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An Assessment of Validity in Entrepreneurship Research

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Based on an analysis of empirical articles published in the highest-rated academic journals between 1999 and 2003, we examined the current state of entrepreneurship research in terms of its validity. We collected 275 relevant publications in order to explore the entrepreneurship field with respect to internal validity, external validity, construct validity and statistical conclusion validity. Our aim was to gain insight into the dominant methodological and statistical practices that currently shape the field, shed light on possible gaps and compare these observations with the findings in general management literature. We found that entrepreneurship studies are mainly cross-sectional using surveys or field study as methods, emphasising external validity. Entrepreneurship research could benefit from more triangulation in research strategies, more advanced analytical techniques and methodologies, and from more longitudinal research resulting in higher validity levels. However, a positive trend towards more longitudinal research and triangulation in data sources is already visible.

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Despite the fact that the field of entrepreneurship is regarded as a relatively young area of research (Cooper, 2003), it has become one of the fastest growing areas in management literature over the past decades (Hüse & Landstroem, 1997; Landstroem, 1999). As a research field continues to progress and mature, it is important for researchers to assess the methods that are employed; such assessment provides insights into

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the rigour with which data is collected and analysed (Pfeffer, 1993; Scandura & Williams, 2000). The choices that are made in terms of research strategy, instrumentation and data analysis are particularly important for the *validity* of the research findings (Cook & Campbell, 1984; Cook et al., 1990; Kerlinger, 1986; Stone, 1978; Stone-Romero, 2002). More specifically, it is important to have an insight into the extent to which the methodological procedures used allow one to make valid inferences about the field's research findings. Furthermore, for an evolving field like entrepreneurship, an analysis of articles with respect to the validity of research findings is particularly important for the field to gain further credibility within the academic community (Chandler & Lyon, 2001; Scandura & Williams, 2000).

Various efforts have been undertaken to assess trends in entrepreneurship research in terms of its theoretical perspective, focus, level of analysis, time frame and methodology (for example, Aldrich & Baker, 1997; Chandler & Lyon, 2001; Churchill & Lewis, 1986; Davidsson, 2004; Davidsson & Wiklund, 2001; Grégoire et al., 2002; Low & MacMillan, 1988; Wortman, 1987). However, few of these studies have focused on the important issue of *validity*. Hence, it is difficult to compare the state of entrepreneurship research with respect to its validity with that of a more mature field like management. In this article, we aimed to fill this gap by providing an in-depth assessment of validity in recent entrepreneurship research.

We adopted Scandura and Williams' (2000) coding framework with regard to research methodology. In particular, we used this framework to assess the validity of recent empirical research in the field of entrepreneurship, that is, referring to the 1999–2003 period (see Figure 1). We compared our results with the findings from Scandura and Williams' (2000) analysis of the management literature for the period 1995–97. Scandura and Williams' model is based on Cook and Campbell's (1984) distinction between four types of validity, that is, internal validity, external validity, construct validity and statistical conclusion validity. The emphasis of the model is on whether appropriate inferences can be made from the findings in empirical research. We chose to use Scandura and Williams' (2000) framework not only because the four types of validity mentioned earlier are very important ones, but also because this approach allowed for a direct comparison between our results and the results from

management literature. While our analysis was mainly based on Scandura and Williams' (2000) framework, we also compared our findings, whenever possible, with Chandler and Lyon's (2001) assessment of methodology in entrepreneurship research for the 1989–99 period. Although Chandler and Lyons' (2000) analysis was not as encompassing as Scandura and Williams' (2000) work in terms of validity, our comparison with the former analysis allowed us to detect potential trends within entrepreneurship literature over a longer period of time.

To summarise, we analysed the internal, external, construct and statistical conclusion validity of 275 entrepreneurship articles that were published between 1999 and 2003 in leading management and entrepreneurship journals. In the remainder of this article, we provide a short overview of the four facets of validity, describe our research methodology and present the results from our validity assessment. In the discussion section, we compare our results with those from management literature (Scandura & Williams, 2000) and entrepreneurship literature (Chandler & Lyon, 2001), and we give some recommendations to researchers in the entrepreneurship field.

Four Dimensions of Validity

Validity is an important concept, reflecting the rigour of research methodology used in the social sciences (Cortina, 2002). The term pertains to the degree to which one can draw appropriate inferences from empirical research results. In order for future research to build on the knowledge gained from previous findings, it is necessary that these findings yield acceptable validity. There is a common agreement that one's overall confidence in empirical research findings is a function of four facets of validity: (1) internal validity, (2) external validity, (3) construct validity and (4) statistical conclusion validity (Cook & Campbell, 1984).

First, internal validity involves the correctness of inferences about causal connections between focal constructs. This facet of validity refers to the level of confidence with which one can establish that there is a true cause-and-effect relationship between the constructs under investigation. Thus, high internal validity means there is evidence that the observed relationships found in a study reflect the real co-variation between the variables. A possible threat to internal validity is concerned with the

failure to implement a control for contaminating and extraneous variance (Cook & Campbell, 1984; Parker, 1990).

Second, external validity reflects the correctness of inferences about the generalisability of a study's results across populations of settings, subjects or time periods. Therefore, this type of validity pertains to the extent to which the conclusions of a study also hold for subjects other than the ones used in the study in terms of place, time or context. External validity may be threatened when empirical findings are generalised to subjects whose characteristics are different from those of the examined sample (Cook & Campbell, 1984).

Third, construct validity is a function of the degree of correspondence between a construct and its operational definitions. This type of validity refers to whether a study's variables have been adequately defined and measured by appropriate instruments, procedures, manipulations or methods. Threats to construct validity occur when investigators use inadequate definitions and measures of variables (ibid.).

Fourth, statistical conclusion validity has to do with the correctness of statistics-based inferences about the extent to which variables are related to one another. Threats to statistical conclusion validity are, for instance, low statistical power and the use of statistical tests when critical statistical assumptions are violated (ibid.).

Methodology

Selection of Journals

An important issue in delineating a research field is the question of what publication outlets are considered as representing 'good' scholarly work in the field. In our study, we chose to include two types of journals, that is, mainstream management journals and specific entrepreneurship journals. First, we relied on prior efforts similar to ours for selecting six management journals that are considered as important publication outlets for entrepreneurship research (Busenitz et al., 2003; Chandler and Lyon, 2001; Fried, 2003; Grégoire et al., 2002; MacMillan, 1991; Ratnatunga & Romano, 1997; Shane 1997). In particular, the following journals were included: *Academy of Management Journal*, *Strategic Management Journal*, *Administrative Science Quarterly*, *Organization Science*, *Management Science* and *Journal of Management*. Second, it has also been shown that the mainstream management journals only account for a small part

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of the comprehensive volume of entrepreneurship publications (Busenitz et al., 2003). Consequently, limiting our analysis to six management journals would not give a good representation of entrepreneurship research. Therefore, based on prior research (Aldrich & Baker, 1997; Busenitz et al., 2003; Chandler & Lyon, 2001; Fried 2003; MacMillan, 1991; Ratnatunga & Romano, 1997; Shane, 1997), we also included the following four 'entrepreneurship journals' in our analysis: *Journal of Business Venturing*, *Entrepreneurship Theory and Practice*, *Journal of Small Business Management* and *Small Business Economics*.

Collection of Articles

We used the ABI/INFORM search engine to compose our database of entrepreneurship articles. For an article to be included in our analysis the following four criteria were employed: (1) the article was published in one of the ten journals mentioned earlier, (2) the article was published in the 1999–2003 period, (3) the article was empirical in nature, and (4) the article included one or more of the following key words in the title or the abstract: entrepreneur (entrepreneurial, entrepreneurship), small business (emerging business), new venture (emerging venture) or founder(s). The choice of these key words is consistent with prior research (Busenitz et al., 2003). We recognise the arbitrariness or the idiosyncratic nature of various decisions pertaining to the inclusion criteria of our analysis. Different classification decisions can indeed yield different results. However, we also believe that as our inclusion criteria are an extension of the criteria applied in prior methodology reviews, our selection of articles based on these provides a good representation of high-quality scholarly research.

The number of articles reviewed from each journal is presented in Table 1. A total of 275 empirical articles were analysed. Approximately 82 per cent articles were published in one of the four specialised entrepreneurship journals: *Journal of Small Business Management* (23.6 per cent), *Small Business Economics* (21.8 per cent), *Journal of Business Venturing* (21.5 per cent) and *Entrepreneurship Theory and Practice* (14.9 per cent). Among the mainstream management journals, only *Strategic Management Journal* included more than 5 per cent (6.5 per cent) of the 275 empirical entrepreneurship articles published between 1999 and 2003. Over time, the increase in the total number of these articles is not statistically significant ($\chi^2 [4] = 4.51; p = 0.34$).

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TABLE 1
Count of Journal Articles Reviewed by Journal and Year

<i>Journal</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>Total</i>	<i>Percentage</i>
<i>Journal of Business Venturing</i>	8	13	15	12	11	59	21.5
<i>Entrepreneurship Theory and Practice</i>	7	7	8	13	6	41	14.9
<i>Journal of Small Business Management</i>	17	10	14	13	11	65	23.6
<i>Small Business Economics</i>	11	14	13	9	13	60	21.8
<i>Academy of Management Journal</i>	1	6	2	2	0	11	4.0
<i>Strategic Management Journal</i>	2	2	10	1	3	18	6.5
<i>Organization Science</i>	0	1	1	0	1	3	1.1
<i>Management Science</i>	2	0	2	4	0	8	2.9
<i>Administrative Science Quarterly</i>	2	0	2	1	0	5	1.8
<i>Journal of Management</i>	0	0	1	1	3	5	1.8
Total	50	53	68	56	48	275	100

Method and Coding Process

We used Scandura and Williams' (2000) work to code the different types of validity. Figure 1 shows the four types of validity, that is, internal validity, external validity, construct validity and statistical conclusion validity, and the several sub-dimensions for each of these categories (see later).

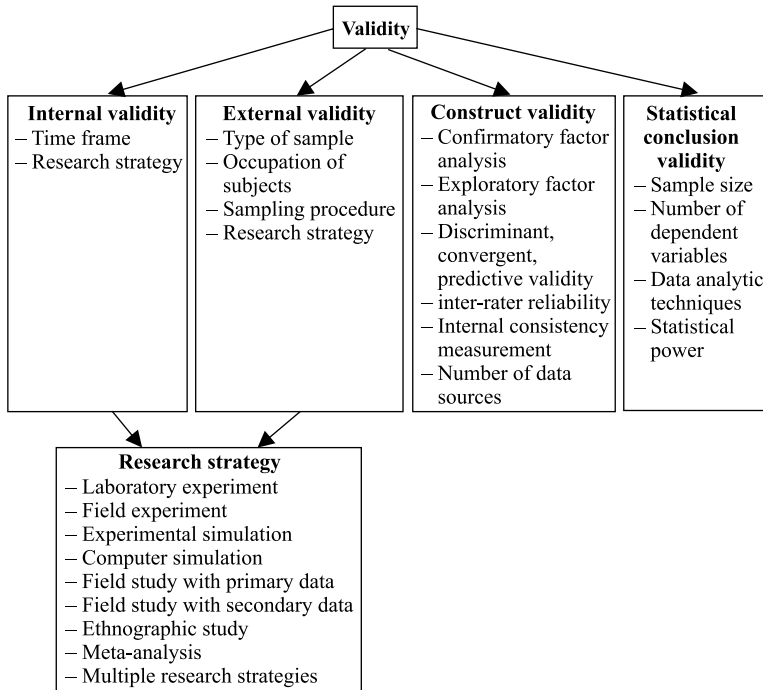
The 275 articles were analysed by a team of four coders. One principal coder analysed all the articles; of the three 'co-coders', each analysed one-third of the articles. In a pre-test, the four coders first analysed and discussed ten articles along the dimensions of the coding framework. The purpose of this discussion was to ensure that all coders had a full understanding of the different components of the framework. After all the articles were analysed, possible controversies were first discussed between the principal coder and each of the three co-coders; if necessary, the points of difference were discussed by the entire coding team.

Internal Validity

The time frame employed in the studies was assigned to four possible categories: (1) cross-sectional design, (2) longitudinal design, (3) a combination of both these designs and (4) unclear time frame design.

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FIGURE 1
*Coding Framework**



* This category includes the following sub-dimensions: (a) factor analysis, (b) cluster analysis and (c) mix of the two.

In order to make an inventory of the research strategies, we adopted McGrath's framework (1982). The research strategies were categorised into (1) experimental methods (laboratory experiment, field experiment, experimental simulation and computer simulation), (2) non-experimental methods (field study with primary data, field study with secondary data and ethnographic study) and (3) other studies (meta-analysis and multiple research strategies). The category 'ethnographic study' was added to Scandura and Williams' (2000) coding framework, and refers to the examination of an 'intact cultural group' in a natural setting over a prolonged period of time by collecting primarily observational data (Lecompte & Schensul, 1999). For a more elaborate explanation of the different possible research strategies, we refer to Scandura and Williams (2000).

External Validity

The type of sample dimension comprises four categories: (1) private sector, (2) public sector, (3) mix of both these sectors and (4) not reported/not applicable.

In terms of subjects' occupations, the following eight categories were chosen: (1) entrepreneurs or small business owners, (2) franchisers or franchisees, (3) venture capitalists, (4) managerial positions, (5) employees, (6) students, (7) a mix of different occupations and (8) not reported/not applicable.

Four categories were created to assess the type of sampling procedure: (1) random sampling, (2) non-random sampling, (3) mix of both procedures and (4) not reported.

It should be remarked that the dimension research strategy falls under both internal validity and external validity. As noted by prior researchers, there is often a trade-off between these two types of validities when a particular type of research strategy is being chosen (Stone-Romero, 2002). For instance, the potential internal validity obtained through laboratory experiments with precise and controlled measurement often comes at the expense of the generalisability of the research findings. Alternatively, field studies in a real business setting may lead to high external validity but low internal validity, given possible contaminating factors. In the final section of the article, we will provide a more in-depth discussion of these issues.

Construct Validity

According to Scandura and Williams (2000), the level of construct validity can be assessed on the basis of the use of statistical techniques and the presence of psychometric properties of the measurements. The following methodologies or aspects have been proposed as important indicators for construct validity: (1) confirmatory factor analysis, (2) exploratory factor analysis, (3) alternative methods to test for discriminant, convergent and predictive validity, (4) inter-rater reliability, (5) internal consistency measurement and (6) number of data sources.

Statistical Conclusion Validity

In order to assess statistical conclusion validity, the following four categories were examined: sample size, number of dependent variables,

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data analytic techniques and statistical power. In terms of the data analytic techniques, six statistical procedures were included: (1) *t*-tests, (2) non-parametric statistics, (3) association measures, (4) time series/event history techniques, (5) multivariate-dependent statistical techniques¹ and (6) multivariate-interdependent statistical techniques.²

Although this framework of methodology analysis is not exhaustive, we believe it is an excellent instrument to compare the trends of validity in research across different sub-domains of management. In short, it yields an important standard to evaluate and compare the level of scientific development and maturity of different research fields.

Results

In the following paragraphs, we highlight the results of our analyses for different types of validities. We compare our findings for the entrepreneurship literature (1999–2003) with the results found by Scandura and Williams (2000) for management literature (1995–97), and, whenever possible, with the results found by Chandler and Lyon (2001) for entrepreneurship literature (1989–99). It is also important to note that articles with qualitative methodology were analysed according to the four validity dimensions. Although this is not the most appropriate manner of assessing the quality of these kinds of articles, we were compelled to choose this option for adopting a common scientific approach in our analysis and ensuring comparability.

Internal Validity

In terms of the time frame used, we found that 71.1 per cent of the reviewed empirical studies were cross-sectional by design, 21.2 per cent were longitudinal in nature, and 2.2 per cent of the studies combined both approaches (Table 2). These observed differences were statistically significant ($\chi^2 [3] = 334.29; p < 0.001$). Our results reveal an increase in the use of longitudinal research designs compared to their use in previous mainstream management research (Scandura & Williams, 2000) and entrepreneurship research (Chandler & Lyon, 2001).

The results for the employed research strategies are displayed in Table 3. The field study with primary data (including survey) is the most popular strategy (63.2 per cent), followed by the field study with secondary data (23.3 per cent). In other words, there is a clear preference for

TABLE 2
Internal Validity

<i>Characteristic</i>	<i>This Study</i> <i>(1999–2003)^a (%)</i>	<i>S&W</i> <i>(1995–97)^b (%)</i>	<i>C&L</i> <i>(1989–99)^c (%)</i>
Cross-sectional	71.1	85.6	93.0
Longitudinal	21.2	14.4	7.0
Combination of both	2.2	n/r ^d	0.0
Not clear	5.5	n/r	0.0

^a $N = 275$, $\chi^2 [3] = 334.29$; $p < 0.001$.

^b 'S&W' stands for Scandura and Williams (2000).

^c 'C&L' stands for Chandler and Lyons (2001).

^d 'n/r' stands for not reported.

non-experimental methods (88.0 per cent). In contrast, we diagnosed the limited application of experimental strategies: 2.9 per cent field experiments, 1.1 per cent laboratory experiments and no experimental or computer simulations. The observation regarding the limited use of experimental strategies is similar to Chandler and Lyon's observations (2001), but different from those of Scandura and Williams (2000), who found that 12.5 per cent of the studies in the management literature employed experimental strategies.

External Validity

Our assessment of external validity is shown in Table 4. In terms of the type of sample, the highest percentage was found for samples drawn from the private sector (82.9 per cent). Samples from the public sector were rarely used (1.5 per cent); in some cases, there was a mix of the two types of samples (3.6 per cent). According to Scandura and Williams (2000), it can also be seen that the use of samples from the public sector is more common in management literature (23.2 per cent).

Our results pertaining to the occupation of the subjects show that 43.6 per cent of the subjects were entrepreneurs or business owners; samples consisting of persons with managerial positions came in the second place (16.1 per cent). It is important to note that in 68 per cent of the cases, the studies involved homogeneous samples of subjects, in 11.6 per cent of the studies there was a mixed sample, and a classification was not possible or was not reported in 22.4 per cent of the subjects.

TABLE 3
Research Strategies

<i>Research Strategy</i>	<i>This Study</i> (1999–2003) ^a (%)	<i>S&W</i> (1995–97) ^b (%)	<i>C&L</i> (1989–99) (%)
Experimental	4.0	12.5	3.1
Laboratory experiment	1.1	6.0	n/r ^c
Field experiment	2.9	2.9	n/r
Experimental simulation	0.0	2.1	n/r
Computer simulation	0.0	1.5	n/r
Non-experimental	88.0	87.4	96.9
Field study: primary data			
(incl. sample survey)	63.2	54.7	70.8
Field study: secondary data	23.3	32.8	24.7
Ethnographic study	1.5	n/r	1.4
Other	8.0	n/r	n/r
Meta-analysis	0.7	n/r	n/r
Multiple research strategies	7.3	n/r	n/r

^a $N = 275$, $\chi^2(7) = 474.87$; $p < 0.001$.

^b The percentages reported in Scandura and Williams (2000) were re-calculated after the omission of the 'formal theory/literature review' category. Furthermore, S&W only reported the primary research category, whereas in our study we made a separate category for 'multiple research strategies.'

^c 'n/r' stands for not reported.

In terms of the sampling procedure, we found that many samples were drawn in a non-random way (59.9 per cent), 33.3 per cent of the samples were drawn randomly and 1.1 per cent of the studies employed a combination of both sampling procedures.

Construct Validity

The indicators for construct validity are reported in Table 5. The first important finding is that many studies did not report construct validation (60.4 per cent); however, this percentage is lower, than the one reported by Scandura and Williams (74.8 per cent). Furthermore, exploratory factor analysis (14.2 per cent) is more common than confirmatory factor analysis (5.8 per cent) when assessing the validity or dimensionality of the constructs under examination. Only a marginal 1.1 per cent of the studies assessed discriminant, convergent or predictive validity through alternative methods.

TABLE 4
External Validity

<i>Characteristic</i>	<i>This Study</i> <i>(1999–2003) (%)</i>	<i>S&W</i> <i>(1995–97)^a(%)</i>	<i>C&L</i> <i>(1989–99)^a(%)</i>
Type of sample^b			
Private sector,			
non-governmental	82.9	54.3	n/r ^c
Public sector, governmental	1.5	11.3	n/r
Mix of private and			
public sector	3.6	11.9	n/r
Not reported/not applicable	12.0	7.6	n/r
Occupation of subjects^c			
Entrepreneurs or small			
business owners	43.6	n/r	67.0
Franchisors or franchisees	1.5	n/r	n/r
Venture capitalists	1.8	n/r	2.0
Managerial position	16.1	23.3	10.0
Employees	1.1	12.2	2.0
Students	2.9	10.7	4.0
Mixed	11.6	11.9	n/r
Not reported/not applicable	22.4	32.3	n/r
Sampling procedure^d			
Random samples	33.3	n/r	n/r
Non-random samples	59.0	n/r	n/r
Combination of both	1.1	n/r	n/r
Could not be assigned	6.6	n/r	n/r

^aThe figures reported do not add up to 100 per cent because we only included those categories that were used in our study.

^b $N = 275$, $\chi^2 (3) = 498.66$; $p < 0.001$.

^c $N = 275$, $\chi^2 (8) = 225.25$; $p < 0.001$.

^d $N = 275$, $\chi^2 (3) = 233.01$; $p < 0.001$.

^e 'n/r' stands for not reported.

Also, we found that almost 10 per cent of the studies (9.5 per cent) reported inter-rater reliability, which is higher than the number found by Scandura and Williams (4.8 per cent) and Chandler and Lyon (3.1 per cent). In 32.4 per cent of the cases, the internal consistency of the constructs under study was assessed (for example, through the calculation of the Cronbach alpha coefficient).

Finally, in terms of the number of data sources, we found that 68.4 per cent of the studies relied on a single data source, while 31.6 per cent used multiple data sources. This last figure shows a positive trend compared

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to those reported by Scandura and Williams (11.1 per cent) and Chandler and Lyon (25.0 per cent).

TABLE 5
Construct Validity

<i>Characteristic</i>	<i>This Study (1999–2003) (%)</i>	<i>S&W (1995–97)(%)</i>	<i>C&L (1989–99)(%)</i>
Construct validation^a			
Confirmatory factor analysis	5.8	6.6	n/r ^c
Exploratory factor analysis	14.2	9.3	n/r
Discriminant/convergent/ predictive validity	1.1	3.3	n/r
Inter-rater reliability	9.5	4.8	3.1
Internal consistency measurement	32.4	n/r	40.0
Not reported	60.4	74.8	n/r
Number of sources of data^b			
Single	68.4	88.9	75.0
Multiple	31.6	11.1	25.0

^a Percentages do not sum to 100 per cent because some studies used multiple indicators.

^b $N = 275$, $\chi^2 (1) = 35.78$; $p < 0.001$.

^c 'n/r' stands for not reported.

Statistical Conclusion Validity

The results relating to statistical conclusion validity are shown in Table 6. There is a skewed spread in the sample sizes with an average of 1,089 and a median of 153. Half of the studies had a sample range between 66 and 461 units. Furthermore, a considerable part of the studies (40 per cent) only used one dependent variable. Another notable outcome is that less than 1 per cent (0.7 per cent) of the studies included a statistical power analysis.

With respect to the use of data analytic techniques, we found that 17.9 per cent of the studies compared means using *t*-tests (15.3 per cent used independent sample *t*-tests, 2.0 per cent relied on dependent sample *t*-tests, and 0.6 per cent employed one-sample *t*-tests). Furthermore, we found that 15.6 per cent used non-parametric statistics, and 17.5 per cent used some type of association measure (14.2 per cent used parametric association measures, 2.9 per cent used non-parametric measures, 0.4 per cent relied on a mix of parametric and non-parametric measures). More

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complex techniques such as time series and event history techniques (both implying longitudinal analyses) were employed in only 7.6 per cent of the studies. As for the use of multivariate techniques, we found a high prevalence of multivariate-dependent statistical techniques (58.9 per cent); however, multivariate-interdependent techniques (22.5 per cent) are also quite popular. A more detailed picture of the several techniques shows that linear regression is the most popular multivariate statistical technique (19.3 per cent), followed by factor analysis (16.7 per cent) and discriminant analysis or logistic regression (11.3 per cent). A rather disappointing result is the low prevalence rate of structural equation modelling and path analysis (2.1 per cent), which is lower than the figure found in the Scandura and Williams study (8.7 per cent). But more encouraging is that 16.0 per cent of the studies employed a combination of at least two multivariate-dependent statistical techniques. A more detailed analysis showed that the most popular combinations consist of: (1) linear regression with analysis of variance (5.8 per cent), (2) linear regression with discriminant/logistic regression (5.1 per cent) and (3) analysis of variance with discriminant/logistic regression (2.5 per cent). Thus, the analytical method of choice in the field is a set of regression techniques.

TABLE 6
Statistical Conclusion Validity

<i>Characteristic</i>	<i>This Study (1999–2003)</i>	<i>S&W (1995–97)</i>	<i>C&L (1989–99)</i>
Sample size^a			
Mean	1,088.79	498.31	n/r ^f
Median	153.00	173.00	n/r
Standard deviation	4661.59	1,703.52	n/r
Interquartile range	66–461	70–376	n/r
Smallest sample	1	n/r	n/r
Largest sample	48,818	23,170	n/r
Number of dependent variables^b			
	(%)	(%)	(%)
Single	40.0	31.1	
Two	13.5	18.9	
Three	9.1	13.2	
Four or more	10.2	18.2	
Not applicable	27.2	18.6	

(Table 6 continued)

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(Table 6 continued)

Characteristic	This Study (1999–2003)	S&W (1995–97)	C&L (1989–99)
Data analytic techniques^c	(%)	(%)	(%)
<i>t</i> -tests	17.9	n/r	13.0
Independent sample <i>t</i> -test	15.3 ^e	n/r	n/r
Dependent sample <i>t</i> -test	2.0	n/r	n/r
One-sample <i>t</i> -test	0.6	n/r	n/r
Non-parametric statistics	15.6	11.1	10.0
Association measures	17.5	1.8	20.0
Parametric	14.2 ^e	n/r	n/r
Non-parametric	2.9	n/r	n/r
Mix	0.4	n/r	n/r
Time series/event history	7.6	7.5	n/r
Multivariate dependent techniques	58.9	64.9	52.0
Linear regression	19.3 ^e	42.4	29.0
Discriminant analysis/logistic regression	11.3	n/r	13.0
Analysis of variance	10.2	13.8	9.0
Structural equation/path analysis	2.1	8.7	1.0
Mix	16.0	n/r	n/r
Multivariate interdependent techniques	22.5	5.1	23.0
Factor analysis	16.7 ^e	5.1	17.0
Cluster analysis	2.9		6.0
Mix	2.9	n/r	n/r
Statistical power analysis^d	(%)	(%)	(%)
Yes	0.7	n/r	n/r
No	99.3	n/r	n/r

^a Calculated based on 260 studies; 15 studies did not report sample size.

^b $N = 275$, $\chi^2(4) = 97.78$; $p < 0.001$.

^c Percentages do not sum to 100 per cent because some studies used multiple techniques.

^d $N = 275$, $\chi^2(1) = 267.06$; $p < 0.001$.

^e Percentages are calculated on the total sample of 275 studies.

^f 'n/r' stands for not reported.

Discussion

Prior research has pointed out that the choice of a specific research strategy involves a trade-off in terms of internal versus external validity (Stone-Romero, 2002). On the one hand, non-experimental strategies (such as sample surveys, field studies or ethnographic studies) often have limited

potential for internal validity because these research strategies are performed in an environment that is not controlled for contaminating influences. However, these non-experimental strategies are more effective in addressing the generalisability of results and therefore score higher in terms of external validity. Experimental research strategies enable a researcher to test a causal relationship between an independent variable and a dependent variable in a setting that is free of 'nuisance.' Controlling these nuisance variables prevents the contamination of the explained variance in the relationship between independent variable and dependent variable, and thus leads to high internal validity. However, experimental designs score lower on external validity because the highly controlled environment of the research differs considerably from real-life situations.

Our analysis showed that entrepreneurship research predominantly uses non-experimental research strategies: 88 per cent of the 275 reviewed studies employed a non-experimental design (field studies with primary data being the most popular category [63.2 per cent]), while only 4.0 per cent made use of experiments (1.1 per cent laboratory experiments, 2.9 per cent field experiments) (see Table 3). We can conclude that there is a clear preference for strategies that pay greater attention to external validity than to internal validity. This preference for field studies, more specifically, mail surveys, also mirrors Davidsson's findings (2004). When we compared our findings with results from management literature (Scandura & Williams, 2000), we noticed a higher prevalence rate of experimental strategies in the latter (12.5 per cent). The use of field studies with primary data (including the sample survey) is also popular in the management field (54.7 per cent) but to a lower extent than in entrepreneurship literature. Our findings imply that management research may have been more considerate in terms of the importance of internal validity.

Given that higher internal validity for experimental strategies is often gained at the expense of external validity—and vice versa for non-experimental research strategies—it has been suggested that empirical research should combine different research strategies in one and the same study to address both internal and external validity issues (Scandura & Williams, 2000). By using different research strategies (that is, triangulation) one can build on the strength of each strategy and thus minimise the flaws of any single approach. Consequently, a triangulation approach can be very beneficial with respect to the validity of the results by using different methods that attempt to cross-validate and corroborate findings

within a single study (Brewer & Hunter, 1989; Jick, 1979; Sarasvathy, 1999). In the light of this discussion, a rather discouraging finding from our analysis was that only 7.3 per cent of the reviewed studies employed multiple research strategies.

Another important aspect regarding internal validity refers to the time frame used in the studies. Our results point to a positive trend in the entrepreneurship literature in terms of the use of longitudinal studies (see Table 2). We found that 21.2 per cent of the reviewed articles were longitudinal in nature (this figure increases to 23.4 per cent after taking into account studies that combined cross-sectional and longitudinal designs), which is higher than the 14.4 per cent found by Scandura and Williams (2000). This positive evolution may be biased by the fact that our sample frame covered studies published in the 1999–2003 period, whereas the reported Scandura and Williams (2000) figures covered the 1995–97 period. However, we also found a positive evolution in terms of the use of longitudinal designs compared to Chandler and Lyon's (2001) review of the entrepreneurship field. We can therefore conclude that recent entrepreneurship researchers have made encouraging efforts to better examine causality through the use of longitudinal time frames.

An important aspect of external validity pertains to the nature of the sample and subjects that are used in the research. Our results showed that the vast majority of samples are drawn from the private sector (82.9 per cent) (see Table 4). Furthermore, almost half of the subjects (43.6 per cent) could be categorised as entrepreneurs or small business owners. However, an alarmingly high percentage of studies (22.4 per cent) did not report the occupation of the subjects under study. This may be problematic for other researchers who want to replicate existing research findings in similar or related settings. According to Vanderwerf and Brush (1989), some of the contradictory findings found in entrepreneurship literature could possibly be explained by the fact that different types of samples are used in different studies; therefore, ambiguity arises while comparing empirical findings across several research projects. Researchers should thus be advised to clearly describe the nature of their sample and indicate how their sample compares to other studies examining the same phenomenon; such rigorous reporting of sample characteristics may then facilitate the undertaking of meta-analyses in the field. In the light of this discussion, it is also worrying that 59 per cent of the samples were found to be non-random samples (see Table 4). Non-random sampling

can also be a threat to external validity and may impede the comparison and aggregation of research findings across different studies.

Furthermore, we found that only 39.6 per cent of the studies reported evidence of construct validity (see Table 5). Put differently, in 60.4 per cent of the cases, no assessment of construct validation was undertaken through factor analysis or other techniques, nor was there an assessment of inter-rater reliability or internal consistency. Although this figure is lower than the one found by Scandura and Williams (2000), 74.8 per cent, the result is still worrying as it may point to a lack of concern by researchers about the correspondence between the constructs used and their operational definitions.

A positive trend, however, was observed with respect to the use of multiple data sources. In 31.6 per cent of the reviewed studies, the data was drawn from more than one data source (see Table 5). This figure is higher than the one reported by Chandler and Lyon (2001) in their review of entrepreneurship literature (25.0 per cent). Our result also compares much more favourably with that reported in management literature: Scandura and Williams (2000) noted that only 11.1 per cent of the management studies in 1995–97 were based on multiple-sourced data.

It has been suggested that in order to increase the statistical conclusion validity of entrepreneurship research, there is a growing requirement for sophisticated statistical techniques (Chandler & Lyon, 2001). Prior reviews in the domain of entrepreneurship have indeed shown an evolution towards more sophistication over time. For instance, it has been indicated that the statistics employed in entrepreneurship research in the 1980s were at a relatively unsophisticated level, including the calculation of means, standard deviations, ranking, t-tests and correlations (Churchill & Lewis, 1986; Low & MacMillan, 1988; Wortman, 1987). In the 1990s, however, a trend towards more sophisticated techniques was identified (Aldrich & Baker, 1997; Chandler & Lyon, 2001; Grégoire et al., 2002). Our study confirms that this positive trend has continued in the recent past. For instance, we found that recent entrepreneurship research showed a high prevalence of multivariate-dependent statistical techniques (58.9 per cent), including the use of linear regression (19.3 per cent), discriminant or logistic regression (11.3 per cent), analysis of variance (10.2 per cent) or a combination of different techniques (16.0 per cent). Furthermore, in more than one-fifth of the studies (22.5 per cent), the research employed multivariate-interdependent statistical techniques such

as factor analysis (16.7 per cent) and cluster analysis (2.9 per cent). Based upon these figures, one can conclude that the level of statistical conclusion validity in entrepreneurship research has been improving.

However, the comparison between our results and the ones derived from management literature (Scandura & Williams, 2000) also showed that greater efforts are needed to promote structural equation modelling or path analysis. These techniques allow for a simultaneous assessment of the construct validity of the variables under study, the estimation of the strength between variables, and the assessment of the overall fit of the hypothesised model (Hu & Bentler, 1995). The 2.1 per cent prevalence rate found in our study with respect to the use of these techniques was disappointingly lower than the figure of 8.7 per cent for management literature (see Table 6).

An additional finding with respect to the statistical conclusion validity of recent entrepreneurship research was the apparently limited use of statistical power analysis: an explicit calculation of the statistical power of the statistical results was made in less than 1 per cent of the studies (see Table 6). However, it should be remarked that the limited application of this calculation does not necessarily imply that there is, in fact, a lack of power because the relative large sample sizes in many of the studies may automatically lead to sufficient power (Neter et al., 1996). Some authors (Hitt et al., 2004) already anticipate that greater attention will be paid to statistical power.

Finally, we would like to add a cautionary note in terms of a potential danger related to the recent use of more sophisticated statistical techniques combined with bigger sample sizes (see Table 6). More specifically, this combination may easily lead to statistical significance but not necessarily to practical significance (the latter referring to the meaningfulness and utility of findings from a practitioner's point of view). One way to tackle this problem would be to undertake robustness tests to evaluate the significance of results depending on the number of subjects that are included. Furthermore, the combination of quantitative and qualitative approaches can also help to establish the practical relevance of such findings.

Recommendations

Based on our investigation of 275 recent empirical articles in the field of entrepreneurship research, we would like to make some recommendations

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for future researchers. First, although we believe that the external validity of empirical research is important and should be stimulated, we think that there is need to complement non-experimental research strategies with more experimental strategies. Such a combination of multiple research methods will allow for the adequate tackling of the potential trade-off between obtaining satisfactory internal and external validity. A possible way of realising this objective is by conducting a combination of experiments in strictly controlled settings (for example, students being asked whether they would invest in a given firm based on a formal listing of specific firm characteristics) with data collection in a real business setting (for example, analysis of the actual investment decisions made by real venture capitalists). Hence, Scandura and Williams' (2000) call for increased triangulation in research is still valid.

Second, despite the growing trend towards the use of longitudinal research designs, more efforts are required in this regard, especially if one intends to uncover causal relationships between constructs. The current research in the field of entrepreneurship is mostly cross-sectional in nature, and concerns about potential reverse causality between variables are—all too often—only touched upon in the 'limitations' or 'future research' section of articles. Therefore, future researchers should be more careful in their research design, and ensure that the relationships they observe reflect the directionality of the co-variation between the variables under study. Despite this growing need for longitudinal research, we already notice an encouraging desire among small business owners and entrepreneurship scholars to form longitudinal or panel samples (Hitt et al., 1998; Schwartz & Teach, 2000).

Third, future small business and entrepreneurship research could also report more evidence of construct validity because less than half of the articles we reviewed provided such evidence. Such assessment is necessary to establish a clear link between the 'conceptual ideas' that are measured and their operational definitions. Also, researchers in the entrepreneurship field should make more use of multiple data sources to avoid contamination of results by common method variance, a serious threat for construct validity (Podsakoff & Organ, 1986). Although construct validation has been neglected, we are quite optimistic about the future and anticipate that greater attention will be paid to the validation of constructs (Boyd et al., 2005).

Fourth, entrepreneurship researchers should master various sophisticated statistical techniques because the demand for more complex research designs (for example, longitudinal designs) automatically implies the use of more specialised techniques (for example, time series regression and event history analysis). Doing so will make it more likely that acceptable statistical conclusion validity will be obtained. Furthermore, we recommend the application of a multi-method approach for undertaking empirical studies. Such an approach minimises the effect of potential flaws related to a particular method, and thereby increases the likelihood of conclusions being drawn from research findings.

Concluding Remarks

We attempted to contribute to entrepreneurship literature by providing a systematic review of the research methodologies used in this literature. More specifically, we assessed the validity of entrepreneurship research by analysing relevant articles that were published in the top-rated academic management and entrepreneurship journals from 1999 to 2003. In doing so, we believe that our study helps to obtain a clearer picture of the current state of research in the field of entrepreneurship. According to Chandler and Lyon (2001), a review of research methodology is necessary for the entrepreneurship field to further develop and gain credibility in academic literature. Along the same lines, Scandura and Williams (2000) posited that the further development of a discipline depends upon the appropriateness and rigour of the chosen research methods. In short, we intended to unveil the strength of entrepreneurship research by providing insights into the validity, the rigour and conformity with which methods are used to collect and analyse data (Pfeffer, 1993). In terms of our own methodology, we relied closely on Scandura and Williams' (2000) seminal review of research in mainstream management literature. Our reliance on this framework not only offered us an effective tool to assess the state-of-the-art in terms of research methodology and validity, but also allowed us to make a direct comparison between the validity of articles in the entrepreneurship field and in that of management literature.

From a philosophical point of view, we would like to note that our article is based on a 'positivist' or 'normal science' approach towards research. The normal science view assumes that being objective is an essential aspect of competent research, and, therefore, that the establishment

of standards of validity is a very important issue (Creswell, 2003). A drawback of this positivist view, however, may be the implicit intent to reduce broader conceptual ideas into a very narrow set of discrete 'sub-ideas,' which can then be tested empirically through the development of specific hypotheses (Phillips & Burbules, 2000). However, even if the assessment of validity is important to create confidence in the appropriateness and rigour of research methods, one could wonder whether taking on such a 'normal science stance' produces knowledge with sufficient realism and practical significance. Bygrave (1989) even remarked that in attempting to measure variables with high accuracy (albeit illusory), researchers in the field of entrepreneurship may create the illusion that their findings have the predictive power equal to that of the findings in the natural sciences. However, such a belief may be problematic because at the heart of entrepreneurship often lie disjointed, discontinuous and non-linear events that cannot be studied with methods designed for continuous and linear processes.

Given the earlier remark, our recommendations in terms of, for example, more experimental research or more sophisticated statistical techniques, have to be seen in the light of the broader question of how the field of entrepreneurship should develop in the future. On the one hand, for an evolving field such as entrepreneurship, our analysis in terms of research methodology and validity is important for the field to gain further credibility within the academic community. Also, it is important for scholars to know whether the research methods employed in their field are becoming more sophisticated and diversified over time, and which methods and/or techniques are rewarded and expected by top journals (Scandura & Williams, 2000). However, if we as an academic community also wish to be concerned about questions regarding 'what works in the real world' and about providing solutions to real-life problems, it is clear that quantitative strategies such as surveys and experiments will not suffice. From this perspective, there is a growing need for more ethnographic studies and other systematic field study approaches, in which real-life situations are directly confronted with conceptual theories (Hjorth & Steyaert, 2004). A positive evolution has been recorded pertaining to the use of qualitative methods. Ireland et al. (2005) noted that the use of qualitative methods is on the rise. In addition, we need to acknowledge that besides assessing qualitative research according to the four validity dimensions, other criteria should be included to make a valuable

judgement of the overall quality of these articles. Finally, we hope that our study can serve as a stepping stone to a further discussion about the rigour and future of entrepreneurship research.

Notes

1. This category includes the following sub-dimensions: (a) linear regression techniques, (b) discriminant analysis/logistic regression analysis, (c) analysis of variance techniques, (d) structural equation/path analytic techniques and (e) mix of several techniques.
2. This category includes the following sub-dimensions: (a) factor analysis, (b) cluster analysis and (c) mix of the two.

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