Criterion Validity of Microsoft's Systems Engineer Certification: Making a Difference on the Job[1]

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Evaluation Overview

Microsoft describes its Certified Systems Engineers (MCSEs) as "network professionals…qualified to effectively plan, implement, maintain, and support information systems in a wide range of computing environments using the Microsoft Windows NT Server and the Microsoft BackOffice integrated family of server products." The certification warrants an advanced level of competence to both employers and customers. The validity of this claim rests on a set of activities beginning with careful analysis of job demands, development of psychometrically sound examinations of skills required to meet these demands, and demonstration that use of the examinations to grant certification is related to job performance. This last element, called criterion validity, was the focus of this study of the MCSE program.

Research Questions

Criterion validity insures that a certification makes a difference on the job. To test criterion validity, the study sought answers to these questions:

1. Do MCSEs find the certification useful, especially for aspects of the job that have been found to be important?
2. Do MCSEs find that certification contributes to their professional credibility with customers and employers?
3. Do supervisors find MCSEs more competent on the job than noncertified SEs?
4. Do supervisors find MCSEs have an advanced level of competence?

Research Strategy

This study employed several strategies to strengthen inference of criterion validity[3]:

- Importance performance analysis, which involves simultaneous study of the importance of job components and the usefulness of the certification for these components. A valid certification has impact on important job tasks and does not waste resources on unimportant job tasks.
- Use of control constructs in performance appraisal, i.e., job tasks that were not expected to differentiate between certified and non-certified professionals. A valid certification is related to supervisor ratings on job tasks that are part of a particular job, and not on tasks unrelated to the job.

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[1] 3/18/99.

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[3] McKillip, J., & Cox, C. (1998). Strengthening the criterion-related validity of professional certifications. Evaluation and Program Planning, 21 (2), 191-197.

Methodology[4]

Two, web-based questionnaires were used. The first surveyed approximately 10,000 MCSEs employed in the US and internationally during April 1998. MCSEs were identified by email addresses in a Microsoft database. Potential respondents received an email notice and description of the study. They were given the Internet URL for responding to the questionnaire. The URL remained open for 10 days. Within the study period, 1711 MCSEs responded, 1671 that were usable. The second survey went to 781 supervisors of MCSEs whose email addresses were provided by respondents to the first survey. The same procedure was used. Supervisors received an email notice and description of the study and were given the Internet URL for responding to the survey. The URL remained open for 10 days. Within the study period, 209 supervisors responded, 205 that were usable. All correspondence and the survey itself were presented electronically by an independent vendor[5].

Instrument Development

Both questionnaires combined the instrument format from previous studies (see footnote 4) with the results of an independent, MCSE job analysis[6]. The job analysis included ratings of the importance of 91 job tasks covering 8 job areas by 415 MCSE from 20 countries. A 5 point scale was used, from (1) Not Important to (5) Extremely Important. These importance ratings provided one dimension of the importance/performance analysis presented in the Results section of this report. From the 91 job tasks, an expert group of MCSEs selected a subset of 24 of the job tasks that covered each of the job areas, were mutually exclusive, and paralleled the importance ratings of the full set of job tasks. These 24 job tasks are listed in Table 1, by job area. As in previous work (see footnote 4) the job area of Hardware Installation and Maintenance was added as a control construct. The job tasks from this area also are presented Table 1 (# 25 and 26). It was not expected that certification would be useful for these job tasks.

MCSE Survey. MCSEs rated:
(1) the percentage of time they spent on each of the job tasks;
(2) how useful the certification process was to their own job performance on each job task using a 9-point scale from (1) Not at all useful to (9) Extremely useful;
(3) usefulness of certification for professional credibility with employer and customers using the same scale as for the individual job task ratings; and answered
(4) questions about demographic characteristics and employment history;
(5) Questions about how they prepared for and paid for certification[7]; and
(6) open-ended questions about how to improve the certification[7].

MCSEs were also asked :

> "If you are willing, please indicate the name and e-mail address of the person you report to at the end of the questionnaire. We would like him or her to participate in a similar study of the Microsoft systems engineer certification."

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[4] General procedures followed previous research directed by Dr. McKillip. Summaries of this research are available at http://www.microsoft.com/Train_Cert/download/downld.htm:
Evaluation of the Microsoft® Systems Engineer Certification (mcsestud.doc); and
The Value of Certification for Solution Developers (mcsdwp.doc).
[5] This procedure was approved by the Southern Illinois University Institutional Review Board.
[6] "An Analysis of the Job of a Microsoft Certified Systems Engineer" (1997). Educational Testing Service.
[7] Results from these questions are presented in separate reports.

Table 1. Job Areas and Job Tasks Used in MCSE Criterion Validity Study.

Task ID#	Job Area	Job Task	Importance (max = 5.0)[+]
1	Planning	Identify the appropriate technology needed to solve specified problems	4.35
2	Planning	Plan the appropriate implementation model for specific requirements (for example, domain or sub-domain, site, directory services architecture, file system).	4.22
3	Planning	Develop a role out plan.	3.60
4	Installation and Configuration	Install, configure, and test network operating systems.	4.22
5	Installation and Configuration	Install and configure the network components of a workstation/desktop computer and server.	4.20
6	Installation and Configuration	Install and configure applications on a workstation/desktop and server.*	4.22
7	Installation and Configuration	Select and use software configuration management tools.	4.19
8	Configuring and Managing Resource Access	Set up user and group accounts to meet security and resource access requirements.	4.12
9	Configuring and Managing Resource Access	Create, share, and monitor remote resources (for example, printers, files, workstations).	3.99
10	Configuring and Managing Resource Access	Set up user environments using profiles logon scripts, and system policies.	3.77
11	Integration/Interoperability	Configure a Windows NT/Windows 95 computer to allow access to and from the Internet.	3.93
12	Integration/Interoperability	Configure a server or workstation/desktop computer for remote access.	3.69
13	Integration/Interoperability	Configure a Windows NT/Microsoft Windows_ 95 computer to integrate with a NetWare network (namely, server to NetWare, client to NetWare, or gateway).	3.46
14	Monitoring and Optimization	Establish baseline data	3.49
15	Monitoring and Optimization	Tune and optimize the system.	3.99
16	Monitoring and Optimization	Monitor system performance.	3.76
17	Troubleshooting	Diagnose and resolve installation process failures.	4.10
18	Troubleshooting	Diagnose and resolve boot process failures.	4.02
19	Troubleshooting	Diagnose and resolve connectivity problems.	4.29
20	Running Applications	Determine appropriate hardware and software to run applications on a server.	3.85
21	Running Applications	Configure an application to run as a Windows NT service.	3.32
22	Internet/Intranet Activities	Manage a Web site (for example, verify and update links, set permissions).	3.25
23	Internet/Intranet Activities	Set up appropriate firewalls.	3.50
24	Internet/Intranet Activities	Set up, configure, and customize Microsoft Internet Explorer.	3.29
25	Hardware Installation and Maintenance§	Know about hardware requirements of applications.	n/a
26	Hardware Installation and Maintenance§	Install, configure, and test hardware.	n/a

[+] Mean importance from job analysis, see footnote 6. * Modified from job analysis. §Control construct.

Participants could request a copy of this report and were entered into a lottery for a gift from Microsoft.

<u>Supervisor Survey</u>. On each of the job tasks, supervisors rated the competence of the MCSE and of another, non-Microsoft-certified (comparison) SE they supervised on a 9-point scale from (1) Not competent in this area to (9) …has an expert level of competence. Supervisors were told:

> "There will be two parts to the survey for you to complete: one for the MCSE who asked that you participate in this study, and the other for a different systems engineer (SE) who also reports to you. This other SE should have a similar job description to the MCSE who asked that you participate, and may or may not have other certification. The other SE should not have Microsoft certification."

Supervisors also rated the MCSE and the noncertified SE on three global dimensions using 9-point scales: (1) positive human resource decisions; (2) absence of performance weaknesses; and (3) overall competence. Supervisors were given the opportunity to make open-ended comments, to request a copy of this report and promised a gift from Microsoft.

Results-MCSE Survey

Sample Characteristics

Demographic and employment responses were received from 1671 MCSEs. Characteristics of these respondents and their employers are presented in Tables 2 and 3. Respondents had been computer professionals for 7.5 years and had held their SE certification for 1.5 years. They were overwhelmingly male and the majority was employed in the US (59%). Forty-one percent of the respondents came from 66 other countries (n=685).

Most respondents held at least one other certification (62%) and most were working on one (60%). Although almost 20 different certifying companies were mentioned, the majority of respondents held an alternative Microsoft certification (53%) and were working on one (54%). The most popular non-Microsoft certifications were those of Novell (30% holding and 11% working on). A relatively large percentage of respondents were working on a Cisco certification (8%) but less than 1% held one. The most popular alternative Microsoft certifications were the Internet (13% held and 31% were working on this certification), Trainer (17% were MCTs) and Solution Developer (3% held and 11 % were working to become MCSDs).

Respondents were employed in a wide range of business settings, with about half directly related to computing (Computer/IT and Consulting). About half of respondents (54%) worked for Solution Providers; their typical client had 15 servers; and they worked with 2 other SEs. Seventy-two percent work with at least one other SE.

The Internet methodology used to conduct this survey resulted in a large and diverse sample of respondents. These respondents had a good deal of profession computer experience, worked around the world and in a wide range of business settings.

Table 2. MCSE Survey Respondent Characteristics

Respondent Characteristics	N=1671
Median Years Computer Professional	7.5 years
Median Years Since Certification	1.5 years
Gender	95% male
Hold Alternative Certification	62%
Microsoft	53%
Novell	30%
16 others < 5% each	
Working on Another Certification	60%
Microsoft	54%
Novell	11%
Cisco	8%
15 others < 5% each	
Provided Supervisor email	781 (47%)
Company Characteristics	
Microsoft Solution Provider	54%
Median Number of SEs Work with	2.0
Median Number of Users Supported by Majority of Business Clients	922
Median Network Servers Used by Majority of Business Clients	14.0

Table 3. Place and Business of Employment, MCSE Survey

Place (Countries=66)	N=1653
US	59%
Europe	16%
Asia	8%
North America (Not US)	8%
Central & South America	3%
New Zealand/Australia	3%
Africa	2%
Middle East	1%
Business Type	
Computer/IT	35%
Consulting/Multiple	14%
Financial/Legal	13%
Training/Education	9%
Industry/Manufacturing	7%
Communications	6%
Government	6%
Commerce/Business	4%
Natural Resources/Utility	3%
Health/Drugs	3%

Other	1%

Time Spent-Job Areas

MCSEs rated the percentage of time they spent on each of the 26 job tasks. On average, MCSE spent 88% of their time on the 24 job tasks from the job analysis. Over job tasks, time spent correlated .67 with importance ratings from the job analysis, showing strong convergence[8]. The final column of Table 4 presents the average percentage of time spent on each of the job tasks in each job area.

Usefulness of Certification Process- Job Areas

As a primary criterion validity measure, MCSEs rated the usefulness of the "certification process to [their] work" on each of the 26 job tasks included in this study. The fourth column of Table 4 presents the average rating of the usefulness of the certification for the job tasks in each job areas. MCSEs rated the certification process useful (5.0) or higher for 7 of the 8 job areas identified by the job analysis. MCSEs rated the certification most useful for the four job areas that also received the highest average importance ratings in the job analysis, i.e., Planning, Installation and Configuration, Configuring and Managing Resource Access, and Trouble Shooting[9]. In addition, it was precisely the two job areas that received the lowest importance ratings in the job analysis that received the lowest usefulness ratings (Running Applications and Internet/intranet Activities).

Importance Performance Analysis-Job Areas

Importance-performance analysis provides a framework for combining the job analysis ratings of **importance for the job** with the MCSE survey ratings of **usefulness of the certification** to test the criterion validity of the MCSE certification. An effective certification process must have utility for performance on important aspects of the job domain. A certification need not support high performance on areas of a job that are unimportant. In fact, certification emphasis on unimportant job tasks probably wastes professionals' time and employers' resources.

Figure 1 displays the hypothesized relationship between how important a job task is and how useful certification is for that performance. Locating job tasks along these dimensions should show a scatter along the lower-left to upper-right diagonal. A valid certification should be more useful to performance in important than in unimportant job areas. Where certification is not related to important job tasks (lower-right quadrant), one finds tasks where certification development may be needed. Where certification is related to performance but job tasks are unimportant (upper-left quadrant), one finds tasks were certification resources may be wasted.

Figure 2 displays the Importance-Performance matrix for the job areas identified by the job analysis. Scores have been standardized[10]. The abscissa of this matrix is the importance rating that the job tasks included in this study had received in job analysis (see footnote 6) and the ordinate is the usefulness rating from the MCSE survey. The location of job areas is presented.

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[8] This is a large and reliable association. The task of rating time spent on each of 26 job tasks was quite difficult. Usable responses were received form 1146 respondents (69%).

[9] The average importance rating from the job analysis is presented in the 3rd column of Table 4.

[10] Values were subtracted from the mean (3.7 importance and 5.9 usefulness) and divided by the standard deviation of their distributions (3.5 importance and .79 usefulness).

Table 4. MCSEs Ratings of Job Tasks, By Job Area

Job Area	No. of Job Tasks	Average Importance Range 1-5[+]	Average Useful Range 1-9	% Time per Job Task
Planning	3	4.06	6.16	7.78
Installation and Configuration	4	4.21	5.98	6.01
Configuring and Managing Resource Access	3	3.96	6.37	2.81
Integration and Interoperability	3	3.69	5.66	2.34
Monitoring and Optimization	3	3.75	5.74	2.15
Trouble Shooting	3	4.14	6.07	3.25
Running Application	2	3.59	5.08	2.06
Internet/Intranet Activities	3	3.35	4.31	1.61
Hardware Installation and Maintenance*	2	n/a	4.39	2.48

*Control Construct Job. + From job analysis, see footnote 6.
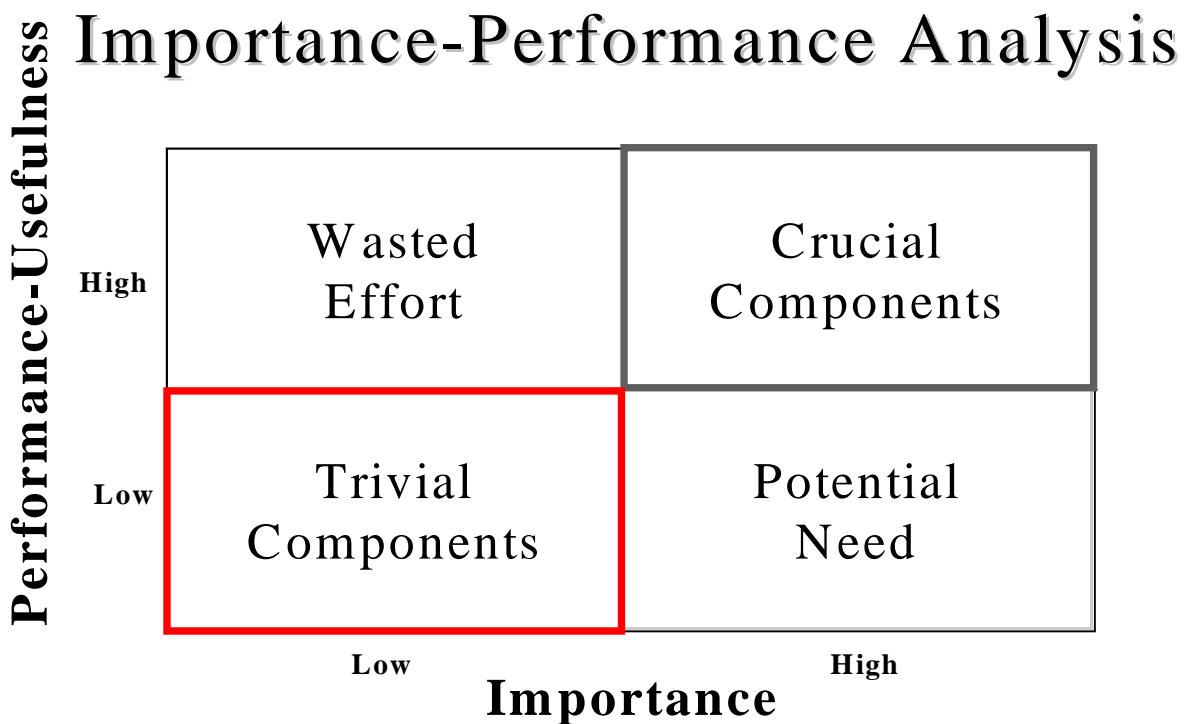
Importance-Performance Analysis

Figure 1. Importance-Analysis Matrix

Inspecting Figure 2, all of the job areas fall along the important lower left to upper right diagonal[11], providing impressive support for the criterion validity of the certification. MCSEs rated the certification as most useful for those job areas that were most important. MCSEs did not routinely rate the certification a useful for everything that they did—unimportant job areas generated lower usefulness ratings for the certification.

Analysis at the level of job task presents a nearly identical picture. Only one job task did not fall along the lower-left to upper-right diagonal: "Select and use software configuration management tools"(#7 in Table 1; Job area: Installation and Configuration) may warrant increased coverage as part of the SE certification.

Professional Credibility

MCSEs rated the usefulness of the certification process for their professional credibility with employer and customer. The average rating was 7.3 (7.0 was labeled "Very Useful"). Figure 3 presents the distribution of MCSEs ratings over the entire usefulness scale. Seventy-seven percent of respondents rated the certification as very to extremely useful for professional credibility with employer and customer[12]. This overwhelmingly positive judgment did not differ due to geographic place of employment, area of business, whether employer was a SP, or time since certification.

Summary of Findings-MCSE Study

- MSCEs spent almost all of their time on the job areas identified by the job analysis that underlies the MCSE certification.
- Microsoft certification was useful for most areas of MCSEs' jobs.
- Microsoft certification was most useful for the more important areas of SEs' job.
- Microsoft certification was "very" to "extremely useful" for professional credibility with employer and customers.
- Usefulness did not differ between US and international MCSEs, by area of business, due to employment with an SP, or due to time since certification.

Conclusions-MCSE Study

1. **Do MCSEs find the certification useful, especially for aspects of the job that have been found to be important?** Yes. MCSEs found the certification useful. They were discriminating in their answers in a way that supported the validity of the certification. MCSEs rated the certification process most useful for the more important areas of their jobs.
2. **Do MCSEs find that certification contributes to their professional credibility with customers and employers?** Yes. Overwhelmingly, MCSEs found that the certification contributed to their credibility with customer and employer.

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[11] The correlation between importance as identified in the job analysis and usefulness of certification from the MCSE study was .71. This is a large and reliable association.

[12] This percentage was higher that found in the previous study of the SE certification and the SD certification. See footnote 4.

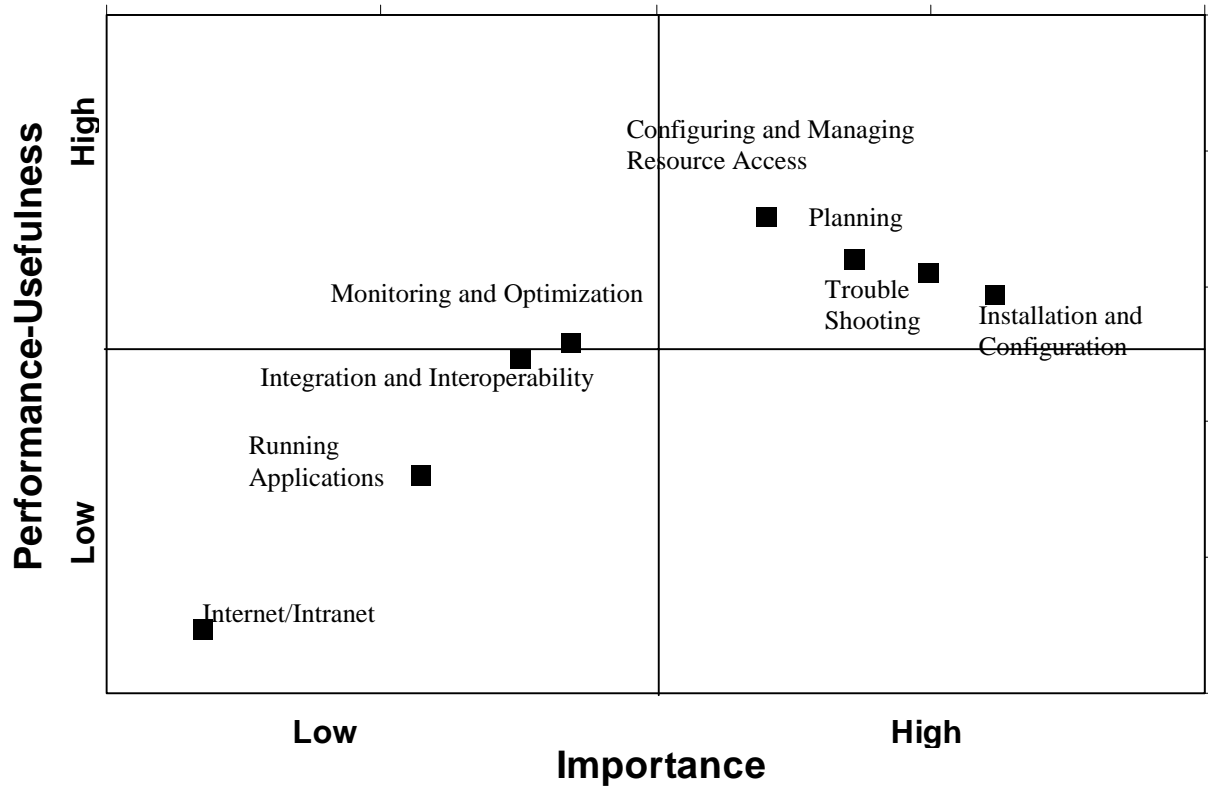# Importance-Performance Analysis of SE Certification

Figure 2. Location of Job Areas for Importance-Performance Analysis
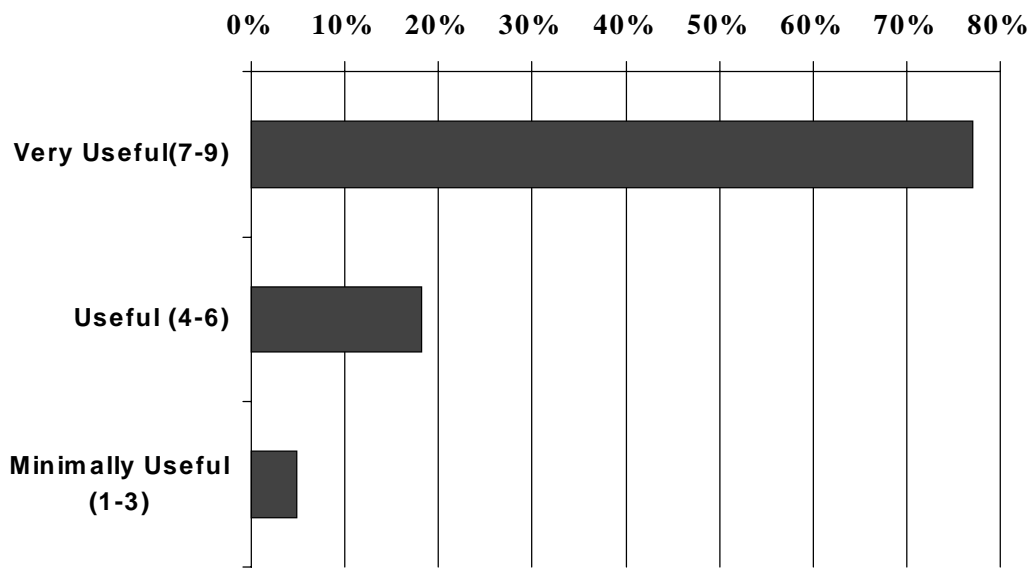
Professional Credibility With Employer and Customers

Figure 3. MCSEs Ratings of Usefulness of Certification for Professional Credibility.

Results-Supervisor Study

Sample Characteristics

Responses were received from 209 supervisors (26% of those surveyed) covering 204 MCSEs and 159 comparison (non-Microsoft –certified) SEs. Table 5 presents characteristics of their companies and the rated SEs. In general, the companies included in the supervisor study were quite similar to those included in the MCSE study:

- Sixty-four percent of the supervisors were employed in the United States with the remaining employed in 28 other countries.
- There was a median of 3.4 SEs under the supervisor (compared to 3.0 SE working together in the MCSE survey).
- Sixty percent of the companies were SPs (compared to 54% in the MCSE study), covering a wide range of business types.
- The companies had a median of 12.4 servers (compared to 14 for the MCSE study).

MCSEs in both studies were also similar in gender and the number of certifications held. The non-certified SE had been with their employers somewhat longer than had MCSE and were working on somewhat fewer other certifications[13].

One hundred thirty five supervisors provided complete information on an MCSE and a comparison SE. These supervisors came from larger companies (median 1000 vs. 720 users and 13.0 vs. 10.4 servers) and were more likely to work for SP than supervisors that did not give complete information (69% vs. 42%)[14]. These supervisors were also less likely to work in the US (55% vs. 66%)[13]. Differences were not found in the number of SEs supervised or in the length of tenure of MCSE compared to the other SE.

Competence Ratings

Supervisors rated the competency of an MCSE and of a comparison SE that they supervised on each of the 26 job tasks. These ratings were averaged over job areas and compared by multivariate analysis of variance. Analysis revealed that MCSEs were rated as reliably more competent than comparison SEs over all job areas together and on each job area except Hardware Installation and Maintenance (the control construct)[15]. These means are presented in Figure 4. Differences on each of the job areas identified by the job analysis were substantial. The

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[13] These differences were not statistically reliable (significant).

[14] These differences were reliable (statistically significant and of medium size).

[15] MANOVA results for overall comparison between MCSEs and SEs indicated that MCSEs were more competent (Wilks lambda $=.439$, $F(9,126) =17.86$, $eta^2 = .561$). Univariate comparisons yielded the same finding for all of the job areas from the job analysis:

Job Area	Direction	F(1,134)	Eta^2
Planning	MCSE>SE	37.3 (p<.01)	.218
Installation and Configuration	MCSE>SE	71.4 (p<.01)	.348
Configuring and Managing Resource Access	MCSE>SE	77.7 (p<.01)	.367
Integration and Interoperability	MCSE>SE	66.7 (p<.01)	.332
Monitoring and Optimization	MCSE>SE	19.4 (p<.01)	.127
Trouble Shooting	MCSE>SE	31.8 (p<.01)	.192
Running Application	MCSE>SE	75.4 (p<.01)	.360
Internet/Intranet Activities	MCSE>SE	53.4 (p<.01)	.285
Hardware Installation and Maintenance*	MCSE>SE	2.28 (ns)	.017

 * Control Construct

Table 5. Supervisor Survey Characteristics

Company Characteristics (N=204)

Microsoft Solution Provider	60%
Median Number of SEs Supervised	3.9
Place of Employment (Countries =29)	
US	64%
Europe	11%
Asia	8%
New Zealand/Australia	5%
North America	4%
Africa	4%
Central & South America	2%
Middle East	1%
Median Number of Users Supported by Majority of Business Clients	900
Median Network Servers Used by Majority of Business Clients	12.4
Business Type	
Computer/IT	34%
Financial/Legal	9%
Industry/Manufacturing	9%
Government	9%
Training/Education	8%
Consulting/Multiple	7%
Commerce/Business	7%
Communications	6%
Health/Drugs	6%
Natural Resources/Utility	5%
Other	1%

MCSE Characteristics (N=204)

Mean Tenure with Company (years)	2.8
Gender	93%
Hold Alternative Certification	53%
Working on Another Certification	44%

SE Characteristics (N=159)

Mean Tenure with Company (years)	3.3
Gender	92%
Hold Alternative Certification	32%
Working on Another Certification	36%

Competence by Job Area
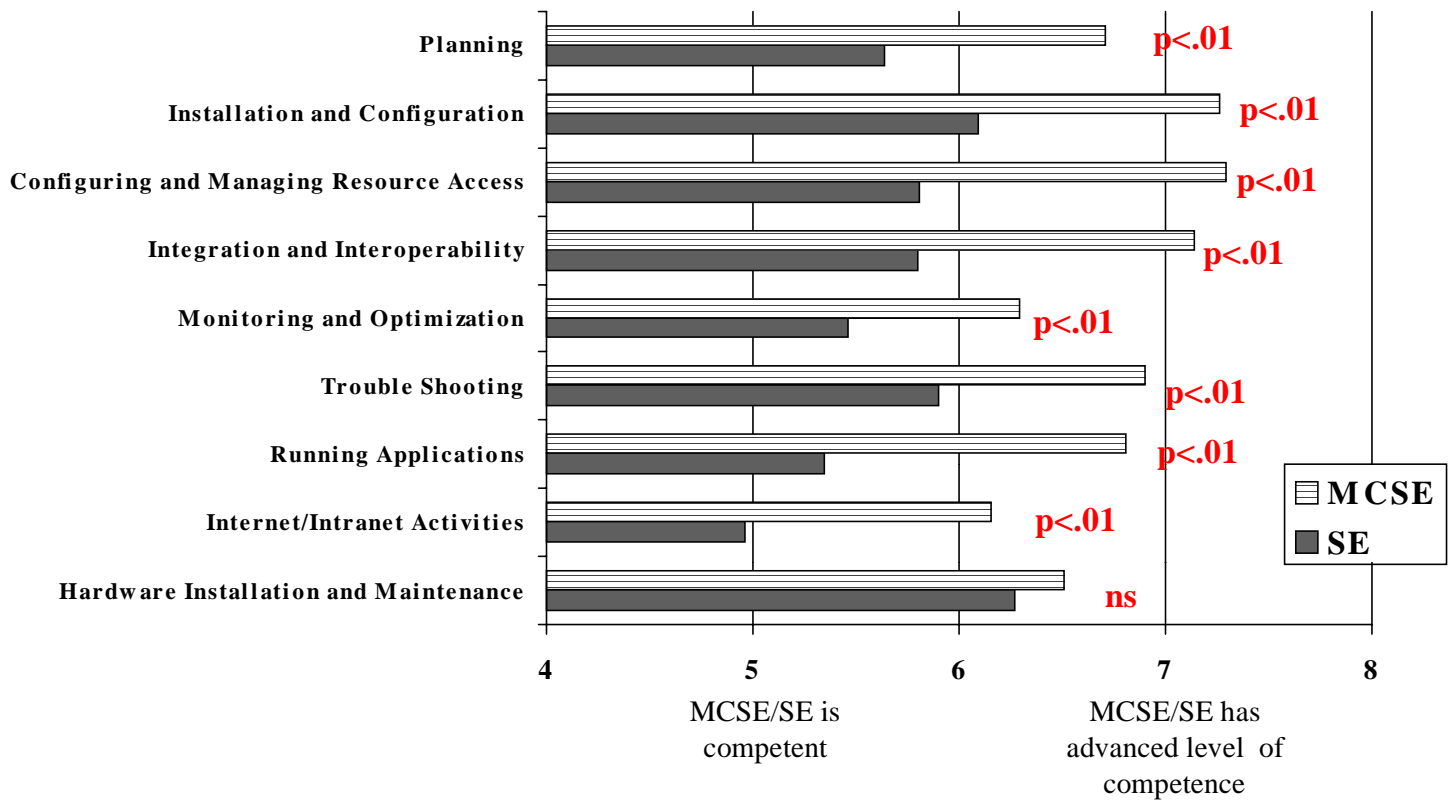

Figure 4. Supervisor Ratings of Competency by Job Area (Wilks lambda=.439, F(9,126) =17.86 eta^2 = .561).

absence of a reliable difference on the job area not identified as part of the job of MCSE adds important credibility to the supervisors' ratings. The lack of difference shows that supervisors were serious in their performance appraisals, not simply rating the certified SE higher on all measures. These findings parallel those found in an earlier criterion validity study of Microsoft's SE certification (see footnote 4).

Additional analyses showed that the superiority of MCSEs was quite robust. Differences were not affected by several variables including whether employed in the US, employed by SPs, length of time the certification was held, or number of servers or users of the majority of business clients.

Global Ratings

Supervisors rated the MCSE and the comparison SE that they supervised on three global, 9-point scales: make positive human resource decisions, has no weaknesses, and overall competence. Analyses revealed that the MCSE was rated reliably higher overall and on each scale[16]. The means for this comparison are presented in Figure 5. Additional analyses showed that the superiority of MCSEs over non-certified comparison SE was quite robust. As in the job areas analyses, differences were not affected by several variables including whether employed in the US, employed by SPs, length of time the certification was held, or number of servers or users of the majority of business clients.

Advanced Level of Competence

Certification seeks to identify employees with an advanced level of competence. This quality was examined for the SE certification by analyzing the percentage of SEs, either MCSEs or non-certified SEs, who received "advanced" or "expert" competency ratings[17] from their supervisors on each of the job areas. The results of this analysis are displayed in Figure 6. A higher percentage of MCSEs received this high level of competency rating for each job area than did the non-certified SEs. Typically the majority of MCSEs received this rating from their supervisors.

## Summary of Findings-Supervisor Study

- MCSEs are more competent than noncertified SEs
    - ◆ on all job dimensions identified by the job analysis.
    - ◆ on all global dimensions.
- As expected by the control construct design, MCSEs were not superior to comparison SEs on Hardware Installation and Management, a job task not identified by the MCSE job analysis.
- The superiority of the MCSEs over comparison SE was robust and not affected by several control variables.

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[16] MANOVA results for overall comparison between MCSEs and SEs showed MCSEs as reliably higher (Wilks lambda = .743, $F(3,132)$ =15.26, eta^2 = .257). Univariate comparisons yielded the same finding:

Global Performance Scale	Direction	F(1,134)	Eta^2
Positive Human Resource Decisions	MCSE>SE	35.6 (p<.01)	.210
No Weaknesses	MCSE>SE	13.8 (p<.01)	.093
Overall Competence	MCSE>SE	36.8 (p<.01)	.215

[17] Rating levels 7 to 9 on the 9-point competency scale.

Global Ratings
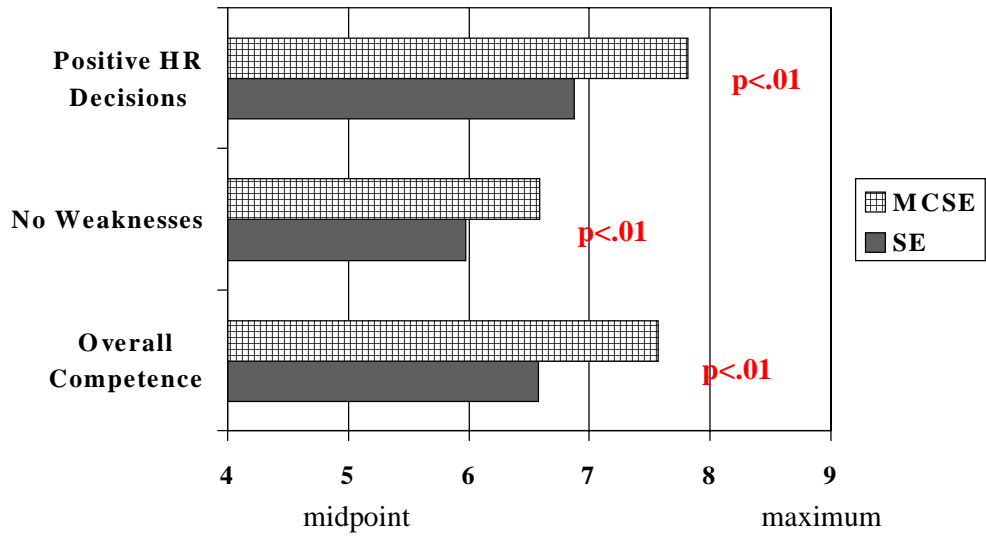
Percent with Advanced Competence
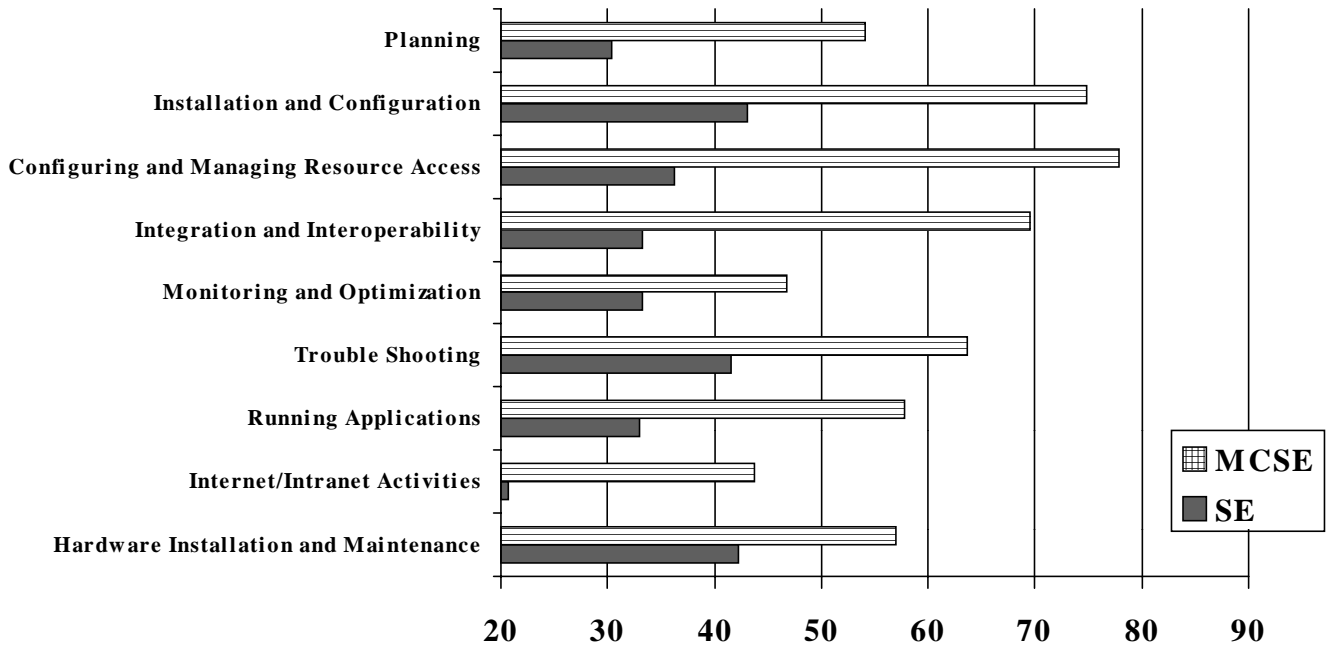

Figure 6. Percentage of SEs with "Advanced" to "Expert" Competence, by Job Area.

Conclusions-Supervisor Study

1. **Do supervisors find MCSEs more competent on the job than noncertified SEs?** Yes. Supervisors related MCSEs as more competent that noncertified SEs on all of the job areas identified in the job analysis for MCSEs and on global scales. Supervisors were discriminating however. MCSEs were not rated as more competent that noncertified SEs in the area of Hardware Installation and Maintenance, as aspect of work they do that is unrelated to their job.
2. **Do supervisors find MCSEs have an advanced level of competence?** Yes Overwhelmingly, supervisors rated MCSEs as having advance competence in the aspects of their jobs that are important.

General Conclusions

The Microsoft Systems Engineer certification does make a difference on the job. Employers, customers and SEs themselves, can count on the advanced level of competence from MCSEs.