‘WE DON’T NEED NO EDUCATION’ – OR DO WE?
MANAGEMENT EDUCATION AND ALUMNI ADOPTION OF STRATEGY TOOLS

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Forthcoming in Journal of Management Inquiry
Section: Provocations and Provocateurs

The authors thank the Economic & Social Research Council (ESRC) of the UK for funding that supported collection of the survey data and analysis reported in this paper. Research grant numbers: RES-000-22-3134; RES-331- 25-3013.

'We Don't Need No Education*' – Or Do We?

Management Education and Alumni Adoption of Strategy Tools

Abstract

Despite concerns about the relevance of management education, there is relatively little evidence about whether graduates use the management tools and concepts they are taught. We address this gap with evidence from a survey of business school alumni adoption of tools typically taught in strategic management courses. Our findings show that four educational characteristics, level of formal education, frequency of management training, specificity of strategic management education, and time elapsed since formal education drive adoption of strategy tools. Specifically, features such as postgraduate over undergraduate qualifications and frequent exposure to management training predispose greater user of strategy tools. However, other factors, such as time elapsed since formal education, are not as great a predictor of variation in use. We conclude with a predictive model of the relative weight and importance of educational and demographic characteristics on strategy tool adoption and discuss our findings in light of the relevance debate.

Key Words: Management Education, Management Training, Strategic Management, Strategy Tools, Relevance Debate

* 'We don't need no education. We don't need no thought control' (from Pink Floyd's 1979 song, Another Brick in the Wall).

Introduction

The application of strategy theory to strategy practice has been part of the growing debate about the relevance of management education to management practice (e.g. Academy of Management Journal, 2001; Baldridge, Floyd, & Markóczy, 2004; British Journal of Management, 2001; Hannah & Peredo, 2011; Jarzabkowski, Mohrman, & Scherer, 2010; Starkey & Madan, 2001). While the growth of business schools and their accrediting bodies is a testimony to their success on one hand, there are also concerns about the extent to which this growth in management education is actually used by graduates in their practice (Ivory et al., 2006; Masrani, Williams, & McKiernan, 2011; H. Thomas & Wilson, 2011). The content of management teaching has been criticized as ambiguous (Pearce, 2007) and there has been a discussion about the extent to which it should be focused around practice (Jarzabkowski & Whittington, 2008) or theory (Grant, 2008). In particular, the role and value of management education has been increasingly questioned and even accused of producing business flaws and failures (Currie, Knights, & Starkey, 2010; Sumantra Ghoshal & Moran, 1996; Whittington et al., 2003). Others have defended that management education plays a vital role in the development of better practitioners and better management practices (Elmuti, 2004; Ivory et al., 2006). In summary, these debates about the relevance of management education and teaching have highlighted the need to gather empirical evidence about the extent to which education provides business school graduates with tools and concepts relevant to their practice (Riggio, Mayes, & Schleicher, 2003). Ultimately, the main aim of the participants in this debate is to achieve the dual goal of academic rigour and practical relevance (Lorsch, 2009). This objective is increasingly important given the growing challenges the business world faces in today's global economy (Hodgkinson & Starkey, 2011).

However, despite these concerns, there remains relatively little evidence about whether graduates use the tools, techniques and concepts taught as part of management education, indicating the need for further studies in this area (e.g Brocklehurst, Sturdy, Winstanley, & Driver, 2007; Mintzberg, 2004; Pfeffer & Fong, 2002; Shareef, 2007; D. C. Thomas, 2006). Some recent studies have begun to address this dearth of empirical research in the field of strategic management, by examining whether practitioners use their strategic management education. For example, Jarratt & Stiles (2010)

found that managers who have done an MBA use strategic management tools at work, both to feel competence over their work and also to display that competence to their work peers. Similarly, in a survey of managers, Hodgkinson, Whittington, Johnson, & Schwarz (2006) found that strategy workshops played an important part in managers strategizing activities and that they used a range of strategy tools within these workshops. Nevertheless, we still have very little understanding of the relationship between what managers are taught in their strategic management education and what they actually use in practice.

This paper addresses this gap by providing survey-based evidence on business school alumni' patterns of adoption of those tools, techniques and frameworks typically taught within strategic management education. As it is not possible to undertake a detailed investigation of all management education tools and techniques in a single survey, strategic management education was surveyed for three reasons. First, strategy is commonly taught as a foundation course in business qualifications (Bower, 2008). Second, applicants to management courses typically express an interest in improving their strategic thinking (Bower, 2008; Grant, 2008). Third, improving the quality and application of strategic management education is seen as one way to enhance management practice (Baldridge et al., 2004; Bower, 2008; Sumantra Ghoshal & Moran, 1996; Grant, 2008; Jarzabkowski & Whittington, 2008; Prahalad & Hamel, 1994; Whittington et al., 2003).

The paper is in four sections. The first section provides an overview of existing debates about the positive and negative impact of management education before outlining our research questions. Based on this literature review, we note that the concept of management education is ill-defined in existing research. We therefore develop a definition of management education on four dimensions, level of formal education, frequency of management training, specificity of strategic management education, and time elapsed since education, which we apply as the framework for this paper. Section two explains the survey-based research design. Section three presents our statistical findings on the association between management education and alumni adoption of strategy tools. In the final section we discuss these findings and their contributions.

Theoretical Background

The relevance of management education to management practice has been widely discussed in the literature (Currie et al., 2010; Kelemen & Bansal, 2002; Lorsch, 2009; Starkey & Madan, 2001). Kelemen and Bansal (2002) openly recognized the failure of management education and research to address practitioners' needs and have urged for new approaches that forge better integration between academia and practice. Generally, the criticism of management education has been based on what it is taught in business schools, how it is taught and the extent to which the knowledge gained transfers into the workplace (Ivory et al., 2006; Starkey & Madan, 2001). First, management education is criticized for focusing excessively on hard skills that are not actionable in the real world. Managers are not provided with an appropriate set of 'soft', interpersonal skills such as communication, leadership, negotiation, critical thinking and ethics (Antonacopoulou, 2010; Elmuti, 2004; Grey, 2004; Pfeffer & Fong, 2002; Simpson, 2006; Warren & Tweedale, 2002). Second, the way that management education is taught, through separation into functional and disciplinary areas, is criticized for providing students with a fragmented thinking process that is in contrast with the complexity and uncertainty of real management practice (Elmuti, 2004; Gosling & Mintzberg, 2006; Monks & Walsh, 2001). Finally, teaching management education in the classroom primarily provides individual career benefits, with limited transfer of knowledge and skills to the workplace (Gosling & Mintzberg, 2006; Legge, Sullivan-Taylor, & Wilson, 2007). There are, therefore, calls for management education to incorporate the central role of action and to teach management as a craft rather than a science (Bailey & Ford, 1996; Jarzabkowski & Whittington, 2008). In order to increase real world benefit, managers' prior and current experience should be emphasized, thus moving away from the full-time postgraduate approach to one that incorporates more workplace-based and reflective learning (Gosling & Mintzberg, 2006).

There has been surprisingly little research designed to evaluate and measure the impact of management education, with some exceptions (e.g. Legge et al., 2007), so that many of these criticisms lack an empirical basis. Nonetheless, the scant and somewhat inconsistent research in this area gives credence to some of the posited criticisms. For example, across different studies, management education has consistently been found to develop 'hard' analytical skills but to have a less pronounced

or even non-existent effect on 'soft' skills (Baruch & Peiperl, 2000; Kretovics, 1999; Simpson, Sturges, Woods, & Altman, 2005). Thus, while management education is found to have a general impact on the development of managers' skills and competencies, indicating that there is some level of knowledge transfer from classroom teaching to the individual's skill profile (Baruch & Peiperl, 2000; Cheng, 2000; Ishida, 1997; Sturges, Simpson, & Altman, 2003; Wren, Halbesleben, & Buckley, 2007), criticisms of weak effects on soft skills are empirically supported.

There is also conceptual support and some empirical evidence that management education is vital for individual managerial development (Elmuti, 2004). For example, management education is reported to have positive effects on developing management skills (Hay & Hodgkinson, 2008; Ishida, 1997; Kretovics, 1999), broadens and challenges management perspectives (Baruch & Peiperl, 2000; Hay & Hodgkinson, 2008; Ishida, 1997) and makes managers more prone to try new things (Baruch & Peiperl, 2000; Hay & Hodgkinson, 2008; Ishida, 1997; Simpson et al., 2005). Furthermore, there are suggestions that managers who engage in management education develop a thinking pattern that is closer to theory (Priem & Rosenstein, 2000). More robust academic theories (Baldridge et al, 2004) and theoretically-informed thinking are perceived to give managers analytic skills that are superior to anecdotal or 'folklore' ways of approaching management problems (Grant, 2008). Thus, a role of management education is that it enables managers to discern which tools and frameworks are theoretically robust and to support their transfer into management practice.

In summary, there has been intense debate on the impact of management education upon management practice, both in support of management education but also, increasingly, critical of its relevance. However, empirical assessment is scant and existing findings are difficult to compare in order to develop any systematic knowledge about the impact of management education on individual practitioners, organizational contexts, or on the business environment more broadly.

Research Model

Much of the debate about relevance is conducted without an explicit statement of what is meant by the term 'management education'. For example, most studies only indicate implicitly that management education is an undergraduate or postgraduate course in management. In this section, we

therefore explain the dimensions we use to operationalize management education and inform our research model. Formal management education is concerned with developing individuals' skills and knowledge about business and management through exposure to academic content and social interactions with other program attendees (Raelin, 1995). The traditional management education approach is to teach management in the classroom using several pedagogical techniques, usually in degree-granting institutions (Elmuti, 2004). The aim of these techniques is to develop a range of social, cognitive and problem-solving skills that lead to a formal qualification (Elmuti, 2004; Hogan & Warrenfeltz, 2003).

The reported effects of formal management education are varied. Some empirical research reported that those with an MBA had developed more skills than those with no postgraduate education (Baruch & Peiperl, 2000; Kretovics, 1999). However, Shipper's (1999) study found no real differences between MBAs and their non-MBAs counterparts in terms of managerial skills, albeit that his findings were developed from a survey of 1000 managers in a single large USA company. By contrast, Priem and Rosenstein (2000) found that MBA graduates hold cause maps that are closer to theory compared with practitioners without postgraduate education or without any management education. Thus, the experience of having formal management education and also the level of education, in terms of undergraduate or postgraduate education appear to be important within the management education concept. For the purposes of this research, we consider one dimension of management education to be any type of formal program resulting in the award of an undergraduate or postgraduate degree in some area of business or management within a degree-granting institution. This definition is important for capturing the management education that is at the core of the business school; teaching undergraduate and postgraduate students. By assessing management education as it most typically occurs within business schools, we are better able to contribute to the debate about its relevance.

Management education may also occur outside formal degree programs. It is particularly important to evaluate management training, as this is an under-researched area that is considered to impact on practitioner's skills and competences (Tharenou, Saks, & Moore, 2007). According to Raelin (1997) management training develops individual knowledge and competence. Specifically, training is

considered to increase an individual's job performance, productivity and work quality (Tharenou et al., 2007). Management training can be defined as the "systematic acquisition and development of the knowledge, skills, and attitudes required by employees to adequately perform a task or job or to improve performance in the job environment" (Tharenou et al., 2007, p. 252). Johannessen and Olsen (2003) note that management training combines theory from formal education with practical tasks. For our purposes, and in order to distinguish it from the first dimension of our management education construct, management training is considered as the management programs and short courses undertaken by practitioners outside formal degree programs.

Third, we considered specificity of education, as we are interested in studying the adoption of strategy tools typically taught in strategic management courses. Strategy tools are defined as "a generic name for any methods, models, techniques, tools, frameworks, methodologies and approaches which provide decision support" (Clark & Scott, 1999, p. 36). A strategy tool, such as Porter's Five Forces, is specific to strategic management education and is disseminated through strategy textbooks and taught in foundation strategy courses (Grant, 2008; Jarzabkowski & Wilson, 2006). Based on Priem and Rosenstein's (2000) finding that graduates use the specific theories that they are taught, the extent of an individual's strategic management education is likely to have an impact on adoption of strategy tools. As the previous dimensions of formal education and management training are general management education concepts, we also incorporated a measure of specific strategic management education arising through either formal education or management training or both.

Finally, the time that has elapsed since the last formal education experience is an important variable. Learning effects fade over time if the particular skills or techniques are not used in practice (Kolb, 1976). The more recent an individual's exposure to strategy tools and techniques in the classroom, the more likely that individual will remember and use these techniques (Hebb, 1949). It is therefore reasonable to assume that there will be variation in the use of strategy tools according to the length of time since finishing formal business school education.

By defining management education along these four dimensions, we are able to generate separate results for the different effects of each type of education, so developing a more specific

understanding of what is meant by management education and its impact. Additionally, we are able to combine the results, in order to analyse whether there are cumulative effects of management education that might indicate a richer and more complex understanding of the term. The aim of our paper is to address the dearth of empirical evidence on the relevance of management education by answering the following overarching research question: To what extent do the educational characteristics of alumni explain their patterns of strategy tool adoption? In order to answer this question, we examined the effect of the following educational characteristics on the adoption of strategy tools:

1. Formal business education at undergraduate and postgraduate level.
2. Exposure to management training
3. Specificity of strategic management education.
4. Time elapsed since leaving formal education

In order to control for the effects of demographic characteristics, we also include five demographic variables of age, job hierarchical level, job function, and job sector., to examine their direct and moderating effect on our four outcome (tool use) variables. Based on the four dimensions of our management education definition and these demographic characteristics, we developed the conceptual framework depicted in Figure 1. Our aim is to map alumni patterns of adoption of those strategy tools and frameworks typically taught in business schools.

INSERT FIGURE 1 ABOUT HERE

Business school alumni use strategy tools in organizational contexts that may be expected to influence tool usage. While our model already controls for a number of demographic variables such as job function and job sector, organization size is a demographic variable that appears frequently in most strategic planning research (e.g. Balabanis & Spyropoulou, 2007; Brews & Hunt, 1999; Gup & Whitehead, 1989; Lenz, 1981). For example, some studies (e.g. Rigby, 2001; Rigby & Bilodeau, 2005; Rigby & Bilodeau, 2007) have suggested a positive relationship between organisation size and the amount of strategic planning undertaken, while others (e.g. Miller & Cardinal, 1994; Stonehouse & Pemberton, 2002) did not find any effect. We thus probed whether we should add organizational size to our model. However, an initial analysis using ANOVA to investigate whether respondents'

organisation size has any effect indicated that there was no significant differences in the means of number of tools used. We therefore did not include organisation size as a variable in this paper.

Methods

Data and Sample

The unit of analysis in our research is the individual business school alumnus. The purpose of looking at business school alumni, is to examine a group of practitioners who have been exposed to management education, in order to ascertain which aspects of that management education they use within their workplace (Keep & Westwood, 2003).

We assess patterns of adoption according to the number of tools used, including four possible dimensions of use: i) those tools which are currently used, ii) those that have been used but are not currently used; iii) those that the alumnus has heard of but has not used; and iv) those of which the alumnus has not heard. This measure is in line with our goal to assess the influence of management education exposure on the level of use of tools typically taught in a business school environment. While we understand that the concept of tool use can be multidimensional and complex, the goal of this research is to take a first step in appraising level of use. Hence we defined use broadly by asking respondents to consider any type of tool use that was relevant to conduct the strategic activities in their organisations, including situations where they adapt tools in order to use them within their work situations. This definition was consistent with manager's definitions of using tools in our pilot study, and fit with the purpose of this research to study the impact of management education on the general use of strategy tools. From this initial basis, future research may be able to further identify and compare different types of tool use. For example, it might be interesting to compare the extent to which management education has an impact on the formal or informal use of tools.

A survey method was used to evaluate the impact of education on the adoption and use of typical strategy tools by a population of domestic and international alumni from 12 of the top 30 UK business schools, selected according to the Times Good University Guide in 2006-07. The ranking from our chosen source is based on: completion rate, entry standards, facilities, proportion of good honours degrees, graduate employment prospects, spending on library and ICT, research ranking and

student satisfaction. At the time of our survey this was one of the most common sources for rankings for UK University by subject (together with the Sunday Times and Guardian)[1]. Although the position of individual Universities has changed over the years the selected 12 Universities always appear in the top 30 from 2005 to the present day in all the 3 sources. Higher-ranked schools were selected because these schools have higher graduate employment, ensuring that the target population is employed in positions where they might reasonably have an opportunity to use tools. As the study does not query how institutional ranking or quality of the educational experience shapes tool adoption, limiting the study to higher-ranked schools with high graduate employment was felt to control for unintended variation effects. The sample population covers both undergraduate and postgraduate alumni who have graduated within a 43 year period to allow for career progression effects.

As common in surveys with similar objectives to ours, investigating the nature of work practices within commercial and public organisations (Frost, 2003; Gunn & Williams, 2007; Katsikeas, Samiee, & Theodosiou, 2006; Snow & Hambrick, 1980), we adopted a self-report approach. As the self-report approach has some problems, such as response bias, which occurs when respondents tend to consciously or unconsciously answer in a particular direction (Zikmund, 2003, p. 178), we implemented a number of procedural remedies during survey design (e.g. use of different response formats, counterbalancing question order) and carried out a series of robustness checks in order to ascertain that the presence of biases in the data did not undermine the validity of our results (Philip M. Podsakoff, MacKenzie, Jeong-Yeon, & Podsakoff, 2003) . First, we conducted a t-test to compare the responses by early respondents with those of late respondents and also to compare responses from alumni of different universities. In all these tests we did not find any statistically significant differences (all tests generated p-values above 0.05). We also conducted a statistical check for common method variance with the Harman one-factor method (P.M. Podsakoff & Organ, 1986)[2], which showed that the first factor accounted for only 23% of the total variance, suggesting no serious common method problem. We suggest that our data do not show evidence of response bias because our respondents could not guess the complex relationships that we intended to test; as indicated by the regression

[1] In 2008 the Complete University Guide, published by The Independent newspaper has been introduced.

[2] In this procedure, a principal components factor analysis of all measures is performed, and if common method bias is not a serious problem, then several factors (and not a single factor) should account for most of the variance (Atuahene-Gima & Murray, 2004, p. 40; Joshi & Sharma, 2004, p. 54; Menon, Bharadwaj, Adidam, & Edison, 1999, p. 31)(Atuahene-Gima and Murray, 2004: 40; Menon *et al.*, 1999: 31; Joshi and Sharma, 2004: 54)

equation and the predictive model, the investigated relationships are sufficiently complex for respondents not to be able to influence the statistical results by misrepresenting their responses.

In order to establish a list of tools most typically taught in foundation strategic management courses, a survey of 66 strategy academics in the top 30 UK business schools was conducted. We found that 11 tools were typically taught by between 75-100% of respondents, another 5 were taught by 50-74% and that there was more variation below 50%. Using a cut off point of 40%, a list of 20 typically taught strategy tools was established as the basis of our survey. The list derived from this survey, included as Appendix Table A1, reflects tools that have been used in previous surveys (Glaister & Falshaw, 1999; Hodgkinson et al., 2006; Stenfors, Tanner, Syrjänen, Seppälä, & Haapalinna, 2007) and so provides confirmation that our study has captured those typically taught strategy tools.

In summary, the final list of tools surveyed contains tools, which are currently taught in Strategy courses in UK business schools. The labels or acronyms by which the tools are identified are commonly used in Strategy courses and in adopted textbooks across the UK. Although we would expect our respondents to have heard of some of the tools we do not expect all respondents to have heard of all of them, as only 11 tools were taught by more than 75% of the lecturers we approached. For this reason we did not deem it necessary to include bogus tools because we would expect that an unknown tool would act as a bogus tool for a respondent who does not know it. Our expectations were confirmed by the finding that none of the tools was known to all respondents. The proportion of respondents not having heard of a particular tool ranged between 0.25% for SWOT to 67% for Bowman's clock.[3]

We then developed a survey instrument to map tool use according to alumni education characteristics, using existing measures where possible. However, as many existing studies are partial or use inconsistent measures, some questions and measures were developed through qualitative interviews. Three pilot studies of this survey were conducted, generating 76 responses in total. Results

[3] In this context it is relevant to highlight the fact that across our sample of about 1400 respondents less than 1% claimed to be currently using 16 or more tools.

of each pilot were analysed, including interviewing some respondents, to ensure that the questions gave robust and practically meaningful measures.

The survey was then administered online between March and May in 2007 to a population of alumni in a sample of 12 out of the top 30 UK business schools. These schools were selected pragmatically because they were prepared to email our survey link to their alumni databases at this time period. The alumni population parameters of these schools are consistent with those of UK business schools within their league (top 30), insomuch as these figures are known. The specific response rate from our target population (business school alumni who have done a foundation strategy course) is difficult to ascertain, as we do not have figures for non-responsive email accounts. However, the response rate from total numbers emailed, without excluding non-responsive emails is 14.2%, from which we gained 1407 usable responses.

In addition to questions about alumni education and training characteristics, variation by individual characteristics is incorporated through personal demographics such as age, job tenure, job function and hierarchical position. These potentially moderating variables are not modelled in this paper, which presents findings about the impact of management education on the use of strategy tools.

Measures

Dependent Variable

As illustrated in Appendix A, we assessed the respondents' use of strategy tools by asking them to indicate, against each of 20 tools typically taught in foundation strategy courses, which tools:

1. they are currently using;
2. they have used previously but do not use now;
3. they have heard of but do not use; and
4. they have never heard of.

We looked at how many tools each respondent listed under each of these categories. These responses were used to create four separate outcomes (dependent variables), in order to generate a measure of respondents' adoption of strategy tools.

Independent Variables

The four educational characteristics were measured as follows.

Level of Formal business education. This measure was assessed by asking respondents to select their highest degree in business related education from a list of four categories: None; Undergraduate; MBA or other taught postgraduate; and others. In subsequent analysis, the frequency counts indicated that all participants could be grouped into two categories; undergraduates and taught postgraduates.

Exposure to 'management training'. This measure was assessed by asking respondents to indicate if they had management training or not. If they indicated that they had received management training, they were asked to indicate frequency of training, under three categories: none; infrequent (if less than annually); and frequent (if annually or more often).

Strategic Management Education. Strategic management tools are taught in most strategic management courses and also comprise much of the content of core strategic management textbooks (see e.g. Johnson, Scholes & Whittington, 2008; Lynch, 2008; Grant, 2008; Henry 2008). Similarly strategy tools form a large part of strategy workshops and some management development courses (Hodgkinson, Whittington, Johnson & Schwarz, 2006; Rigby, & Bilodeau, 2007). We therefore operationalized a variable - specificity of strategic management education – which assesses whether respondents have had specific strategic management courses throughout their management education. This will provide further detail into our management education concept as it allows us to understand whether specific education has a stronger influence than more general management education. The 'Specificity of strategic management education' variable was operationalized by asking about the type, if any, of formal strategic management education received as part of management development courses; and/or as part of their formal education at undergraduate or postgraduate level. Respondents were asked to tick as many as applied, so that we could use the number of training activities that they have been exposed to as a measure of the extent of specific strategic management training received.

Time elapsed since Education. This variable was measured as a continuous variable by asking respondents to indicate the number of years elapsed since they had completed formal education

Demographic Variables

We measured and categorized the demographic characteristics as follows:

Age was measured as a continuous variable, expressed in terms of number of years, however due to the wide range of the values observed and in order to present the information in a more parsimonious format. We therefore categorized this variable into three groups containing a similar number of respondent; those less than 30 years; those between 30 and 40 years; and those above 40 years.

Job function was measured by asking respondents to indicate from a given list their major management function. The answers were categorized into the following 6 groups: Administration management service (including personnel management, public relations, corporate affairs, human relations and finance); marketing/sales; general management; strategy (including business development); management consultancy; and operations (including production, facility management, purchasing, contracting, and all others).

Job Hierarchical Level was measured by asking respondents to select one from a list of several hierarchical levels. The answers were categorized into the following 4 groups: Senior management including directorate; Middle management including line managers and supervisors; Professionals; others including technical and clerical.

Job Sector was measured job sector by asking respondents to select from a list the status of their organization and grouped these into 3 categories: public sector; private sectors and NFP (not for profit/charity and including all others.)

Findings

Before undertaking statistical tests, we checked the distributive properties of the dependent variables. As our sample is large, normality was assessed simply by graphical analysis and by computing the z-scores of skewness and kurtosis (see Field, 2005, pp. 72-73). Visual observation of the various graphs indicated that all the variables follow a normal distribution. Also, for most variables, values of z-scores of skewness and kurtosis were found to be below the recommended upper threshold of 3.29 for a large sample (see Hair et al, 2006: 80 – 82; Field, 2005: 72); indicating that normality is not seriously violated. In our initial and subsequent analyses, we employed a t-test or ANOVA statistical techniques

in order to determine any statistical differences (Altman & Baruch, 2008; Parnell, 1997; Tanghe, Wisse, & Van Der Flier, 2010)

We also assessed homogeneity of the variance using the Levene's test for equality of variances. In those cases when the assumption of homogeneity of the variance is violated ($p < 0.05$), we report the values of *t*-test and significance for the cells "Equal variances not assumed". Table 1 shows the descriptive statistics and the correlation coefficients for the independent variables in our study.

INSERT TABLE 1 ABOUT HERE

Descriptive Statistics and Correlation Coefficients

The results are presented in three main sections. First, we discuss the effect of the education variables on the four outcome variables. Secondly, we briefly highlight the impact of the demographic variables on our main outcome variable (number of tools used). Finally, in order to evaluate which characteristics are most useful for predicting patterns of tool adoption, we present the results of a regression analysis that combines the effects of both educational and demographical variables.

Education Characteristics and Strategy Tool Adoption

Formal Business Education and Strategy Tool Adoption

Our first research question examined whether the level of formal business education, undergraduate or postgraduate, influences tool use. We examined this question by using a *t*-test for differences in the means of our four tool use variables; the results are tabulated in Table 2.We found two interesting patterns. First, on the average, postgraduates (PG) "use" more tools ($M = 5.83$; $S.D. = 3.78$), than undergraduates (UG) ($M = 3.95$; $S.D. = 3.78$); and this difference was found to be significant ($t = -7.00$; $p = 0.00$). Second, there is significant difference ($t = -2.84$; $p = 0.01$) between postgraduate ($M = 2.64$, $S.D.$ 2.84) and undergraduates ($M = 2.07$; $S.D. = 2.66$) in the number of tool they "have used before but are not using now"; although for both groups the number is smaller, on average, than the number of tools currently used.

INSERT TABLE 2 ABOUT HERE

These results indicate that a higher level of formal business education, in terms of postgraduate as opposed to undergraduate degrees, results in the use of more tools. Postgraduates have also used a

larger number of tools that they no longer use. As Table 2 shows, increased use by formal level of education is reinforced by the fact that undergraduates have a higher mean than postgraduate for the tools "have heard of but don't use" and also tools "have never heard of". All of these differences were found to be highly significant ($p < 0.01$ in the t-test for Equality of means).

Management Training and Strategy Tool Adoption

Research question two addressed whether exposure to, and frequency of, management training (e.g. short courses, seminars, workshops) influences tool use. Here again, we used a t-test to examine whether attending management training influences tool use on our four outcome variables. The results are summarized in Table 3. Examination of Table 3 indicates two interesting results. Namely, those who have been exposed to management training (M = 6.10; $S.D.$ = 3.85) use more tools than those who have not (M = 4.45; $S.D.$ = 3.62); and this difference was found to be highly significant (p = 0.00). Also for the variable "have used but no not use now"; exposure to management training (M = 2.62; $S.D$ = 2.81) leads to higher tool use than for those not exposed to management training (M = 2.44; $S.D.$ = 2.94). This difference was however not statistically significant (p = 0.26). Nonetheless, this trend is reinforced by the fact that those with no management training have a higher number of tools that they "have heard but don't use" (M = 6.45; $S.D.$ = 4.48 vs. M = 5.42; $S.D.$ = 4.11) and fewer tools that they "have never heard of" (M = 5.27; $S.D.$ = 3.99 vs. M = 5.87; $S.D.$ = 4.21). In both cases the differences were highly significant (p=0.00 and p=0.01).

INSERT TABLE 3 ABOUT HERE

Table 4 expands on this set of results by showing that on the average participants with frequent management training use more tools (M = 6.44; $S.D.$ = 3.93) than those with infrequent training (M = 5.41; $S.D.$ = 3.63) and this difference was highly significant (p = 0.00). However, there was no significant difference in the outcome variables, which refer to tools that our respondents "have used but do not use now" (p = 0.48), and tools that they "have heard of but don't use" (p = 0.06). Nonetheless, the trend for a positive impact of management training is reinforced by the fact that participants with infrequent management training have more tools they "have never heard of" (M =

5.77; *S.D* = 3.98) than respondents with frequent management training (*M* = 4.99; *S.D.* = 3.91). This difference was highly significant ($p = 0.00$).

Examination of Tables 2 and 3 indicates that exposure to management training led participants on average to use more tools (*M* = 6.10) than postgraduate do (*M* = 5.83). Similarly, examination of Tables 2 and 4 indicates that frequency of management training led participants on average to use more tools (*M* = 6.44) than their highest level of formal business education (*M* = 5.83). These results are examined further below.

INSERT TABLE 4 ABOUT HERE

Strategic Management Education and Strategy Tools Adoption

Our third research question examines whether the amount of formal strategic management training received is related to tool use. We examined this by computing a correlation measure between this discrete variable measuring strategic management education and our four tool use variables. Table 5 shows that there is a significant level of correlation between the 'amount of strategic management education' and 'tool use' ($p < 0.01$); however the extent of the correlation is small $r = 0.14$ ($R^2 = 0.02$). The results were also the same for 'tools used but not used now'; where we found a small positive correlation $r = 0.13$ ($R^2 = 0.02$). As expected the other tool use variables exhibited a statistically significant negative correlation.

INSERT TABLE 5 ABOUT HERE

Time Elapsed since Leaving Education and Strategy Tool Adoption

We measured the number of years since leaving education as a continuous variable and observed variation between 0 and 43years. Our initial examination of the descriptive and distribution properties of this variable indicated that it does violate some of the assumptions for use in multivariate analysis. In particular, we observed a high value of Kurtosis (4.78), indicating that this variable is heavily skewed to the right. This indicates that most of our respondents have left education relatively recently as is expected since the links of alumni with their alma mater become less strong as time elapses and they progress in their career. We therefore adopted a logarithmic (log10) transformation before using the variable in the analysis (e.g. Hair, Black, Babin, & Anderson, 2009; Stavrou & Kilaniotis, 2010).

We measured years after education as a continuous variable but in order to present information in a parsimonious way and to generate further insights on potential tool use differences between individuals who finished their education at different points in time, we have recoded the original variable into 3 categories; 3 years or less; between 3 and 8 years; more than 8 years since leaving education. We chose these categories because we were interested to see if individuals who left education more recently had different usage patterns than those who left education many years ago. Furthermore, using these 3 categories allowed the allocation of similar number of respondents across each group. We now analyse the role of "time elapsed since leaving education" on our dependent variables. Table 6 shows correlation of the continuous variable (in logarithms) with the four outcome variables.

INSERT TABLE 6 ABOUT HERE

Table 6 shows that there is a very weak correlation between "time since left education" and our first two outcome variables (r = 0.02 and r = 0.01 respectively); the correlation is not statistically significant (p = 0.54 and p = 0.63 respectively). There is however, a highly significant but moderate negative correlation (r = - 0.22; p = 0.00) with tools that our respondents "have heard of but don't use"; and a positive correlation (r = 0.19; p = 0.00) with tools that they "have never heard of".

We further investigated this effect by using the one-way ANOVA with a Tukey multiple comparison *post hoc* test to examine the differences in means in our 3-way categorical variable. The results are presented in Table 7. They confirm our earlier findings that there are no significant differences between the groups for the tool "use" (F = 1.22; p = 0.30) and tools that our respondents "have used but do not use now" (F = 1.02; p = 0.36). On the other hand, we observe highly significant differences between the groups for tools that the respondents "have heard of but don't use" (F = 29.65; p = 0.00); and tools that the alumni "have never heard of" (F = 17.10; p = 0.00). Our analysis therefore indicates that the length of time since leaving formal education seems to affect the number of tools which were heard of but not used and the number of tools which are not known.

INSERT TABLE 7 ABOUT HERE

Demographics Variables and Strategy Tool Adoption

We also investigated the individual effects of our demographic variables. However, for the sake of parsimony (other results available from the authors on request), we focus only on our main outcome variable (number of tools used). Table 8 provides the results of a one-way ANOVA analysis for all demographic variables.

INSERT TABLE 8 ABOUT HERE

Age and Strategy Tool Adoption: Table 8 indicates that there are significant differences in tool use between the different age groups in terms of the number of tools used. The *R Squared* and *Eta Squared* measures of association are both 0.03. Although this indicates a low level of association, they are within the values that we expect knowing that our main education variables account for some of the observed variance in tool use.

Job Hierarchical Level and Strategy Tool Adoption: Table 8 shows significant differences between hierarchical position of the respondents and the number of strategy tools used. Using a Tukey multiple comparison *post hoc* test (Appendix B) we further investigate these findings. Significant differences regarding the number of tools used were only found for Senior Management, indicating that senior managers tend to use more strategy tools than the other categories. For example the mean difference between senior managers and middle managers was 1.31 and this difference was found to be significant at the 1% level ($p = 0.00$).

Job Sector and Strategy Tool Adoption: The job sector variable has been categorized into 3 main groups: public, private and NFP (not for profit/charity). Table 8 shows that the private sector has the highest mean use, although not statistically different from the mean level of use in the public sector ($p = 0.97$), as shown by the Tukey multiple comparison *post hoc* test (Appendix C). Only the NFP sector exhibited significantly lower mean level of tool use when compared to both the public (*Mean Diff.* = - 0.55, $p = 0.03$) and the private sector (*Mean Diff.* = - 0.60, $p = 0.02$). Furthermore, the results also show that the variance accounted for by differences in job sectors are negligible (*R Squared* = 0.01).

Management Function and Strategy Tools Adoption: Analysis of the effect of management function (Table 8), identified a relatively large association of the management function variable with tool use (*R Squared* = 0.06 or 6%). The results also showed that those in strategy (including business

development) and management consultancy on average use more tools (6.13 and 6.59 respectively) than alumni with other functions. Also further analysis using Tukey multiple comparison *post hoc* test (Appendix D) indicated that there can be high differences between these two functions and others. For example, the mean difference between strategy and operations is 1.99 (p = 0.00) and between consultancy and administration is 2.43 (p = 0.00). The results also show that there is no statistical difference (p = 1.00) in the means of operations and administration and also between strategy and consultancy management function; however there are significant differences in the means between all other groups.

Regression analysis of Education and Demographic Characteristics on Adoption

We next evaluated the joint effects of educational and demographic factors in order to better understand the part played by each in accounting for the variance in our main outcome variable: number of strategy tools used. Our aim also is to develop a predictive formula that can indicate the expected number of strategy tools used as a result of various combinations of educational and demographic characteristics. This section involves the use of multiple regression analysis to evaluate the impact of each explanatory variable after controlling for the effect of other potential factors affecting the use of strategy tools.

Our regression equation involves a linear function linking the number of tools used to a series of educational and demographic variables observed over the sample of 1407 business school alumni. The regression equation was estimated using the ordinary least squares method[4].

The form of our regression equation can be represented as:

$$Y = f(B_i X_i) + f(B_j Z_j) + B_0 + \varepsilon_i \qquad (1)$$

where Y is the dependent variable, number of tool used.

X_i identifies the set of educational variables

Z_j is the set of demographic variables

[4] Given the discrete nature of our dependent variable it might be thought that the choice of a linear estimation method could be incorrect as it would be based on an incorrect assumption of normality on the of the dependent variable. However our analysis of the dependent variable indicates that this assumption is not violated, possibly due to the large number of observations available in our sample.

ε_i identifies the unobservable error term.

Bis and *Bjs* are the unstandardized estimated coefficients to be estimated from the regression analysis.

B_0 is the intercept and represents the average number of tools used when all the independent variables take a value of zero.

In estimating this regression equation we are interested in the t-values of the estimated coefficients (B_i and B_j) and their significance level.

For all category variables we used a dummy-variable coding system to code *g-1* variables (where *g* is the number of groups in the category variable). Strategic management training and time elapsed since leaving education were entered as continuous variables in the multiple regression equation. Our analysis of the effect of educational and demographic characteristics on strategy tool adoption also involved testing for a potential significant effect of interactions between all variables which potentially affect tool use. The inclusion of these interactions in the regression equation did not reveal any statistically significant effect. The final specification for our regression equation (1) is presented in Table 9 listing the estimated coefficients for all the variables which turned out to have a statistically significant effect on the number of tools used, and the value of probability associated with their effect.

INSERT TABLE 9 ABOUT HERE

The regression results highlight the importance of both educational and demographic factors in the use of strategy tools with a statistically significant effect of frequent management training and of job functions in business, strategy and management consulting ,which double the expected number of tools used relative to the base case. Working in the private sector also seems to have a positive effect on tool use that is quantitatively larger than for jobs in the public sector. Finally, the model summary for our final regression model is presented in Table 10 in order to illustrate the relative contribution (measured by the *R-squared* statistic) of each of the significant independent variables to the variance of the dependent variable.

INSERT TABLE 10 ABOUT HERE

The model summary indicates that the three educational variables together account for 10% (R^2 = 0.10; $p < 0.00$) of the variance in tool use. The value of R^2 = 0.10 although a medium effect in quantitative terms (Cohen, 1988, 1992; Field, 2005) is however highly significant ($p < 0.00$), indicating that these educational characteristic can be used reliably to explain and predict tool use. An examination of the change in R Square (ΔR^2) in Table 10 (see change statistics columns) also confirms our earlier results regarding formal business education (ΔR^2 = 0.04; ΔF = 45.02; p = 0.00) and strategic management education (ΔR^2 = 0.01; ΔF = 8.85; p = 0.00). Having some management training accounts for more variance in tool use compared to the base case of no management training (ΔR^2 = 0.05; ΔF = 34.60; p = 0.00). Indeed, management training accounts for is 5 times as much (ΔR^2 = 0.05) as strategic management training (ΔR^2 = 0.01).

The model summary also indicates that of the four demographic variables considered, the biggest predictor of tool use is job function (ΔR^2 = 0.05; ΔF = 13.39; p = 0.00). We did not find any significant impact of time elapsed since leaving education (ΔR^2 = 0.00; ΔF = 0.01; p = 0.92) and for this reason this variable was not included in Table 10. The model summary indicates that the total variance accounted for by our educational variables and demographic variables is 18%. This is a medium effect (see Fields, 2005: 32; Cohen, 1988 & 1992) and it suggests that we can reliably use all these variables to form predictions about mean of tool use by individuals with different educational and demographic characteristics.

Predictive Modelling of Educational and Demographic Characteristics and Adoption

Using the estimated coefficients from Table 9 it is possible to calculate the expected number of tools used by alumni with different characteristics and combinations of business education. In order to illustrate our results with the aid of an intuitive example we use the non-standardized estimated coefficients from Table 9 to generate the predicted number of tools used in the predictive equation (2) where only variables which were found to be significant at 5% level were included:

$$E(Y) = 0.89 + [1.06X_1 + 2.03X_2 + 1.03X_3 + 0.48X_4]$$
$$+ [2.11Z_1 + 2.07Z_2 + 0.86Z_3 + 0.82Z_4 + 0.86Z_5 + 0.83Z_6 + 0.57Z_7] \quad (2)$$

where E(Y) is the expected value of the dependent variable: number of tools used

X_1 is formal education (UG/PG)

X_2 is Frequent Management Training (DV)

X_3 is Infrequent Management Training (DV)

X_4 is Strategic Management

Z_1 is Strategy Job Function (DV)

Z_2 is Management Consultancy Job Function (DV)

Z_3 is Marketing/Sales Job Function (DV)

Z_4 is General management Job Function (DV)

Z_5 is More than 40 years (>40yrs) Age (DV)

Z_6 is Private Job Sector (DV)

Z_7 is Public Job Sector (DV)

Where (DV) indicates a dummy variable which takes values of either 0 or 1.

The predictive equation (2) can be used to determine the expected number of tools used by alumni with different levels of business education. For instance an 'average' undergraduate with no other business education is expected to use less than 1 tool (0.89) but if the same 'average' person acquires postgraduate qualifications the expected number of tools would nearly double to 1.96. More specific numerical examples of our estimated effects of the significant explanatory variables will be provided in the discussion section below.

DISCUSSION

This paper set out to analyse the extent to which the educational characteristics of alumni explain their patterns of strategy tool adoption, controlling for the effects of demographic characteristics (see Figure 1). Our findings showed that a higher level of formal business education (postgraduate over undergraduate) is associated with greater use of strategy tools by an individual alumnus. They also showed that exposure to and frequency of management training results in greater use of strategy tools by an individual alumnus. Our correlation analysis showed that the more specific the strategic management training that participants have had, the more tools they will use. The analysis of time elapsed since leaving education showed that this variable does not have a significant impact on

the number of tools used although it influences those tools managers "have heard but do not use" and those "never heard of".

The analysis of demographic variables demonstrated some impact on the number of tools used. Specifically, the analysis of age showed significant differences in tool use between alumni aged less than 30 years old and older ones. With respect to hierarchical level, we provide evidence that senior managers use more tools than any other group of managers. Also, managers in the job functions of "management consultancy" and "business development and strategy" were shown to use more tools than others (e.g. in marketing/sales or production). Finally, we found no significant differences in patterns of tool use when comparing the private and the public sector.

Regression analysis was used to generate a finer-grained understanding of the part played by both the educational and the demographics characteristics in the use of strategy tools. The results show that the educational variables accounted for more of the variance in strategy tool use than the demographical variables (9.9% vs. 7.6%). The results also showed that the frequency of management training and the job function of managers ("business development and strategy" and "management consultancy") are the most important drivers of strategy tool use. Having post-graduate education is the next most important variable. Overall, the findings of this research provide a detailed understanding of some of the factors driving managers use of the strategy tools that they have been taught.

Table 11 summarizes our findings in a practical way with illustrative examples of the estimated effect of educational and demographic factors on tool use. It shows that increasing levels of business education are associated with a higher expected number of tools used, with the highest marginal impact on tool use being driven by the exposure to frequent management training and a job function related to strategy. Taken together, the combination of education and demographic variables indicate substantial differences between the minimum and maximum average tool use (0.89 vs. 5.88).

INSERT TABLE 11 ABOUT HERE

One motivation for this study was to generate reliable and comprehensive empirical evidence to further the relevance debate on management education, which is, as shown in our theoretical framework, is characterized by contradictory views (Hodgkinson & Starkey, 2011; Ivory et al., 2006; H.

Thomas & Wilson, 2011). Based on these contradictory arguments, we might have expected ambiguous results from our study of the impact of management education on strategy tool adoption. However, our results indicate a strong positive effect; the greater the exposure to management education, the more alumni use the techniques, tools and frameworks taught in business schools, at least in the area of strategic management. Our findings thus confirm and extend those studies that indicate that education makes practitioners eager to incorporate their learning into their practice (Cheng, 2000; Hay & Hodgkinson, 2008; Simpson et al., 2005). In particular, our finding that increasing levels of education increase the use of tools gives credence to the suggestions that management education may increase practitioners self-confidence and sense of self in the workplace (Baruch & Peiperl, 2000; Hay & Hodgkinson, 2008; Ishida, 1997; Jarratt & Stiles, 2010; Simpson et al., 2005; Sturges et al., 2003).

The evidence that formal management education at postgraduate level and exposure to and frequency of management training increases the use of strategy tools may be explained in two ways. First, increased use may be based on the teaching approach (Knowles, 1990), as postgraduate and management training tend to use a combination of case method and practical experience and, particularly for MBA and management training, often requires practical experience as a prerequisite for enrolment (Christensen & Hansen, 1981; Greiner, Bhambri, & Cummings, 2003). These characteristics may increase the relevance of tools to the individual at the time of learning (Knowles, 1990) and, hence, their retention in the workplace. In particular, the results for management training may be related to the fact that managers remain in the workplace and can immediately make interactions between learning and their practice in order to instantly test some of their new learning. In fact, they can engage in a reflective learning experience which may be more fruitful in promoting learning (Elmuti, 2004; Gosling & Mintzberg, 2006). This view was further supported by our regression results, which indicated that management training has a much greater impact on tool use than having a post graduate education. Particularly impressive was the impact of frequency of management training on tool adoption. The strength of the management education effect is even further emphasized by the fact that it does not correlate with any hierarchical level (e.g. middle or senior manager). In other words, irrespective of the hierarchical level a manager occupies in an organization, management training has a similar beneficial

effect, illustrating the cumulative effect of training as a form of education (Tharenou et al, 2007). These findings thus provide support for those scholars who call for greater incorporation of management experience during the learning process (Bailey & Ford, 1996; Bower, 2008; Elmuti, 2004; Gosling & Mintzberg, 2006; Jarzabkowski & Whittington, 2008).

However, it is important to recognize that our study did not test whether management training resulted in an increase in the use of specific tools taught during that training. Rather, we found that management training in general increased the use of strategy tools specifically, even where strategic management education remained constant. Hence, it appears that exposure to management training increases the general learning characteristics of participants, making them more prone to use their repertoire of educational tools. This finding may be explained by the belief that training is generally positive because it increases the knowledge of individuals (Raelin, 1997) and makes managers more prone to try new things (Baruch & Peiperl, 2000; Hay & Hodgkinson, 2008; Ishida, 1997; Simpson et al., 2005; Sturges et al., 2003). There may also be career effects in this result (Milton, 2008), as postgraduates and management training participants have often self-selected or been selected for management training as a career move (Baldwin & Ford, 1988). Interestingly, undergraduate education, supplemented by management training gave a similar level of tool use to postgraduate education with no management training, which further supports the notion that career effects may be influential in this finding, as undergraduates who engage in further management training are likely to be those on a career trajectory.

The results of this research have also demonstrated a relationship between the number of strategy tools used and the amount of formal strategic management education that participants have had. This result elaborates on suggestions that the content of management education shapes management cause maps and mental models (Priem & Rosenstein, 2000). The fact that education content does make a difference may also suggest that business schools and scholars need to think carefully about the consequences of what they are teaching in order to avoid damaging outcomes. Indeed, Donaldson (2002) and Ghoshal and Moran (1996) aver that some theories taught in business schools (e.g. agency theory, institutional theory, transaction cost theory) are the cause of some bad

management practices and behaviours. However, we must point out that specific management education had the least predictive effect on strategy tool adoption compared with broader characteristics of formal education and management training. Hence, specificity of educational content may not be as dominant in driving workplace practices as the fact of education itself.

This research also found that the amount of time elapsed since leaving education has no significant impact on the strategy tools practitioner use. This may suggest that a manager's core toolkit is a function of what is widely known and legitimate in a certain business context (Masrani et al., 2011; Mazza & Alvarez, 2000; H. Thomas & Wilson, 2011). However, there were significant differences regarding the tools that practitioners have heard of but do not use and the tools that they have never heard of. In the former case, practitioners who left education less than three years ago have a higher number of tools they have heard of but do not use compared with those who finished more than eight years ago. This indicates that education has some exposure effects, as those who left education recently have heard of more tools. This can also mean that those who finished education recently are not yet in a position than enables them to use all the tools they learned. Our study also found that those alumni who have left education more than eight years before have a higher number of tools that they have never heard of. This may indicate two things. First, as new tools are developed and introduced in management education courses, those who had their exposure longer ago are less up-to-date and thus have heard of fewer tools. This could also indicate memory effects, as this group may have forgotten some of tools they were exposed to, particularly if they did not use them (Hebb, 1949; Kolb, 1976).

Our findings also show that the effects of demographic characteristics do not interact with educational effects and thus both demographic and educational characteristics are important to explain tool adoption. Age was reported to be an important explanation to differences in work attitudes and behaviours (Rhodes, 1983) and technology adoption (Morris and Venkatesh, (2000). In line with these studies, our analysis showed significant differences in strategy tool use between managers within different age groups; alumni who are over 30 years old use more tools than younger ones. Nevertheless, these differences are partially explained by the fact that older managers are normally in higher

hierarchical positions (we found a moderate correlation between age and hierarchical position). In fact, senior managers were found to use significantly more tools than other managers.

These two findings suggest that tool use is also dependent on managers being in a position where they have the opportunity to use strategy tools (Ford, Quiñones, Sego, & Sorra, 1992; Quinones, 1995) and where these tools are useful to the performance of their work responsibilities. This idea is further supported by the fact that management function is a strong predictor of tool use. In particular, this research found that managers in positions more related to organizational strategy (e.g. "strategy function"; "management consultancy") are the ones who significantly use more tools.

Generally, the outcomes of this research make two important contributions. First, our findings help to address assessment of management education in the career readiness and preparation of undergraduate and postgraduate business students (Riggio et al., 2003). Examining whether graduates use the tools and concepts they learn during their education provides an important basis for this topic that can be drawn upon in future research. Second, our results inform the current relevance debate (Hodgkinson & Starkey, 2011; Lorsch, 2009) because they confirm a statistically significant association between management education and alumni's adoption of strategy tools in their workplace. Whether this is a beneficial impact is a double-edge sword. That is, if traditional business schools models are appropriate and provide valuable outcomes, then the impact of management education on tool adoption in the workplace can be seen as beneficial. However, if the critics of management education are correct, then this impact may contribute to bad management practices, a charge that has been levelled at business schools (Economist, 2008; S. Ghoshal, 2005; Sumantra Ghoshal & Moran, 1996; Whittington et al., 2003). Future research might examine the extent to which the adoption of specific strategic management tools is beneficial or not, and under which circumstances.

CONCLUSION

Our results indicate a strong impact of management education on the adoption of strategy tools by business school alumni. Three of the educational characteristics measured in this research (level of formal education, management training and strategic management training) demonstrated that management education has an effect on the number of tools that alumni use in their workplace.

Although these results do not enable us to conclude that management education is beneficial to management practice, they fuel the relevance debate by showing that what we teach is associated with what practitioners use in their workplace. The scope of these results is thus profound. They mean that instead of discussing if management education is transferred into management practice, we should be more concerned in ensuring that the effect is beneficial. The fact that education does matter increases the responsibilities of those who teach management education. While the findings of this research will not end the relevance debate, they add a reliable, robust and consistent body of empirical evidence on the impact of management education on individual alumni's propensity to use strategy tools.

By providing empirical evidence of use, this research opens several interesting avenues of research. Armed with the understanding that management education does have a significant impact on the tools managers use in their workplace, we now need to explore this finding further by comparing how different teaching approaches and the different ways business strategy is addressed in the classroom has an effect on patterns of use in the workplace. For example, is the impact of education the same for the traditional lecture approach when compared with a more active and participative case method approach? Similarly, do the advocated experience-based approaches to educating managers in the workplace (e.g. Gosling & Mintzberg, 2006; Jarzabkowski & Whittington, 2008; Mintzberg, 2004) lead to different patterns of use, or alter perceptions of usability? This latter point draws attention to another interesting research avenue regarding the concept of strategy tool use. We have purposefully conceptualised tool use broadly, however in future research there is much to be gained by identifying different types of use and understanding the impact of education in different patterns of use. For example, is the impact of education more noticeable on those individuals who use tools in a more formal way (e.g. in line with theory and textbook instructions) or in those who use tools informally (e.g. perform adaptations to the tool to make it fit their specific situational needs)? Furthermore, future studies may address what rationale managers provide for using tools, such as for career and status purposes arising from the ability to speak a common and potentially influential business language (Jarratt & Stiles, 2010; Legge et al, 2007).

While some researchers consider that management education has little impact on the development of softer skills (e.g. communication, cooperation, etc.), future studies may find that the ability to use tools has an impact by developing a common language for workplace communication and so developing a group of 'insiders' who speak the language and 'outsiders' who do not. Simply, by better understanding how education shapes managers' exposure to and use of tools in practice, we can shed more light on the impact of education on a range of workplace skills and behaviours. With such knowledge, we can better address what relevance means to managers and how this aligns with our own academic debates and concepts of business school relevance. In sum, this research opens a number of exciting avenues for future research, which will contribute to developing a stronger empirical and evidential basis with which to take the relevance debate forward.

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Appendix A

List of Strategy Tools Surveyed for Patterns of Use

Strategy tools	Currently Use	Have used but do not use now	Heard of but never used	Never heard of
Scenario Planning				
Dynamic Capabilities analysis				
Corporate Parenting Matrices				
SWOT				
Value Chain				
Porter's Five Forces				
Globalisation Matrices				
Strategic Groups Analysis				
Resource-Based Analysis				
Portfolio Matrices, e.g.: BCG or McKinsey				
Bowman's Strategy Clock				
Merger and Acquisition Matrices				
PESTLE Analysis				
Porter's Diamond				
Benchmarking				
Industry Life Cycle				
Porter's Generic Strategy Model				
Key Success Factors				
Balanced Scorecard				
Methods of Expansion Matrices				
Ansoff's Product/Market Matrix				
Core Competences analysis				

APPENDIX B

Multiple Comparisons Table - Tool use and Job Hierarchical Level

(I) Job Hierarchical Level	(J) Job Hierarchical Level	Mean Difference (I-J)	Std. Error	Sig.
Other:	Professional	-0.08	0.30	0.99
	Middle management:	-0.16	0.29	0.95
	Senior management:	-1.47*	0.28	0.00
Professional	Other:	0.08	0.30	0.99
	Middle management:	-0.08	0.23	0.99
	Senior management:	-1.39*	0.22	0.00
Middle management:	Other:	0.16	0.29	0.95
	Professional	0.08	0.23	0.99
	Senior management:	-1.31*	0.20	0.00
Senior management:	Other:	1.47*	0.28	0.00
	Professional	1.39*	0.22	0.00
	Middle management:	1.31*	0.20	0.00

APPENDIX C

Multiple Comparisons Table - Tool use and Job Sector

(I) Job Sector	(J) Job Sector	Mean Difference (I-J)	Std. Error	Sig.
public	private	-0.05	0.21	0.97
	NFP	0.55	0.22	0.03
private	public	0.05	0.21	0.97
	NFP	0.60	0.23	0.02
NFP	public	-0.55	0.22	0.03
	private	-0.60	0.23	0.02

*. Mean difference significant at the 0.05 level.

APPENDIX D
Multiple Comparisons Table - Tool use and Management Function

(I) Management Function	(J) Management Function	Mean Difference (I-J)	Std. Error	Sig.
Operations	Administration	-0.02	0.28	1.00
	Marketing/sales	-1.02	0.29	0.00
	General Management	-1.42	0.27	0.00
	Strategy	-1.99	0.28	0.00
	Consultancy	-2.45	0.28	0.00
Administration	Operations	0.02	0.28	1.00
	Marketing/sales	-1.00	0.29	0.01
	General Management	-1.40	0.27	0.00
	Strategy	-1.97	0.28	0.00
	Consultancy	-2.43	0.29	0.00
Marketing/sales	Operations	1.02	0.29	0.00
	Administration	1.00	0.29	0.01
	General Management	-0.40	0.28	0.71
	Strategy	-0.97	0.29	0.01
	Consultancy	-1.43	0.29	0.00
General Management	Operations	1.42	0.27	0.00
	Administration	1.40	0.27	0.00
	Marketing/sales	0.40	0.28	0.71
	Strategy	-0.57	0.27	0.28
	Consultancy	-1.03	0.28	0.00
Strategy	Operations	1.99	0.28	0.00
	Administration	1.97	0.28	0.00
	Marketing/sales	0.97	0.29	0.01
	General Management	0.57	0.27	0.28
	Consultancy	-0.46	0.28	0.59
Consultancy	Operations	2.45	0.28	0.00
	Administration	2.43	0.29	0.00
	Marketing/sales	1.43	0.29	0.00
	General Management	1.03	0.28	0.00
	Strategy	0.46	0.28	0.59

* Mean difference is significant at the 0.05 level.

TABLE 2

Impact of Level of Formal Business Education on Tool Use Variables

Dependent Variables (Tool Use Variables)	Formal Business Education	N	Descriptive: Mean (M)	Descriptive: Std. Deviation (SD)	Levene's Test for Equality of Variances: F	Levene's Test for Equality of Variances: Sig.	t-test for Equality of Means: t	t-test for Equality of Means: Sig. (2-tailed)
Tools 'use'	UG	246	3.95	3.76	0.93	0.36	-7.00	0.00
	PG	1009	5.83	3.78				
Tools that you 'have used but do not use now'.	UG	246	2.07	2.66	2.57	0.11	-2.84	0.01
	PG	1015	2.64	2.84				
Tools that you 'have heard of but don't use':	UG	246	6.70	4.58	6.16	0.01	3.21	0.00
	PG	1015	5.67	4.22				
Tools 'have never Heard of'	UG	246	7.09	4.70	12.66	0.00	6.28	0.00
	PG	1015	5.07	3.82				

TABLE 3

Impact of Exposure to Management Training on Tool Use Variables

Dependent Variables (Tool Use Variables)	Exposure to Management Training	N	Descriptive: Mean (M)	Descriptive: Std. Deviation (SD)	Levene's Test for Equality of Variances: F	Levene's Test for Equality of Variances: Sig.	t-test for Equality of Means: t	t-test for Equality of Means: Sig. (2-tailed)
Tools 'use'	Yes	858	6.10	3.85	2.05	0.15	7.95	0.00
	No	540	4.45	3.62				
Tools that you 'have used but do not use now'.	Yes	858	2.62	2.81	0.05	0.82	1.14	0.26
	No	540	2.44	2.94				
Tools that you 'have heard of but don't use':	Yes	858	5.42	4.11	6.31	0.01	-4.35	0.00
	No	540	6.45	4.48				
Tools 'have never Heard of'	Yes	858	5.27	3.99	3.96	0.05	-2.66	0.01
	No	540	5.87	4.21				

TABLE 4

Impact of Frequency of Management Training on Tool Use Variables

Dependent Variables (Tool Use Variables)	Frequency of Management Training	N	Descriptive: Mean (M)	Descriptive: Std. Deviation (SD)	Levene's Test for Equality of Variances: F	Levene's Test for Equality of Variances: Sig.	t-test for Equality of Means: t	t-test for Equality of Means: Sig. (2-tailed)

Tools 'use'	Infrequent	365	5.41	3.63	0.65	0.42	-3.96	0.00
	Frequent	524	6.44	3.93				
Tools that you 'have used but do not use now'.	Infrequent	365	2.55	2.94	1.83	0.17	-0.70	0.48
	Frequent	527	2.68	2.76				
Tools that you 'have heard of but don't use':	Infrequent	365	5.79	4.20	0.10	0.75	1.91	0.06
	Frequent	527	5.26	4.04				
Tools 'have never Heard of'	Infrequent	365	5.77	3.98	0.31	0.58	2.90	0.00
	Frequent	527	4.99	3.91				

TABLE 5
Correlation between Strategic Management Education and the Four Tool Use Variables (*N*=1407)

	Pearson Correlation	Sig. (2-tailed)
Tools 'use'	0.**14****	0.00
Tools that you "have used but do not use now".	0.**13****	0.00
Tools that you "have heard of but don't use":	-0.08**	0.00
Tools "have never Heard of"	-0.15**	0.00

** Correlation is significant at the 0.01 level (2-tailed).

TABLE 6

Correlations between Time Elapsed Since Leaving Education and the Tool Use Variables

	N	Pearson Correlation	Sig. (2-tailed)
Tools 'use'	1202	0.02	0.54
Tools that you "have used but do not use now".	1208	0.01	0.63
Tools that you "have heard of but don't use":	1208	-0.22**	0.00
Tools "have never Heard of"	1208	0.19**	0.00

** Correlation is significant at the 0.01 level (2-tailed).

TABLE 7

Comparison between the Means of Time Elapsed Since Leaving Education (ANOVA)

Outcome Variables (Tool Use Variables)	Time Since Left Education	N	Mean	Std. Deviation	F	Sig.
Tools 'use'	finish time <=3	422	5.26	3.90	1.22	0.30
	3<finish time<=8	401	5.67	4.02		
	finish time>8	379	5.53	3.63		
Tools that you 'have used but do not use no'	finish time <=3	426	2.37	2.92	1.02	0.36
	3<finish time<=8	401	2.61	2.80		
	finish time>8	381	2.60	2.61		
Tools that you 'have heard of but don't use'	finish time <=3	426	6.85	4.47	29.65	0.00
	3<finish time<=8	401	5.96	4.19		
	finish time>8	381	4.60	3.77		
Tools 'have never heard of'	finish time <=3	426	4.92	3.82	17.10	0.00
	3<finish time<=8	401	5.16	3.79		
	finish time>8	381	6.48	4.49		

TABLE 8

Demographic Variables –

Comparison between the Means of Number of Tool 'Use' (ANOVA)

Demographic variable		Mean	F	Sig.	R Squared	Eta Squared
Age	<30	4.31	18.84	0.00	0.03	0.03
	31-40	5.57				
	>40	6.06				
Job Hierarchy	Senior man.	6.14	21.6	0.00	0.02	0.03
	Middle man	4.83				
	Professional	4.76				
	Other	4.68				
Job Sector	Public	5.39	4.21	0.02	0.01	0.01

	Private	5.43				
	NFP	4.83				
Management Function	Operations	4.14	25.52	0.00	0.06	0.06
	Administration	4.16				
	Marketing/sales	5.16				
	General Management	5.56				
	Strategy	6.13				
	Consultancy	6.59				

TABLE 9
Estimation Results

Explanatory variables	Unstandardized coefficients		Standardized coefficients		
	B	Std. Error	beta	*t*-stat	*p*-value
Constant	0.89	0.54		1.67	**0.10**
Education variables					
Formal business Education (UG/PG)	**1.06**	0.29	0.11	3.62	**0.00**
Frequent Management Training (DV)	**2.03**	0.25	0.25	8.15	**0.00**
Infrequent Management Training (DV)	**1.03**	0.27	0.12	3.80	**0.00**
Strategic Management education	**0.48**	0.18	0.08	2.75	**0.01**
Demographic characteristics					
Strategy Job Function (DV)	**2.11**	0.37	0.21	5.77	**0.00**
Consultancy Job Function (DV)	**2.07**	0.38	0.20	5.45	**0.00**
Marketing/Sales Job Function (DV)	**0.86**	0.38	0.08	2.24	**0.03**
General management Job Function (DV)	**0.82**	0.37	0.08	2.21	**0.03**
More than 40 years of age (DV)	**0.86**	0.37	0.11	2.35	**0.02**
Private Job Sector (DV)	**0.83**	0.27	0.10	3.05	**0.00**
Public Job Sector (DV)	**0.57**	0.27	0.07	2.12	**0.03**

Notes: DV indicates a dummy variable taking only discrete values of either 0 or 1. The constant term is significant only at 10% level.

TABLE 10
Model Summary

Explanatory variables	R	R Square	Change Statistics: R Square Change	Change Statistics: F Change	Change Statistics: Sig. F Change
1 (Formal Education UG/PG)	0.19	0.04	0.04	45.02	0.00
2 (Management Training)	0.30	0.09	0.05	34.60	0.00
3 (Strategic Management Education)	0.31	0.10	0.01	8.85	0.00
4 (Job Function)	0.39	0.15	0.05	13.39	0.00
5 (Age)	0.40	0.16	0.01	6.20	0.00
6 (Job Hierarchical Level)	0.41	0.17	0.01	5.15	0.00
7 (Job Sector)	0.42	0.18	0.01	4.78	0.01

Note: Dependent variable is number of tools used (tool "use"). Variables are added cumulatively.

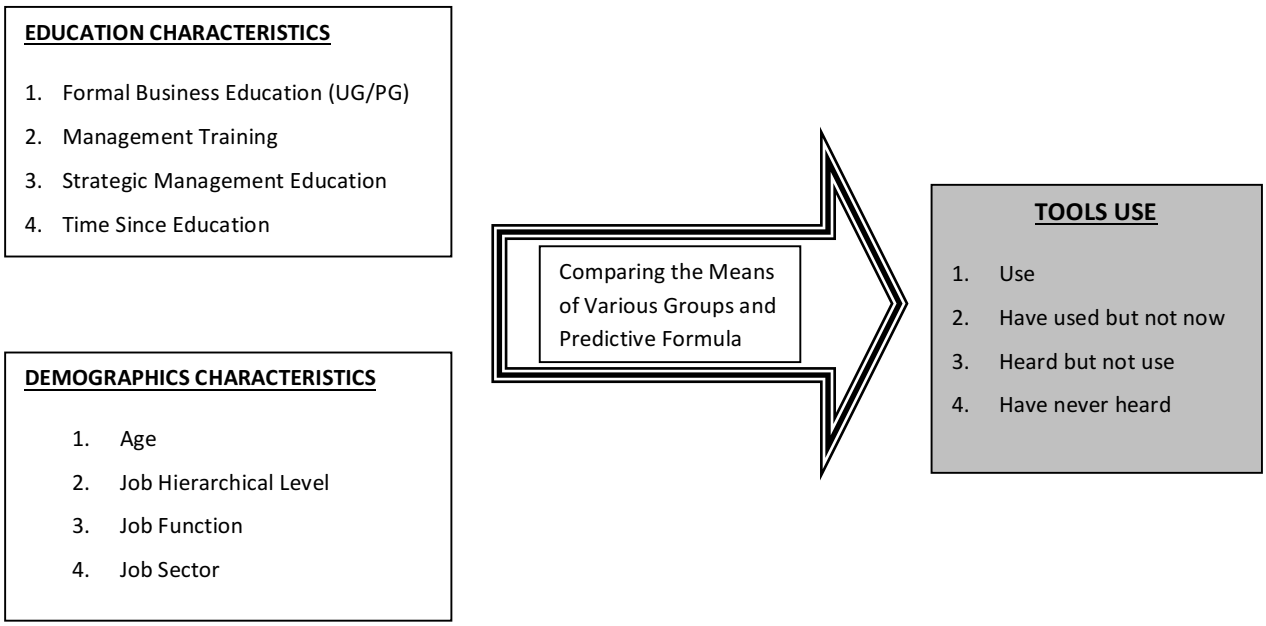
TABLE 11

Prediction of Mean Number of Tools Used

LEVEL OF BUSINESS EDUCATION, DEMOGRAPHIC AND JOB CHARACTERISTICS	PREDCTED AVERAGE TOOL USE
UG with no other business education, less than 40 and working in the NFP sector	0.89
UG with no other business education, less than 40 and working in the public sector	1.46
UG with no other business education, less than 40 and working in the private sector	1.72
PG with infrequent management training, less than 40 and working in the private sector	2.76
PG with frequent management training, less than 40 and working in the private sector	3.75
PG with infrequent management training, more than 40 and working in the private sector with strategy function	4.89
PG with frequent management training, more than 40 and working in the private sector with strategy function	5.88

FIGURE 1

Impact of Educational and Demographic Characteristics on Patterns of Adoption



Biographical Note

Paula Jarzabkowski is a Professor of Strategic Management at Aston University and also currently holds an EU 7th Framework Marie Curie International Outgoing Fellowship at Cornell University. Paula's research focuses on strategy-as-practice in complex and pluralistic contexts, such as regulated infrastructure firms, third sector organizations and financial services, particularly insurance and reinsurance. She is particularly interested in ethnographic methods and has conducted extensive, internationally comparative audio and video ethnographic studies in a range of business contexts. Her second strand of research focuses on the relevance of management studies and she has edited a special issue *of Organization Studies* on this topic. Her work has appeared in a number of leading journals including *Academy of Management Journal* and *Organization Science* and in 2005, she published the first book on strategy-as-practice, Strategy as Practice: An Activity-Based Approach (Sage).

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