

HUMAN RESOURCE MANAGEMENT PROBLEMS OVER THE LIFE CYCLE OF SMALL TO MEDIUM-SIZED FIRMS

Matthew W. Rutherford, Paul F. Buller, and Patrick R. McMullen

This study uses a sample of 2,903 small to medium-sized firms to examine the manner in which HR problems vary over the organizational life cycle. We found that a four-stage model was appropriate. Interestingly, firm age did not emerge as a significant indicator of stage—the firms' HR problems varied across stages defined by growth. Training problems were highest in high-growth firms and lowest in low-growth firms; compensation problems were highest in moderate-growth firms and lowest in high-growth firms; and recruiting problems were highest in no-growth firms and lowest in low-growth firms. © 2004 Wiley Periodicals, Inc.

Introduction

It is widely held that new ventures experience different kinds of problems as they grow and mature. This so-called *life cycle* or *stage model* of organizational growth has received considerable empirical support (Dodge & Robbins, 1992; Hanks & Chandler, 1994; Kazanjian, 1988; Kazanjian & Drazin, 1989). Most previous studies of the life-cycle model have identified or examined different types of problems based on the size, age, and/or growth rate of the firm. Examples of these problems include the following: strategic positioning, sales/marketing, product development, production, accounting/financial management, external relations, people/human resource management, organization, general

management, and regulation. It is the general “people” or “human resource” (HR) problems facing firms in various stages that we intend to examine. However, the specific types of people problems or issues are not well defined or well documented in previous research. This article adds to the literature by examining *specific* HR problems across the life cycle of small and medium-sized enterprises (SMEs).

Another important feature of this work is based on the fact that we address a primary weakness of other life-cycle studies. Researchers often decide upon a number of stages and then “force” firms into a predetermined stage. The problem with this is that there has been no agreement upon the correct number of stages in a life-cycle

Correspondence to: Matthew W. Rutherford, The Hogan Entrepreneurial Leadership Program, Gonzaga University, Spokane, WA 99258, 509-323-3406, rutherford@jepson.gonzaga.edu

There is no clear evidence regarding the number of stages a firm experiences...

model—models range anywhere from three to ten stages depending upon the study (Stubbart & Smalley, 1999). We will overcome this problem by using a novel, powerful exploratory classification analysis called a self-organizing map (SOM). Similar to a cluster analysis, the SOM approach will group cases together based on their similarity to one another. However, when compared to cluster analysis, the SOM provides a more rigorous grouping procedure through “learning” iterations and does not bias the data by assuming a certain number of groups (Jain, Mao, & Mohiuddin, 1996).

First we will examine what we know about the SME organizational life cycle. We will then investigate the limited research addressing the intersection of life-cycle and human resource problems. This will lead to specific propositions, which we will test using the SOM and multivariate analysis of variance. Finally, we will report results and provide a discussion for these results.

The SME Organizational Life Cycle

Theory and research on the organizational life cycle (OLC) and stages of development indicates that firms progress through various stages over time. Life-cycle models typically reflect a sequential progression through stages such as birth or start-up, growth, maturity, and even decline. There is no clear evidence regarding the number of stages a firm experiences—scholars have submitted models varying between three and ten stages (Churchill & Lewis, 1983; Dodge & Robbins, 1992; Greiner, 1972; Kazanjian, 1988; Kazanjian & Drazin, 1989; Kimberly & Miles, 1980; Miller & Friesen, 1984; Quinn & Cameron, 1983; Scott, 1971). The controversy regarding the proper number of stages is made apparent by examining the overview of OLC studies presented in Table I.

There are, however, at least two observable themes across models. The most common theme is that, regardless of number, each stage is determined by the contextual factors of age of firm, growth rate, and size. The other common theme is that many of these models or studies suggest that there

are unique problems (content factors) associated with various stages.

For example, Kazanjian’s (1988) study based on four life-cycle stages in technology new ventures—conception and development, commercialization, growth, and stability—found differences in the types of dominant problems across these stages. Six general sets of problems were identified using a questionnaire methodology: strategic positioning, sales/marketing, people, organizational systems, production, and external relations. Some problems (e.g., strategic positioning and sales/marketing) were found to be dominant across all stages, while other problems (e.g., external relations and organization) were more important in some stages and less so in others. People problems appeared to be moderately important across all stages.

Using a different research method (open-ended classification rather than forced-choice), Terpstra and Olson (1993) identified ten different types of problems—obtaining external financing, internal financial management, sales/marketing, product development, production, general management, human resource management, economic environment, and regulatory environment—over two stages (start-up and growth). Consistent with Kazanjian (1988), some problems (e.g., sales/marketing and internal financial management) were dominant in both stages. Other problems (e.g., obtaining external funding and human resource management) were more important in some stages than others. Huang and Brown (1999) conducted a follow-up to the Terpstra and Olson (1993) study using a sample of 973 small Australian firms. Their results generally supported the classification framework put forth by Terpstra and Olson (1993).

Life-Cycle and Human Resource Management Problems

Several studies have examined human resource management (HRM) problems or activities related to the organizational life cycle. While the distinction between HRM problems and activities is not always clear in the literature, we define *HRM problems* as people-related issues or concerns per-

TABLE I Table I Summary of OLC Works

<i>Author</i>	<i>Year</i>	<i>No. of Stages</i>	<i>Empirical?</i>	<i>Method</i>	<i>SME Focus?</i>
Adizes	1999	10	No		No
Dodge et al.	1994	2	Yes	Chi-square	Yes
Gupta and Chin	1994	3	No	Cluster analysis	No
Hanks and Chandler	1994	4	Yes	Chi-square	Yes
Gupta and Chin	1993	3	Yes	Factor analysis, Cluster analysis	Yes
Hanks et al.	1993	5	Yes	Cluster, ANOVA	Yes
Dodge and Robbins	1992	4	Yes	Chi-square	Yes
Drazin and Kazanjian	1990	4	Yes	Del procedure	No
Kazanjian and Drazin	1989	4	Yes	Del procedure	Yes
Adizes	1988	10	No	No	
Kazanjian	1988	4	Yes	1) Case study 2) MANOVA, Factor analysis, and ANOVA	Yes
Scott and Bruce	1987	5	No		Yes
Flamholtz	1986	7	No		Yes
Smith, Mitchell, and Summer	1985	3	Yes	1) Field study, Cluster analysis, MANOVA 2) Simulation data, MANOVA, and ANOVA	No
Miller and Friesen	1984	5	Yes	Case study (histories) and ANOVA	No
Miller and Friesen	1983	5	Yes	Case study (histories) and ANOVA	No
Churchill and Lewis	1983	5	No		Yes
Quinn and Cameron	1983	4	No		No
Galbraith	1982	5	No		Yes
Cameron and Whetten	1981	4	Yes	Simulation, ANOVA	No
Adizes	1979	6	No		No
Kimberly	1979	4	No		No
Katz and Kahn	1978	3	No		No
Lyden	1975	4	No		No
Torbert	1974	8	No		No
Greiner	1972	5	No		No
Scott	1971	3	No		No
Steinmetz	1969	4	No		Yes
Downs	1967	3	No		No
Lippett and Schmidt	1967	3	No		No

ceived by a manager or managers in the firm. *HRM activities* are specific human resource management practices used by the firm. Our assumption is that HRM activities are formal practices that are put in place to deal with HRM problems. Thus, HRM problems generally precede the development of HRM activities. The present study focuses on specific HRM problems as defined by managers of SMEs.

Even though Hess (1987) showed that small-business owners rank human resource management as the second most important management activity next to general management or organizational work, not much has been written regarding the specific HRM problems or the role of HRM activities in SMEs. Yet the large-firm literature increasingly has focused attention on the critical role of HRM practices to a firm's success.

... human resource management and human resource activities are strategically important to creating and sustaining competitive advantage.

Barney (1991, 1995) and others (Boxall, 1996; Pfeffer, 1994; Senge, 1990) have argued that certain firm-specific intangible sources of advantage (such as organizational history, culture, learning, and other human dimensions of organizations) can be particularly important to sustaining competitive advantage precisely because they are valuable, rare, and extremely difficult to imitate. Accordingly, human resource management and human resource activities are strategically important to creating and sustaining competitive advantage. Further, we assume that this proposition should hold for firms of all sizes and for all stages of development.

A related perspective on the relationship of human resource management to firm performance is offered by Dess and Lumpkin (2003). They use the term *human capital* to define the “individual capabilities, knowledge, skills, and experience of the company’s employees and managers” (Dess & Lumpkin, 2003, p. 118). Similar to the resource-based view, human capital is a resource that is potentially valuable, rare, and inimitable. Dess and Lumpkin (2003) further argue that to be successful, organizations must continually enhance their human capital through three primary sets of HRM activities or practices: *hiring/selection* (including recruitment and selection), *development* (including training, employee involvement, and performance appraisal), and *retention* (including compensation and a stimulating work environment). Again, though not explicitly stated, we assume that these HRM activities apply to firms of all sizes and stages of development, including SMEs. In this study, we use an augmented version of the Dess and Lumpkin (2003) typology to investigate HR problems.

The preceding discussion suggests that human resource management is important to the success of SMEs. There is no well-developed theory to describe the role that HRM plays (or should play) in various stages over the life of the firm. Based on interview data with 20 HR professionals, Baird and Meshoulam (1988) have made the theoretical argument that HRM practices are related to the firm’s stage of development. Their model suggests that HRM practices should fit the business needs and that the business

needs differ depending on whether the firm is in a start-up, fast-growth, controlled-growth, or mature stage. For example, they hypothesize that in a start-up phase HRM activities are loose and informal and most likely performed by the owner/founder. In this first phase, the owner/founder is focused on a narrow range of HR issues related to hiring and firing. As the firm experiences high growth, the demand for new employees increases; this demand exceeds the owner/founder’s capacity to manage effectively. The organization typically responds to these problems by adding a more formal structure and functional specialists, including HRM managers. Further, Baird and Meshoulam (1988) argue that the primary HRM tasks in the high-growth stage shift from attracting and hiring the right kinds of people to developing these people, managing the paperwork associated with employment, and compensation and benefits. While employee training is beginning to become an issue in the high-growth stage, evaluation, labor relations, and affirmative action activities are not viewed as critical to the business at this early stage. As the organization matures, employee performance appraisal, labor relations, and EEO/affirmative action issues become more important. Also, in the mature stage, top management prescribes a broader role for the HR function and HRM activities are more integrated with one another and with the business needs.

As noted above, a number of previous studies have found that people- or human resource-related problems or activities are associated with the life cycle of the firm. For example, Kazanjian (1988) and Terpstra and Olson (1993) classified “people” or “human resource management” as problems. Further, they found that the importance of these general HRM-related problems varied across stages. Similarly, Dodge and Robbins (1992) found that “organizational design and personnel” problems differed by stage. Huang and Brown (1999) analyzed problems across firm size and found that very small firms (0–4 employees) were less likely to have HR problems than medium-sized firms (5–19 employees) and larger firms (20+ employees). Dodge, Fullerton, and Robbins (1994) found that “human resource” problems were

identified as a moderate concern but did not vary across stages. In a related study, Hanks and Chandler (1994) examined patterns of specialization in various functions over life-cycle stages based on the assumption that such specialization is an organizational response to specific dominant problems. This study, focusing on technology firms, found that specialization of specific organizational functions varied across stages. In particular, specialization of the personnel (HR) function was associated with the maturity stage. This stage was characterized by firms that were 16 years old, had 495 employees, \$45 million in sales, and sales growth of 37%. Finally, in a rare study of family business and HR issues, McCann, Leon-Guerrero, and Hailey Jr. (2001) examined 231 family firms in the state of Washington. They found that growth firms ranked general HR issues significantly higher on a scale of importance than firms that were not growing.

While *general* people/HRM problems have been identified in previous research on the organizational life cycle, few studies have focused on specific SME HRM problems. Consequently, we know very little about the specific kinds of HRM problems associated with various stages. Hornsby and Kuratko (1990) conducted a benchmark study of the important HRM problems in a sample of small businesses. The sample was divided into three groups based on firm size (i.e., number of employees) based on the assumptions that the kinds of issues facing firms and their sophistication in dealing with these issues will vary as the firms grow in size. The three size categories ranged from 1–50 employees (small), 51–100 employees (medium), and 101–150 employees (large). Five specific HRM areas were examined: job analysis/job description, recruiting/selection, compensation/benefits, training, and performance appraisal. Using a survey methodology, respondents were asked to indicate the kinds of HRM practices they currently used and also rate the importance of several HRM problems to be dealt with over the next ten years. The results showed that the size of the firm was related to the sophistication of some HRM practices. For example, small businesses increasingly use

the questionnaire approach to job analysis, application blanks and drug tests in the selection process, and more sophisticated benefits packages and performance appraisal processes as they increase in size. However, the three categories of companies did not vary significantly with respect to the perceived importance of future HRM issues (problems) and trends.

The Hornsby and Kuratko (1990) study is important because it is one of the few that has examined specific HRM problems and practices in terms of the life cycle. Firms of different sizes do apparently have different HRM problems and practices. However, the measures-of-size categories used in the study are problematic because they appear to be arbitrarily assigned. All firms in the sample had less than 150 employees and, by definition, are small businesses. It is important to examine differences in HRM issues in firms over a greater range of employee size. Further, neither growth nor age was considered in this study. It is reasonable to assume that a 50-employee firm that is two years old and growing at 20% sales growth would face different HRM problems from those faced by a firm of 50 employees that is 95 years old and stagnant.

With respect to the latter issue, Buller and Napier (1993) examined the nature and integration of strategy and HRM practices and their effects on firm performance in two groups of mid-sized firms: fast-growth firms and a random sample of similarly sized mature firms. Size in this study was defined in terms of annual sales, not employees. All firms in both samples ranged in size from \$5 million–\$150 million in annual sales. Six kinds of HRM practices were examined: human resource planning, recruitment/selection, compensation/benefits, training/development, labor relations, and EEO/affirmative action. The two groups were compared in terms of the HRM activities deemed to have the most strategic importance to the firm. The random-sample firms placed a higher strategic importance on HRM activities based on a composite measure including all six HRM areas. The random-sample firms placed significantly more importance on the specific areas of human resource planning, labor relations, and EEO/affirmative action.

... a 50-employee firm that is two years old and growing at 20% sales growth would face different HRM problems from those faced by a firm of 50 employees that is 95 years old and stagnant.

... problems facing organizations differ across stages of development.

In addition, the random-sample firms were found to have higher strategy-HRM integration than the fast-growth firms. There was no conclusive evidence regarding the relation of HRM activities and/or strategy-HRM integration to firm performance. However, there was some evidence that the level of strategy-HRM integration was related to firm size (i.e., annual sales), firm age, and the number of years the firm had been engaged in strategic planning. These findings lend some support to the life-cycle model; similarly sized mature firms emphasized different specific HRM practices than fast-growth firms.

Research Propositions

In summary, previous research shows considerable support for the life-cycle model of organizations and that problems facing organizations differ across stages of development. While there is some indication that HRM is one set of general problems that occur in the various stages of the life cycle, there is little definitive examination of how the specific HRM problems or activities differ across stages. The present study contributes to our understanding of specific HRM problems associated with the life cycle in a sample of family firms.

Based on the work by Dess and Lumpkin (2003), we group HR problems into three categories: hiring, development, and retention. We have selected the most simplistic life-cycle model—the three-stage model—for the purposes of making propositions. This point is noteworthy because, until we run our SOM, we will not know how many stages (if any) are present in our sample. Therefore, we first propose:

Proposition 1: Firms will organize in an organizational life-cycle model.

Next we look at our specific HRM problems and their place in the OLC. As stated, there is a dearth of literature looking at this relationship. However, the work of Baird and Meshoulam (1988), combined with the recent literature on legitimacy, leads us to believe that hiring problems will be most pronounced in

the birth stage of the life cycle. Williamson (2000) proposes that small, young, and slowly growing firms will have trouble finding and selecting adequate human resources because prospective employees do not view the firm as viable or “legitimate.” This leads to our first subproposition:

Proposition 2a: Hiring problems will be most prevalent in the birth stage of the organizational life cycle.

After overcoming the liabilities associated with age and size to attract a base level of human resources, we propose that the SME owner/manager will primarily encounter challenges associated with developing that employee base. This proposition, too, is based on the work of Baird and Meshoulam (1988), but also on the idea of managerial capacity. In this context, managerial capacity essentially asserts that a firm’s growth is limited by the ability of managers to handle the communication problems that are associated with training a growing number of employees (Barringer, Jones, & Lewis, 1998). Thus, our second subproposition is:

Proposition 2b: Development problems will be most prevalent in the growth stage of the organizational life cycle.

The fact that the organization has reached the maturity stage implies that it has overcome the liabilities of smallness and newness and has developed its managerial acumen to adequately address development problems. Following our line of reasoning, we believe that once employees are attracted and developed, the concern moves to retaining those employees. This situation is compounded by the tendency of “growth” employees to become bored with the less dynamic environment of the larger, older, and more slowly growing firms (Muse, Rutherford, Oswald, & Raymond, in press). This leads to our third subproposition:

Proposition 2c: Retention problems will be most prevalent in the maturity stage of the organizational life cycle.

Method

Data

The data for this study were taken from the 1997 Arthur Andersen/Mass Mutual American Family Business Survey. The survey is a comprehensive survey that analyzes family business on a host of issues. The survey polled a broad cross-section of family businesses representing 12 industries (agriculture, construction, financial services, biotech, manufacturing, mining, real estate, retail, services, telecommunications, transportation, and wholesale) throughout the country. The questionnaire was mailed to more than 37,000 family businesses and 3,033 were returned for a response rate of 8.2 %. For the purposes of this survey, family businesses were defined as businesses with at least two officers or directors having the same last name. Following the definition put forth by the Small Business Administration, we excluded firms larger than 500 employees, leaving a final sample size of 2,903 firms.

Contextual Measures

The contextual variables used here are the same as those used in nearly every OLC study (Dodge et al., 1994; Kazanjian & Drazin, 1988; Smith, Mitchell, & Summer, 1985). These variables are essentially those that speak to the interrelated conditions in which the OLC exists, and are implicit in the OLC.

Age. This is the number of years since the company was founded.

Size. This is the number of full-time employees employed by the organization.

Growth. This is the level of sales growth achieved in the past year.

Following the advice of Hoy, McDougall, and Dsouza (1992), we utilized a historical measure of growth rather than a perception of future growth. This provides the benefit of objectivity, as it is easier to measure past financial results than future opinions of growth. Furthermore, past growth has been shown to be highly correlated with future

growth and perceptions of future growth (McMahon, 2001). This categorical variable is coded as follows:

- 1 = decreased more than 5%
- 2 = decreased 1%–5%
- 3 = no change
- 4 = increased 1%–5%
- 5 = increased 6%–10%
- 6 = increased 11%–15%
- 7 = 16% or more

Content Measures

Another set of variables, which are situational in nature, is also commonly used to define stage. In the literature, these have been termed organizational problems, managerial concerns, crises, and important issues (Adizes, 1979; Kazanjian, 1988; Smith et al., 1985). This set of variables (called organizational HR problems here) has received increased attention in the OLC literature especially when SMEs are considered (Dodge & Robbins, 1992; Dodge et al., 1994; Terpstra & Olson, 1993). Here the content portion of the OLC is made up of three areas of HR problems. OLC researchers (Greiner, 1972; Kazanjian, 1988; Kazanjian & Drazin, 1990; McMahon, 2001) generally hold that it is the owner/manager's ability to solve a set of problems brought on by past levels of growth that allows the firm to survive and grow. As a result, we are interested in knowing how owners or managers feel now regarding the problems that they need to solve to move toward continued survival and/or growth. The following question was asked: What are the most significant challenges to the future growth and survival of your business?

Hiring Problems. We operationalize this as recruiting. This is a categorical variable ranked on a scale of 1 to 5, with 1 representing that recruiting problems are the most significant challenge and 5 representing a minor challenge.

Retention Problems. We operationalize this as compensation. This is a categorical variable ranked on a scale of 1 to 5, with 1 rep-

... it is the owner/manager's ability to solve a set of problems brought on by past levels of growth that allows the firm to survive and grow.

representing that compensation is the most significant challenge and 5 representing a minor challenge.

Development Problems. We operationalize this as training. This is a categorical variable ranked on a scale of 1 to 5, with 1 representing that training problems are the most significant challenge and 5 representing a minor challenge.

Dependent Measure

Life-Cycle Stage. For the multivariate analysis of variance (MANOVA), this is a categorical variable—ranging from 1 to 4—derived from the SOM.

Analysis

Because the OLC has critics who cast doubt on its existence (Stubbart & Smalley, 1999; Tichey, 1980), and because the contextual characteristics (age, size, and growth rate) have not been sufficiently substantiated in the literature, we use an exploratory technique to develop an “appropriate” life-cycle model. Dodge et al. (1994) note that a significant drawback of many empirical OLC studies is the possible misclassification of firms by forcing them into predetermined groups. To counter this, we use Kohonen’s (1990) self-organizing map (SOM) to address these issues and identify the appropriate life-cycle model before testing differences for significance. The SOM is similar, but analytically superior to, a traditional cluster analysis when classifying large amounts of data (Mangiameli, Chen, & West, 1996).¹ While the SOM is a relatively recent development, it is particularly useful for analyzing the OLC (Rutherford, McMullen, & Oswald, 2001). Rather than force the firms into ill-defined stages, we allow the data to organize naturally into stages that more accurately depict the data under study.

Analysis and SOM Description

A SOM is a special type of artificial neural network (ANN). An ANN emulates neural activity of an intelligent organism to perform functions that are not necessarily objective

in nature—they can be complex, subjective functions (Jain et al., 1996).

The SOM, proposed by Kohonen (1990), is a topologically organized neural network (TONN). TONNs are based on biological neurons in the manner that they recognize complex patterns. A common example is the human brain’s ability to recognize a person’s face in a very short time period. The brain takes in a large number of inputs about a person (e.g., nose, lips, complexion) through the senses and organizes them to recognize the person. The SOM takes inputs in the form of data and organizes the data into a group, or groups, based on common characteristics. The same way the brain will recognize a person more efficiently each time that person is encountered, the SOM goes through iterations and recognizes data as belonging to some group more efficiently with each iteration. Eventually the brain will perfectly identify a person at each encounter and, similarly, the SOM will reach a point where all inputs are “correctly” classified at each iteration.

The SOM uses unsupervised learning to accomplish its goal of classification. In the context here, unsupervised learning refers to a procedure where there is no prior knowledge of how the data should be classified. It is intended, then, to use this unsupervised learning for classification so that there are no classification biases of any type (Kohonen, 1990; Mehrotra, Mohan, & Ranka, 1997). This is contrasted with supervised learning where a neural network is trained to recognize the input as belonging to the correct group. This type of analysis—called *backpropagation*—is not suited for the type of data classification used in this study (Mangiameli et al., 1996).

SOMs are frequently discussed in relation to other statistical clustering techniques (i.e., cluster analysis) used in statistical analysis; however, there are several keys that separate the SOM from other clustering techniques. Mangiameli et al. (1996) conducted a study comparing Kohonen’s SOM with hierarchical cluster techniques, and showed that SOMs have “superior accuracy and robustness” when classifying large amounts of data. Specifically, cluster analysis has two primary weaknesses that stem from the lack of an efficient optimal solution methodology:

TONNs are based on biological neurons in the manner that they recognize complex patterns.

1. The inability to identify the number of clusters present in the data in an a priori manner, and
2. The manner in which in observations are assigned to mutually exclusive clusters.

Kohonen (1990) developed an efficient methodology to overcome these problems (this is described in detail below). Essentially, because of the iterative process used in self-learning, the a priori identification becomes a nonissue because the researcher can set the number of initial clusters very high. Upon execution of the SOM procedure, however, fewer groups may be formed if the database does not exhibit enough “separation” to justify the specified number of groups.

The SOM procedure solves the second problem by allowing observations in the SOM to “switch” groups from iteration to iteration as the neural network “learns.”

The data were first standardized for all k attributes so that scaling differences do not bias classification. Standardization, of course, is done prior to SOM classification so that each of the k attributes has a mean of zero and a standard deviation of unity.

The data were then introduced to the SOM. As stated, an unsupervised learning algorithm is employed here to classify the data into j groups, when the database uses k variables for classification. The self-organizing map classification procedure works as follows:

A $j \times k$ matrix of weights is generated ($w_{(j \times k)}$)—each value in the matrix is a uniformly distributed random number on the interval $[0,1]$. Also, an iteration counter, t , is initialized to zero. The database is converted to $i \times k$ matrix form with the identification of $x_{(i \times k)}$. For the i th record in the database, the dissimilarity, or squared distance between itself and the j th weight, is determined:

$$d_{i,j} = \sum_{h=1}^k (x_{ih} - w_{jh})^2, \text{ for each of the } j \text{ groups.} \tag{1}$$

This distance calculation is made for all j groups. The group having the smallest distance from the i th record is deemed the “winner,” and has its weight values adjusted

so that these values are “closer” to the i th record. This weight adjustment is done according to the following:

$$w_{\text{winner},h}(t) = w_{\text{winner},h}(t - 1) + \eta (x_{i,h} - w_{\text{winner},h}), \text{ where } 0 < \eta < 1. \tag{2}$$

The value η is referred to as the learning rate, and controls the rate at which the newly adjusted weights converge to the values of $x_{i,h}$.

After this adjustment is complete, the next record in the database is processed in the same way. Once all records have been processed in this way, the learning rate is adjusted according to the following relationship:

$$\eta = \eta \times \text{Adjustment Rate, where } 0 < \text{Adjustment Rate} < 1. \tag{3}$$

After the SOM indicates an adequate grouping, we then test our proposition by examining the differences between life cycle stages using MANOVA.

Results

The descriptive statistics and correlations for all variables are presented in Table II. The SOM indicated that the firms in this sample do not follow a traditional OLC with respect to HR problems, because the age variable was not significant. An examination of Table III shows that the size and growth variables do define stage. As a result, our first proposition—that HR problems will vary over the OLC—is only partially supported, because a traditional life cycle was not evident.

Because our initial proposition was not upheld, our following hypotheses are likewise not supported by the data. Without the significance of the context variable age, we cannot discuss stage in the traditional OLC manner. The HR problems did, however, vary significantly over growth and size. Table III shows means, standard errors, and MANOVA statistics for the four-group solution. The MANOVA analysis shows that the SOM grouping approach was effective in finding differences between groups, and has a significant multivariate effect on the five variables

... our first proposition—that HR problems will vary over the OLC—is only partially supported, because a traditional life cycle was not evident.

TABLE II Descriptive Statistics and Correlations

	N	Mean	Std. Error	1	2	3	4	5
1. Age	2,903	50.25	0.61					
2. Size	2,903	87.59	2.08	0.06				
3. Growth	2,903	4.03	0.03	-0.05	0.15			
4. Training	2,903	3.06	0.01	-0.03	0.04	0.04		
5. Compensation	2,903	3.03	0.02	-0.02	-0.02	-0.02	0.07	
6. Recruiting	2,903	2.84	0.02	-0.03	0.00	0.01	0.10	0.12

TABLE III MANOVA Results

	Stage A <i>n</i> = 482	Stage B <i>n</i> = 731	Stage C <i>n</i> = 268	Stage D <i>n</i> = 1,422	<i>F</i>	<i>p</i> -value
Size	72.61 (3.46)	76.96 (4.26)	91.16 (2.48)	109.62 (5.71)	13.63	0.00***
Growth	2.08 (.04)	3.80 (.05)	4.97 (.03)	5.28 (.07)	1,068.36	0.00***
Training	3.10 (.02)	3.29 (.03)	3.22 (.02)	2.62 (.04)	30.84	0.00***
Compensation	2.98 (.03)	2.97 (.04)	2.94 (.02)	3.26 (.06)	9.38	0.00***
Recruiting	2.48 (.03)	3.79 (.04)	2.49 (.02)	2.60 (.05)	335.26	0.00***

* $p < .10$; ** $p < .05$; *** $p < .001$

TABLE IV Human Resource Problems and Growth Stages

(MP = most problematic; LP = least problematic)

	Stage A No- Growth	Stage B Low- Growth	Stage C Moderate- Growth	Stage D High- Growth	Pairwise Significance
Training		LP		MP	All stages but B-C
Compensation			MP	LP	D-All other stages
Recruiting	MP	LP			B-All other stages
Average	2.85	3.35	2.88	2.83	

* $p < .10$. ** $p < .05$. *** $p < .001$

All pairwise comparisons were run with Scheffe contrasts to ensure that the probability of type 1 error was held to α .

shown here (Wilks' $\lambda = .32$, $F = 225.02$, $p < .00$). This omnibus (overall) model, however, does not tell us about differences between stages. To accomplish this goal we ran pairwise analysis of variance comparisons.

The results of the pairwise ANOVA analyses are shown in Table IV. We have broken the stages down by growth, because size was significant in the omnibus model, but not significant between all stages (i.e., pairwise comparisons). Training problems were highest in the high-growth stage, followed by

no-growth, moderate-growth, and low-growth; however, the low-growth and moderate-growth stages did not differ significantly from one another—all other stages did vary significantly from one another. The only significant relationships among compensation problems existed between high-growth and all other stages—the problems were lowest in the high-growth stage. Recruiting problems showed significance between the low-growth stage and all others—they were highest in the no-growth stage.

Discussion and Conclusions

The goal of this work was to test one proposition: that HR problems in small firms varied over the OLC. The proposition was partially supported. We employed an exploratory technique to derive an appropriate number of stages. Like Hanks, Watson, Jansen, and Chandler (1993) and Drazin and Kazanjian (1990) we found support for a four-stage model. However, the age variable proved not to be significant. The finding contradicts researchers who submit that age is a discriminating factor in stage identification (Kazanjian & Drazin, 1989; Smith et al., 1985). Instead, the stages were defined by size and—to a larger extent—growth. As a note, the size variable should be treated with caution. Even though it was significant across most stages, the small F statistic and lack of variability between stages indicate that this variable has less explanatory power than growth. That fact that growth is the key context variable here supports previous studies that found growth to be the impetus for firms moving through organizational development stages, regardless of the problem being studied (Kazanjian & Drazin, 1989; Scott, 1971).

While not the primary intention of this work, the lack of support for an OLC-like configuration is an interesting finding. This supports researchers (Stubbart & Smalley, 1999; Tichey, 1980) who cast doubt on the practical effectiveness of the OLC as organizational development theory. Alternative explanations for the evolution of HRM problems and activities might also exist. For example, the research of Baron, Hannan, and Burton (1999) suggests that HRM problems and activities are largely a function of the “mental” blueprints held by company founders and the gender mix of employees during the first year of operations. Their findings support a path-dependent model of organizational evolution that does not explicitly include the OLC. It should, however, be noted that inserting different content variables may yield a different configuration. For example in a similar analysis using a self-organizing map, Rutherford et al. (2001) used different variables (financing and management issues), and found the age variable to be significant in discriminating between stages.

The differences between growth stages and HR problems also present several interesting observations. The highest-growth firms demonstrated the most challenges with development. This is not surprising given the fact that high-growth firms generally experience communication problems because the owner/manager can no longer easily train every employee. Instead the firm must move toward formalizing development and this is often a painful transition (Hanks & Chandler, 1994). In contrast, these high-growth firms reported the lowest levels of retention problems. This is likely caused by the fact that high-growth environments tend to attract employees who enjoy the fast-paced atmosphere and may be willing to accept less money to be involved (Muse et al., in press).

Of the four groups, moderate-growth firms reported that retention issues were the most problematic. As noted above, individuals may accept less money for a high-growth environment; however, if the environment is not sufficiently stimulating, these individuals will not make the same trade-off. This would leave cash-strapped owner/managers with slowly increasing workloads and little to offer the employee in terms of excitement (Kanungo & Mendonca, 1992).

Low-growth firms reported the lowest levels of both training problems and recruiting problems. It may be that the stable environment makes it ideal for the owner/manager to develop employees at his or her own pace without having to adopt a formalized approach. In addition, low levels of growth likely make it less necessary to add new employees, greatly reducing recruiting problems.

No-growth firms reported the highest levels of recruiting problems. This is slightly counterintuitive, as one would think that a firm that is not growing would not have a need to attract many new employees. However, this finding may be the result of these low-performing firms never being able to attract an adequate base of effective employees.

The highest-growth firms demonstrated the most challenges with development.

Study Limitations and Directions for Research

Some limitations should be mentioned here. First, the cross-sectional nature of the data

Some researchers have posited that the life cycle of the family may interact with the life cycle of the firm.

precludes us from making definitive cause-and-effect statements. For example, it would be interesting to know if HR problems caused the firms to move from one stage to the next. Related to cross-sectional issues, a weakness of the survey is that historical growth rates were only collected for one year prior. This may not be enough time to experience a change in HR problems, and while highly correlated, past growth rates are no guarantee of future growth rates.

Second, the fact that we utilized a family-business data set may limit implications for nonfamily SMEs. Some researchers have posited that the life cycle of the family may interact with the life cycle of the firm (Gersick, Davis, Hampton, & Lansberg, 1997). Specifically, small family firms may be more likely to engage in lifestyle ventures, which may “stunt” growth. Also, Bjuggren and Sund (2002) put forth the idea that family idiosyncratic knowledge will make for smoother stage transitions and therefore family firms would display lower levels of all content variables (i.e., problems) throughout the life cycle. However, based on the fact that in the United States, family firms represent between 90–95% of all firms and the large majority of small firms are, in fact, family firms, generalizability should be possible (Gersick et al., 1997; Rosenblatt, De Mik, Anderson, & Johnson, 1990). Additionally, some researchers have found support for the notion that family firms adopt strategies similar to small firms in general, which suggests that differences between the two may be minimal (McCann et al., 2001; Upton, Teal, & Felan, 2001).

A final caveat relates to the fact that we studied firms over 12 industries, but did not control for industry effects. Our primary goal in this research was to lay an initial foundation for examining HR issues over the small-firm life cycle; as such, we chose a data analysis method—the self-organizing map—that accomplished that goal most effectively. The drawback of this choice was that it is not effective for handling control variables. As a result, it is possible that the results reported here may be confounded by industry membership. We submit that studying firms across industries is fertile ground for a future work on SME HR issues.

In light of these limitations, there are some clear recommendations for future research. In an ideal setting, one would study the OLC with a time-series sample, as a temporal component is inherent in the phenomenon. Even though it would be time-consuming and costly, an examination of the variables studied over several periods may lead to different and interesting findings. Also, there have been several classification schemas submitted for human resource problems; we have chosen a broad schema put forth by Dess and Lumpkin (2003), but others may be valid. As a result, future research may want to consider different problem sets.

For owner/managers (and those who assist them) our results provide guidance regarding human resource management issues over the life cycle of the SME. As firms achieve increasing levels of growth, HR issues seem to shift from attracting to retaining, and finally to training. As a result we would recommend that SME owner/managers prepare themselves for these changes if and when growth occurs. On the other hand, if an SME is consistently achieving very low levels of growth, the owner/manager should focus on improving his or her recruiting and selection skills. Finally, it appears that the low-growth stage is the least problematic with regard to all HR issues. Firms with growth rates in approximately the 1%–5% range seem to be able to adequately address their HR problems. Outside of these ranges, the level of problems escalates, so the owner/manager will want to closely monitor growth to prepare for this escalation.

Future research should continue to examine HRM issues in SMEs. This article has laid some empirical groundwork for the relationship between HR problems and the organizational development of SMEs—a heretofore neglected area. It is hoped that researchers can use these results to more effectively guide SME owners and managers as they navigate uncertain business environments.

The authors would like to thank The Arthur Anderson Center for Family Business and Mass Mutual, Loyola University-Chicago Family Business Center, and the Family Business Center at Kennesaw State University.

MATTHEW W. RUTHERFORD is an assistant professor of management at Gonzaga University's College of Business. He received his PhD in management from Auburn University. He has also served as an independent management consultant for numerous organizations. His research interests lie in the area of small-firm performance/growth.

PAUL F. BULLER holds the Kinsey M. Robinson Chair in Business Administration at Gonzaga University, where he teaches courses in strategic management and entrepreneurship. Dr. Buller has authored or co-authored over 50 articles in a variety of academic and practitioner journals. He is co-editor, with Randall S. Schuler, of *Managing Organizations and People: Cases in Management, Organizational Behavior, and Human Resource Management (7th Edition)*, South-Western Publishing, 2003. Dr. Buller has served on the editorial boards of the *Journal of World Business* and *Human Resource Management Journal* and is past president of the Western Academy of Management. He is currently director of the Hogan Entrepreneurial Leadership Program at Gonzaga.

PATRICK R. McMULLEN is an associate professor at Wake Forest University's Babcock Graduate School of Management. His PhD is from the University of Oregon. He has held prior teaching positions at the University of Oregon, the University of Maine, Auburn University, and Harvard University. His research interests lie in the areas of artificial neural networks, applied optimization, and search heuristics.

NOTE

1. For a complete overview of Kohonen's self-organizing map, see Jain, Mao, & Mohiuddin (1996).

REFERENCES

- Adizes, I. (1979). Organizational passages: Diagnosing and treating lifecycle problems of organizations. *Organizational Dynamics*, 8, 3–25.
- Adizes, I. (1988). *Corporate lifecycles: How and why corporations grow and die and what to do about it*. Englewood Cliffs, NJ: Prentice Hall.
- Adizes, I. (1999). *Managing corporate lifecycles*. Paramus, NJ: Prentice Hall Press.
- Baird, L., & Meshoulam, I. (1988). Managing two fits of strategic human resource management. *Academy of Management Review*, 13, 116–128.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17, 99–120.
- Barney, J. (1995). Looking inside for competitive advantage. *Academy of Management Executive*, 9(4), 49–61.
- Baron, J. N., Hannan, M. T., & Burton, M. D. (1999). Building the iron cage: Determinants of managerial intensity in the early years of organizations. *American Sociological Review*, 64, 527–548.
- Barringer, B. R., Jones, F. F., & Lewis, P. S. (1998). A qualitative study of the management practices of rapid growth firms and how rapid growth firms mitigate the managerial capacity problem. *Journal of Developmental Entrepreneurship*, 3(2), 97–122.
- Bjuggren, P., & Sund, L. (2002). A transaction cost rationale for transition of the firm within the family. *Small Business Economics*, 19(2), 123–133.
- Boxall, P. (1996). The strategic HRM debate and the resource-based view of the firm. *Human Resource Management Journal*, 6(3), 59–75.
- Buller, P. F., & Napier, N. K. (1993). Strategy and human resource management integration in fast growth versus other mid-sized firms. *British Journal of Management*, 4, 77–90.
- Cameron, K. S., & Whetten, D. A. (1981). Perceptions of organizational effectiveness over organizational life cycles. *Administrative Science Quarterly*, 26, 525–544.
- Churchill, N., & Lewis, V. L. (1983). The five stages of small business growth. *Harvard Business Review*, 61(3), 30–40.

- Dess, G. G., & Lumpkin, G. T. (2003). *Strategic management: Creating competitive advantages*. Boston: McGraw-Hill Irwin.
- Dodge, H. R., Fullerton, S., & Robbins, J. E. (1994). Stage of the organizational life cycle and competition as mediators of problem perception for small businesses. *Strategic Management Journal*, 15, 121–135.
- Dodge, H. R., & Robbins, J. E. (1992). An empirical investigation of the organizational life cycle model for small business development and survival. *Journal of Small Business Management*, 30(1), 27–37.
- Downs, A. (1967). The life cycle of bureaus. In A. Downs (Ed.), *Inside bureaucracy* (pp. 296–309). San Francisco: Little, Brown & Company and Rand Corporation.
- Drazin, R., & Kazanjian, R. K. (1990). A reanalysis of Miller and Friesen's life cycle data. *Strategic Management Journal*, 11, 319–326.
- Flamholtz, E. G. (1986). How to make the transition from an entrepreneurship to a professionally managed firm. San Francisco: Jossey-Bass.
- Galbraith, J. (1982). The stages of growth. *Journal of Business Strategy*, 3(1), 70–80.
- Gersick, K. E., Davis, J. A., Hampton, M. M., & Lansberg, I. (1997). *Generation to generation: Life cycles of family business*. Boston: Harvard Business School Press.
- Greiner, L. E. (1972). Evolution and revolution as organizations grow. *Harvard Business Review*, 50(4), 37–56.
- Gupta, Y. P., & Chin, D. C. W. (1993). Strategy making and environment: An organizational life cycle perspective. *Technovation*, 13(1), 27–45.
- Gupta, Y. P., & Chin, D. C. W. (1994). Organizational life cycle: A review and proposed directions. *The Mid-Atlantic Journal of Business*, 30(3), 269–295.
- Hanks, S. H., & Chandler, G. N. (1994). Patterns of functional specialization in emerging high tech firms. *Journal of Small Business Management*, 32(2), 23–37.
- Hanks, S. H., Watson, C. J., Jansen, E., & Chandler, G. N. (1993). Tightening the life-cycle construct: A taxonomic study of growth stage configurations in high-technology organizations. *Entrepreneurship: Theory and Practice*, 18(2), 5–30.
- Hess, D. (1987). Relevance of small business courses to management needs. *Journal of Small Business Management*, 25(1), 26–34.
- Hornsby, J. S., & Kuratko, D. F. (1990). Human resource management in small business: Critical issues for the 1990s. *Journal of Small Business Management*, 28(3), 9–18.
- Hoy, F., McDougall, P., & Dsouza, D. E. (1992). Strategies and environments of high growth firms. In D. L. Sexton & J. D. Kasarda (Eds.), *The state of the art of entrepreneurship* (pp. 341–357). Boston: PWS-Kent Publishing.
- Huang, X., & Brown, A. (1999). An analysis and classification of problems in small business. *International Small Business Journal*, 18(1), 73–84.
- Jain, A. K., Mao, J., & Mohiuddin, K. M. (1996). Artificial neural networks: A tutorial. *Computer*, 29(3), 31–44.
- Kanungo, R. N., & Mendonca, M. (1992). *Compensation: Effective reward management*. Toronto, ON: Butterworths Canada Limited.
- Katz, D., & Kahn, R. L. (1978). *The social psychology of organizations*. New York: Wiley.
- Kazanjian, R. K. (1988). Relation of dominant problems to stages of growth in technology-based new ventures. *Academy of Management Journal*, 31, 257–280.
- Kazanjian, R. K., & Drazin, R. (1989). An empirical test of a stage of growth progression model. *Management Science*, 35, 1489–1504.
- Kazanjian, R. K., & Drazin, R. (1990). A state-contingent model of design and growth for technology based new ventures. *Journal of Business Venturing*, 5, 137–151.
- Kimberly, J. R. (1979). Issues in the creation of organizations: Initiation, innovation, and institutionalization. *Academy of Management Journal*, 22, 437–457.
- Kimberly, J. R., & Miles, R. H. (1980). Preface. In J. R. Kimberly & R. H. Miles (Eds.), *The organizational life cycle: Issues in the creation, transformation, and decline of organizations*. San Francisco: Jossey-Bass.
- Kohonen, T. (1990). The self-organizing map. *Proceedings of the IEEE*, 78, 1464–1480.
- Lippitt, G. L., & Schmidt, W. H. (1967). Crises in a developing organization. *Harvard Business Review*, 45(6), 102–112.
- Lyden, F. J. (1975). Using Parson's functional analysis in the study of public organizations. *Administrative Science Quarterly*, 20, 59–70.
- Mangiameli, P., Chen, S. K., & West, D. (1996). A comparison of SOM neural network and hierarchical clustering methods. *European Journal of Operational Research*, 93, 402–418.
- McCann, J. E., Leon-Guerrero, A. Y., & Hailey, J. D.,

- Jr. (2001). Strategic goals and practices of innovative family businesses. *Journal of Small Business Management*, 39(1), 50–59.
- McMahon, R. G. P. (2001). Growth and performance of manufacturing SMEs: The influence of financial management characteristics. *International Small Business Journal*, 19(3), 10–28.
- Mehrotra, K., Mohan, C. K., & Ranka, S. (1997). *Elements of artificial neural networks*. Cambridge, MA: MIT Press.
- Miller, D., & Friesen, P. H. (1983). Successful and unsuccessful phases of the corporate life cycle. *Organization Studies*, 4, 339–357.
- Miller, D., & Friesen, P. H. (1984). A longitudinal study of the corporate life cycle. *Management Science*, 30, 1161–1184.
- Muse, L., Rutherford, M., Oswald, S. L., & Raymond, J. E. (in press). Commitment to employees: Does it help or hinder small business performance? *Small Business Economics*.
- Pfeffer, J. (1994). *Competitive advantage through people*. Boston: Harvard Business School Press.
- Quinn, R. E., & Cameron, K. (1983). Organizational life cycles and shifting criteria of effectiveness: Some preliminary evidence. *Management Science*, 29(1), 33–52.
- Rosenblatt, P. C., De Mik, L., Anderson, R. M., & Johnson, P. (1990). *The family in business*. San Francisco: Jossey-Bass.
- Rutherford, M. W., McMullen, P., & Oswald, S. (2001). Examining the issue of size and the small business: A self-organizing map approach. *Journal of Business and Economic Studies*, 7(2), 64–79.
- Scott, B. R. (1971). Stages of corporate development—Part 1. Case No. 9-371-294. Boston: Intercollegiate Case Clearing House.
- Scott, M., & Bruce, R. (1987). Five stages of growth in small business. *Long Range Planning*, 20(3), 45–52.
- Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday.
- Smith, K. G., Mitchell, T. R., & Summer, C. E. (1985). Top level management priorities in different stages of the organizational life cycle. *Academy of Management Journal*, 28, 799–820.
- Steinmetz, L. L. (1969). Critical stages of small business growth: When they occur and how to survive them. *Business Horizons*, 12(1), 29–34.
- Stubbart, C. I., & Smalley, R. D. (1999). The deceptive allure of stage models of strategic processes. *Journal of Management Inquiry*, 8, 273–287.
- Terpstra, D. E., & Olson, P. D. (1993). Entrepreneurial start-up and growth: A classification of problems. *Entrepreneurship: Theory and Practice*, 17(3), 5–21.
- Tichey, N. M. (1980). Problem cycles in organizations and the management of change. In J. R. Kimberly & R. H. Miles (Eds.), *The organizational life cycle: Issues in the creation, transformation, and decline of organizations*. San Francisco: Jossey-Bass.
- Torbert, W. R. (1974). Pre-bureaucratic and post-bureaucratic stages of organization development. *Interpersonal Development*, 5, 1–25.
- Upton, N., Teal, E. J., & Felan, J. (2001). Strategic and business planning practices of fast growth family firms. *Journal of Small Business Management*, 39(1), 60–72.
- Williamson, I. O. (2000). Employer legitimacy and recruitment success in small businesses. *Entrepreneurship: Theory and Practice*, 25(1), 27–43.