Chapter 9

Summary of findings and recommendations

9.1 The aim of the study

Knowledge-based economies require highly educated citizens, and insight into the factors that affect success in higher education is more important than ever. Enrolment numbers in higher education are increasing annually, yet graduation rates are decreasing (CBS, 2010). Although the Dutch government has set new targets to increase graduation rates, they are not likely to be met.

The findings from this dissertation provide insight into the relationships between intelligence, personality, motivation, and competencies on the one hand, and academic achievement and early career success on the other. The findings can help promote policies that increase graduation rates, decrease time-to-graduation, and help students make more informed decisions. Knowing how student characteristics and academic achievement are related to early career success is important for individuals and business organizations alike. Individuals can work on their developmental needs in the safety of the college environment and businesses can make better selection decisions. The findings are useful to several stakeholders: science, business organizations, educational institutions, and students.

Three questions drove the research in this dissertation:

1. How well do student characteristics predict grades?
2. How well do student characteristics predict time-to-graduation?
3. How well do student characteristics and academic achievement predict early career success?

An overview of all variables in the current study is presented in Figure 9.1, the research model.
Figure 9.1  Research model

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Figure 9.1  Research model
9.2 Summary of the main findings

The set of student characteristics in the current study are intelligence, the Big Five personality traits, motivation, four specific personality traits, and learning styles. Academic achievement and early career success are the two major sets of dependent variables. Overall GPA, grades in five specific learning environments, and time-to-graduation measure academic success, whereas salary and self-reports measure early career success. In the main, the different studies in this dissertation focus on how well various predictors account for variance in the dependent measures.

1. How well do student characteristics predict grades?

Intelligence

The findings suggest a modest and stable positive correlation between intelligence and grades throughout college (chapters 3 and 4). Intelligence is related to first year GPA as well as to overall GPA (chapter 6). This result is in line with other research findings concerning the predictive validity of intelligence for GPA in university samples, both within The Netherlands (Busato et al., 2000; Resing & Drenth, 2009; Wolting, 2006) and outside it (Farsides & Woodfield, 2003; Furnham & Chamorro-Premuzic, 2004). It is often argued that the lack of a strong correlation is surely an artefact due to restriction of range in the intelligence variable (Drenth, 2004).

Big Five Personality Traits

The main finding is that the personality trait of conscientiousness correlates more highly with overall GPA than does intelligence (chapter 3). Not only does conscientiousness, after controlling for intelligence, account for 22% of the variance in GPA, it is also consistently related to each of the five specific academic achievement criteria. In fact, conscientiousness explains five times as much variance in academic achievement as does intelligence (chapter 4). An additional set of studies within other academic disciplines confirms the importance of conscientiousness for first year grades. There were comparable validity coefficients in a second HRM sample as well as in a Sports, Health & Movement sample (chapter 6). Many studies report that conscientiousness is related to academic achievement (Bratko et al., 2006; Gilles & Bailleux, 2001; Nフトle & Robins, 2007; Poropat, 2009), or that conscientiousness has even more predictive power than intelligence (Conard, 2006; Di Fabio & Busoni, 2007; Furnham & Chamorro-Premuzic, 2004; Furnham, et al., 2003; Petrides et al., 2005). Conscientious individuals perform better because they persevere longer and are more organized than their counterparts.

Relationships with grades for the other personality traits occur only sporadically: neurotic students perform better in the skills training learning environment, extroverts
perform less well in skills training, and open minded students perform less well in team projects (chapter 3).

**Intrinsic motivation**

The findings show that intrinsic motivation is moderately correlated with overall GPA as well as with first year GPA (chapters 4 and 6). Intrinsic motivation explains more than twice as much variance in GPA as does intelligence, and intrinsic motivation has incremental validity over and above intelligence. The magnitude of this effect coincides with meta-analytic findings (Robbins et al., 2004; Vallerand et al., 1993). However, intrinsic motivation has no incremental validity above and beyond conscientiousness. As noted in chapter 4, motivation and conscientiousness are strongly related and an item content analysis shows that both tap ‘sustained effort’. Therefore, the lack of incremental validity, once conscientiousness is held constant, can create the misperception that intrinsic motivation does not predict academic achievement. Of course, nothing is further from the truth.

**Specific Personality Traits**

The effects of anxiety, need for pressure, need for status, and study motivation were explored. The findings show that anxiety is unrelated to GPA. Environmental pressure correlates negatively, and study motivation correlates positively, with GPA (chapter 4). Study motivation is of importance across the curriculum - that is, study motivation correlates with achievement in all learning environments. Environmental pressure showed a negative correlation with GPA and achievement across the learning environments – of note significantly with thesis. Students who need additional external pressure achieve lower grades in general and especially for their thesis.

**Learning Style**

The findings reported in chapter 5 show that the learning styles of the Learning Style Questionnaire by Honey and Mumford (1992), namely Activists, Theorists, Pragmatists, and Reflectors are neither related to overall GPA, nor to grades from any of the five specific learning environments. This casts doubt on the importance of learning styles for academic achievement, contrary to the believe of many teachers and scholars.

**Summary**

Student characteristics that are related to academic achievement are, in order of importance; conscientiousness, motivation and intelligence (chapter 3-6). When combined, the student characteristics explain 33% of the variance in GPA, with conscientiousness and intelligence contributing the most variance. This means that intelligent, eager, disciplined, and hardworking students obtain the best grades.
2. How well do student characteristics predict time-to-graduation?

Intelligence
The results presented in chapter 4 report a meagre correlation between intelligence and timely graduation. Intelligent students seem to graduate only slightly faster than less intelligent students.

Big Five Personality Traits
By far, the most important predictor of time-to-graduation is, again, conscientiousness, which explains about 17% of the variance. This is in line with results from meta-analytic studies by Noftle and Robins (2007), O’Conner and Paunonen (2007), and Poropat (2009) and also with results from studies in the Netherlands by Van Bragt (2010) and Busato (2000) who reported that conscientiousness is a key determinant for study progress in the first year of college (Van Bragt, 2010) and the first year of university (Busato, 2000). Neuroticism and openness to experience are somewhat related to time-to-graduation (chapters 3 and 4). This means that disciplined and hard working students need less time to graduate and open, curious as well as emotionally less stable students need more time to graduate.

Intrinsic motivation
Intrinsic motivation explains twice as much variance, as does intelligence, in time-to-graduation, and has incremental validity over and above intelligence (chapter 4). However it should be noted that intrinsic motivation and conscientiousness are highly intercorrelated.

Specific Personality Traits
None of the specific personality traits, namely, anxiety, need for pressure, need for status, and study motivation, is related to time-to-graduation.

Learning Style
The findings reported in chapter 5 show no significant relationships between the four learning styles of the LSQ and time-to-graduation.

Summary
Student characteristics that are related to time-to-graduation are, in order of importance; conscientiousness, openness to experience, intrinsic motivation, neuroticism and intelligence (chapter 3-6). This implies that eager, disciplined, motivated and hardworking students need less time to obtain their diploma and open, curious as well as emotional less stable students generally need more time. When combined, the student characteristics explain 30% of the variance in time-to-graduation, with conscientiousness
and openness to experience being the most important predictors. This means that disciplined, hard working students who are not easily distracted and are able to focus on the study goals are those who graduate on the timeliest manner.

3. How well do student characteristics and academic achievement predict early career success?

Factors related to success in early careers are examined in chapter 8. Objective measures of career success include initial salary, current salary, salary growth; and subjective measures include job satisfaction, self-rated performance, and self-rated competency. Intelligence, broad and specific personality traits, intrinsic motivation, and learning styles are used as predictor variables, as are the academic achievement measures of overall GPA, specific learning achievement criteria, competencies, and time-to-graduation.

*Student Characteristics*

Intelligence explains 8% of the variance in current salary and 10% in salary growth, but no variance in initial salary, self-rated job performance and competencies, or job satisfaction. This is in line with research findings concerning the predictive validity of intelligence tests for work settings (e.g., Hunter & Hunter, 1984; Kunzel et al., 2004; Salgado et al., 2003; Schmidt & Hunter, 1998). Intelligence also shows incremental validity, over and above GPA and an overall assessment rating (OAR), for current salary and salary growth. Of the Big Five personality traits, only extroversion and conscientiousness correlate significantly with career success – and then only with the objective measures. Conscientiousness predicts salary growth on its own, but not after controlling for GPA and the OAR. In other words, there is less chance of an incremental contribution over and above GPA because GPA and conscientiousness are so strongly intercorrelated.

Of the other predictor variables, intrinsic motivation, anxiety, study motivation, activist and pragmatic learning styles, each correlate significantly with two objective career success measures. The pragmatic learning style predicts three career success variables (chapter 8) after controlling for GPA, the OAR, and intelligence. That the pragmatic learning style had an incremental validity was unexpected because this style is not related to academic achievement in the HRM program (chapter 5) and because a review by Coffield et al. (2004) indicates little evidence that learning styles have predictive validity at all. Nevertheless, pragmatism predicts current salary and a self-rating of competency, over and above the other predictor variables.
Academic Achievement

Overall GPA. Overall GPA explains 8% of the variance in current salary and 12% in salary growth. The percentages are of the same magnitude as those explained by intelligence.

Specific Learning Environments. The findings show that the GPA’s based on achievement in the specific learning environments together explain 12% of the variance in initial salary, 12% of the variance in current salary, and 15% of the variance in salary growth. Initial salary is best predicted by lecture grades, current salary is best predicted by lecture and skills grades, and salary growth is best predicted by grades in all five learning environments.

Time-to-graduation. Time-to-graduation correlates inversely and significantly with current salary and inversely and marginally with salary growth.

Competencies. The overall competency rating (OAR), which is an average of nine competencies ratings based on two large scale assessment centers (chapter 7), is related to the three objective measures and explains significant portions of the variance in initial salary (4%), current salary (12%), and salary growth (11%). Further analyses show that the OAR has an incremental contribution over and above GPA on four of the six career success measures.

Besides an OAR, three competency dimensions were distinguished, namely thinking, feeling and firmness. The competency dimensions of feeling and firmness are significantly related to all three objective measures of career success. The competency ratings show stronger correlations with initial salary, current salary, salary growth, and self-ratings of performance, than does GPA. Although the competency ratings correlate moderately with GPA, they still explain unique variance in career success beyond GPA, a result in line with a study by Waldman and Korbar (2004). In general, competencies outperform GPA as a predictor of career success when the student characteristic variables are partialled. This result supports the hypothesis by Donofrio and Davis (1997) that competencies correlate better with job performance than does GPA. It appears that competencies capture additional important job related aspects, notably behavior. That AC competency ratings are more effective than GPA as predictors of early career success can be explained by the goal of the AC’s, cutting across the curriculum, whereas tests and exams are designed to measure a specific skill or knowledge base.

Summary

The set of predictor variables explain up to 29% of the variance in certain early career success variables such as current salary. The predictor variables explain more variance in objective than in subjective measures of career success. Competency ratings show incremental validity for early career success measures, after controlling for the other
predictors. This finding provides clear support to the value of competence-based educational methods.

9.3 Recommendations

One of the goals, as enumerated in chapter 1 of this dissertation, is to provide practical recommendations to the various stakeholders who might benefit from educational research: business organizations, educational institutions, and students. This goal answers the proverbial “so what” question and bridges the gap between knowledge (kennis) and application (kunnen).

Companies should, where possible, factor student competencies, intelligence, and conscientiousness into their hiring process. Research shows that interviewers give higher ratings to job applicants who exert extrovert behavior (Barrick, Dustin, Giluk, Stewart, Shaffer, & Swider, in press). That extroverts do better in interviews is not unusual because the interview is a social situation and extroverts generally do better in social situations. The results from chapter 8 show that extroversion is correlated with initial salary. However, salary growth is a better measure of employee capability than is initial salary and growth is predicted not by extroversion, but rather by competencies, intelligence, and conscientiousness. Because extroversion is unrelated to conscientiousness, $r = .05$ (chapter 3) and unrelated to competencies, $r = .03$ (chapter 7), companies are losing many good prospective employees by focusing too much on extroversion and not enough on competencies and conscientiousness.

Institutes of higher education that use admission tests may consider including tests of personality and/or motivation. Some caution is, based on the percentages of explained variance, in place. Not only is much variance in academic success unaccounted for, one should also be aware that the students in this study filled out the questionnaires on a voluntary basis, which is very different from using tests for selection. Institutions that have an open admission policy, and are therefore unwilling or unable to be selective, may consider administering a personality or motivation test during a student’s first coaching session. Students who score low on conscientiousness are at risk of not graduating on time and such students could be ‘signal’ so that proper and timely interventions can be developed. In the main, there a two types of strategies that can be used to help students.

The first strategy develops conscientiousness related skills, such as planning, time-management, and being more organized in general. There are three possible interventions with this strategy. A course on time-management skills during the first semester might increase the students’ first year grade point average as well as their study pace. A second intervention would be to teach teachers how to act upon the strengths and weaknesses of
students in their classes. Teachers could make use of formative assessment rather than just a summative assessment at the end of their academic course in order to stimulate active learning and avoid procrastination. The use of short assignments can also be helpful to actively engage students in learning during a course. Formulating clear learning objectives and translating them into sub-goals may also help students to structure their learning. Setting clear, well defined and also challenging learning objectives may also trigger students’ motivation. Another intervention is to create study associations in which students share notes, discuss difficult topics, collect and disseminate lecture notes and book summaries, organize presentations and workshops by (foreign) guest speakers, but also study jointly on difficult courses. These study groups could be effective for students who have motivational problems and therefore need additional pressure to start studying or for students who have low self-discipline and who therefore have difficulty studying alone.

A second strategy, currently being widely discussed in the Netherlands, is for institutions to make changes in the learning environment or (elements of) the educational concept. Currently there is an emphasis, starting on day 1, on self-regulated learning. Therefore skills such as being organized and being able to reflect on one’s actions and to plan learning activities are important. Students often have less than 20 hours of instruction and coaching, which, assuming a study load of 40 hours per week, leaves a full 20 hours for self-study activities. Moreover, in later years, students often have 15 hours or less of instruction and coaching. This educational approach is counteractive to students who lack conscientiousness. Institutions can help students by placing less emphasis on self-regulation at the start of a program so that students have the opportunity to develop self-regulation skills gradually. For example, curricula could be very structured in the first year, somewhat less so in the second year, and students should be prepared to self-regulate more during the third and fourth academic years. A second curriculum based intervention may be altering the amount of lectures, skills training, internship training or team projects. The study reported in chapter 3 shows that conscientiousness has the lowest correlation with team projects. Based on this finding one may suggest more complex team projects with longer time spans. Team projects clearly have certain advantages like the opportunity for students to develop communication and leadership skills. However, performance on team projects is negatively correlated with openness to experience. When curious, open minded students underperform in team projects one wonders if the project deadlines tend to become the main objective of students rather than discussing and learning with and from each other. The clear deadlines may be interfering with deep learning. So implementing more complex team projects will be a challenge for curriculum developers because what is an advantage for one student may be a disadvantage for another student. A major policy change may be needed, namely more individually tailored education. In such an approach, students have the same learning objectives, however the paths along which they reach these learning goals can differ.
Students who score high on neuroticism could be assessed at the end of the year with a portfolio whereas other students, for example those who need additional pressure because they are less conscientious, could be frequently assessed with small, individual, or group assignments, and traditional exams. Critics may argue that such an approach is too costly and results from aptitude-treatment interactions (Kanfer & Ackerman, 1989) and personality-treatment interaction (Trown & Leith, 1975) are not encouraging. This is not an argument for individualized higher education, but there is a clear need for customized learning packages for groups of individuals with similar characteristics. Such an approach could benefit large institutions that have large numbers of students who come from diverse backgrounds and who suffer from low graduation rates.

The intercorrelations between the different GPA’s are reported in chapter 2. The medium sized correlations between the GPA’s were tested and revealed that the HRM curriculum is heterogenous in nature. Heterogeneity in types of learning environments is one of the basic principles of competence-based education. However, of note is the correlation between thesis and the other learning environments. The thesis is often considered to be the cumulative end product of student learning and should reflect the student’s overall capability or level of knowledge. The modest correlations between thesis and the other learning environments suggests that the thesis is not the cumulative end product but should be regarded as a separate measure. This is probably caused by the individualistic, active nature of writing a thesis versus the more passive, collective and instruction driven nature of traditional learning environments and exams. If the thesis is to remain as the final exam of student learning, then curriculums should be designed so skills that are relevant to completing a thesis are learned in the earlier parts of a student’s education. For example students, as individual or as a group, should be trained to write research proposals, short research articles or advisory reports, and even a paper that starts to approximate the basic thesis. As in universities, students are asked to write a bachelor thesis to acquire their bachelor diploma and to write a masters thesis as part of their master’s degree. There is currently a debate in the Netherlands about whether to start testing student knowledge with a standardized exam at the end of the college education. Such an exam would ensure that standards at institutions of higher education are being maintained on an equal basis throughout the entire country. As reported in chapter 2, the intercorrelations between lectures and the other specific performance measures are above .40 (except for thesis), and lectures has the highest reliability estimate. From this perspective, a knowledge exam may be a better criterion than is a written thesis. However, from the social constructivist view of learning (chapter 1) implementing a knowledge exam at the end of a bachelor program is not desirable. After all, tests are known to control learning (Biggs, 2003) and the purpose of competence-based education is to learn how to apply knowledge in complex work situations rather
than merely possess knowledge. From this perspective a knowledge-based exam is undesirable.

Clearly, we need to know more about the construct validity of conscientiousness. The correlations between the NEO-FFI personality questionnaire and the intrinsic motivation scale of the Work Style Inventory is $r = .45$. A simple reason for this finding is that a number of items between the two scales of conscientiousness and intrinsic motivation have similar content. A factor analysis of the conscientiousness and intrinsic motivation items yields a three factor solution and showed that the overlapping items load on the same factor. As reported, adding motivational factors in a prediction model with personality traits can lead to the inaccurate perception that motivation is less important. The use of the full version, the NEO-PI-R, which measures five facets of conscientiousness, may prove to be a fruitful approach to unravel the overlap between conscientiousness and motivation. This is important for practice because teacher and student counsellors need to know how conscientiousness and motivation affect academic achievement so that they can develop and implement suitable interventions.

Recent research suggests that many young adolescents may not be fully equipped to act as self-regulated learners. The prefrontal cortex, which makes reflection and planning possible, is not fully developed until the age of 22 to 25 (Paus, 2005). So, if students need self-discipline to be successful in competence-based education and students are not fully equipped to plan and organize their own learning activities right from the start, then they have less chance to succeed. Research shows that the prefrontal cortex in men matures later than in women, so men might be more at risk during the early stages of their higher educational careers. Students should be made aware of the strengths and weaknesses in their own learning capabilities, style and personality, and they should act on that knowledge. However, simply informing students about their strengths and weaknesses may not be enough because they are not yet equipped to fully understand how these factors affect academic achievement. What could be helpful in this respect is peer-coaching by senior students in addition to the evidence-based information.

The average time students need to graduate is increasing which, in light of the current budget cuts, is an immediate problem for the government and a potential problem for students. Although a prolonged stay in college is not necessarily a waste, targets have been set to reduce study duration. In 2012, students who need more than five years to finish will be charged an extra 3,000 euro by the government. As is shown in chapter 8, openness to experience is related to a prolonged study duration. Why and how openness exerts a negative effect on study pace deserves further examination. A starting point may be that 50% of the students in higher education testify that they are not challenged enough by the content of the curriculum nor by their teachers, and therefore spend only 30 hours a week on school activities instead of the required 40 hours. Open and curious students may then be tempted to seek challenge outside the classroom which
may have a negative effect on their academic performance and cause them to stay in school longer. These students may also benefit from time-management courses to strengthen their self-discipline and to learn how to focus on their (learning) goal(s), or alternatively, may decide to choose a more challenging program and additional courses to help them stay focussed.

9.4 Limitations, strengths, and suggestions for future research

There are several limitations as well as strengths in the current research that warrant discussion. One limitation is that data are collected from a naturally occurring field study. Thus, no interventions or controlled experiments with random samples were possible. For example, it would have been interesting to compare directly the effects of traditional and competence-based curricula on measures of early career success and job performance. It also meant that existing data (grades) were used of which the independence of the measurements can not explicitly be guaranteed.

A second issue that limits how far the results may be generalized concerns how competencies are measured. Competency ratings in the current study stem from two large scale assessment centers that were specially designed for the HRM program by a commercial assessment firm. However competency ratings in higher education are also often derived by assessing student portfolios or through observation in the classroom or during coaching. Because of the differences between assessment center, portfolio, and classroom observation, the results presented in chapters 7 and 8 cannot be generalized to other assessment formats – at least not until the intercorrelations among the various competency measures are investigated. Research on the validity of portfolio competency ratings is recommended because the portfolio is widely used in the Netherlands and validity evidence is lacking (McMullan et al., 2003). A third issue is the collective nature of the grades students received for their team projects. Such group grades do not only reflect the individual’s capabilities which limits the conclusions concerning the team projects criterion.

There are additional relevant issues that cannot be addressed in the current research. For example, there is no measure of class attendance, a variable that accounts for significant variance in GPA beyond that of intelligence. However, conscientiousness may be used as a surrogate for attendance because conscientious students will most likely attend more classes than their less conscientious colleagues. A minor limitation is that only pass grades rounded up to the nearest whole number were available. Clearly, GPA’s based on pass grades that range from 6 to 10 have smaller standard deviations than GPA’s based on first try grades that range from 1 to 10. Grades with decimal points (e.g., 6.5) might also be more meaningful because they contain less error.
Students who dropped-out of school are not included in the current research. Drop-out rates in higher education are high and dropping out has financial as well as psychological consequences for a student. The highest drop-out rates in the Netherlands occur during the first six to twelve months and individual differences measures (chapter 3) were administered during the assessment center (chapter 7) at the end of the first year of college.

Whether the HRM curriculum in this research is fully competence-based is an open question. The characteristics that are associated with competence-based education include: a) the use of authentic, open problems and learning materials that have personal meaning for students and are presented in a variety of formats, b) teaching methods that arouse interest, activate prior knowledge, clarify meanings, and model appropriate learning strategies and reflective processes, c) small group learning that facilitates competencies like teamwork, debating and reflection, and d) changes in the goal and use of assessments like integrating instruction, learning and assessment (e.g., Entwistle, 2000). The HRM curriculum uses different learning environments, including small group learning, and also promotes competency development through the student counselling program, the internships, and in the assessment centers. Moreover, competencies, along with learning goals, are described in the student manuals of each course. Based on these characteristics, the HRM program is in the early stage of a competence-based program. Although meaningful relationships between the learning environments (e.g., internships) and the competency ratings are reported, these correlations might be higher in a program that is fully competence-based. To that end, effect sizes in this dissertation may be regarded as being conservative.

A known problem with assessment center research is that competency ratings by assessors are often contaminated with bias, which causes correlations with criterion variables to be artificially inflated (chapter 8). There can be no rating contamination in the current research, except for the self-ratings of job performance, because supervisors of the HRM graduates would not have known how graduates performed in the assessment center while they were still students. That the current findings show meaningful relationships between AC competency ratings and performance appraisal scores at work strengthens the belief that competencies predict important real life outcomes.

Although gender differences are not pivotal in this dissertation, the findings show that female students in general outperform male students. Therefore, future research should consider the direct effect, and the incremental effect of gender on academic achievement.

Most empirical studies in the Netherlands use university samples, despite the fact that there are twice as many college, as university, students. Findings from the current study are based on a college sample and parallel those of studies conducted with university students.
9.5 Concluding remarks

Businesses are in constant need of talent to stay competitive. Institutes of higher education try to provide individuals with the right qualifications to be successful in the labour market. Therefore there is a need for knowing what makes individuals successful in their careers. There is also a need to know what makes a student successful in college. This dissertation examines both the determinants of early career success and of academic achievement. Results show that intelligence, conscientiousness and intrinsic motivation are important predictors of academic and early career success. Academic achievement and especially competency ratings are also related to early career success. Knowing what key determinants of success are and acting upon that knowledge may improve the absolute number of students who graduate as well as time-to-graduation rates. Students, counsellors, teachers and managers need to be educated on what factors are related to academic and career success. All involved can use this knowledge to increase their chances of success.