platforms to optimize performance.”*

VP of IT, Manufacturing

*“Cost savings combined with new functions and flexible hardware options not available with the mainframe.”*

CTO, Regional Bank

*“Our decision to modernize [was] based on cost savings combined with access to new functionality and flexible hardware options not available with mainframe.”*

VP of IT, University

*“Our decision to modernize was primarily to reduce total cost of ownership and have access to new applications done the best way.”*

CIO, Regional Healthcare Org.

the financial services sector. The others include a manufacturing company, a gaming corporation, and an airline. The average annual revenue for the seven companies that are still relying solely on the mainframe is \$1.67 billion; average employee size is 4,403.

Overall, the businesses that had not migrated from the mainframe or significantly modernized their mainframe workloads remain very loyal to IBM. They have a dedicated team of mainframe programmers with historically low job turnover and an IT executive team that is committed to finding ways to improve mainframe performance without switching to a different platform. These businesses, primarily banking and manufacturing companies, were actively rewriting their applications in such areas as human resources, logistics, CRM, employee relationship management (ERM), and legacy databases to maintain mainframe flexibility in a rapidly changing global economy. These businesses obviously have sufficient programming resources to keep pace and are not feeling pressured to change. Only one of these companies indicated any plans for migration in the future; interestingly, this company has decided to migrate to Windows Server and Microsoft .NET technology.

### **Technological Hurdles**

When asked what technological hurdles were involved in their decision not to migrate, one respondent mentioned issues surrounding what to do about the screen interface Customer Information Control System (CICS) panel code and Development Management System (DMS) (they have not yet converted to Basic Mapping Support [BMS] or modernized this unsupported code). Another mentioned that the inflexibility of the existing systems was a constant concern, but the company was confused as to which course to take.

One respondent indicated that the company had no technological hurdles because the mainframe handles everything that the company needs to do; it has no desire to change.

Although one respondent's company has decided to migrate, its migration is in the planning stages and is due to be completed in no less than three years. This respondent did cite that the company was now converting COBOL programs to Visual Basic, which was proving to be something of a hurdle.

### **Future Migration and Modernization Plans**

Of the seven companies surveyed that still relied completely on a zSeries mainframe, six of them (86 percent) have no definite plans for a full migration. One of the seven indicated that it plans to migrate within the next year or two and is already working with the Microsoft Enterprise Partner Group (EPG) to assist with plans and timing. It appears likely that this business will migrate to Windows Server.

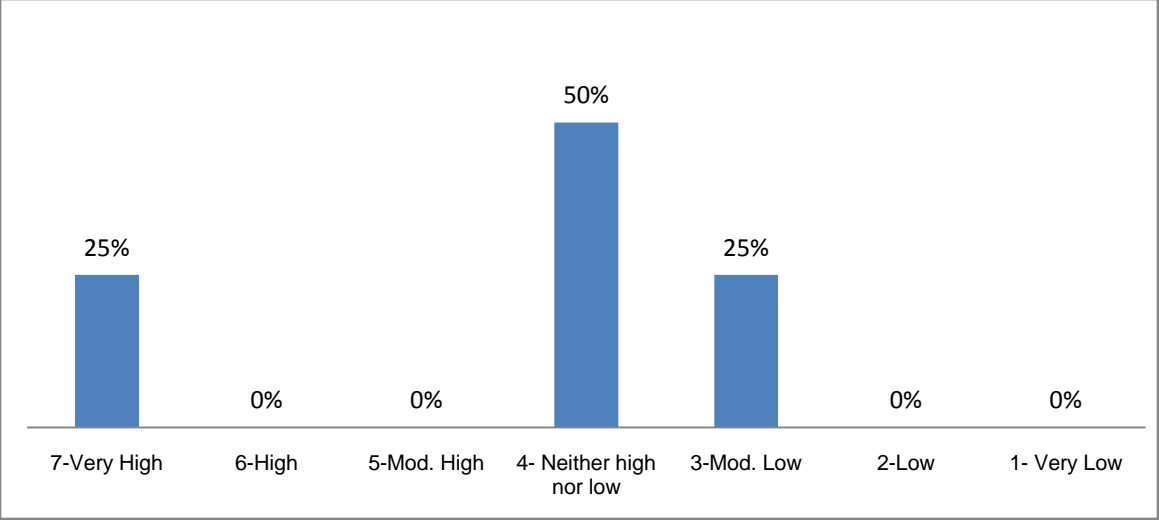
When asked what steps, if any, were being taken toward migration or modernization, four respondents reiterated the fact that there was no current push or initiative toward modernization.

One respondent reported that they are updating the mainframe software instead of modernizing. Another indicated that his company was rewriting all of its applications (for human resources, agent administration, game selection, financials, and all databases).

Another mentioned that they were considering shifting some mainframe workloads to workable packaged solutions in the marketplace, but that no decision had yet been made and everything was still status quo.

With respect to specific plans for either Windows Server or Linux solutions, one company indicated that Microsoft software was being considered; another said that a Linux or other open-source solution was being discussed; and the other five respondents were unsure about either option, although one respondent went on to say that "Linux may have a part to play, it all depends on flexibility."

Finally, when asked to rate the likelihood that Windows Server would be considered in the future, one-quarter of this segment gave the highest rating on the 7-point Likert scale (see Figure 6).



**Figure 6. Likelihood ratings regarding future role of Windows Server in migration or modernization.**

Thus, even among companies with strong attachment and loyalty to the mainframe, one in four of the surveyed companies would consider the Windows Server platform for migration in the future, if a decision to migrate legacy workloads is finalized.

## ***Summary and Conclusions***

Overall, the results of this survey of randomly selected former and present mainframe-dependent businesses illustrates the important role that Microsoft and the Windows Server platform has assumed as a major provider of modernization solutions. Somewhat surprising is the number of businesses that have already completely migrated to Windows Server; 18 of the 23 companies that reported a full migration from the mainframe with mainframe shutdown chose to adopt the Windows Server platform to handle all or most of their legacy applications.

In fact, 40 of the 77 companies surveyed (52 percent) adopted Windows Server solutions for the majority of their mainframe workloads in both the migration and modernization scenarios. Their level of satisfaction with Windows Server is also very high, with two-thirds awarding the top two satisfaction ratings (6 and 7 on a 7-point scale).

The most important driver for modernization or migration to Windows Server is cost savings. This was the most frequently cited reason of IT leaders who were interviewed in this MetricView survey. The second most important driver cited is the increased flexibility and timesavings that results from using the Windows Server platform compared to the mainframe. A third important factor involves the difficulties that mainframe businesses face in finding qualified programmers to work on the mainframe, when the majority of younger IT professionals have been trained on Windows Server and are more comfortable using the desktop for business functions. In contrast, the extent of Linux usage for modernization and migration is much more limited, although a few companies are considering doing more with open-source resources in the future. Packaged solutions have been a preferred migration and modernization approach for many companies, especially those with a large number of end users who are already comfortable with PCs and the Windows® operating system.

It appears from these results that the efforts of the Mainframe Migration Alliance (100 former mainframe companies are now in the alliance) combined with other technological, pricing, and licensing improvements, have had a significant impact and influence on U.S. businesses searching for alternatives to the mainframe.

Although Microsoft has made considerable progress in convincing the IT community that Windows Server is capable of handling legacy workloads safely and efficiently, the survey results, especially some of the candid comments made by certain IT professionals, indicate that there still may be resistance among mainframe-dependent companies to migrate or modernize core workloads running on the mainframe. Some major concerns include cost, retraining, the inability of alternative platforms to handle enterprise-level workloads, and the number of workloads of differing standards (lack of unification). In the future, the role of Microsoft technologies in mainframe migration and modernization is likely to grow stronger as companies become more committed to virtualization and to decreasing their total cost of ownership for legacy systems.

## Appendix

Appendix A illustrates the varied industries that have relied on Windows Server to modernize mainframe workloads and the diversification in the types of workloads that have been modernized (for example, from Accounts Payable to legacy databases). The data presented in Table 4 was obtained from 40 of the 77 companies in the Mainframe MetricView Survey sample.

**Table 4. Role of Windows Server in Modernizing Mainframe Workloads**

Industry Vertical	Mainframe Workload Moved to Windows Server
Agribusiness	Databases, purchasing
Automotive	Databases
Banking	CRM
Computer Services	CRM, personnel
Consumer Durable Goods	Logistics database
Consumer Electronics	Custom warehouse system
Engineering	All business applications
Entertainment	CRM
Financial Services	Customer database
Food Processing	Supply chain management
Food Service	Database
Government	Customer database
Healthcare	All workloads, databases, Web applications
Heavy Manufacturing	Customer Service, SAP
Insurance	Accounts Payable, databases, e-commerce, payroll, Web site applications
Professional Association	ERP
Retail	CRM, databases, SAP
School Board	Data retrieval and storage, payroll, project management
Telecommunications	Databases
Transportation	Printing
Unified School District	Production
University	Many different applications
Utility	Billing
Wholesale Durable Goods	CRM
Wholesale Foods	Databases