

Identifying and Explaining Environmental Complexity

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Abstract

Objective: This paper aims to introduce the reader to a simple, yet challenging process of reconceptualising the dimensions of any firm's environment. In doing so, it is the intention of this paper to challenge the manner in which resource movement within a given environment is accounted for.

Prior Work: This paper builds upon the author's recent work focused upon restaurant survival in Australia and the UK (i.e. North Yorkshire) that have demonstrated the importance of defining the ecological, selective and general dimensions of the environment experienced and influenced by individual firms.

Approach: The epistemological foundations of this paper are guided by the principles of the critical realism approach, specifically transcendental realism. Using a mixed method approach has allowed firm survival data (from 2,440 firms) for the period 1975 to 2004 to be combined with researcher observations, qualitative interviews and local archival data.

Results: It is argued that once we can determine the nature of the environment experienced by individual firms, we are able to better understand the flow of resources (or energy) upon which firm survival is dependent. This paper demonstrates (via high levels of triangulation) that the nature of interaction (deliberate or otherwise) occurring between firms in isolated towns can be reconciled to their capacity to capture vital resources directly related to their survival.

Implications and Value: This paper is highly innovative, introducing numerous ecological concepts not previously used in the social sciences to explain firm survival. For example, the issue of ecological scale is used to reduce the researcher's focus from regional to town specific survival factors. Such fine grained investigation allows causal factors to be discovered and confirmed empirically. Rather than assuming that (resource specific) networks are visible, this paper demonstrates the importance of identifying invisible networks that may operate and therefore influence firm survival at different levels of ecological scale.

Researchers discussing/researching the nature of complex environments make various assumptions about the composition of such environments. Likewise, when the issue of resource networks is considered, assumptions are made about the flows of resources between entrepreneurs and their environments. This paper challenges these assumptions, offering new ways to think about both.

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Introduction

The process of resource transfer/acquisition/networking always takes place between firms and various stakeholders within an 'environment'. This paper argues that the greatest challenge when considering the acquisition of valuable resources by firms is being able to accurately define the environments within which such resource transfer is assumed to occur. Therefore, this paper steps back from focusing upon resource transfers between firms, to first consider the issue of resource transfer between environment and firm. In doing so, the nature of the environment experienced/created by the small firm takes centre stage. Do small firms 'belong' to an environment that is difficult (if not impossible) for them to alter (see Aldrich, 1979) or even react to (see Hannan and Freeman, 1986)? Or, do small firms create and/or operate independently in unique environments from which they draw upon resources vital to their survival? Debate about such issues started in earnest in the late 1970s (see Aldrich, 1979; Rumelt, 1979) and has yet to be determined conclusively one way or the other. It will be argued in this paper that such important issues are difficult to address in the absence of a more advanced understanding of what is an environment.

It will be empirically demonstrated that understanding environmental heterogeneity is of critical importance to understanding resource flows between firms and/or the environs they operate within. Therefore, within this paper a specific consideration is given to the most fundamental of questions; what is an environment? Environment is a term/concept that has of recent times been poorly defined with regards the movement of resources. Like the concept of competition, it is central to many approaches to the study of firms, yet vaguely defined. Consider Michael Porter's (1980; 1985; 1990) various competitive strategy theories, he has managed to successfully develop a theory related to firms, markets and environments without accurately defining in any detail competition or the nature of the environment. This paper proceeds in the following manner. First, the underlying issue of what is an environment (vis-à-vis firms) is addressed. Second, the nature of a study of firm survival in North Yorkshire (UK) and related methodology is outlined. Third the findings of this study specifically related to resource acquisition are presented and discussed. Fourth, the implications that arise from this paper are discussed in the concluding comments.

What is an Environment?

Within organizational studies, the past work of human ecologist Hawley (1950) remains highly influential with regards notion of what is an environment. He noted that:

"Environment is a generic concept under which are subsumed all external forces and factors to which an organism or aggregate of organisms is actually or potentially responsive. The very breadth of the concept restricts its use for the purposes of precise description. In general however, environment refers to the medium in which an organism exists. Environment comprises the raw materials of life and the conditions, both favorable and unfavorable, that affect the use of those materials" (1950, pp. 12-13).

Thus, Hawley's (1950) seminal work articulated that the environment is comprised of the 'raw materials of life', the conditions that affect the use of such materials, and is directly related to an entity's location. Given Hawley's belief that human ecology is the study of the relationships between an entity (and/or a group of entities) and their environment, his broad definition of what is an environment, is problematic. How can we study such relationships and understand the movement of resources if we operate with such vague definitions? Also, assumptions that the environment cannot be independent of our own activities because it is but merely an image in the entrepreneur's mind (Penrose, 1959) also make analysis at the firm/population/community level very difficult. We will begin this section with an overview of how environments have been considered in organizational studies, before considering a potentially useful conception of environment that is used widely in the broader ecological literature.

Past and current literatures continues to provide credence to environments as being enacted (Weick, 1979), a dispenser of blind selection and/or a source of new variation (Hannan and Freeman, 1977), that may either be related to organizations strongly or weakly (McKelvey, 1982). Given the centrality of the concept of *environment* (as a form of indiscriminant selection or as a habitat of various benign shades), it is important that its composition and influence is clearly understood by researchers. The often cited paper by Emery and Trist (1965, p. 21) notes that the constant dilemma of organizational researchers is "that the environmental contexts in which organizations exist are themselves changing, at an increasing rate, and towards increasing complexity". Perhaps this explains

the dominance of descriptive accounts of the *types* of environments firms might intuitively expect to encounter are more common than succinct and workable definitions of what the environment is comprised of. Further complicating the challenge of identifying what organizational environments are has been the 'scholarly turf fighting' (Baum and Rowley, 2002) between organisational researchers seeking to determine the hierarchical relationships between task, institutional, technical and general environments.

For example, Meyer and Scott (1983) proposed a typology to distinguish between the environment's technical and institutional aspects. Their typology aims to highlight certain production (i.e. technical) and regulatory (i.e. institutional) pressures that the respective firms will encounter. This form of typology provides guidance to managers as to specific prerequisite behaviours required to increase fitness, however for the purposes of this paper, we require a more precise explanation of what constitutes an environment.

It would appear that the advent of the open systems model of organizational form brought forward a greater need to understand the nature of the environment (Scott, 1987). For example, viewing firm survival as a function of successfully acquiring resources from beyond organizational boundaries (i.e. the general environment) required a greater appreciation of and maintenance of organizational boundaries. Furthermore, recognizing that no steady state of conditions surround this processes, Emery and Trist (1965) drew on the past works of Simon (1957), Ashby (1960), Schutzenberger (1954), Selznick (1957), Heyworth (1955) and Chein (1943) to devise a typology of causal textures. Step one was placid and randomized (i.e. mostly bare, but small unchanging resources for consumption in isolated and scattered locations). Step two was placid and clustered (i.e. unchanging resources clustered so that location becomes a survival factor). Step three was disturbed and reactive (i.e. the effectiveness and efficiency of firm strategies vis-à-vis competitors will be of great importance). Step four is turbulent (i.e. survival determined by the ability to manage interconnectedness in the relevant organizational field). Scott notes that other alternative typologies (e.g. Warren, 1967; Aldrich and Whetten, 1981) have been developed that are similar or address other organizational issues (e.g. Longevity).

However, at present the literature still appears no closer to a concrete definition of what *is* an environment. First year business school students are typically taught about relatively plastic *task* (or internal) environments (i.e. suppliers, distributors, customers and competitors) and essentially fixed *general* environments (i.e. political, economic, social/cultural, technological and international factors). Definitions of what *is* the environment remain basically broken into multiple components, components that may remain within organizational boundaries or be located outside. Many of Hawley's (1950, p. 17) ideas remain influential, perhaps even his assessment that "any attempt to enumerate the components of the environment involves one in any endless task; for each species [i.e. firm] and type of life responds to a variety of stimuli in a way more or less peculiar to itself". Despite the ongoing acknowledgement (e.g. Baum and Rowley, 2002, pp. 9-10) that the task environment is a source of various inputs, current attempts to define the environment appear far from certain on how firms *relate* to the environment given that the literature accepts that "environments may not only be *observed* and (*mis*)*interpreted*" they may also be *enacted* by individual firms. This state of affairs within the literature is concerning given the explicit acknowledgement in the natural sciences that it is only those *specific factors* in the external environment that affect an entity that matter, and therefore are of importance (Brandon, 1996). It would also seem that current notions of what the environment is have placed less focus on the role of the environment as a source of explicit energy, preferring rather to consider it as a predominately constraining force.

Despite Emery and Trist's (1965, p. 21) explicate acknowledgement that "any living entity survives by importing into itself certain types of material [i.e. resources] from its environment", the issue of environmental *energy* seems to have lost currency. As one of the most fundamental factors in ecology (see Odum, 1971), energy flow is seemingly missing from our current conceptions of environment. The more dominant issue within the literature would seem to be environmental constraint, perhaps an indication of the strength of the selection based theories that have developed during the past 30 years (e.g. Hannan and Freeman, 1977; Aldrich, 1979). However, the recent work of Biologist Brandon (1990) offers a succinct and seemingly obvious way to account for defining what the environment is. With reference to the theory of natural selection, Brandon suggests three specific environmental dimensions through which the process of evolution occurs. First, the *external* environment typically refers to the sum total of all factors external to the firm that influence its survival. However, this overarching view of the environment does little to highlight which factors are of most importance to one firm or another. It essentially relates to the factors that all firms in all industries are exposed to (e.g. high interest rates).

Then, Brandon (1990) identifies the second dimension as the *ecological* environment, which refers to a narrowing down of focus. Now we are only concerned with those factors that specifically affect a firm's ability to contribute to the growth of its industry (e.g. the increasing availability of specific vital resources). The third and last form of

environment is the *selective* environment. The selective environment refers to those factors of the external environment that specifically determine the differential fitness of the firm's interacting elements (e.g. consumer taste). Under such a proposal, the *general* environment can exist independently of a firm, and aspects of it can be altered by a firm, without any positive or negative impact on the nature of selection. What matters it would seem, is the relationship between the firm and its *selective* environment. The *selective* environment has no existence independent of the firm/population; it represents the actual *niche* of the firm/population. Therefore, selective environmental heterogeneity is an issue that must be accounted for. Brandon notes that sometimes this heterogeneity can be accounted for due the discrete nature of the environment (i.e. town boundaries) or through the development of selective environmental neighborhoods around arbitrarily chosen entities. Accepting the presence of environmental heterogeneity requires a consideration of why regional landscapes vary across time and space.

In ecology, one of the most fundamental tenets is an acceptance of ecological succession. Originally championed by Warming (1909) and subsequently developed by Connell and Slatyer (1977), ecological succession relates to the modification of the environment across time and space in ways that influence the survival prospects of new species on a patch by patch basis. The concept has also been applied to urban space (see Decker et al., 2000) demonstrating how an underlying ecological process could be at the heart of much environmental heterogeneity. That is, in accepting the presence of selective neighborhoods, we can explain heterogeneity with reference to the process of succession whereby the direction and speed of development from one urban centre to the next could naturally be expected to be out of sync.

To recap, the environment can be broken into different forms, the external, ecological and selective. The ecological environment contains those factors that influence potential growth and the selective environment relates to those factors specifically associated with differential selection. There are likely to be unequal degrees of selection pressure spread across time and space that may relate specifically to discrete spaces or arbitrarily determined selective neighborhoods within which similar types of firms will not be selected for or against equally. Brandon's (1990) conception of the environment as three interrelated dimensions provides a means to account for the sources of energy (or resources) available to firms (i.e. the ecological environment), the constraints encountered (i.e. the selective environment) and all manner of other factors external to the firm that may influence its survival (i.e. the external environment). Several propositions arise naturally from this discussion.

Proposition 1: Identifying the external, ecological and selective environments would enable researchers to gain a more precise understanding of resource acquisition between firms and/or the environs they operate within.

Proposition 2: The external environment experienced by a firm is an identifiable feature that can be reconciled to their existence.

Proposition 3: The ecological environment experienced by a firm is an identifiable feature that can be reconciled to their existence.

Proposition 4: The selective environment experienced by a firm is an identifiable feature that can be reconciled to their existence.

The above propositions attempt to advance the suggestion that the environment is more than a space within which several firms exist. Collectively they argue that to understand the transfer of resources between firms and/or the environs they operate within we must account for the nature of any environmental heterogeneity that is derived from the each individual firm's existence across time and space. Before continuing with this discussion, we will now consider the focus of this study of firm survival and its research methodology. Then, the emergent findings from this study will be discussed vis-à-vis the above propositions.

Investigating the Survival of Pizza Firms in North Yorkshire

During the past 5 years an investigation of firm survival in the Pizza industry in Australia and most recently in the UK has been conducted. The Australian phase of the research was only focused on only Pizza firms developing a model of firm survival. Alternatively, the North Yorkshire-East Riding phase accommodated all forms of restaurant and fast food providers (e.g. Chinese, Indian, Burgers, Sandwiches sub-populations) to accommodate intra-firm comparisons whilst seeking to confirm/disconfirm a particular model of firm survival (developed from the Australian phase of the study). In the UK phase, a data set comprising 2,440 North Yorkshire firms across the

time period 1975 to 2004 was developed. It accounted for 24 separate sub-populations occurring in 23 discrete towns. Therefore, the survival of independent Pizza shops was compared between towns, and against all other sub-populations. As such, the study area is treated as a metapopulation (Giplin and Hanski, 1991) where space is assumed to be discrete, as is the divide between the size and suitability of specific niches.

A critical realist approach (Bhaskar, 1975) was employed to enable the researcher to conceive a model of firm survival (derived from the Australian phase) that could be empirically confirmed/disconfirmed in the UK phase. Using the process of retrodiction (Peirce, 1908), components of the model where postulated as were the conditions that would be associated with the model's operation (and non-operation). To date, the research process has proceeded on the basis of combining data received from semi-structured interviews, analysis of archival phone listing records and observational data related to specific niche dimensions (i.e. time, space and customer type) (Pianka, 1969). This approach has enabled both accurate and codable data to be used in conjunction with data representative of the views of the operators across the life course of the industry. The phone listing records in particular offer valuable insights (Usher & Evans 1996) into the goals, boundaries and activities of each firm over time. The statistical software package SPSS 14.0 was used to provide an initial analysis of the data using its survival analysis program and subsequent analysis using regression and correlation procedures. A range of new analytical tools were also drafted into this study from the broader field of ecology to gain access to new ways of determining the degree of environmental heterogeneity. The specific research method employed was used to facilitate an outcomes-based explanation (Mahoney 2003) due to the fact that the events under investigation have already occurred and therefore cannot be tested. Therefore the challenge was to find evidence to support the model of firm survival postulated in the Australian phase of the study.

Whilst a mixed-methods (see Creswell, 2003) approach was employed in both the Australian and UK phases of the study, the propositions under consideration in this paper relied primarily upon quantitative forms of data analysis. All four propositions used data from the Yellow Pages phone directory and regional statistics, with proposition 4 also using data from semi-structured interviews with nine local restaurateurs and the researcher's own observations. Many of the methods used to analyse the data were very unique in domain of the social sciences. First, several diversity indices were used to determine the degree of 'ecological' diversity within and between each town. Having determined the levels of diversity (and other ecological measures, e.g. abundance etc) the data was organised so that the process of Canonical Discriminant Analysis could be used to address proposition 1. Next, Pianka's (1973) Community Similarity Index was modified to allow the external environment (i.e. proposition 2) of each town to be compared across the time period of the study. When considering the issue of the ecological environment (i.e. proposition 3), again the actual degree of average spending possible in each town was calculated using regional statistics and the Yellow Pages data, then using Paired Samples T-Tests, comparisons were made of the potential resource availability across both time and space. Finally, proposition 4 required the development of an Advertising Efficiency Index to enable a more accurate comparison of how firm survival differed across towns according to the degree of actual spending upon advertising. Semi-structured interviews with 9 restaurateurs also help to provide insights into differences in the selective environments of the firms investigated. These methodological innovations can now be explained in more detail in the findings section.

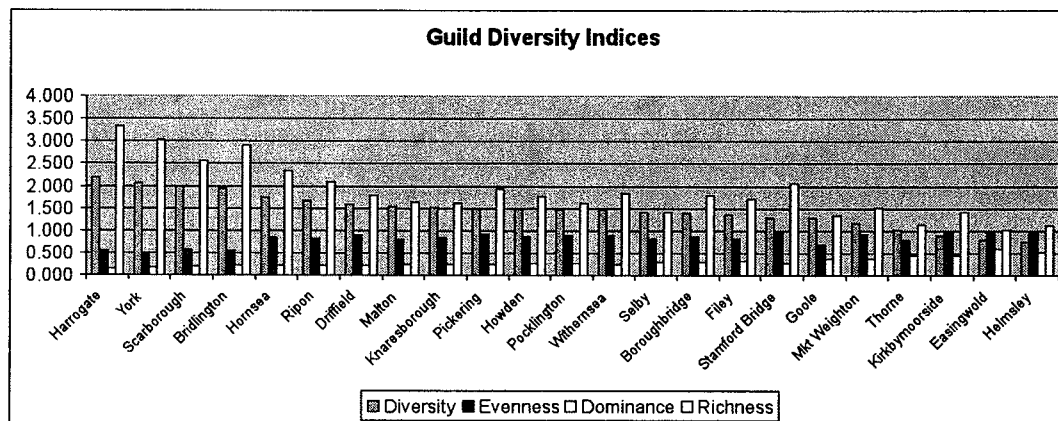
The Findings

We can now consider those specific study findings that relate to the propositions noted above. The first proposition being that: *identifying the external, ecological and selective environments would enable researchers to gain a more precise understanding of resource acquisition between firms and/or the environs they operate within.*

The degree to which firms experience different external, ecological and selective environments should be evidenced by an identifiable variance across the 23 North Yorkshire towns under investigation. Support for this postulate should involve the identification of specific factors that are reconcilable to the general conditions experienced (i.e. the external environment), factors of growth (i.e. the ecological environment), and factors that impinge directly on firm survival (i.e. the selective environment). The first task therefore is to determine what degree of variance¹ exists across the 23 towns investigated. Figure 1 below highlights the variance across the 23 identified towns with respect to differences in diversity, evenness, dominance, and richness indices.

¹ All indices calculated using the PAST software program (<http://folk.uio.no/ohammer/past/diversity.html>). **The Diversity Index** (Shannon index) takes into account the number of firms as well as number of sub-populations. Varies from 0 for communities with only a single sub-population to high values for communities with many sub-populations, each with few firms. **The Evenness Index** (Shannon index divided by the logarithm of number of sub-populations) measures the evenness with which individuals are divided among the sub-populations present. **The Dominance Index** (Berger-Parker index) is simply the number of firms in the dominant sub-population relative to the overall number of firms in total. **The Richness Index** (Margalef's index) or, $(S-1)/\ln(n)$, where S is the number of sub-populations, and n is the number of firms.

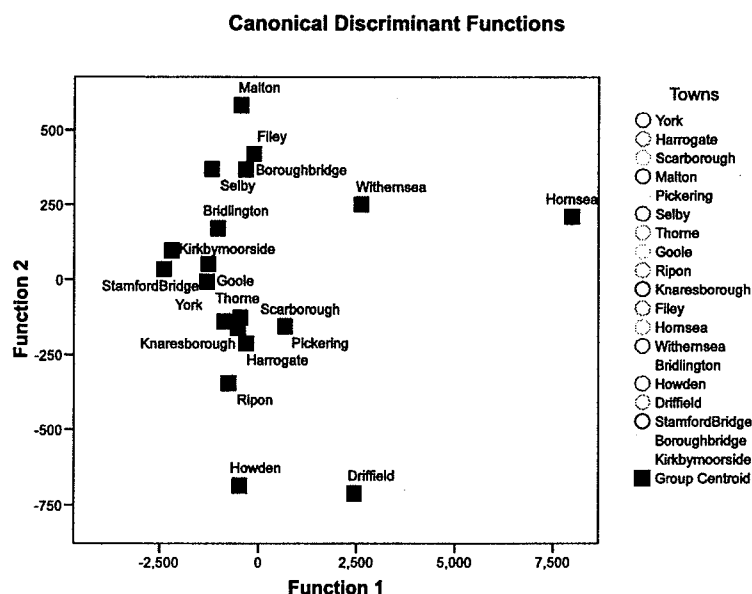
Figure 1 – Diversity, Evenness, Dominance, and Richness Indices



The use of diversity indices (above) provides a means to observe a snap short of the actual nature of ecological difference between the individual towns. Organized from the most diverse town (Harrogate) down to least diverse (Helmsley), there are noticeable differences between the towns vis-à-vis their composition and sub-population balance. It is revealed that the larger towns have higher levels of diversity and firm richness, whereas the smaller towns are more likely to have an even guild² structure, that may nevertheless be dominated by one particular sub-population.

A useful method of analysis to tease out how the town environments might differ is Canonical Discriminant Analysis. Using the individual towns as a dependent categorical variable, we can test the relationship between each town and a diverse set of independent variables (e.g. the full range of diversity indices, the change in resources, the growth of the guild, and the relative abundance of resources). Figure 2, and Tables 1, 2 and 3 below present the results of using discriminant analysis for the year 1975.

Figure 2 – Inter-Town Variance 1975



² Root (1967, p. 335) first used the term ecological guild to refer to "a group of species that exploit the same class of environmental resources in a similar way"

Simply put, statistically, there is a highly significant difference between the examined towns across a combination (i.e. discriminant functions) of the following variables; Guild change, Resource abundance, Margalef index, FisherALPHA index, and Resource change. These variables (illustrated in the structure matrix) provide insights into the varied composition of the general, ecological, and selective environments across each town.

Table 1 – Structure Matrix

	Function				
	1	2	3	4	5
Guild Change	-.006	-.192	.080	.699*	.684
Resource Abundance	.005	-.076	-.329	-.233	.912*
Margalef	.017	-.037	.575	-.090	.812*
Exit Rate ^a	.017	-.037	.575	-.090	.812*
FisherALPHA	.295	-.077	.528	-.161	.776*
Resource Change	-.020	.608	.347	-.151	.698*

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions

Variables ordered by absolute size of correlation within function.

*. Largest absolute correlation between each variable and any discriminant function

a. This variable not used in the analysis.

Whilst nearly all of the variance of the model is explained by the first two discriminant functions (i.e. 1 and 2), the Wilks' Lambda values indicate that all five variables are useful within the model. The association between the discriminant scores and the towns is strongly correlated, as evidenced by the Eigenvalues all equaling 1.

Table 2 – Eigenvalues Table

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	10081329 ^a	97.3	97.3	1.000
2	227962.961 ^a	2.2	99.5	1.000
3	27837.184 ^a	.3	99.8	1.000
4	16796.263 ^a	.2	100.0	1.000
5	3111.860 ^a	.0	100.0	1.000

a. First 5 canonical discriminant functions were used in the analysis.

The very low value of the Wilks' Lambda indicates greater discriminatory ability of the function. The incorporated chi-square statistic tests the extent that the means of the functions used are equal across the towns investigated. The small significance value indicates that the discriminant function does better than chance at separating the towns.

Table 3 – Wilks' Lambda Table

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 5	.000	1411.739	90	.000
2 through 5	.000	1008.584	68	.000
3 through 5	.000	700.161	48	.000
4 through 5	.000	444.307	30	.000
5	.000	201.082	14	.000

From the findings presented above for the year 1975 (and very similar results for the years 1990 and 2004), we are able to discern several variables that collectively combine in various ways to explain the degree of environmental heterogeneity present in the North Yorkshire region. As such, we have areas of focus that link directly to an understanding of the composition of the external, ecological, and selective environments. Space limitations do not permit a fuller discussion of such factors, but they are explained elsewhere in detail (see Jones, 2008). Now we can move forward to consideration of the second proposition.

The second proposition being that: *the external environment experienced by a firm is an identifiable feature that can be reconciled to their existence*. The findings arising from the first proposition suggest that any attempt to aggregate the data (within this study) to determine firm survival will mostly likely conflate possible results in a misleading way due to the lack of symmetry between the linear time of the study and the ecological time found within the study that varies from town to town. That is, aggregated analysis exposes the researcher to committing an ecological fallacy (Babbie, 2003) whereby inferences about individual cases are drawn from a broader group to which they belong. As such, it is important to test both the similarity of towns in an alternative (and accepted manner) and to determine the degree to which variance is averaged away through aggregation of the data.

The use of Canonical Discriminant Analysis has revealed significant inter-town differences related to spatial heterogeneity that has existed throughout the study period. To further explore (and confirm) the extent of such difference, Pianka's (1973) Community Similarity Index³ was used to measure the extent to which the towns within the guild differ, and to also compare any such difference across time (see Figure 3 below for an example of a complete Community Structure Matrix [for 1975]). Consistent with the results of the Canonical Discriminant Regression, Community Similarity values for the North Yorkshire / East Riding guild are low and relatively consistent across time. At the beginning of the study time, the value is lowest ($\bar{X} = .39$, $S.E. = .015$, $s = .248$, $N = 253$), increasing by the studies mid point (i.e. 1990) ($\bar{X} = .47$, $S.E. = .012$, $s = .187$, $N = 253$) and essentially holding that degree of similarity at the end of the study period ($\bar{X} = .48$, $S.E. = .012$, $s = .185$, $N = 253$).

Figure 3 – Inter-Town Variance in 1975

	York	Hess	Scar	Thames	Keare	Goole	Grild	Milton	Sally	Wetherby	Ripon	Driffield	Pock	Withers	Picker	Kirby	Fley	Mt W	Barnes	Endon	Stam	Wade	Borough
York		0.60	0.77	0.18	0.36	0.27	0.50	0.45	0.27	0.09	0.36	0.36	0.00	0.36	0.27	0.18	0.36	0.09	0.27	0.09	0.27	0.27	0.27
Hess	0.60		0.50	0.17	0.31	0.25	0.50	0.31	0.25	0.08	0.33	0.33	0.00	0.33	0.25	0.17	0.33	0.08	0.29	0.08	0.25	0.25	0.25
Scar	0.77	0.50		0.17	0.31	0.25	0.46	0.41	0.25	0.08	0.33	0.33	0.00	0.33	0.25	0.17	0.33	0.08	0.46	0.08	0.25	0.25	0.25
Thames	0.18	0.17	0.17		0.40	0.66	0.33	0.40	0.66	0.50	0.50	0.50	0.00	0.50	0.66	0.33	0.50	0.00	0.33	0.00	0.66	0.25	0.25
Keare	0.36	0.31	0.31	0.40		0.60	0.33	0.43	0.60	0.20	0.50	0.50	0.00	0.50	0.33	0.40	0.50	0.00	0.57	0.20	0.33	0.33	0.33
Goole	0.27	0.25	0.25	0.66	0.60		0.50	0.60	1.00	0.33	0.75	0.75	0.00	0.75	0.50	0.66	0.75	0.00	0.50	0.33	0.50	0.50	0.50
Grild	0.50	0.50	0.46	0.33	0.33	0.50		0.57	0.50	0.17	0.66	0.66	0.00	0.66	0.50	0.33	0.66	0.17	0.50	0.17	0.50	0.50	0.50
Milton	0.45	0.31	0.41	0.40	0.43	0.60	0.57		0.60	0.20	0.80	0.80	0.00	0.80	0.60	0.40	0.66	0.20	0.57	0.20	0.60	0.60	0.60
Sally	0.27	0.25	0.25	0.66	0.60	1.00	0.50	0.60		0.33	0.75	0.75	0.00	0.75	0.50	0.66	0.75	0.00	0.50	0.33	0.50	0.50	0.50
Wetherby	0.09	0.08	0.08	0.50	0.20	0.33	0.17	0.20	0.33		0.25	0.25	0.00	0.25	0.33	0.50	0.25	0.00	0.17	0.00	0.33	0.33	0.33
Ripon	0.36	0.33	0.33	0.50	0.50	0.75	0.66	0.80	0.75	0.25		1.00	0.00	1.00	0.75	0.50	0.60	0.25	0.66	0.25	0.75	0.75	0.75
Driffield	0.36	0.33	0.33	0.50	0.50	0.75	0.66	0.80	0.75	0.25	1.00		0.00	1.00	0.75	0.50	0.66	0.20	0.66	0.20	0.75	0.75	0.75
Pock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Withers	0.36	0.33	0.33	0.50	0.50	0.75	0.66	0.80	0.75	0.25	1.00	1.00	0.00		0.75	0.50	0.66	0.25	0.66	0.25	0.75	0.75	0.75
Picker	0.27	0.25	0.25	0.66	0.33	0.50	0.50	0.60	0.50	0.33	0.75	0.75	0.00	0.75		0.25	0.40	0.33	0.50	0.00	1.00	0.75	0.50
Kirby	0.18	0.17	0.17	0.33	0.40	0.66	0.33	0.40	0.66	0.50	0.50	0.50	0.00	0.50	0.25		0.50	0.00	0.33	0.50	0.50	0.66	0.66
Fley	0.36	0.33	0.33	0.50	0.50	0.75	0.66	0.66	0.75	0.25	0.60	0.66	0.00	0.66	0.40	0.50		0.00	0.43	0.33	0.40	0.40	0.40
Mt W	0.09	0.08	0.08	0.00	0.00	0.00	0.17	0.20	0.00	0.00	0.25	0.20	0.00	0.25	0.33	0.00	0.00		0.17	0.00	0.33	0.33	0.33
Barnes	0.27	0.29	0.46	0.33	0.57	0.50	0.50	0.57	0.50	0.17	0.66	0.66	0.00	0.66	0.50	0.33	0.43	0.17		0.17	0.50	0.50	0.50
Endon	0.09	0.08	0.08	0.00	0.20	0.33	0.17	0.20	0.33	0.00	0.25	0.20	0.00	0.25	0.00	0.50	0.33	0.00	0.17		0.00	0.33	0.33
Stam	0.27	0.25	0.25	0.66	0.33	0.50	0.50	0.60	0.50	0.33	0.75	0.75	0.00	0.75	1.00	0.50	0.40	0.33	0.50	0.00		0.50	0.50
Wade	0.27	0.25	0.25	0.25	0.33	0.50	0.50	0.60	0.50	0.33	0.75	0.75	0.00	0.75	0.75	0.66	0.40	0.33	0.50	0.33	0.50		1.00
Borough	0.27	0.25	0.25	0.25	0.33	0.50	0.50	0.60	0.50	0.33	0.75	0.75	0.00	0.75	0.50	0.66	0.40	0.33	0.50	0.33	0.50	1.00	

0.39

Given the (confirmed) degree of dissimilarity observed across towns through time, it perhaps would be expected that the nature of survival of firms on the North Yorkshire / East Riding Guild would vary significantly. However, Figure 4 below illustrates the range of survival outcomes across all 23 towns for 5yr, 10yr and 15yr time periods, suggesting that the pizza sub-population appears *not* to hold any obvious survival advantage vis-à-vis the other main sub-populations.

³ Pianka's (1973) Community Similarity Index is simply X/N , where X is the number of sub-populations common to two towns and N is the total number of sub-populations occurring in either; thus community similarity equals 1 when two towns are identical, and 0 when they share no sub-populations.

Figure 4 – Overall and Sub-Population Survival (a)

	5yrs	10yrs	15yrs
All Firms	78%	64%	51%
All Pizza	75%	64%	50%
Chinese	99%	68%	59%
Indian	97%	57%	44%
Fish & Chips	87%	68%	54%

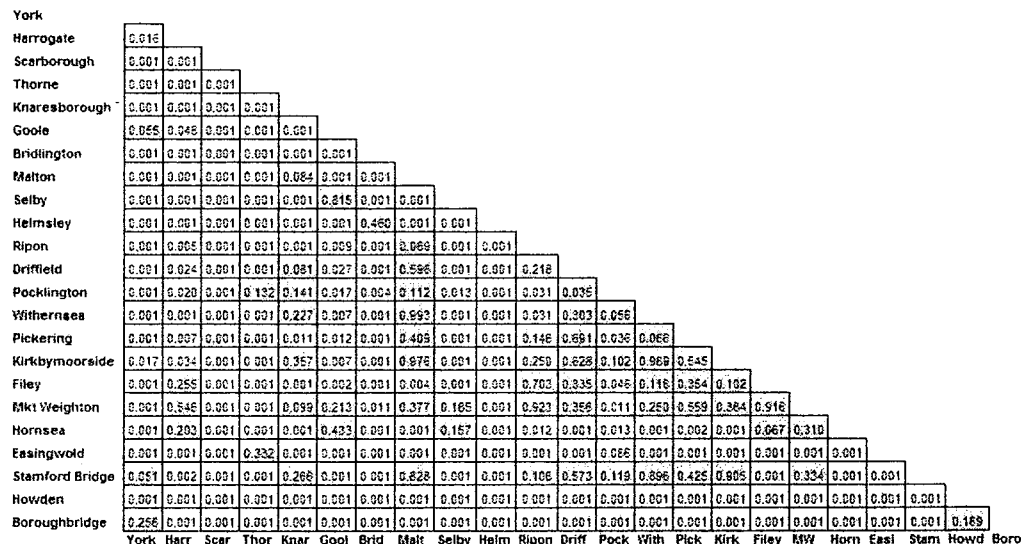
However, as illustrated in Figure 5 below, when the individual survival means for each of the 23 towns are compared for 10yr and 15yr time periods, a wide degree of variance between towns is demonstrated. Thus, it is confirmed that in addition to real and measurable differences between each town (and therefore differences in the local environments experienced), survival outcomes for all of the main sub-populations vary quite considerably across both time and space. As such, it can be concluded with a high degree of confidence that the external environment experienced by pizza firms in the North Yorkshire / East Riding region is unique and reconcilable to their operations.

Figure 5 – Overall and Sub-Population Survival (b)

	N	Range	Minimum	Maximum	Mean		Std.	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
OVERALL10yr	21	.49	.51	1.00	.6886	.02835	.12983	.017
OVERALL15yr	21	.68	.32	1.00	.5729	.04119	.18874	.036
PIZZA10yr	13	.56	.44	1.00	.7554	.06506	.23458	.055
PIZZA15yr	10	.78	.22	1.00	.6110	.08477	.26806	.072
Chinese10yr	19	.50	.50	1.00	.7874	.04636	.20210	.041
Chinese15yr	15	.58	.42	1.00	.7900	.05665	.21941	.048
Indian10yr	11	.45	.30	.75	.5300	.04139	.13726	.019
Indian15yr	4	.25	.25	.50	.3850	.05979	.11958	.014
FC10yr	20	.57	.43	1.00	.7330	.04184	.18711	.035
FC15yr	19	.71	.29	1.00	.6026	.04713	.20542	.042
Valid N (listwise)	4							

Now, we can consider the third proposition, that: *the ecological environment experienced by a firm is an identifiable feature that can be reconciled to their existence*. As demonstrated in proposition 1 and 2, there is significant inter-town differences related to spatial heterogeneity. Therefore, it should be reasonable to discern identifiable elements of the ecological environment that reflect such variance also. The primary component of the ecological environment is the availability of resources through which consumer income is possible. By determining the potential level of resource availability within each town across the period of the study we can test this postulate. To do so, I have measured the total resource availability (i.e. average consumer spend per firm) for each year in each of the 23 towns over the period of study. An accompanying assumption to this process being that the level of expenditure of take-away and restaurant food is relatively similar in total, but most likely different in its distribution across the various sub-populations. Using a Paired Samples T-Test to compare the potential resource availability across both time and space, the findings were very strongly in support of proposition 3. As illustrated in Figure 6, 75% of all comparisons were significantly different (at .05 or better). Those comparisons that were deemed *not* to be significantly different are highlighted by shading. Thus it can be concluded with confidence that the (proposed) primary component of the ecological environment does indeed vary in an identifiable and important way across both time and space.

Figure 6 – Comparison of Potential Resource Availability



The final proposition being that: *the selective environment experienced by a firm is an identifiable feature that can be reconciled to their existence*. At the regional or aggregated level, it would seem that independent pizza firms held a survival advantage over all other firms for 5 and 10 year timeframes (i.e. 81% & 72% compared to 60% and 44% respectively). Putting aside the issue of temporal variations, the nature of survival outcomes for local pizza shops is illustrated below in Figure 7.

Figure 7 – 5 and 10 Year Survival Comparisons

Town	5 Yr Survival	Town	10 Yr Survival
Thorne i	100%	Helmsley i	no data
Stamford Bridge c	100%	Mkt Weighton i	no data
Howden i	100%	Easingwold c	no data
Filey c	100%	Thorne i	100%
Malton i	100%	Stamford Bridge c	100%
Boroughbridge i	100%	Howden i	100%
Driffield i	100%	Filey c	100%
Helmsley i	100%	Malton i	100%
Hornsea i	100%	Boroughbridge i	100%
Pickering i	100%	Driffield i	100%
Mkt Weighton i	100%	Hornsea i	100%
Scarborough	95%	Pickering i	100%
Selby c	86%	Scarborough	95%
Bridlington	82%	Knaresborough c	75%
York	82%	Harrogate	73%
Overall	81%	Overall	72%
Harrogate	79%	Selby c	69%
Knaresborough	75%	York	65%
Goole i	60%	Goole i	60%
Ripon c	50%	Bridlington	55%
Easingwold c	50%	Pocklington i	50%
Pocklington i	50%	Ripon c	33%
Withernsea c	0%	Withernsea c	0%

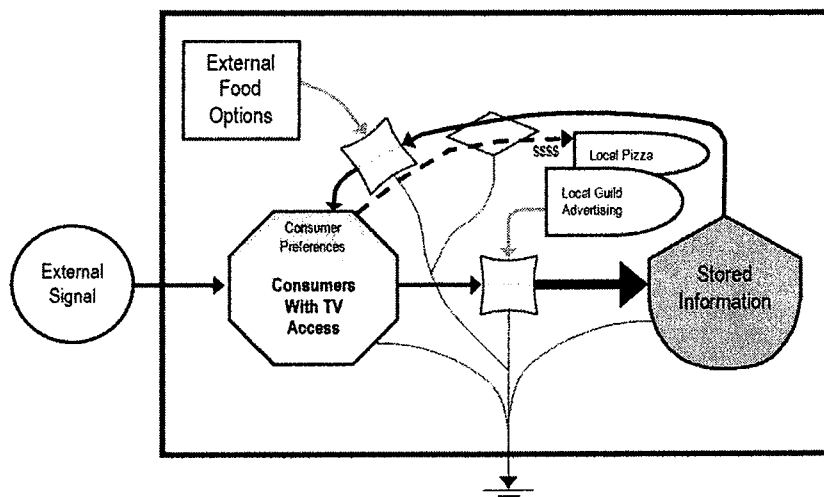
An interesting issue of note is the influence of the larger cities on the aggregated average survival. Both Harrogate and York potentially bias the sample due to their disproportionate size. The towns in *italics* all represent towns where pizza firms clearly exceed the regional average survival for pizza firms. Alternatively, the towns in **bold** all represent towns where pizza firms achieve relatively poor survival outcomes vis-à-vis the regional average. What is clear is that firms scattered across the region experience a range of selective environments from benign to very difficult. However, again it is those pizza firms located in isolated towns (identified with an 'i' in Figure 7) that appear most likely to benefit from a benign environment whereas those located in connected towns (identified with an 'c') would appear to have a much more difficult challenge in surviving.

In summary, it would seem that the differential survival of local pizza firms within the 23 towns investigated relates to an acceptance that within each town, different types of selection pressures will combine to impact firms on a town by town basis. Therefore, sufficient evidence has been presented to support the four propositions derived from arguing that the environment has distinct and identifiable dimensions that are experienced uniquely by individual firms across time and space. The remainder of the paper discusses (by way of further example) the findings and considers the research implications that emerge from the paper.

Discussion and Conclusion

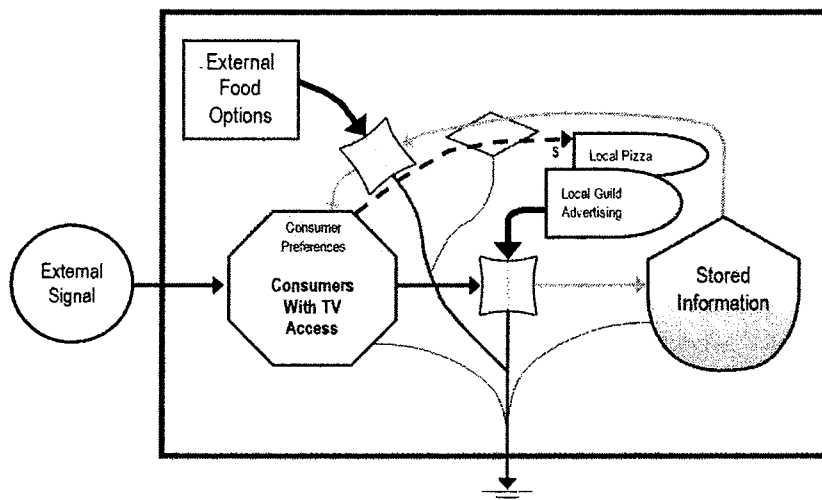
Throughout the findings presented, it is contended that we must employ more fine-scale analysis to fully appreciate how firms might acquire resources from their environs. Returning to the North Yorkshire restaurant example, we can consider the different processes impact resource flows (to pizza firms) in connected and isolated towns. We can model the extreme differences between isolated and connected towns by employing the systems diagrams of Odum (1996). In Figure 8 below, we can observe the external signal of the franchised firm/s entering (the isolated towns) from the left of the diagram. This signal is received by consumers with a television and the repetitive pulse of the signal results in information (about pizza) being stored within the minds of the town's consumers. It is argued that this information storage influences the food preferences of the consumers and in the absence of the advertiser's pizza; they consume pizza from the local provider. Thus, when the franchise signal is received, stored, and alters consumer preferences, the latent energy within the signal is converted into dollars for the local pizza shops. The 'thinnest' lines indicate the dispersal of available energy from the town.

Figure 8 – Isolated Town Energy Flow



Alternatively, in connected towns the flow of energy can be diverted by two separate 'switches'. As illustrated in Figure 9 below, increased levels of advertising by the local guild members can reduce the clarity of the franchise signal, thereby reducing the degree of information stored in the town about pizza. Also, the increased food options available to local consumers who are 1) more likely to work in a location outside their or residence and/or 2), are will to travel to nearby towns/cities to eat reduces the attractiveness of the local pizza shops. Now, the 'thinnest' lines become thicker as more potential energy (related to the franchisor's signalling) is lost from the town.

Figure 9 – Connected Town Energy Flow



Consideration of the suggested flows of energy through connected and isolated towns allows one to draw a clear distinction between the type of contingent conditions that would support or suppress the efficient acquisition of vital resources from the firms' environs. In connected towns 'switches' are activated due to high levels of guild advertising that reduces the clarity of the franchise signal, reducing the amount of information (about pizza) stored. This in turn reduces the influence on consumer preferences for pizza, which even in the event that they might exist are weakened by the availability of other food options immediately beyond the town's boundaries. In contrast, in isolated towns, the switches are not activated by increased levels of (local) advertising or the immediate availability of *attractive* food options external to the town.

In summary, while it is highly likely the clever operators in large towns have altered their operations to avoid direct competition, by and large resource acquisition is seen (in this example) to be a process related to specific properties of the environment (as determined on a firm by firm basis) that is gifted to local firms. Its influence is governed by factors beyond the control of a single firm, but enhanced by the presence of non-adversarial behaviour. Under conditions of non-adversarial coactions and isolation, the advertising signal can be usefully thought of as a form of *emergy* (Odum, 1996). Odum defined *emergy* as available (or stored) energy of one kind previously required directly and indirectly to make a product or service that can (via the process of transformity⁴) be converted into useful energy by other entities located within a specific region. There was little evidence in the UK context that local firms are aware of the benefit they gain from the invisible force that in this study is referred to as *Transferred Demand*. Likewise, neither of the major franchised firms seemed aware of the (overall) positive influence their advertising had on the survival of local pizza firms. Essentially, *Transferred Demand* can be categorized as a classic commensalism, where one firm benefits and the other remains unharmed, regardless of intentionality.

Some important implications arise from the findings presented here. First, it has been demonstrated in the above discussion that unobserved heterogeneity *can be observed* if we operate at the correct level of scale and collect specific data expected to relate to the resource transfer processes of interest. Data such as local advertising, accurate estimates of consumer spending on a good or service, and the degree to which firms operate within the same location, same operating hours and/or with the same offerings provides such data. Such an approach is consistent with the contention of Sears (1980, p. 223) who suggested that when the ecologist enters the study area, he or she "sees not merely what is there, but what is happening there". At present, it is argued within this paper that regardless of the statistical rigor claimed in past and current organizational studies research incorporating abstract notions of the environment, the field is often too far removed from other mainstream approaches (e.g. ecology) in conceptualizing the environment to expect progressive theory development.

⁴ In defining transformity, an analogy regarding natural energy transfer is useful. Trees absorb energy over a period of years, which is stored and eventually (via the process of transformity) is released as carbon to fuel other things in society.

A second implication to arise is the problem of resource flows/transfers being invisible to recipients and/or researchers. In this study, many of the Pizza shop owners were unaware of the benefit they potentially stood to gain from the franchised firms' advertising. Given that the large franchise chains were also unaware of the potential positive impact of their advertising upon independent firm, we as researchers should not always assume that accurate data can be collected from single sources. Clearly there is a need to use mixed-methods to increase the use of triangulation to develop greater consensus of the reality we investigate. Further, the very nature of the tools and concepts we carry into the research field should be reflected upon for their actual usefulness. It is interesting to note that the fascinating study by Kangas and Risser (1979) of resource partitioning in the fast-food industry by two ecologists is rarely cited in the organizational studies literature. Within the Kangas/Risser study, the mindset of the ecologist considering the application of existing ecological approaches to the study of a socio-economic setting is both transparent and of great interest. Here we are introduced to several new means to investigate the flow of resources occurring between firms and the environs they are located within.

A third implication also being that we as researchers must ensure we understand the nature of the environmental conditions associated with the process of resource acquisition. A limitation of this study is that it was limited in drawing upon the input of individual small business owners (due to an inability to access such data across the entire time period under investigation). However, it can be concluded with reasonable confidence that the process of resource acquisition (be it between firms and other firms and/or other stakeholders) will be influenced positively and/or negatively by the environs that operate within. To study the process of resource acquisition and/or networking, it would seem logical to ensure an attempt is made to factor in the likely impact of environmental heterogeneity. At present however, it would seem that researchers are quite likely unaware of the possible methods (from other domains of study) from which such heterogeneity is made obvious.

Therefore, and finally, the dangers of being trapped within one paradigm of thinking are evidenced in this paper. This study is unashamedly inter-disciplinary, seeking to adhere to Hodgson's Principle of Consistency that argues that "explanations in one domain have to be consistent with explanations in another, despite examination of different properties and deployment of different concepts". The failure to do so is evident in the inability of past work in the area of organizational ecology to satisfy even the most basic tenant of ecological thought (see Young, 1988; Zucker, 1988). The exciting challenge it would seem is to introduce ourselves to other research approaches that are employed to research similar phenomena in different domains of enquiry. To continue to use what adds value to our efforts and not to be afraid to import other practices that increase the value of our research efforts.

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