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How to choose your minor?

Decision making variables used in the selection of a minor by undergraduate students from a Dutch university of applied sciences.

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ABSTRACT

In recent years the higher education sector (HE) has been influenced by a marketised approach in which students are perceived as customers and in which student satisfaction is used as a measure of educational quality. Demand-driven education can be looked at as one of the consequences of this marketisation. In response to this phenomenon Dutch universities of applied science have designed their undergraduate professional bachelor programs education in majors and minors thereby offering students the possibility to customize their educational program. However, hardly any knowledge is available on minor choices of students.

This paper presents the results of a survey looking into decision making variables influencing the minor choice of undergraduate students from a consumer behaviour perspective. Bachelor students from a large university of applied sciences in the Netherlands participated in the survey. Analysis of the data led to the discovery of nine decision making attributes and five sources of information & advice.

The learning value of the minor proved to be the most important minor characteristic students take into consideration when selecting a minor. The contribution of the minor to the future career opportunities of the student and to the broadening horizon of the student also proved important when choosing a minor. The same goes for the contribution of the minor to the development of the competences required for the bachelor degree. Students use several sources of information & advice to form an impression of the minor of their choice. The digital information & advice from the department that offers the minor programme is most important in finding out about the relevant minor characteristics. Students use the information that is in the digital minor catalogue and they consult minor-specific websites. Non-digital information & advice seems less important.

These results contribute to the theoretical knowledge about minor selection specifically and about student choices in higher education in general. The results of this study can be used by universities of applied sciences in developing the minor portfolio, in providing information and in coaching students. This study is one of the first into minor decision making variables. Further research is needed to test its results and to elaborate on aspects of minor-selection not dealt with in this study.

INTRODUCTION

The higher education sector is increasingly characterised by marketisation, meaning the application of economic theory to the higher education sector (Brown, 2009; Newman & Jahdi, 2009). Marketisation is assumed to contribute to improvement of performance of institutions, thereby making a major contribution to the public good (Brown, 2009; Lowrie & Hemsley-Brown, 2011). Naidoo and Jamieson (2005) explain the underlying assumption: "Higher education services that are below standard will be rejected, thus forcing higher education providers to improve or loose out on 'customers' and revenue. The student-consumer thus emerges as the focus of competition and a modernizing force that will bring about increased efficiency, diversity and flexibility to the higher education sector." In much of continental Europe the development of a common European Higher Education Area and the Bologna reforms have contributed to this trend of a more market oriented higher education sector (Robertson, 2009). In the Netherlands, the Bologna reforms have led universities of applied science to redesign their former educational programs to undergraduate programs leading to the degree of professional bachelor. Both this reform and the marketisation trend contributed to the introduction of the major-minor concept in Dutch undergraduate programs. In this major-minor concept the major constitutes the largest part of the bachelor program and is a rather fixed and prescribed program. The minor is a smaller part of the bachelor program and is subject to students' choice. From a marketing perspective, choosing minors offers students the possibility to customize their undergraduate bachelor program in such a way that it reflects their personal ambitions and interests (HBO-raad, 2004a; HBO-raad 2004b; Inspectie van het Onderwijs, 2005).

Central to the concept op marketisation in higher education is student choice behaviour. Related to this is a growing research interest on how students, as consumers, make their choices in higher education (Naidoo, Shankar & Veer, 2011). In the field of consumer behaviour research, decision making is conceptualised as a process consisting of several phases (e.g. Gabbott & Hogg, 1998; Moogan, Baron & Harris, 1999; Moogan & Baron, 2003; Solomon, Bamossy & Askegaard , 2002; Vrontis, Thrassou & Melanthiou, 2007). In the first stage of problem recognition students realise they are in a position that requires them to make a higher education choice. Afterwards, in the second phase students start gathering information on aspects deemed relevant for making the higher education decision. This information is used in the third phase of decision making in which available alternatives are evaluated based on attributes of the options at hand. The final choice is made as a result of this evaluation and implemented by applying to the chosen university or educational program. Moogan and Baron (2003) categorize variables affecting student choice in two categories. First, variables in the category decision

making attributes refer to characteristics of universities and programs. Second, variables in the category influencers of choice refer to sources of information and influence used by students in the decision making process.

Research on student choice behaviour focuses on different choices students make in order to shape their career in higher education. A range of research has emerged on students' decision making on programs and universities (e.g. James, Baldwin & McInnis, 1999; Moogan et al., 1999; Moogan & Baron, 2003; Vrontis et al., 2007). These choices usually are made by prospective students prior to the start of their career in higher education. Other research focuses on choices made by students throughout their years in higher education. Research in this area mainly focuses on the course selection process whereby students, prior to a semester or trimester, make one or more course selection decisions (e.g Babad, 2001; Babad & Tayeb, 2003; Bryce Wilhelm & Comegys, 2004). However, hardly anything is known regarding factors influencing students' minor choices specifically. The only research found (Li, Records and Fougère, 2004) is restricted to the choice of computer information system (CIS) minor by students at a college of business in New England and focuses on a limited number of decision making attributes.

Therefore, the present study deals with minor choice behaviour of undergraduate students and looks into minor decision making variables. The research described here aims to identify both decision making attributes and sources of information and influence and their relative importance in student decision making. Undergraduate students from a large Dutch university of applied sciences participated in this survey research. The findings of this research are expected to assist universities of applied sciences in guiding and informing students and in developing a minor product range. The results of the study contribute to the theoretical knowledge about student minor choice specifically and about student choice behaviour in higher education in general.

The paper consists of four parts. First, the literature on student decision making variables is reviewed. Then the research methodology is presented and data analysis techniques are discussed. Next, the findings are discussed and summarised. The paper concludes with a discussion of theoretical and managerial implications and directions for further research.

LITERATURE REVIEW

Student's higher education choices

Making higher education choices confronts students with a complex decision making situation. First, many higher education choices can be characterised as multi-attribute decision making problems. In this

choice situation a number of alternatives exist. Each alternative is described by a number of attribute values with each attribute value reflecting the extent to which each option meets the objectives of the student as a decision maker. Payne and Bettman (2007 : 116) state that the presence of value conflicts is a key feature of almost all these kind of choice situations, "since usually no single alternative is best (most preferred) on all attributes. Attributes generally vary with respect to their desirability to the decision maker." This requires the decision maker to accept a loss on one attribute for a gain on another attribute. Second, higher education choices are relatively unique decisions. Decision makers can not draw upon experience to act appropriately. This requires them "to make reasoned choices in the face of uncertainty and in the face of questions about what he or she really wants" (Beach & Connolly, 2005 : 48). These decisions are usually solved using processes of information gathering and evaluation of alternatives (Payne & Bettman, 2007). It can be argued that for students as adolescents decision making is even more difficult because of lack of decision making experience in general. The third characteristic of higher education choices refers to the nature of the higher education 'product'. Higher education institutions deliver services. Gabbott and Hogg (1998 : 22) state "that services present particular challenges to consumers". Services have several characteristics contributing to complexity of consumer decision making. They are intangible: they can't be seen or felt. Furthermore, the production and consumption of services are inseparable. And the quality level of services is heterogeneous: each delivery is influenced by the participants, by the time of performance and the circumstances. The service nature of higher education leads to complexity for students: it becomes increasingly difficult to get a clear picture of the attribute values of available options. The fourth and last characteristic of higher education choices concerns the high impact of the decision. Wrong choices have large personal and societal consequences because of waste of talent or waste of investments in education. High impact decisions are expected to create high involvement with customers as motivation to engage in extensive information search on decision making attributes (Brown, Varley & Pal, 2009; Schiffman & Kanuk, 1997). The next paragraphs describes decision making attributes and sources of information & advice found in the literature on bachelor program selection and on course selection.

Decision making attributes

An extensive literature review on decision making attributes indicates that many attributes play a role in student decision making. However, some attributes seem to be more importany than others. The three most important attributes seem to be personal interest in the topic of the program, labour market related variables and location.

Personal interest in the topic studied in a course seems to be one of the most important characteristics students take into account when choosing a course (Babad, Darley & Kaplowitz, 1999; Babad, 2001; Beggs, Bantham & Taylor, 2008; Garman, Crider & Teske, 1999; Owen & Jensen, 2004). Also students choosing a bachelor or a major indicate that their personal interest in the subject taught is of great importance in the selection process (e.g.Calkins & Welki, 2006; Collison, Gray, Owen, Sinclair & Stevenson, 2000; James, Baldwin & McInnis, 1999; Lapan, Shaugnessy & Boggs, 1996; Maringe, 2006). Second, labour market related variables as employability, career opportunities and expected earnings play a large role when deciding on which program to study. Based on results of research in the area of educational economics it can be concluded that expected future earnings play a role in students' choice of a major (e.g. Berger, 1988; Boudarbat, 2007; Cebula & Lopez, 1982; Eide & Waehrer, 1998; Montmarquette, Cannings & Marhseredijan, 1997). Also, research from a consumer behaviour perspective indicates the importance of future labour market perspectives (Aldosary & Assaf, 1996; Calkins & Welki, 2006; Durndell, Siann & Glissov, 1990; James et al., 1999; Malgwi, Howe & Burnaby, 2005; Maringe, 2006). And third, the location of the university delivering the program seems to be of relative great importance when deciding on a higher education program. Briggs (2006), Moogan et al. (1999) and Moogan and Baron (1999) found location is one of the three most important attributes UK-students take into consideration in university choice. The importance of this attribute seems to increase when the moment of actually leaving school comes nearby and when students realise the 'logistical' implications of their choice (Brown et al., 2009; Moogan, Baron & Bainbridge, 2001; James et al., 1999).

Besides the attributes mentioned, research has found more attributes to influence student choice. Unfortunately the relative importance of these attributes is less clear either because of the limited research or results not being comparable. However, it seems fair to conclude that students take into account more or less the following attributes when choosing a course, a bachelor or a major:

- reputation (Anderson, 1999; Briggs, 2006; Brooks, 2002; Maringe, 2006; Moogan et al., 2001; Moogan & Baron, 2003; Veloutsou, Lewis & Paton, 2005).
- educational characteristics like study material and the use of (practical) assignments (Babad et al., 1999; Babad, 2001; Owen & Jensen, 2004),
- grading leniency, perceived difficulty and perceived study-load (Babad et al., 1999; Babad, 2001; Babad & Tayeb, 2003), Calkins & Welki, 2006; Maringe, 2006; Owen & Jensen, 2004; Bryce Wilhelm & Comegys, 2004),
- campus surroundings, social life and sporting facilities (Anderson, 1999; Briggs, 2006; James et al., 1999, Maringe, 2006)

- staff profile and lecturers' characteristics (Babad et al., 1999; Babad, 2001; Babad & Tayeb, 2003; Babad, Icekson & Yelinek, 2008; Maringe, 2006; Owen & Jensen, 2004; Rask & Bailey, 2002),
- contribution to personal development (Babad, 2001; Babad & Tayeb, 2003; Bryce Wilhelm & Comegy, 2004),
- flexibility, schedule (day and hour) and attendance requirement (Babad, 2001; James et al., 1999; Garman et al., 1999; Owen & Jensen, 2004),
- entry requirements (Briggs, 2006; Brown et al., 2009; Galotti & Mark, 1994; Galotti, 1995; Moogan et al., 1999; Moogan & Baron, 2003),
- requirement for major (Owen & Jensen, 2004),
- expectation to do well (Owen & Jensen, 2004) and
- intellectual challenging (Babad, 2001; Babad et al., 2008).

Sources of information & advice

The second category of decision making variables relates to sources of information and influence used to gather information & advice on the available options. The literature indicates students make use of several sources in the process of decision making.

Universities inform students in a variety of ways about the offer of educational programs, ranging from open days to brochures and from websites to hand outs. Research suggests this is the most important source of information (e.g. Briggs, 2006; Brooks, 2002; James et al., 1999; Moogan et al., 1999; Moogan & Baron, 2003; Owen & Jensen, 2004). Not surprisingly, Briggs (2006) found that university websites are becoming increasingly important in the information gathering by students. Parents are a second source of information & advice for students; however their importance seems to be relatively lower that other sources of information (e.g. Brooks, 2002; Foskett & Hemsley-Brown, 2001; James et al., 1999; Malgwi et al., 2005; Maringe, 2006). Besides, the influence of parents seems to diminish when students get older (Foskett & Hemsley-Brown, 2001; Moogan & Baron, 2003). Parents, however, play a more indirect role in the shaping of students' perceptions and attitudes towards higher education (Brooks, 2003b; Hossler & Gallagher, 1987). A third source, friends and peers, exercises its influence in several ways. Discussions with friends help students to find their place in the higher education area. Comparing themselves with others helps them in discovering their own preferences and talents (Brooks, 2003a; Brooks, 2003b). Students also ask directly for information & advice from friends and peers. This seems to be of a higher importance for course selection (e.g. Garman et al., 1999; Owen & Jensen, 2004) than for bachelor or major selection (Briggs, 2006; Calkins & Welki, 2006; Moogan et al., 1999). However, students seem not inclined to follow the choices made by peers and friends (James et al., 1999; Owen &

Jensen, 2004). The fourth source refers to quality assessments of programs by external parties. That may be in the form of student rating of teaching. Specifically in the selection of courses, this information source seems relevant to students (Bryce Wilhelm & Comegys, 2004. Rankings and league tables are available to compare programs and universities. Their influence seems to be rather limited (Briggs, 2006; Brooks, 2002; Clarke; 2007a; Clarke, 2007b; McDonough, Antonio, Walpole & Pérez, 1998).

Other sources of information & advice are career advicers and staff and lecturers. Career advicers are perceived as important in the course selection process where many options are available (Ackerman & Gross, 2006). However, their role in the selection of a bachelor or major seems to be rather limited (Calkins & Welki, 2006; Malgwi et al., 2005; Maringe, 2006). The results of research on the relative importance of staff and lecturers do not point in the same direction, as is also suggested by Szekeres (2010). Some studies indicate that staff and lecturers are of less importance than parents (Malgwi et al., 2005; Newell, Titus & West, 1996). Other studies (James et al., 1999; Maringe, 2006) find the opposite results.

Conclusion

The complexity of students' decision in higher education is illustrated by the sheer number of decision making variables. Table 1 summarizes the findings of the literature review on decision making variables. The section on methodology describes how these findings are used in preparing a questionnaire for measurement of decision making variables in the process of choosing a minor.

Table 1: Decision making variables (result from literature review)

Decision making attributes	Sources of information & advice
Personal interest	Universities / provides of education
Employability	Parents
Career opportunities	Friends and peers
Expected earnings	External quality assessments
Location	Career advicers
Campus surroundings	Staff and lecturers
Reputation	
Educational characteristics	
Grading leniency	
Perceived difficulty	
Perceived study-load	
Staff profile	
Contribution to personal development	
Flexibility	
Schedule (day and hour)	
Attendance requirement	
Entry requirements	
Requirement for major	
Expectation to do well	
Intellectual challenge	

METHODOLOGY

Sampling

The target population for this study consisted of undergraduate students of a large university of applied sciences in the Netherlands, recently having gone through a minor selection process. Sampling included the selection of students studying bachelor programs in six different sectors of higher education in the Netherlands: health, social sciences, education, economics, technology and art. Within these group those students were selected that made a minor choice in the nine months prior to the data-collection. In total 1567 students were sent an e-mail with the request to participate in the study and with a link to a digital questionnaire. The final realised sample included a total of 406 usable questionnaires, representing a 25,9 % response rate.

Table 2 provides a comparison between the target group consisting of 1567 students and the response group with 406 students. The response group contains a significantly higher percentage female students (χ^2=34,99; p<0,01). The differences in the previous education of the students is not significantly (χ^2=3,68; p>0,10). Furthermore, students studying for a bachelor degree in science and art are significantly underrepresented and students studying for a bachelor degree in education and economics are significantly overrepresented (χ^2=19,70; p<0,01).

Table 2: Comparison target group and response group

	Target group	Response group
Gender:		
- Male	39%	27%
- Female	61%	73%
Average age	20,8	20,8
Previous education[1]:		
HAVO	55%	51%
VWO	15%	16%
MBO	21%	23%
Other	9%	10%
Bachelor program		
- Health	23%	22%
- Social sciences	25%	25%
- Education	7%	10%
- Economics	17%	20%
- Technology	8%	7%
- Art	20%	16%

At the time of data collection students' four year professional bachelor programs consisted of a major (75% of the total bachelor study load) and two minors (together 25% of the total bachelor study load). At the time of the research the minor catalogue contained almost seventy minors. Departments within

[1] HAVO and VWO are two types of secondary education. MBO is vocational education.

the university offered minor programs related to their bachelor program. E.g. the department Marketing Management offers minors in the area of marketing. Furthermore, the university had competence-based education and each student had a personal coach.

Measurement

The development of the questionnaire started with the results from the literature review (table 1). To increase the relevance for minor selection it was decided to conduct semi-structured interviews in which students were asked to comment on these variables taking into account the students' experience with the minor selection process. In total 30 students took part in the interviews. The results of the interviews were used in designing the questionnaire. Table 3 and 4 list the decision making variables resulting from the semi-structured interviews and taken up in the questionnaire. The questionnaire asked students to rate the importance of each item on a 7-points Likert scale (Alreck & Settle, 2004; Kerlinger & Lee, 2000) ranging from 1 ('not important at all') to 7 ('very important'). Some questions offered the answering option 0 ('not relevant').

Table 3: Decision making attributes measured in the survey

- Personal interest in subject	- Contribution to competence profile of the bachelor program
- Characteristics of learning material	- Opportunity to gather educational evidence
- Characteristics of assignments	- Advice from major
- Opportunity to gain practical experience	- Fit with personal capabilities
- Perceived difficulty	- Location
- Perceived study load	- Reputation minor
- Perceived grading leniency	- Reputation provider minor
- Lecturers' characteristics	- Career opportunities
- Perceived challenge	- Contributes to easily finding a job
- Expectation to learn something new	- Expected earnings
- Contribution to personal development	- Educational formats in the minor
- Flexibility to design personal learning route	- Characteristics of assessments
- Part-time or full-time delivery of the program	- Expectations concerning fellow minor students
- Number of contact hours	- Expected contribution to next study
- Attendance requirement	- Opportunity to orientate on other field of study
- Ability to meet entry requirements	- Language
- Logical sequel to other minor	
- Perceived relation major-minor	

Table 4: Sources of information & advice measured in the survey

- Parents	- Representative from the minor
- Friends not studying the same program	- Exhibitor at minor market
- Fellow-students engaged in minor selection	- Information session at minor market
- Fellow-students having actual minor experience	- Information given by major provider
- Same minor as fellow-students	- Written information
- Personal career advicer	- Information from other universities of applied sciences
- Staff from major	- Information from experts in the field of practice
- Website minor catalogue	
- Website minor	

Data collection

The initial questionnaire was pre-tested with a group of 10 students. Data were digitally collected during a six-week period in September and October 2008. To increase the response rate three measures were taken. First, students were informed that a number of small incentives would be raffled among the respondents. Second, the study was brought under the students' attention not only by the mails from the researcher but also by additional communication from management and staff. Furthermore, two additional mails were sent to the students reminding them to complete the questionnaire.

RESULTS

Data analysis

Principal component analysis was used to identify factors underlying clusters of variables. Factors found were selected on the criterion: eigenvalue > 1. Furthermore, varimax orthogonal rotation was used and variables were placed with factors based on factor loading > 0,4. To test the relevance of factor analysis the Kaiser-Meyer-Olkin measure of sampling adequacy was calculated. Based on the outcome (0,79) it can be concluded that the sample size is large enough to use factor analysis (Field, 2005). To test the reliability of the items in the questionnaire Cronbach's alpha was calculated for factors with three or more underlying variables (Field, 2005). For factors with two underlying variables the significance of the correlation coefficient was used as a measure for the reliability. The outcomes of these measurements fall within acceptable levels, except Cronbach's alpha for the factor enlargement of students' horizon, (see table 5). Next , based on Babad (2001) the relative importance of each factor is determined using the average score per factor. First, for each respondent the score per factor is calculated averaging the respondents' scores on the variables underlying the factor (Afifi, Clark & May, 2004; Rencher, 2002). Then, the average score per factor is calculated for the total group of respondents leaving out missing values. Calculations for three factors were done with less than 400 respondents: non-digital information & advice from the provider of the minor (n = 346), information & advice from private persons (n=384) and logical sequel 1^{st} /2^{nd} minor (n=285).

Factors underlying decision making variables

First, the results of the factor analysis are presented. 14 factors have been found with underlying 45 decision making variables and explaining 64,22% of the total variance. Table 5 presents an overview of the factors discovered in the analysis. This table lists for each factor the eigenvalue, the amount of

variance explained and the outcome of the reliability measurement. Furthermore, the variables underlying the factor are listed. The names of the factors are determined based on the variables underlying the factor. Due to low factor loadings the following five variables could not be allocated to a factor: opportunity to gain practical experience, location, lecturers' characteristics, representative from the minor and ability to meet entry requirements.

The results suggest that decision making attributes used by students in the selection of a minor relate to the following nine characteristics of the minor program:

- Risk profile of the minor
- Contribution of the minor to future career
- Contribution of the minor to the competence profile of the bachelor program
- Educational characteristics of the minor
- Learning value of the minor
- Reputation
- Operational characteristics of the minor
- Enlargement of students' horizon
- Logical sequel 1st / 2nd minor

Furthermore, the results suggest students' decisions are influenced by five sources of information & advice:

- Non-digital information & advice from the provider of the minor
- Information & advice from students' bachelor department
- Information & advice from fellow-students
- Digital information & advice from the provider of the minor
- Information & advice from private persons

Average score per factor as a measure of relative importance of decision making variables

Now the results of calculating the average score per factor are presented. Table 6 gives an overview of the average score and standard deviation per factor and for the five variables not allocated to a factor. The results suggest students attach more importance to some decision making attributes than to other decision making attributes. Most important is the learning value of the minor (average score is 5,58). The attributes that follow relate all to the content of the minor program: the contribution of the minor to the competence profile of the bachelor program (4,89), the contribution of the minor to the future career (4,21) and the enlargement of the students' horizon (4,15).

Tabel 5: Factors found using explorative factor analysis (including eigenvalue, variance explained, reliability index, underlying variables and factor loading)

Factors and underlying variables	*Factor loading*
1. Risk profile of the minor	
Eigenvalue: 3,50; Variance explained: 7,00 %; Cronbach α: 0,82	
- Perceived study load	0,81
- Perceived difficulty	0,76
- Perceived grading leniency	0,71
- Number of contact hours	0,66
- Attendance requirement	0,63
2. Non-digital information & advice from the provider of the minor	
Eigenvalue: 2,82; Variance explained: 5,65 %; Cronbach α: 0,76	
- Information session at minor market	0,83
- Exhibitor at minor market	0,76
- Written information	0,64
- Information from other universities of applied science	0,49
3. Information & advice from students' bachelor department	
Eigenvalue: 2,70; Variance explained: 5,39 %; Cronbach α: 0,71	
- Staff from major	0,71
- Information given by major provider	0,67
- Personal career adviser	0,61
- Advice from major	0,51
- Information from experts in the field of practice	0,48
4. Contribution of the minor to future career	
Eigenvalue: 2,66; Variance explained: 5,33 %; Cronbach α: 0,75	
- Contributes to easily finding a job	0,79
- Expected earnings	0,78
- Expected contribution to next study	0,65
- Career opportunities	0,59
5. Contribution of the minor to the competence profile of the bachelor program	
Eigenvalue: 2,60; Variance explained: 5,20 %; Cronbach α: 0,78	
- Contribution to competency profile of the bachelor program	0,82
- Opportunity to gather educational evidence	0,74
- Perceived relation major – minor	0,70
6. Educational characteristics of the minor	
Eigenvalue: 2,58; Variance explained: 5,17 %; Cronbach α: 0,76	
- Educational formats in the minor	0,78
- Characteristics of assignments	0,77
- Characteristics of assessments	0,62
- Characteristics of learning material	0,54
7. Information & advice from fellow-students	
Eigenvalue: 2,35; Variance explained: 4,71 %; Cronbach α: 0,78	
- Same minor as fellow students	0,83
- Fellow students engaged in minor selection	0,81
- Expectations concerning fellow minor students	0,63
- Fellow students having actual minor experience	0,48
8. Learning value of the minor	
Eigenvalue: 2,24; Variance explained: 4,48 %; Cronbach α: 0,65	
- Fit with personal capabilities	0,68
- Personal interest in subject	0,67
- Expectation to learn something new	0,64
- Perceived challenge	0,58

Table 5: continued	
Factors and underlying variables	*Factor loading*
9. Reputation	
*Eigenvalue: 2,22; Variance explained: 4,44 %; Pearson r: 0,74**	
- Reputation provider minor	0,80
- Reputation minor	0,77
10. Operational characteristics of the minor	
*Eigenvalue: 1,81; Variance explained: 3,62 %; Pearson r: 0,36**	
- Part-time or full-time delivery of the program	0,74
- Language	0,68
11. Digital information & advice from the provider of the minor	
*Eigenvalue: 1,80; Variance explained: 3,61 %; Pearson r: 0,67**	
- Website minor catalogue	0,79
- Website minor	0,78
12. Information & advice from private persons	
*Eigenvalue: 1,80; Variance explained: 3,59 %; Pearson r: 0,51**	
- Parents	0,81
- Friends not studying the same program	0,79
13. Enlargement of students' horizon	
Eigenvalue: 1,68; Variance explained: 3,36 %; Cronbach α: 0,47	
- Contribution to personal development	0,66
- Flexibility to design personal learning route	0,50
- Opportunity to orientate on other field of study	0,49
14. Logical sequel 1st /2nd minor	
Eigenvalue: 1,33; Variance explained: 2,67 %	
- Logical sequel to other minor	0,64

*=significant Pearson correlation (p<0,01, two tailed)

Attributes not related to the content of the minor seem to play a less important role in student decision making: operational characteristics of the minor (3,87), educational characteristics of the minor (3,63), risk profile of the minor (3,27), reputation (2,69) and logical sequel 1st/2nd minor (2,41). The importance of the not-allocated variable location is relatively high (average score is 4,32); this attribute that is not related to the content of the minor seems relatively important in students' decision making.

Furthermore, the results suggest students rely most on digital information & advice from the provider of the minor (average score is 4,22). Next, information & advice from students' bachelor department and information & advice from fellow-students is used. Less important seem to be non-digital information & advice from the provider of the minor (2,71) and information & advice from private persons (2,03).

Table 6.: Average score and standard deviation (for all factors and for variables not allocated to factor)

	Average score	*Standard-deviation*
Factors related to decision making attributes		
Learning value of the minor	5,58	0,82
Contribution of the minor to the competence profile of the bachelor program	4,89	1,45
Contribution of the minor to future career	4,21	1,40
Enlargement of students' horizon	4,15	1,25
Operational characteristics of the minor	3,87	1,93
Educational characteristics of the minor	3,63	1,29
Risk profile of the minor	3,27	1,26
Reputation	2,69	1,57
Logical sequel 1st /2nd minor	2,41	1,73
Factors related to sources of information & advice		
Digital information & advice from the provider of the minor	4,22	1,73
Information & advice from students' bachelor department	3,19	1,26
Information & advice from fellow-students	3,17	1,45
Non-digital information & advice from the provider of the minor	2,71	1,41
Information & advice from private persons	2,03	1,27
Variables not allocated to factor		
Opportunity to gain practical experience	4,49	1,88
Location	4,32	1,89
Lecturers' characteristics	3,06	1,81
Representative from the minor	2,86	1,82
Ability to meet entry requirements	2,79	1,67

DISCUSSION

This study aimed at investigating which decision making variables influence students' minor selection, both variables in the category decision making attributes and sources of information and influence. Furthermore, this study was aimed at investigating the relative importance of the decision making variables found. The results contribute to the theoretical knowledge about minor selection specifically and about higher education choices in general. This study in one of the first on decision making variables influencing undergraduate students' minor choices.

Summary of findings

The findings of this study indicate factors underlying the decision making variables measured. This is in line with a previous study by Babad (2001) on decision making attributes in students' course selection.

The learning value of the minor is the most important decision making attribute in the selection of a minor. Students want to select a minor that suits them and has added learning value. This is in line with previous studies on student choices in higher education (e.g. Babad, 2001; James et al., 1999; Li et al., 2004; Maringe, 2006). This finding also relates to the objective of introducing minors in Dutch universities of applied sciences: choosing minors offers students the possibility to customize their undergraduate bachelor program in such a way it reflects their personal ambitions and interests. Next,

students consider the contribution of the minor to required bachelor competences of great importance. This comes as no great surprise since minors are part of a bachelor program. This finding relates to the research of Li et al. (2004) on minor selection and to the research of Owen and Jensen (2004) on course selection. Third, students take into consideration the contribution of the minor to their future career. Students can use a minor to orientate themselves on or to prepare themselves for specific parts of the labour market. Also, minors can support in acquiring additional future income or in preparing for a master program. The importance of this factor is consistent with the results of previously cited research (e.g. James et al., 1999; Maringe, 2006) showing that students in choosing a higher education program give relatively great importance to various labour market aspects. The importance of the factor enlargement of students' horizon, fourth in the row, shows that students see minors as a possibility for further self-development. Also this result is consistent with the objective of the major-minor concept as referred to in the introduction of this article: the affixing of individual accents in the study by the student themselves. The above mentioned four most important decision making attributes all relate one way or the other to the content of the minor. The scores for these factors are all larger than four on a seven-point scale. Minor attributes not related to content seem less important. The scores of these factors are all smaller than four on a seven-point scale. This also corresponds to previous research into minor selection suggesting that difficulty and course load are of less importance (Li, Fougeres & Records, 2004). Partly, this result is consistent with research on course selection indicating that aspects such as difficulty level, course load and grading leniency are less important than aspects such as value added and personal interest (e.g. Babad et al., 1999; Babad Tayeb &, 2003; & Wilhelm Comegys, 2004).

The investigation however shows two variables not allocated to a factor that come with a score greater than four and therefore have a relatively large influence on the minor selection of students. First is the variable location of the minor. The average score of this variable is 4.32. Closer analysis shows significant difference ($t=2.86$; $p<0.01$) between students who have chosen a minor with the same site as the major ($m=4.46$) and students who have chosen a minor with a site that is different from the major location ($m=3.77$). The importance of location may have to do with any extra travel time following a minor in another location. Activities of the minor may also be combined easier with activities of the major if both have the same site. The importance of location is in line with studies by e.g. Briggs (2006) and Moogan et al. (1999). The second variable not allocated to a factor with a score greater than four concerns the possibility in the minor to acquire experience in the professional practice. Students choose a study at a university of applied sciences with the aim of preparing for a future professional career. The results suggest that getting acquainted to the future professional practice through minors is appreciated.

Students use sources of information & advice to acquaint themselves with relevant minor attributes. The provider of the minor is the most important source used by students. This is in line with previous research on students' higher education choices (e.g. Briggs, 2006; Moogan et al., 1999; Owen & Jensen, 2004). Students clearly prefer digital information compared to non-digital information. Contemporary students clearly live in the digital age. Students look for additional information & advice in their 'educational neighbourhood', both from fellow students and from the department delivering their bachelor program. Fellow students with minor experience can assist in overcoming problems related to the service nature of educational programs: they can rely on actual experience with a specific minor program.

It can be noticed that the relative importance of decision making attributes is higher than the relative importance of sources of information & advice. This is in line with research by Owen and Jensen (2004) on students' course selection. It is assumed that students focus in the decision making process is on minor attributes. In this perspective, sources of information & advice are just instruments to get a clear picture of these attributes and are therefore of less importance.

Managerial implications

The results of this study have implications for universities of applied sciences in three aspects: design and maintenance of the minor portfolio, the provision of information on available minors and the coaching of students during the minor selection process.

Students consider the learning value of the minor as important. From a marketing perspective, the minor portfolio should meet the learning requirements of students. However, since learning value is a subjective aspect that differs per student, it is recommended to regularly investigate into students' needs for minors and into students' satisfaction with the actual minor portfolio. Furthermore, the results suggest students want minors to contribute to future career opportunities. This implies that the minor portfolio should also reflect developments in the relevant labour markets. Universities of applied sciences therefore should reserve at their annual budget resources to develop new minors that fit needs of students and labour market. Besides, they should decide on the frequency of this market research and on maintenance of the minor portfolio. Maintenance deals with decisions on development of new minors and on phasing out of old minors.

Second, the results of this study have implications for the provision of information to students. The results indicate minor attributes and their relative importance in student decision making. The provision of minor information should therefore concentrate on attributes considered most important by students. Furthermore, the results indicate the importance of digital information for students.

Universities of applied sciences are advised to use available communication budgets mainly for digital information provision and reduce the amount on non-digital information provision. A digital minor catalogue is a logical way of providing this information. Also, students consider information & advice from fellow students as valuable in the decision making process. Universities of applied sciences could assist students in gathering this information by systematically supplying quantitative and qualitative data on student satisfaction as part of the digital minor catalogue.

Universities of applied sciences should also consider the results of this study in their policies on students coaching. The importance of the subjective attribute learning value of the minor implies that students should not only gather information on available minors, but also about their personal interests and capacities. Student coaching should be organised in such a way that it contributes to students' self-knowledge and thereby to a good match between minor and student. Furthermore, student coaching could create situations in which students are able to discuss their minor selection process with fellow-students and thereby explicitly giving them the opportunity to use perspectives and experiences of fellow-students.

Directions for future research

This study aimed at developing a model of decision making variables affecting students' minor selection. Future research should focus on replication of this study and at research aimed at other aspects of students' decision making. Indeed, decision making variables are only one aspect of a broader theory on student' minor selection.

Replication is needed in order to test the outcomes of this study on decision making variables and make the model more robust (Dul & Hak, 2008). Replication adds to the generalizability of the model and deals with the selection of the sample and / or the research strategy. This study was restricted to students from one university of applied sciences in the Netherlands. Furthermore, the response group differs from the population chosen on some aspects. In order to improve the generalizability the study should be replicated at other universities both inside and outside the Netherlands. Generalizability could further be improved by using a combination of research strategies. This study used student self reports baring the risk of distortions in perception due to e.g. elapse of time or new experiences gained. Testing the model in an experimental setting (Babad & Tayeb, 2003) would not have that risk and add to the generalizability.

Furthermore, to arrive at a larger theory of students' decision making it is advised to investigate other aspects of the decision making process. First, research could focus on whether individual differences in the use and importance of decision making variables. Second, research could aim at describing

characteristics of the decision making process as e.g. the number of options considered by students, the length of the decision making process and emotions related to the minor selection process. Third, research could look into the relationship between characteristics of the choice process on the one hand and students' satisfaction with the choice made and the study success in the minor program on the other hand. And fourth, further research could investigate the effectiveness of approaches and tools supporting students' decision making.

Final comment

Minor selection is just one of the choices students make to shape their career in higher education. The importance of good decision making in these choice situations is beyond doubt. Good decision making contributes to a future career that matches students' ambitions, interests and talents. Bad decision making may contribute to a loss of talent and is an ineffective use of resources spent on higher education. Good decision making is the result of efforts of both students and higher education institutions. Research on students' decision making contributes to making students' and institutions' efforts more effective.

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