This is quite an anomalous article.

Liberal arts majors argue repeatedly, but without much success, that what they learn in college can be valuable in business, as everyone knows they earn less than those whose majors are more career oriented. But this could be because the supply of liberal arts graduates exceeds the demand, as it were. Good economic studies on the matter are vanishingly rare. This is the only study I found that considers the career paths of those with different kinds of degrees *in a single company*. It reports on two longitudinal studies of managers in the various operating companies that were formerly part of American Telephone and Telegraph. The first started in 1956 and followed employees for twenty years (few studies even go up to ten years). It was followed by another study started just after the first. These studies looked at level of education, grades, college quality, major field of study, and extracurricular activities during college.

The surprising finding is that humanities and social science majors were more successful than business, science and math, and engineering majors, in that order. Humanities and social science majors were not only the most motivated but got the most promotions as well, owing, it seems, to high interpersonal and verbal skills.

I would not make too much of this one article and can rattle off many caveats, but it is such an anomaly that careful consideration must be given to it. At the least, the article powerfully suggests that humanities and social science studies in college develop habits of thinking that help a career even in a high-tech industry like AT&T.

What should be done is to isolate just what these habits of thinking are and how they might be directly cultivated, as efficiency might dictate. Indeed, college could promote direct cultivation of diverse habits of thought by offering courses in the thinking patterns of engineers, nurses & physicians, economists, lawyers, businessmen, sociologists, historians, and on and on, as opposed to aiming at quickly forgotten content. In my ideal education, an student would take three-semester hour courses each semester. He would wind up being able to tackle a given problem though examining it in several ways simultaneously. He would be extraordinarily gifted, under a concept of giftedness that differs fundamentally from the usual concept of giftedness as just being unusually intelligent.

Developing such courses will be dauntingly challenging, but I think it is inevitable, in the wake of a
thorough re-examination of the purpose of higher education in the wake of mounting tuitions and student, that college (and eventually K-12) will be redirected from mastering content toward getting an intuitive understanding of methods, and in many fields.

Here's the article. I can't reproduce the tables and figures but can send the pdf in a jiffy.

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Ann Howard: College Experiences and Managerial Performance
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SUMMARY

Relationships between various college experiences and management potential, as demonstrated in assessment center performance and later promotions, were studied in two AT & T longitudinal samples of managers (one graduating in the 1950s and one in the 1970s) as well as for samples of middle-aged and young managers in 10 different organizations. Five types of college characteristics were studied independently and in combination--level of education, grades, quality of undergraduate institution, major field of study, and extracurricular activities. Results varied according to the managerial quality studied, with college major, extracurricular activities, and higher education accounting for most of the variance in management performance. Grades related specifically to intellectual ability and motivation to do quality work, whereas better quality schools seemed mostly to produce nonconformity. Humanities and social science majors had the best overall performance, with particularly good interpersonal and verbal skills; in contrast, engineers and math and science majors lacked many important managerial skills. The MBA degree was primarily related to administrative and cognitive abilities.

For decades it has been common practice for business and other organizations to recruit on college campuses to fill their entry-level management positions. From this employee pool, they also hope to staff their future executive positions. If recruiters are to select the best among the would-be graduates, they need to know which aspects of college experiences, if any, are related to later managerial success.

Past research on this question has explored at least five different aspects of college experiences hypothesized to relate to later business success: level of education, grades, quality of the undergraduate institution, major field of study, and extracurricular activities. The evidence has been mixed at best and generally discouraging.

With respect to level of education, the fact that college graduates on the average achieve a higher socioeconomic status than do noncollege persons is sometimes thought to imply that college has some effect on later success. Yet some have argued that education acts primarily to affect job placement, with people allocated to adult roles on the basis of the length and type of their education, regardless of what was learned in the educational process (Kerckhoff, 1976; Meyer, 1977). Those arguing for the socializing aspects of college have had difficulty finding supporting hard data, although Winter, McClelland, and Stewart (1981) and Development Dimensions International (1984) made notable contributions in this area by contrasting incoming and graduating students at several types of undergraduate institutions. Still, the translation of such differences into actual management job
performance has been elusive.

Investigations of whether a master's degree influences later management success have been conducted by several researchers, with inconsistent results. Schick and Kunnecke (1981) found no differences in salary increases among engineers and scientists between those who had gone on to a master's degree and those who had not. Orpen (1982) found that after 5 years MBAs were ahead of a matched non-MBA sample in position and salary, but Livingston (1971) found that non-MBAs in an advanced management course at Harvard earned one third more than MBAs with the same amount of experience. Apparently lacking in the literature are studies that contrast MBAs with other master's degree holders or that contrast graduates on specific qualities rather than global success measures. With global measures, the same allocation argument could be made with respect to MBAs as was made with college versus noncollege people; that is, that MBAs are given higher positions and salaries because of the prestige of their degrees rather than specific skills obtained.

The greatest amount of research contrasting college experiences and later occupational success has concerned grades. In 1965 Hoyt reviewed seven business studies and found that only the two done at AT & T (Bridgman, 1930; Walters & Bray, 1963) produced significant relationships between grades and later success. A review of studies since that time repeats that trend. No significant relationship was found between undergraduate grades and global success measures in business (Ferris, 1982; Pallett & Hoyt, 1968; Schick & Kunnecke, 1981; Weinstein & Srinivason, 1974; Williams & Harrell, 1964). Pallett and Hoyt (1968) also found no relationship between grades and supervisory ratings of more specific qualities. Muchinsky and Hoyt (1973) used several types of grades as well as multiple success criteria, but with only 6 out of 60 computations statistically significant, they concluded that grades were largely irrelevant to later success for engineers. However, another AT & T study (Adams, 1982) found grades significantly related to performance ratings after 1 year in management in two different samples, and a study at Ford Motor Co. (Heckman, Lazenby, & Moore, 1968) showed a significant relationship between grades and later salary progress. Studies within one company have the advantage of common criterion standards, which may help explain their greater success in predictive studies. At the same time, however, they suffer the disadvantages of restrictions of range in grades if scholarship is used for selection.

Studies of graduate grades have been somewhat more promising than those with undergraduates; those reviewed all concerned MBAs and related their grades to later salaries. Weinstein and Srinivason (1974) found a significant relationship between salaries and overall grades, but three other studies (Marshall, 1964; Williams & Harrell, 1964; Harrell & Harrell, 1984) found significant relationships with grades in elective courses only.

The research on quality of undergraduate college and later business success has shown negative or only mildly positive results. Walters and Bray (1963) and Heckman et al. (1968) found that those from average and below schools, and Schick and Kunnecke (1981) found those in the top two categories of schools did better than those in the lower two. On the other hand, Ferris (1982) found no relationship between college quality and later salary and performance of auditors, and Rosenbaum (1984) found no greater promotion probabilities among those from colleges high and low on selectivity.

Results with college major have also been contradictory. Walters and Bray (1963) found no significant salary differences between business vs. liberal arts vs. engineering majors, and Pallett and Hoyt (1968) found equal supervisory ratings for liberal arts and business majors. However, Harrell and Harrell (1984) found that engineers were lower than economics, business, or English majors in both salary and job satisfaction after 20 years.
The relationship of extracurricular activities in college and later management success may be better established than is readily apparent, for many studies of biodata as predictors report strong correlations of inventory scores and later management success. Buried in these inventories are undoubtedly some questions about extracurricular and especially leadership activities (cf. Korman, 1968; Harrell & Harrell, 1973). In an AT & T study, Ritchie and Boehm (1977) reported that 87 biodata items discriminated between recommended and not recommended women in an assessment center. Though not reported in their article, a review of the items indicated that participants in activities like social or political clubs and some leadership positions could discriminate successfully between the women. The earlier AT & T studies (Bridgman, 1930; Walters & Bray, 1963) had found that substantial campus achievement related to later salary. Williams and Harrell (1964) also found that leadership was a good predictor of later salary, and Weinstein and Srinivason (1974) found that social activities related to later success of staff managers and athletic activities related to line managers' success.

In summary, past research on college experiences and management success shows inconsistent findings and has seldom addressed specific characteristics of management. Moreover, the relative contribution of different college experiences to later success has seldom been explored. A new evaluation of college data seems called for in a study that is comprehensive enough to include all variables of interest.

There were several purposes to the present study: (a) to explore the relationship of various college experiences (including level of education, grades, college quality, college major, and extracurricular activities) within the same sample with later managerial performance measured with a common criterion; (b) to relate the college experiences to critical behaviors needed in management, not just global measures of success; (c) to look at the college characteristics in combination to determine their relative contributions in explaining variability in different managerial qualities, and (d) to detect possible changes in relationships between college experiences and management success over the last generation. The last purpose was born of the concern that college experiences have changed over the last 25 years; that is, grade inflation has occurred, higher degrees are more common, and the popularity of various majors has shifted. Any of these factors could have affected the importance of college experiences to later management success.

METHOD

Samples

The primary evidence for this study came from AT & T's two longitudinal studies of managers in the various operating telephone companies that were formerly part of the Bell System. The first research project, the Management Progress Study (MPS), was begun by Douglas W. Bray in 1956. The original sample size was 422, including 274 college graduates hired into first-level general management jobs and 148 participants who did not have college degrees when they were hired into nonmanagement positions but who advanced into management jobs by the age of 32. The median age for the college graduate sample was 24 and for the noncollege sample was 30 at the start of the study. All were white males.

The second study, begun in 1977 by Bray and the author, was called the Management Continuity Study (MCS). It was designed to parallel MPS as much as possible and to track differences in the characteristics and development of a new generation of Bell System managers. Criteria for inclusion of college graduates in the MCS sample were the same as in MPS; that is, hired into a general management job and considered to have potential for middle or upper management. Because of
changing times, use of those criteria meant that the MCS sample of 344 included 129 white males, 108 white females, 57 minority males, and 50 minority females. The median age of these recruits was 25. No noncollege graduates were included because the sample would require additional subdivision to reflect race and sex differences.

To confirm some of the MPS and MCS findings in organizations outside the Bell System, two additional samples were used from the Inter-Organizational Testing Study (ITS). Data were collected for this study in 1981-82 from managers roughly comparable in age, status, and experience to those in the MPS and MCS samples at the time. The samples came from 10 outside organizations, including a bank, chemical company, architecture and engineering consulting firm, news organization, office products company, power utility, insurance company, a federal government agency, and a state government agency. The total sample size for the middle-aged group (ITS MID) was 386; their median age was 46. For the young group (ITS YOUNG), the sample size was 380 and the median age 25.

Measures of College Experiences

In all three samples, evidence of college experiences was gathered primarily by questionnaire, supplemented by personal interviews and essays in the longitudinal studies. Respondents were asked about degrees earned, and the longitudinal samples were also queried about specific institutions granting degrees. The quality of the undergraduate institution attended was evaluated for the MPS sample using an index developed by Knapp and Greenbaum (1953) for a study of scholarship in the United States. The index was based on the ratio of male graduates from each institution in 1946-51 who had attained a graduate fellowship or scholarship or who later earned a PhD. Because the index was sharply skewed and ranged from 0 to 61, the total list of rated colleges was divided into quarters. Each MPS participant received a quality code for his college ranging from 4 (highest quartile) to 1 (lowest quartile). The distribution of the sample was 30% in the top quartile, 36% in the third quartile, 22% in the second quartile, and 12% in the lowest quartile.

Unfortunately, the difference in time of graduation between the two AT & T samples did not permit using the same measure of college quality. For the MCS sample, the Gourman report (1983) offered point ratings of colleges and universities to two decimal places on a continuous scale ranging from 2 to 5. The schools were first arranged into quartiles, as had been done for the MPS sample with the Knapp and Greenbaum indexes, but assigning these quartile scores to the MCS sample found 69% of them in the top quartile, 18% in the third quartile, and 8% and 5% respectively in the bottom two quartiles. The difference in distributions between the two samples was not due to any pronounced change in recruiting practices over the years but due to the inclusion of more schools of smaller size and reputation in the Gourman report (N = 1845 schools) versus the Knapp and Greenbaum index (N = 377 schools in male index). Because such a skewed distribution would have reduced the meaningfulness of the data, the raw scores assigned to each school by Gourman were used instead.

For extracurricular activities, participants in MCS and ITS were asked to give the number of activities they participated in for nine different categories (athletic, social, scholastic, musical, special interests, student government, school paper, debating, and other). The sum of activities across categories was derived arithmetically. In addition, participants were asked the number of activities in which they had leadership positions in seven categories (athletic, social, scholastic, special interests, student government, school paper, and other), and their sum was derived arithmetically. In the MPS sample the participants were asked only for the total number of extracurricular activities in which they participated. Within each sample, sums of activities and leadership positions were recoded into 7-point scales to normalize their distributions.
The MPS, MCS, and ITS samples were asked to describe their undergraduate grades on a 4-point scale of Excellent, Good, Average, or Poor. In addition, percentile rank in college class was obtained for each MPS participant by writing the undergraduate college. For part of the MCS sample (those assessed 1979 or later) and the ITS samples, participants were asked to give their grade point average on a 4-point scale.

College major fields were requested from all samples and coded into nine categories: (a) science, (b) business, (c) engineering, (d) humanities (English, art, languages, philosophy), (e) social science (psychology, sociology, economics, history, political science), (f) mathematics, including statistics, (g) education, (h) interdisciplinary, and (i) other. Interdisciplinary included general degrees and those where two majors seemed to be truly equal in importance; if there were two majors but one seemed to be dominant, the dominant major was coded.

Assessment

Although the ITS samples were administered only a few tests and questionnaires, the MPS and MCS participants were put through a three-day assessment center. This took place for the MPS participants in the summers of 1956-60, and the MCS participants followed a similar procedure during the summers of 1977-79 and 1981-82. The MPS men were reassessed 8 years after their original assessment in a parallel procedure. A final assessment in the 20th year of the study partially replicated the first two assessments but reoriented its focus to midlife and midcareer issues (Bray & Howard, 1983). Unless specified otherwise in the text or tables, "assessment" refers to the original assessment center for MPS and not one of the reassessments.

The assessment centers encompassed a variety of tests and exercises. Cognitive tests included the School and College Ability Test or SCAT, also given to the ITS samples, which measured verbal and quantitative skills independently. Personality or motivation inventories included the Edwards Personal Preference Schedule (given to all samples), the Bass version of the California F-scale of authoritarianism (MPS and MCS samples), and the California Psychological Inventory or CPI (MCS sample only). An extensive biographical inventory, from which the college experiences data were extracted, was included in the assessment center for the MPS and MCS samples and as part of the ITS battery.

Other exercises in the assessment centers included questionnaires of expectations and job preferences, two sentence-completion tests, six cards from the Thematic Apperception Test, a lengthy personal interview, biographical essay questions, a simulation of a middle manager's in-basket, and competitive group discussions, which were also simulations. Teams of assessors observed the simulations, conducted the interviews, and wrote narrative reports of each participant's performance.

In later sessions the assessors rated each participant on 26 dimensions, each selected to represent important managerial characteristics and rated on a 5-point scale. (Additional dimensions were rated at the MPS:20 and MCS assessments but are not pertinent to the issues considered here.) The dimensions were first rated independently by each assessor, but agreement within one point was obtained after discussion. Absolute (not relative) standards were maintained in rating the dimensions in each MPS and MCS assessment to facilitate making comparisons across time and generations.

Results of a factor analysis of the 26 managerial dimensions for the MPS sample (Bray & Grant, 1966) were later supported for the MCS sample with the same dimensions. The factor analysis produced 7 lower order factors for the MPS noncollege sample and 8 lower order factors for the MPS and MCS
college samples. In addition, higher order factors were derived, with one General Effectiveness factor in common across all three samples.

Scores for the factors, computed for each participant, were averages of unit-weighted ratings on component dimensions as follows: (a) administrative skills = planning and organizing, decision making; (b) interpersonal skills = leadership skills, behavior flexibility, personal impact, including forcefulness and likeableness; (c) stability of performance = tolerance of uncertainty, resistance to stress; (d) intellectual ability = range of interests, general mental ability; (e) work involvement = primacy of work, inner work standards; (f) advancement motivation = need for advancement, energy, need for security (reflected), ability to delay gratification (reflected), realism of expectations (reflected); (g) independence of others = need for superior approval (reflected), need for peer approval (reflected), and goal flexibility (reflected); (h) nonconformity (college only) = social objectivity or lack of prejudice, range of interests, need for security (reflected), Bell System value orientation (reflected), need for superior approval (reflected).

The general effectiveness factor consisted of the average of unit-weighted ratings on organizing and planning, decision making, creativity, leadership skills, oral communication skills, behavior flexibility, personal impact, perception of threshold social cues (social sensitivity), range of interests, general mental ability, tolerance of uncertainty, resistance to stress, primacy of work, inner work standards, energy, self-objectivity, and need for advancement. Also included in the average were reflected unit-weighted ratings on need for security, ability to delay gratification (of a promotion), need for superior approval, need for peer approval, and goal flexibility.

The factor scores were used here as global measures of the management qualities desired. (The term factor scores is used here to mean scores derived from the factor analysis of dimensions, although each dimension was given a unit weight rather than being weighted by its factor loading.) In addition, after agreeing on the ratings of the assessment dimensions, the assessors made several predictions about management potential. These included the following:

1. Will Make Middle Management Within 10 Years. In the telephone companies' seven-level management hierarchy, the third level is considered the entry to middle management. It was expected that those participants thought to have good potential for middle and upper management would have been promoted to the third level within a 10-year period. The assessment prediction of whether or not a participant would indeed achieve these promotions was called Yes if a majority of the assessors felt the candidate would attain third level within 10 years and No if a majority of the assessors felt he or she would not. Where the assessors were tied or nearly tied in their judgments, the prediction was scored "?". For later statistical uses, Yes was scored 3, ? scored 2, and No scored 1.

2. Should Make Middle Management Within 10 Years. Because it was felt that some participants would be promoted erroneously and others might not get promoted even though their underlying qualities would suggest they should, a second judgment was made as to whether the participant truly had the qualities needed for progression to middle management. Responses were again Yes, scored 3, ?, scored 2, and No scored 1. For the MPS sample, the data were later reviewed and some participants were rated as having the potential to go beyond the third level of management; these participants were given a score of 4.

3. Level Should Be. For the MCS sample, rather than adding an extra rating of 4 to the Should Make Middle Management Within 10 Years judgment, the assessors made an additional judgment of the ultimate level the participant should achieve in a Bell System career. Responses were above third level,
scored 4, third level scored 3, marginal, scored 2, and poor, scored 1.

4. Potential. Where this term is used in the tables that follow, it refers to the 4-point scale of Should Make Middle Management Within 10 Years for MPS and Level Should Be for MCS.

Criteria of Success

The level of management actually achieved within a specified period of time was taken as the criterion of success in the Bell System samples. For the MPS men, on whom 20-year follow-up data were available, success criteria included number of years to reach the second level from the time of assessment and level attained 4, 8, and 20 years after the start of the study. For the MCS sample, only those assessed in 1977-79 were considered to have been employed long enough to have meaningful measures of success; their level 4 years after their original assessment was the criterion.

The ITS data collection was restricted to paper-and-pencil testing and no external criteria of success or performance were obtained. However, a crude measure of success was developed for eight of the ITS MID organizations using titles and salaries. Participants were grouped into high (N = 59), middle (N = 199), and low (N = 59) levels of management.

A. Results for Single Predictors

In this section results are presented for each type of college experience independently; combinations of predictors are described in the next section.

Higher Education

A first question was whether or not simply going to college provides an advantage in terms of management skills attained. Table 1 shows the performance of the average college and average noncollege participant at the original MPS assessment center. Results are presented in terms of average scores on the assessment dimension factors as well as on two overall predictions. The factors have been categorized into abilities, motivations, and personality.

Table 1. Assessment Performance of College Versus Noncollege MPS Participants [omitted]

It is clear that the assessors thought the college men had greater overall potential for middle and upper management than did the noncollege men. The two areas where the college men excelled were intellectual ability and motivation for advancement. The noncollege men scored higher on independence, but later evidence suggests this is probably little more than an age-related difference between the two samples (Bray & Howard, 1983).

These initial differences between the college and noncollege samples became even more pronounced later in their careers. This was evident at the reassessment, conducted 8 years after the original assessment. As can be seen in Table 2, on the average there was very little gain in ratings of managerial characteristics after 8 years. An exception was the independence factor, again seemingly a phenomenon of aging and not particularly relevant to the question here. What is most significant is that the college men held steady or gained slightly on all but two of the remaining factors and remained the same in general effectiveness, whereas the noncollege group declined significantly on all the other factors, including general effectiveness. This created much greater differences between the college and noncollege samples in terms of managerial characteristics than had been in evidence at the original assessment. Thus, as Table 2 shows, there was a sample effect as well as a sample by time effect on
every factor except stability of performance.

Table 2. Dimension Factors Over Time by MPS Sample [omitted]

One question that might be raised is whether the noncollege men suffered more at the reassessment because of a direct comparison with the college men. The two groups were assessed separately at the original assessment, but this was true for only one half the noncollege group at the reassessment. However, a comparison of the two "halves" of the noncollege sample reassessed under diverse conditions showed no significant differences in their abilities. Those reassessed in the mixed college/noncollege groups were rated lower in advancement motivation.

There were sharp differences in the relative success of the college and noncollege groups 20 years after the first assessment. As shown in Table 3, the typical management level for the college men at this point was third, whereas the typical level for the noncollege men was second. Only 3% of the noncollege sample had been advanced beyond the third level of management compared to 31% of the college men, including three men promoted to the level of Vice President (Level 6). Although ability differences can account for some of this disparity, it is also possible that the college group was treated more favorably by management because of the status of the degree and the expectation that college graduates should progress further.

Table 3. Management Levels 20 Years After Original Assessment [omitted]

Further evidence comes from contrasts with the noncollege men who obtained bachelors degrees while employed by the company. Four men had received their degrees by the time of the original assessment and 12 additional men received their degrees later in their careers, 10 before the reassessment at Year 8 and 2 between the Year 8 and Year 20 reassessments. To see what difference this made, the men present at the 20th year were separated into (a) those noncollege men who never received a bachelor's degree (N = 113), (b) noncollege men who received a bachelor's degree after employment by the company (N = 16), (c) college men who got no degree beyond the bachelor's (N = 119), and (d) college men who attained a master's degree (N = 18). A comparison of their assessment performances at the Year 20 reassessment as well as their progress in management by that point are shown in Table 4.

Table 4. Managerial Performance of MPS Samples With High School, Bachelor's, and Master's Degrees [omitted]

The evidence clearly illustrates that the noncollege men who went on to receive college degrees at night equalled the 20th year reassessment performance of those who entered the companies with a college degree on all the ability factors as well as general effectiveness. This may appear supportive of a possible developmental effect of a college education, yet except for interpersonal skills, the groups could be similarly distinguished at the original assessment. Because the majority of noncollege men completed their degrees within 2 years of the original assessment, the evidence is not definitive as to whether the degree helped increase abilities or whether the year 20 differences only reflect the fact that the most able get degrees.

Also differentiating the two noncollege groups at the original assessment (though not at year 20) was advancement motivation, where those who would later achieve bachelor's degrees scored higher (M for bachelors = 3.11, SD = .61; M for high school = 2.62, SD = .63; LSD significant at p < .005). This suggests that the ambitions of the bachelor's group were a driving force in pushing them toward attaining their degrees.
When actual progress in management was compared for the different educational groups at Year 20, the noncollege men who obtained a degree had progressed further than the noncollege men who did not obtain a degree, but not as far as those who entered with a college degree. Thus promotion rates for the night school graduates did not equal those of the regular college graduates in spite of comparable abilities demonstrated at Year 20. In a study of corporate mobility in another organization, Rosenbaum (1984) also found that a college education had its primary benefit if achieved before age 35 and before the employee entered the organization.

The Management Progress Study also offers some limited evidence about the effect of attaining a master's degree. Of those who remained on the payroll after 20 years, only one had a master's at the original assessment. An additional 17 men acquired such degrees at night, 9 before the 8-year reassessment and 8 between the year 8 and year 20 reassessments. Of the 18 men who obtained master's degrees, all but 2 did so in a business curriculum. A comparison of the Year 20 assessment performance of those with master's degrees versus those with bachelor's and high school degrees is also shown in Table 4.

In spite of a small sample size, the LSD tests indicated that the master's participants were rated higher on administrative skills, intellectual ability, work involvement, and general effectiveness; a one-tailed test would include advancement motivation as well. In tracing cause and effect, it could still be argued that it was the most motivated, bright, and capable men who went on to receive master's degrees. Yet when the college men remaining at the bachelor's level were compared in performance at the original assessment to those obtaining later master's degrees, the differences between the groups were much smaller and nonsignificant, even with one-tailed tests. The differences in the factors noted above at the Year 20 reassessment were due to increases in the performance of the men who had acquired master's degrees in the interim.

Repeated measures analyses of variance (ANOVAS), comparing the master's and bachelor's participants on the dimension factors at Years 0 and 20, showed significant Group × Time interaction effects for both motivation factors (F = 9.10, p < .003 for work involvement and F = 4.22, p < .04 for advancement motivation). In the case of work involvement, the master's group increased, whereas the bachelor's group held steady; for advancement motivation, the master's group held steady, whereas the bachelor's group declined.

Overall, the data at least suggest that higher education could have been an important developmental experience; at a minimum it was related to greater motivation, and there is evidence that administrative and intellectual abilities improved to some extent as well. There was also an apparent payoff in terms of promotions; by the 20th year 55.5% of those with master's degrees had progressed beyond the third level of management compared to 26.9% of the college men who got no degree beyond the bachelors. The ITS MID sample also showed higher management levels for those with master's degrees versus those with bachelor's (t = 3.08, p < .002). The average level for the 48 MBAs was 2.29 (SD = .58) and for the 22 with other master's degrees was 2.27 (SD = .63); those going no further than the bachelor's degree had an average level of 2.04 (SD = .55).

Other evidence delineating desirable characteristics of master's graduates comes from the MCS sample, shown in Table 5. An initial comparison of the 248 participants with bachelor's degrees with the 95 participants with master's degrees shows better performance in assessment by the latter group on all of the ability factors as well as stability, nonconformity, and general effectiveness. The average level attained four years later among the subsample with that much tenure was also greater for the MCS.
participants with master's degrees, although their levels at the original assessment had been equivalent. By Year 4, 62% of the master's sample had attained the second level of management, compared to 27% of the bachelor's-only sample. Again, one could argue that the ability differences led to faster advancements, but the prestige of the master's degree may also have had an influence on management's promotion decisions.

Table 5. Managerial Performance of MCS Sample with Bachelor's and Master's Degrees [omitted]

There are other interesting comparisons of those with MBA degrees and those with other kinds of master's degrees, also shown in Table 5. The bachelor's/master's difference in administrative skills can properly be attributed to the MBA sample. In fact, on the dimensions of organizing and planning, those with MBAs were superior to both those with bachelor's degrees and those with other kind of master's degrees.

The MBAs were also higher than those with bachelor's degrees on advancement motivation, particularly the dimensions need for advancement and unwillingness to delay gratification of a promotion. Although this quality may be enhanced by the MBA program, it could also have been a preexisting characteristic that inspired the participants to get a higher degree as an avenue to advancement. As mentioned earlier, such greater advancement motivation had been shown at their original assessment by the MPS noncollege men who went on for bachelor's degrees, and it was also evident at the Year 8 reassessment for the MPS college men who went on for master's degrees.

One of the qualities in which those with other (non-MBA) master's degrees stood out was in interpersonal skills. Their superiority to those with bachelor's degrees was evident for leadership skills, personal impact, social objectivity, and perception of threshold social cues. They were also rated more likeable than either those with only bachelor's degrees or the MBAs.

It should be noted that those obtaining higher degrees were not distributed equally across undergraduate majors, as shown in Table 6. The engineers and business majors were much less likely to go on for a higher degree than were the liberal arts majors. The MBAs were also more likely to have an undergraduate degree in business than were the other masters recipients, although the findings of the MBAs' superiority on administrative skills held for the liberal arts undergraduate majors taken alone. Implications of undergraduate major on managerial performance are discussed later.

Table 6. Proportion of MCS Sample Obtaining Higher Degrees by Major [omitted]

Grades

Correlations between measures of college grades and later managerial performance for both the MPS and MCS samples are presented in Table 7. It is not surprising to find that those who perform better academically either in undergraduate or graduate programs have greater intellectual ability. Colleges screen prospective students with tests of scholastic aptitude because scores on such tests predict academic performance.

Table 7. Correlations of Undergraduate and Graduate Grades with Managerial Performance [omitted]

According to results on the SCAT tests administered in the MPS and MCS assessment centers, the relationship with grades holds for verbal ability but not quantitative ability in most cases. For example, in MPS the correlation of rank in class with SCAT-V was .24 (p < .01), whereas that with SCAT-Q
was .13 (ns). Within MCS, using GPA as the measure of grades, the correlations were .24 (p < .01) with SCAT-V and .08 (ns) with SCAT-Q. Even for those MCS participants majoring in math and science, the correlation of grades with SCAT-V was noticeably higher than that with SCAT-Q. There were similar findings with the ITS YOUNG sample (for an N of 276, rs with GPA were .27, p < .001 for SCAT-V and .004, ns for SCAT-Q), but neither correlation was significant for ITS-MID.

The same trend held in the MCS sample for graduate grades, which correlated .33 (p < .01) with SCAT-V and .16 (ns) with SCAT-Q for the total sample of those with master's degrees. Both verbal and quantitative ability seemed to be reflected in MBA grades; however, correlations were .37 (p < .01) with SCAT-V and .36 (p < .01) with SCAT-Q. Neither ITS sample had significant correlations of graduate grades with the SCAT.

Grades are not only a measure of intellectual ability. Their relationship to the work involvement factor, shown in Table 7, illustrates the importance of motivation in scholastic achievement. The dimension responsible for the relationship of the work involvement factor to grades was inner work standards, or having one's own high standards for work regardless of what might be required by one's superior. Apparently, those inspired to get good grades showed the same conscientious work habits in the assessment center exercises.

Another factor related to undergraduate grades within MPS and graduate grades within MCS was nonconformity. However, the individual dimension ratings contributing to the relationship were different for the two samples. In the MPS sample, grades were related to range of interests and low need for superior approval; in the MCS graduate sample, grades were significantly related to social objectivity, low need for job security, and low ratings on Bell System value orientation (organizational identification).

Graduate grades also differed from undergraduate grades by correlating significantly with administrative skills. The dimensions of organizing and planning, decision-making, and creativity were all related to graduate grades for the total sample of master's participants, with those in programs other than business primarily responsible for the correlations. It will be remembered that MBAs in general were rated higher on administrative skills, but the best students did not seem to have that great an advantage over those with lesser scholastic records. For the dimension organizing and planning, for example, the correlation with graduate grades was .21 for MBAs (ns) and .38 (p < .05) for those with other master's degrees.

Because grades were related to several meaningful factor scores, it should be expected that they would also correlate significantly with ratings of overall potential. The results were statistically significant for undergraduate grades; for graduate grades they were of the same magnitude though not statistically significant due to the smaller sample size of those with master's degrees. Within MPS grades were significantly related to later advancements, both in terms of attaining the first promotion earlier and making greater progress up the management ladder whether measured at year 4, 8, or 20. Within ITS MID, self-reported ratings of undergraduate grades correlated significantly with management level (r = .13, p < .05, N = 280). The relationship was not quite established for undergraduate grade point average (r = .11, ns, N = 271) or ratings of graduate grades (r = .16, ns, N = 123). Relationships of grades and progress are not yet established with the MCS sample.

In reviewing these statistics there is an opportunity to compare results using different measures of grades. It has been argued (Walters & Bray, 1963) that rank in class as stated by the college should be the best measure of grades because self-reports are often inaccurate. But rank in class did not have the
strongest relationships with management performance criteria among the MPS men. It may be that the self-reports on the simple scale used here were not only accurate enough but served to eliminate trivial differences in rank.

On the other hand, between the time of MPS and MCS, considerable grade inflation has occurred, and the likelihood that a simple scale would differentiate appropriately seems more remote. The distribution of participants in the two samples on the self-reported categorization of undergraduate grades seems to verify the grade inflation. Among the MPS participants 15% rated their grades as excellent, 56% good, 25% average and 2% poor, whereas the MCS participants responded 46% excellent, 44% good, 10% average, and 0.3% poor. It is unlikely that recruiters raised their standards that much over the 20 years, so the more likely explanation is grade inflation. With the scale for undergraduate grades reduced to little more than two points, use of grade point average with the MCS group produced somewhat stronger relationships with the important managerial factors.

For newer samples, then, it appears that greater precision in defining grades is called for, but the question still remains of whether it is worth the trouble and expense of getting actual college records rather than using self-report data. Of course, the MPS and MCS studies were off-the-record and did not influence participants' selection or promotion chances, so the participants may have had less motivation to distort self-reports. Another problem with using official records is that many colleges do not collect rank in class data. Among those that do it would be interesting to see if rank in class is a better predictor than grade point average.

College Quality

College quality seemed to be a meaningful predictor of management performance for those in MPS. As shown in Table 8, those from better rated colleges were rated higher at the assessment center on intellectual ability, advancement motivation, nonconformity, and general effectiveness. In spite of these advantages, the relationship of college quality and management progress did not become evident until the 20th year.

Table 8. Correlations of College Quality With Managerial Performance [omitted]

The distribution of average college quality by management level at year 20 shows that differences were negligible between those at the first through third levels. It was only above third level that average ratings began to differ noticeably by level. This raises the question of whether the kinds of things learned at a high-quality college are important only at higher executive levels or if the prestige of one's college somehow makes one more acceptable in the executive suite. It is possible that credentials are used in advancement decisions at higher levels where performance may be more difficult to measure.

The positive relationships between college quality and critical ability and motivation factors did not hold for the MCS sample. Only the personality factors of independence and nonconformity related significantly to college quality. Although the difference in measures of college quality could certainly be responsible for the different results, a look at some of the dimensions and tests that are related to college quality in MCS suggests characteristics that may not augur well for future performance as a manager.

The troubling relationships are particularly apparent in the white sample (correlations for minorities were small and nonsignificant). There was no significant mean difference in average college quality between the white and minority samples, but a significant race by sex interaction ($F = 3.00, p < .05$)
indicated that white males more often went to high-quality schools.

The negative correlation of work involvement and college quality in the white sample comes from the dimension primacy of work, which correlated -.13 (p < .05) with college quality for the total MCS sample, and -.15 (p < .05) for whites. In addition, scores on a questionnaire measure of career expectations correlated negatively with college quality (r = -.15, p < .01 for the total sample and r = -.17, p < .01 for the white sample). This suggests that those from the best colleges found work a less important aspect of their lives than other activities, and they didn't expect as many rewards from a career in management as did those from lesser schools. Ratings on the dimension of cynicism also related positively to college quality (r = .11, p < .05 for the total sample; r = .16, p < .05 for whites). Whites at the best colleges, then, may be most susceptible to the declining work ethic among newer managers (Howard & Wilson, 1982).

Other indicators of potential problems among whites attending high-quality colleges indicate strong independence needs, lesser respect for authority, and less identification with the organization, all of which may be aspects of the significant correlation of college quality and nonconformity in Table 7. College quality correlated positively with motivation for autonomy on the Edwards Personal Preference Schedule (r = .16, p < .01 for the total group, r = .23, p < .01 for whites) and mildly negatively with deference (r = -.11, p < .05 for the total group, r = -.12, ns for whites). Consistent with this were negative correlations between college quality and need for superior approval (r = -.18, p < .01 for the total group, r = -.22, p < .01 for whites). Correlations between college quality and Bell System value orientation were also negative (r = -.12, p < .05 for total group, r = -.14, p < .05 for whites).

The pattern of correlations for the MCS sample, at least for the whites, points to potentially troublesome employees from the top-quality schools. Although independence is generally considered a positive quality, when combined with cynicism, lack of deference, lack of organizational identification, low expectations about what a management career can offer, and less interest in work in general, the concern arises as to whether such participants will have adequate motivation to excel in a management role. The correlation of -.16 between college quality and level attained by Year 4 for whites is not statistically significant, but its size and direction bear watching.

More positive relationships with management characteristics may be obscured because two thirds of the MCS participants graduated from the top quartile of ranked colleges. It is also possible, of course, that the MCS results are an artifact of ratings by the Gourman method. The exact method used is considered proprietary, but it is one of the few surveys rating overall undergraduate quality (Grambau, 1984). Because few MCS participants graduated from "ivy league" colleges, those from large universities usually obtained the highest-quality ranks. Although large universities often have the advantages of well-stocked libraries and professors renowned for their research, Astin (1982) has demonstrated that smaller institutions are much more effective in promoting student achievement, including the development of leadership ability.

Major Field of Study

Historically, the hiring policies of the Bell System have been to select approximately equal numbers of business, technical, and nontechnical majors into beginning general management jobs. Among the 274 Management Progress Study men, there were 104 (38.0%) business majors, 67 (24.5%) engineers, 12 (4.4%) science, 3 (1.1%) math, 15 (5.5%) humanities, 56 (20.4%) social science, 6 (2.2%) education, 1 (0.4%) interdisciplinary, and 10 (3.6%) other majors. Groups were combined and comparisons made between (a) math or science, (b) business, (c) engineers, and (d) humanities or social science majors, as
There were marked differences among the undergraduate major groups in six of the eight assessment factors and on all measures of overall performance and progress. On most measures the humanities and social science majors were clearly superior, and the business majors came in second. The math and science majors and engineers performed more poorly.

The greatest differences among the majors were in abilities, and almost every dimension underlying the three areas of ability showed significant differences across major groups. Within administrative skills decision-making showed the greatest differentiation, with the humanities and social science majors clearly outpacing the other three majors. Creativity in solving business problems showed the same pattern of differences by major. The humanities and social science majors also exceeded the other three groups on intellectual ability, including range of interests and written communications skills. They were not significantly higher than the math and science majors in general mental ability, however, although they did exceed the other two groups.

In interpersonal skills the humanities and social science majors were joined by the business majors in beating out the engineers, with the math and science majors falling somewhat in between. This was true for leadership skills, oral communications, behavior flexibility, personal impact, and social objectivity.

Perhaps surprising, the humanities and social science majors also were rated higher in advancement motivation than the engineers and math and science majors. The business majors did not lag far behind, however, and on several dimensions (energy, need for advancement, low need for security) they joined the humanities and social science majors in attaining higher ratings than the engineers. The work involvement factor did not show differences among the majors for either the dimension of primacy of work or inner work standards. Apparently all the majors were equally concerned about their work, but the humanities, social science, and business majors were more likely to combine this with desires to advance higher in the organization.

Personality factors generally showed less difference among the majors, although the humanities and social science majors did top the others in nonconformity. This came primarily from the dimensions of range of interests, where they exceeded each of the other groups, and social objectivity, where they, along with the business majors, were rated higher than the engineers. The group differences on the stability factor came from the dimension of tolerance of uncertainty, where the humanities and social science majors were rated higher than the engineers. The engineers were also surpassed by the business majors on resistance to stress, although the overall difference among the four major groups was not statistically significant.

The general effectiveness factor and assessment predictions followed the trend of the other assessment factor results, with the humanities and social science majors faring best and the business majors also performing better than the engineers. Actual progress within the company was in accord with the assessment center results for the most part, especially in the early years. The math/science majors and engineers took about two years longer to get the first promotion. By the fourth year of the study the humanities and social science majors had progressed the furthest, with the business majors not far behind, but the other two groups lagged seriously behind. After the next four years the engineers moved ahead of the math and science majors (note, however, that the sample of the math and science majors is quite small), and the average levels by major were arranged in that same order at Year 20. Another
measure of success at year 20 would be whether or not a participant did better than the mode for the college group; that is, reached Level 4 or higher. This was true for 45% of the humanities and social science majors, 32% of the business majors, 21% of the engineers, and 14% of the math and science majors.

In addition to promotions as a criterion of success, it is also advantageous to see if evaluations of current job performance reflect the same kind of differences. To eliminate any effects of management level on performance ratings, the level with the greatest number of MPS participants at Year 20 (Level 3) was selected for comparisons by major. Performance data were taken from ratings made by interviewers of the participants' bosses in the 20th year of the study. Among those at Level 3 were 24 business majors, 23 engineers, and 15 humanities and social science majors. For ratings of overall adequacy of performance, made on a 5-point scale, both the humanities/social science majors and business majors were rated better than the engineers (humanities/social science M = 4.07, SD = .80; business M = 4.00, SD = .83; engineers M = 3.39, SD = .99; F = 3.73, p < .03). Ratings of potential level were also made on a 4-point scale (1 = below third level, 2 = third, 3 = fourth, 4 = above fourth). On this scale the humanities and social science majors were rated higher than the other two groups (humanities/social science M = 3.00, SD = .65; business M = 2.42, SD = .58; engineers M = 2.52, SD = .79; F = 3.58, p < .03). The relative advantage of the humanities/social science majors not only applies to past promotions, then, but to current performance and possible future promotions as well.

Comparisons of management level in the ITS MID sample among the four major groups also showed significant differences (F = 3.16, p < .03) and provide support for the lesser advancement of engineers. Across the eight organizations where management level could be estimated, 59 engineers had an average level of 1.93 (SD = .64) compared to 2.18 for the 51 humanities/social science majors (SD = .52) and 2.16 for the 102 business majors (SD = .52). The math and science majors in the ITS MID sample had advanced further than in MPS relative to the other major groups (M = 2.31, SD = .60), but their small sample size of 18 running across a variety of organizations casts some doubt on the findings.

There is much corroborative evidence for the MPS results by major within the Management Continuity Study. The distribution of majors for this study was 107 (31.2%) business, 52 (15.2%) engineers, 17 (5.0%) science, 33 (9.6%) math, 15 (4.4%) humanities, 71 (20.7%) social science, 16 (4.7%) education, 7 (2.0%) interdisciplinary, and 25 (7.3%) other majors. This distribution was very similar to that of MPS with one exception: There were fewer engineers and more math majors. A primary reason for this discrepancy was the desire to fill affirmative action quotas for technical jobs and the relative shortage of engineering majors among women.

A comparison of the four major groups on the various performance criteria is shown in Table 10. Once again there were significant group differences on the majority of assessment factors. There was also a significant group difference on general effectiveness and one of the predictions (Will Make Middle Management). For the subgroup that had 4 years of tenure since their assessment, differences in level attained were not statistically significant. Thus although on overall measures the case is not so strongly made for group differences by major, there were just as many differences on the individual factors.

Table 10. Managerial Performance By Undergraduate Major, Management Continuity Study [omitted]

In most cases, as with MPS, the results showed the humanities and social science majors at or near the top of the scale and the math/science majors and engineers nearer the bottom. For the various abilities and advancement motivation, which are the most important factors in terms of predicting future success
as managers (Howard, 1984), the differences by major for MPS in comparison to MCS are shown in Figure 1.

Figure 1. Average ability and motivation dimension factor scores by undergraduate major [omitted]

For administrative skills, the engineers were the poorest rated, as in MPS, but the MCS business majors moved ahead of the humanities and social science majors. On the dimension organizing and planning, the business majors were the top group, significantly higher than the engineers, with the humanities/social science and math/science groups about equidistant between them. On decision making the business and humanities/social science majors had the same average score, which was significantly higher than that for the engineers and math/science majors. Creativity still found the humanities/social science majors ahead, as in MPS, with the engineers and math/science majors the low scorers and the business majors in between.

Interpersonal skills were still the great strength of the humanities/social science majors. On nearly every dimension in that category they were rated significantly higher than the engineers and math/science majors. On several dimensions the business majors also exceeded the average ratings of the engineers (oral communication skills, personal impact, likeableness, perception of threshold social cues), but they seldom were rated as highly as the humanities/social science majors.

A number of personality test scales administered at the MPS and MCS assessment centers support the differences in interpersonal skills. For example, on the Edwards, for both samples the engineers were high on need for order while the social science majors and humanities majors scored low. The results on this scale for the engineers and social science majors were confirmed by both samples of ITS. Both MPS and MCS also found the engineers low on exhibition on the Edwards (not supported by ITS) and high on authoritarianism on the Bass version of the California F-scale (the humanities and social science majors scored low). On the Guilford-Zimmerman, given only to MCS, the engineers and math majors scored low on sociability whereas the humanities and social science majors scored high. Similarly, on the CPI, also given only to MCS, the pattern was for engineers and math majors to score low and humanities and social science majors to score high on such scales as dominance, capacity for status, sociability, social presence, and self-acceptance. The opposite pattern held true for self control, where the engineers and math majors were the high scorers.

The test scores suggest that the humanities and social science majors had self-concepts that support relating to other people in a self-assured, outgoing, and flexible manner. The engineers were more controlled, orderly, rule-oriented, and reserved with others, characteristics that do not as readily translate into a smooth leadership style, a strong personal impact, or behavior flexibility.

On intellectual ability, as in MPS, the humanities/social science majors were rated higher than the other three groups on range of interests. They also did better than the engineers and business majors on written communication and better than the business majors on general mental ability. General mental ability needs more elaboration, however, because the majors had disparate strengths and weaknesses on the subtests of the SCAT. Raw score differences are shown in Table 11, illustrated by differences in percentile scores in Figure 2.

Table 11. School and College Ability Test Scores By Undergraduate Major [omitted]

Figure 2. Average School and College Ability Test (SCAT) scores by undergraduate major [omitted]
The greatest disparity between the subtests occurred for the humanities/social science group, who scored notably higher than the other groups on the verbal scale but were the low scorers on the quantitative scale. Quantitative reasoning is clearly a weakness for such majors, with great consistency across the two longitudinal samples. The ITS results also confirm this disparity in scores for humanities/social science majors: the ITS MID average verbal score was at the 73rd percentile of the Bell System norms and their quantitative score at the 19th percentile; within ITS YOUNG corresponding scores were the 65th and 23rd percentiles.

By contrast, the engineers showed more strength in quantitative skills relative to the other majors, a fact also confirmed in both ITS samples. The business majors did little better than the humanities/social science majors on the quantitative scale in either AT & T or ITS sample, and their verbal scores were not outstanding. Consequently, their total test scores were among the lowest in all samples studied. This is consistent with the finding that students with poorer grades tend to be recruited into business and education (Astin & Panos, 1969).

The major groups presented here have shown surprisingly clear and consistent results, but they did involve some grouping of majors within liberal arts. Although subsamples of these majors are small in size, it should be noted that the humanities majors outperformed even the social science majors on intellectua