

Bar Code Users and Their Performance

A report on information technology and manufacturing productivity

Based on responses from over 1,000 manufacturing plants participating in a study sponsored by: The National Association of Manufacturers The National Science Foundation, and The Thomas Walter Center for Technology Management

Background & Methodology

Bar code is a series of alternating bars and spaces printed or stamped on parts, containers, labels, or other media, representing encoded information that can be read by electronic readers for accurate data input to computer systems. Although, the use of bar codes has been increasing each year, they are not used by all manufacturers. In a recently concluded study, the use of bar codes was investigated as one of 17 different manufacturing technologies. It is well understood that bar code technology is an enabling technology that can contribute to manufacturing cost reduction, quality improvement, cycle-time reduction, and improved profitability. The sample and the details of how the study was conducted is described in Appendix I. Data was collected through a questionnaire which was completed by a member of the plant management with responsibility over manufacturing and/or technology.

This study provides evidence from 1,025 manufacturing plants about the use and benefits of bar code under certain conditions. Out of the total of 1,025 plants participating in this study, 505 or 49 percent said that they use bar codes. The study also asked users to indicate if they use bar codes with some skill, moderate skill or extreme skill. While these designations for the use of a technology are not precise yet they capture differences in the use of the technology. For example, those who indicate that they use a particular technology in an extremely skilled manner, must be extremely satisfied with their use of the technology and must feel that they are getting all they could from the use of the said technology.

The performance of the 505 bar code users is summarized in Table 1 below.

TABLE 1

ALL BAR CODE USERS
(n=505; 49.2% of all respondents)

Average	Performance*	
1	Sales per employee	\$155k
2	Rejection and Rework (% of manufacturing costs)	3.2%
3	Inventory turns	9.5
4	ROI	17.7%
5	Decrease in Average Manufacturing Costs	11%
6	Decrease in average cycle time	17.4%
7	Percent reporting decreased manufacturing costs	82.4%
8	Percent reporting decreased cycle time	84.3%

*NOTE: The survey gathered data on the use of 17 different technologies including bar codes. The benefits may be the cumulative result of more than one technology.

The performance of 520 non-users is summarized in Table 2.

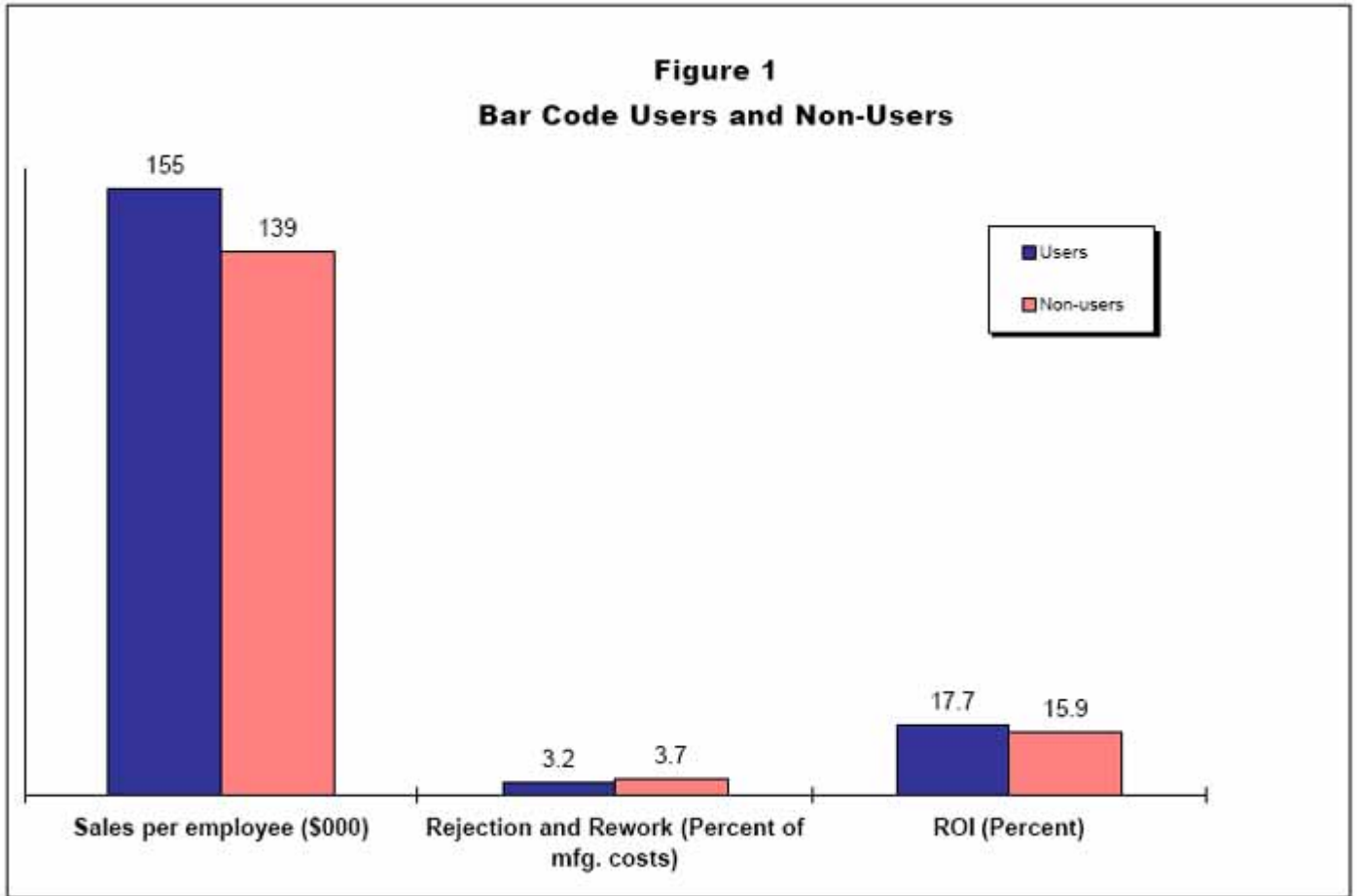
TABLE 2

NON-USERS OF BAR CODES
(n=520; 50.8% of all respondents)

Average	Performance*	
1	Sales per employee	\$139k
2	Rejection and Rework (% of manufacturing costs)	3.7%
3	Inventory turns	10
4	ROI	15.9%
5	Decrease in Average Manufacturing Costs	10%
6	Decrease in average cycle time	15%
7	Percent reporting decreased manufacturing costs	68.1%
8	Percent reporting decreased cycle time	70.2%

*NOTE: The survey gathered data on the use of 17 different technologies including bar codes. The benefits may be the cumulative result of more than one technology.

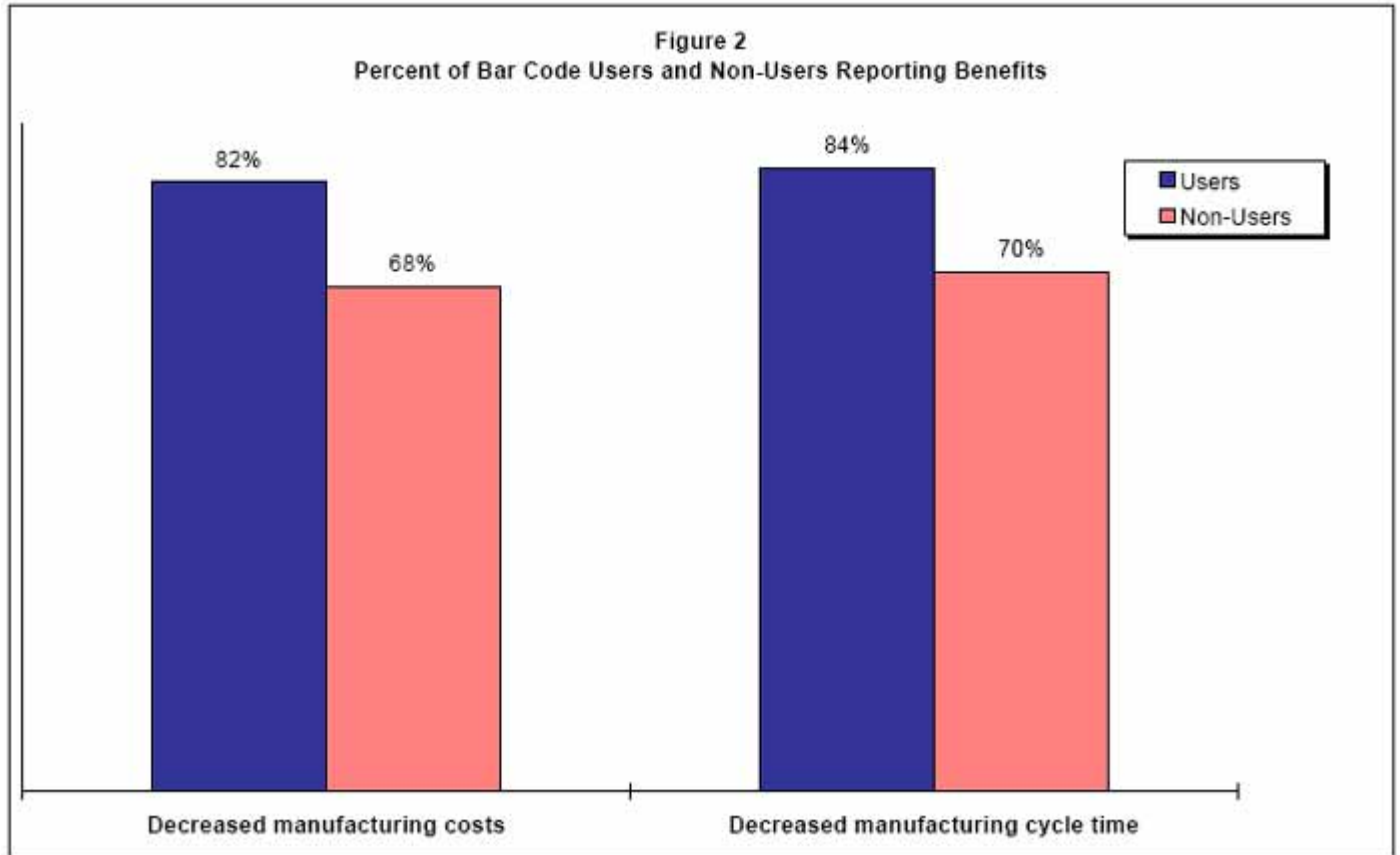
In reading the two tables, the reader must be aware that the study covered the use of 17 different technologies listed in Appendix II. While one may argue that the benefits of using bar codes are blended with the benefits accruing from the use other technologies, the averages across several hundred users reveal a pattern of benefits that can be assigned to a particular technology use such as bar codes.



Findings

According to Figure 1, bar code users report \$16,000 more (or 11 percent better) in sales per employee over non-users, fewer rejection and rework, and about 10% better return on investment.

Additional comparisons in Figure 2 reveals that significantly more bar code users report decrease in manufacturing costs and cycle time.



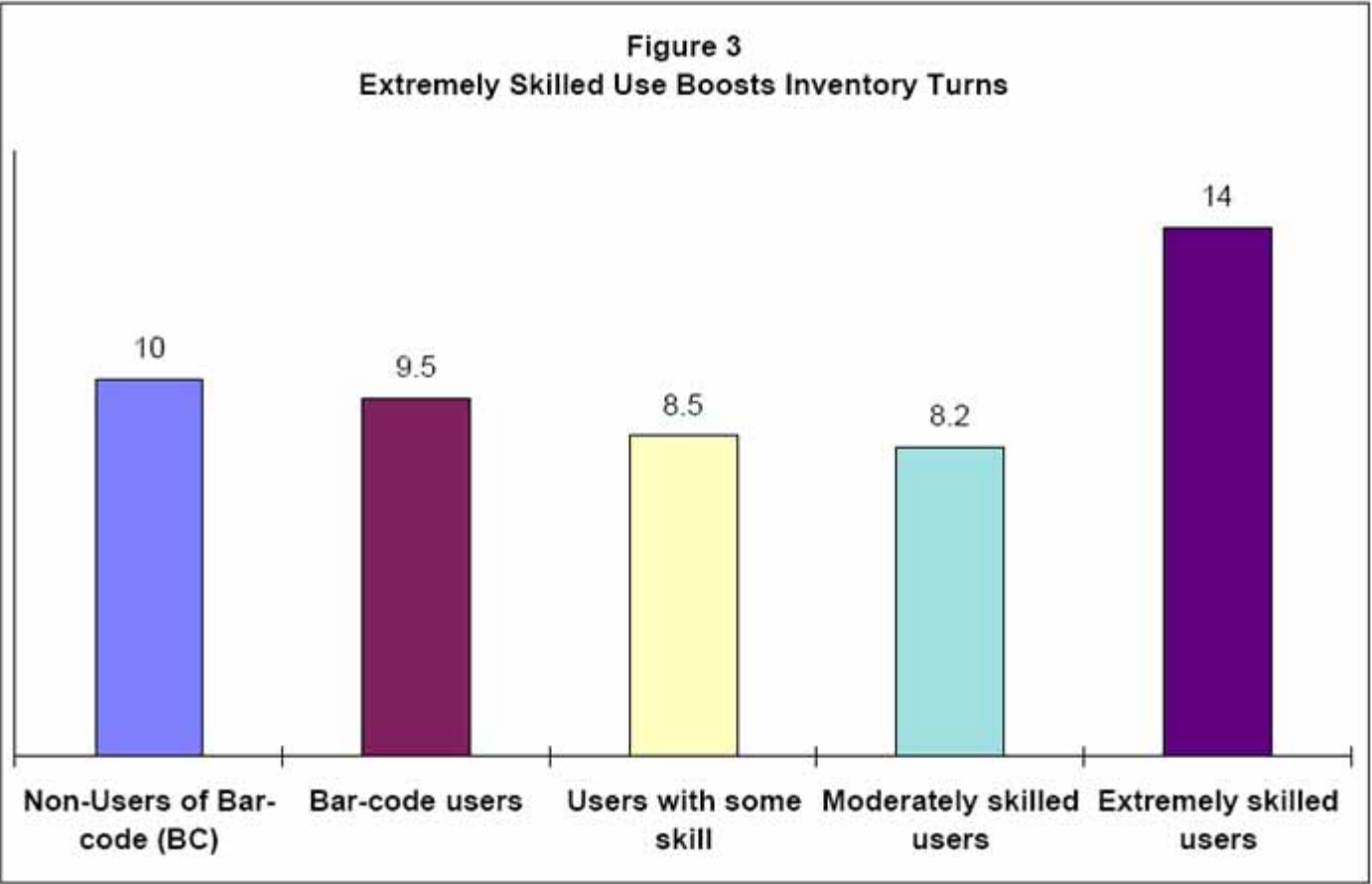
Thus, on five vastly different measures, bar code users are reporting superior performance over nonusers. This should be taken as rather strong evidence that bar code users are indeed reaping benefits from the use of this technology.

Skilled Use Pays Off

Technology use is often not similar across factories; some factories may use a technology with moderate or limited skills while others may use it with extreme skill. It is logical to expect extremely skilled users of a technology to enjoy more benefits than those who use the same technology with lesser skill. But, do they?

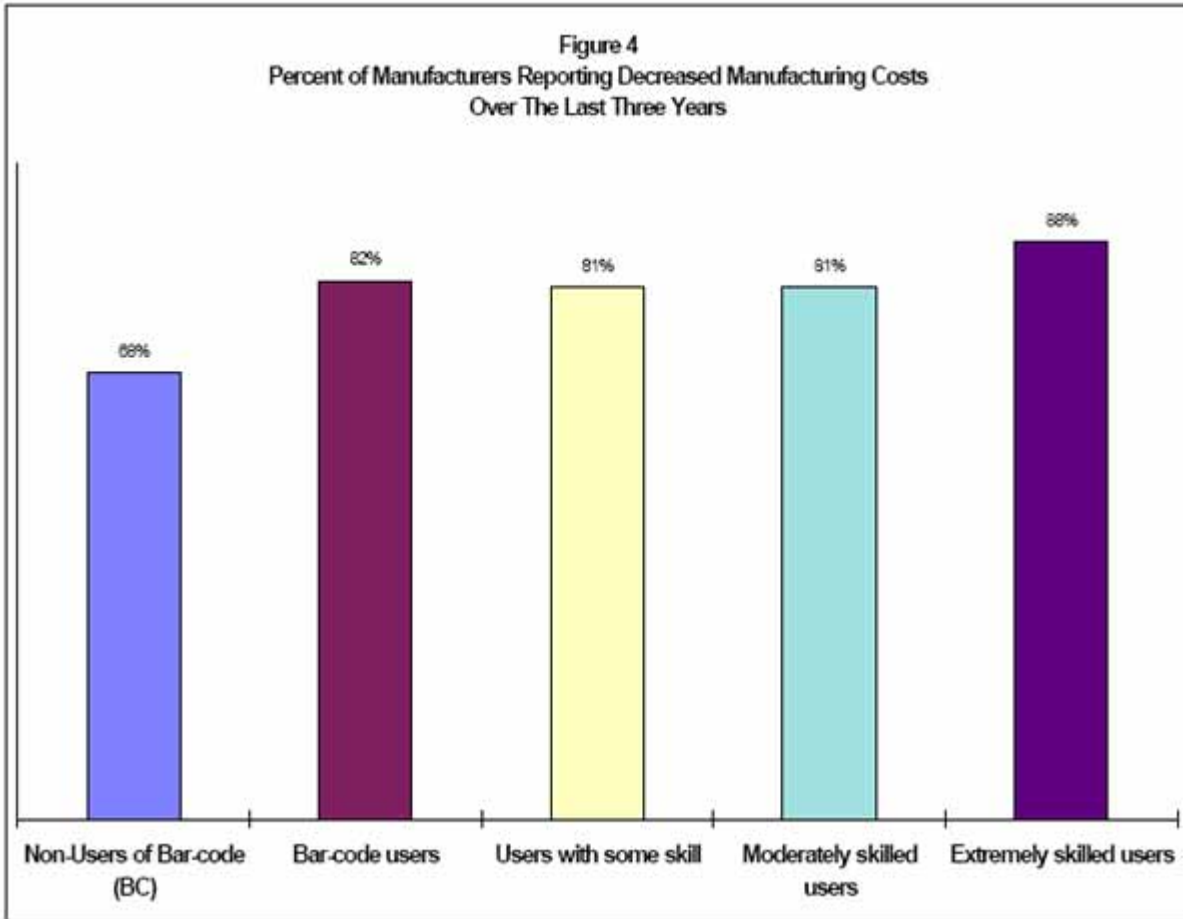
Inventory Turns.

In Figure 3, we see that extremely skilled users of bar code technology report inventory turnovers of 14 while non-users report 10; 40 percent better. It is notable that non-users report better inventory turns than those who use bar codes with some or moderate skill. In interpreting this finding, the following should be considered. Bar codes being enabling technologies, the use of bar codes enables the implementation of technologies such as JIT, SQC, CIM, automated inspection, CAD, CAM and many hard and soft technologies. Thus, if bar codes are not used with extreme skill, the use of several other technologies may suffer and inventory turns may not improve. The conclusion to draw here is that, factories using bar codes must consider using it with extreme skill, that is, use it in such a manner as to get the most out of its use.



Decreased Manufacturing Costs.

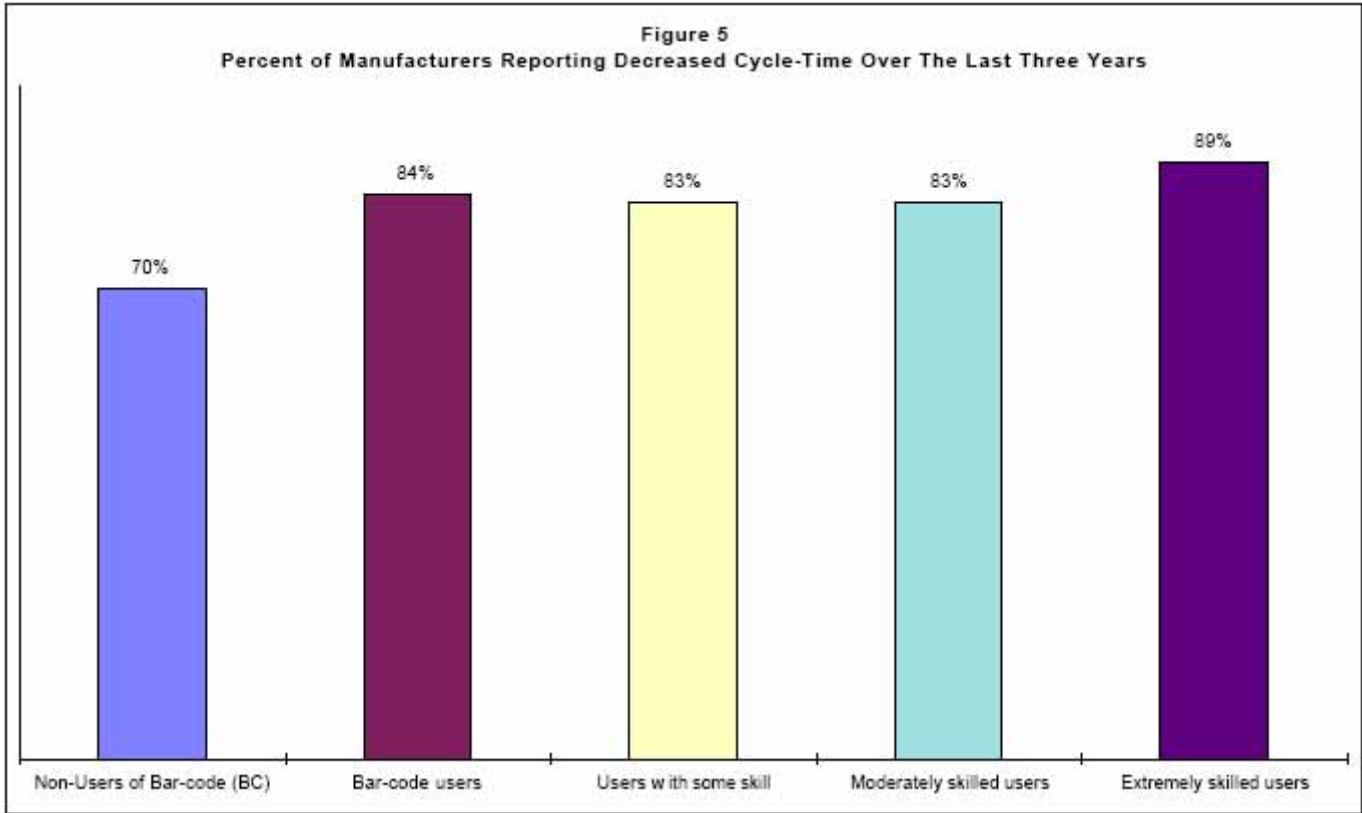
In Figure 4, we see that 82 percent of bar code users report decreased manufacturing costs where as only 68 percent of non-bar code users experience decrease in manufacturing costs.



Notably, 88 percent of extremely skilled users of bar codes report decrease in manufacturing costs. This confirms the above finding that extremely skilled use of bar codes leads to better performance.

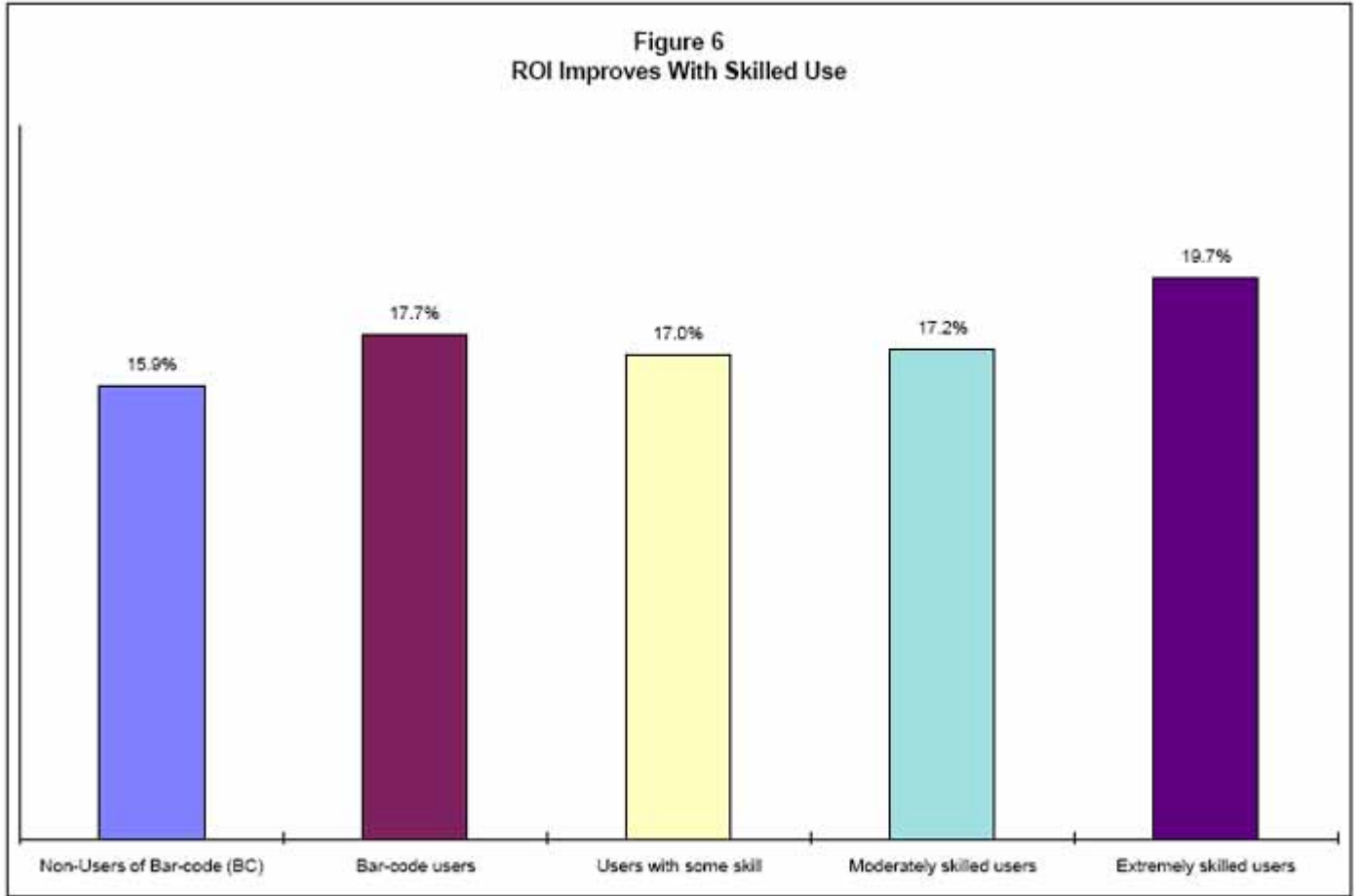
Decreased Cycle Time.

Once again, Figure 5 confirms that extremely skilled users of bar codes experience decreased cycle time more often than those who use the technology with some or moderate skill.



Return On Investment.

Finally, bar code users report better return on investment than non-users (Figure 6). But, extremely skilled users report far superior return on investment than those who use the technology with some or moderate skills.



Additional information on bar code users with varying skills is provided in Tables 3 through 5. The evidence in Figures 1 through 6 very convincingly favor the use of bar codes with extreme skill. The reward for extremely skilled use of bar codes is reflected in five different performance measures.

TABLE 3

BAR CODE USERS WITH SOME SKILL
(n=202)

Average	Performance*	
1	Sales per employee	\$157k
2	Rejection and Rework (% of manufacturing costs)	3.5%
3	Inventory turns	8.5
4	ROI	17.0%
5	Decrease in Average Manufacturing Costs	10%
6	Decrease in average cycle time	18%
7	Percent reporting decreased manufacturing costs	81.2%
8	Percent reporting decreased cycle time	83.2%

*NOTE: The survey gathered data on the use of 17 different technologies including bar codes. The benefits may be the cumulative result of more than one technology.

TABLE 4

**BAR CODE USERS WITH MODERATE SKILL
(n=190)**

Average	Performance*	
1	Sales per employee	\$151k
2	Rejection and Rework (% of manufacturing costs)	2.7%
3	Inventory turns	8.2
4	ROI	17.2%
5	Decrease in Average Manufacturing Costs	11.2%
6	Decrease in average cycle time	18.0%
7	Percent reporting decreased manufacturing costs	80.5%
8	Percent reporting decreased cycle time	82.6%

*NOTE: The survey gathered data on the use of 17 different technologies including bar codes. The benefits may be the cumulative result of more than one technology.

TABLE 5

**EXTREMELY SKILLED USERS OF BAR CODES
(n=113)**

Average	Performance*	
1	Sales per employee	\$157k
2	Rejection and Rework (% of manufacturing costs)	3.5%
3	Inventory turns	14.0
4	ROI	19.7%
5	Decrease in Average Manufacturing Costs	11.6%
6	Decrease in average cycle time	15.2%
7	Percent reporting decreased manufacturing costs	87.6%
8	Percent reporting decreased cycle time	89.3%

*NOTE: The survey gathered data on the use of 17 different technologies including bar codes. The benefits may be the cumulative result of more than one technology.