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Examining Relationships between Culture, Creativity and Business Stage in an Emerging Market: A Categorical Data Analysis of Vietnam's Data Set

Quan Hoang Vuong, Nancy K. Napier and Tri Dung Tran

In this article, we offer a new way of exploring relationships between three different dimensions of a business operation, namely the stage of business development, the methods of creativity and the major cultural values. Although separately, each of these has gained enormous attention from the management research community, evidenced by a large volume of research studies, there have been not many studies that attempt to describe the logic that connect these three important aspects of a business; let alone empirical evidences that support any significant relationships among these variables. The paper also provides a data set and an empirical investigation on that data set, using a categorical data analysis, to conclude that examinations of these possible relationships are meaningful and possible for seemingly unquantifiable information. The results also show that the most significant category among all creativity methods employed in Vietnamese enterprises is the "creative disciplines" rule in the "entrepreneurial phase," while in general creative disciplines have played a critical role in explaining the structure of our data sample, for both stages of development in our consideration.

JEL Classifications: C02, L26, M21, Z10

Keywords: 3-D creativity; Serendipity; Aha! Moment; Cultural values; Entrepreneurship; Categorical data; Log-linear model

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A Categorical Data Analysis of Vietnam's Data Set

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** Abstract:*

In this article, we offer a new way of exploring relationships between three different dimensions of a business operation, namely the stage of business development, the methods of creativity and the major cultural values. Although separately, each of these has gained enormous attention from the management research community, evidenced by a large volume of research studies, there have been not many studies that attempt to describe the logic that connect these three important aspects of a business; let alone empirical evidences that support any significant relationships among these variables. The paper also provides a data set and an empirical investigation on that data set, using a categorical data analysis, to conclude that examinations of these possible relationships are meaningful and possible for seemingly unquantifiable information. The results also show that the most significant category among all creativity methods employed in Vietnamese enterprises is the "creative disciplines" rule in the "entrepreneurial phase," while in general creative disciplines have played a critical role in explaining the structure of our data sample, for both stages of development in our consideration.

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Examining Relationships between

Culture, Creativity and Business Stage in an Emerging Market:

Evidence from Vietnam

Introduction

For decades, thanks to studies by scholars in many research disciplines, culture has become an accepted factor that can affect the organizational process of setting values, building goals and guiding behaviors of employers and employees. Researchers have also examined other factors, such as business stage of development (e.g., start up or entrepreneurial versus established mature firms) which plays a role in organizational success, in particular, in contribution to wealth creation in society but also by investing in new methods, new products help shape part of the changing cultures, and reinforce and realize true values of creativity.

Could these two factors, then, when joined by a third – creativity – may make organizations even more likely to succeed? In recent years, creativity has come under increasing scrutiny as a resource, renewable and unrestricted or "unrestrictable" in that it resides in no specific person, place or organization. Rather than complementing only the concept of "optimizing currently available resources" to obtain the best output/value possible for owners and stakeholders of the business firm or sector, creativity may rather bring yield the capability of making substantial changes either in the technology that firms use to manufacture better consumer goods, or of inventing new business logics and models that help to create new service markets, or of generating new methods that could turn waste of time and/or energy into new kind of value. In today's global market, then, creativity may become key to building cutting edge competitive advantage and building corporate financial value.

In this paper, we explore insights from these three management issues – culture, growth stage and creativity – to examine relationships among them and to present a tentative assessment of what those links might be and how they play out. We first review selected relevant literature related to the key factors we wish to explore, namely relevant creativity dimensions, cultural values and stages of business development. Following the review, we raise several questions on how to examine the factors and present a method and exploratory data to carry this out. We then discuss the findings from this initial examination and finally, discuss possible implications and future research directions.

We use Vietnam as the research context for several reasons. First, it is a prime example of a fast changing emerging economy, with GDP growth averaging 7.22% in the last decade. Second, despite of the dominance of state-own enterprises, small and medium scale enterprises (SMEs) are widely considered the driving force of Vietnam's economic growth (Vuong & Tran, 2009), especially since the financial turbulence that started in 2008. The expectation is that the SMEs' capacity of creating new services and products – and of course, new jobs – could help the country get out of economy stagnation and is more likely than from the state owned enterprises. Finally, the concept relating to creativity have not received as much attention yet in Vietnam, so using it as an example may yield some new insights not seen in more developed settings.

Brief review of selected literature

In this section, we will review briefly literature relating to the three broad variables or factors we will examine: (1) Creativity/insight/serendipity; (2) organizational growth stage; and (3) culture.

Creativity, insight and serendipity

Creativity can be considered a broad "umbrella" comprising several concepts, including insight and serendipity. All three have been researched for their relationships to individuals; more recently, some researchers have begun to consider whether the concepts could also be

developed at an organizational level, eventually as a way to build competitive advantage. We review briefly the three concepts below.

Creativity. Research on creativity has long tended to focus on individuals (e.g., John-Steiner, 1997; Runco & Richards, 1997; Runco, 2004; Sternberg, 1999). Klein (1982), for example, conducted a survey on words and phrases that people -- ranging from novelists and musicians, to social scientists and high school students -- use to define creativity. The result was a diverse set of words and phrases, demonstrating that creativity is a catchall term. Some characteristics and behaviors were similar across groups, however, including the following:

(1) Ability to maximize options and broaden perceptions of behavioral alternatives.
(2) Ability to defer judgment, accept all ideas as plausible and eliminate prejudice on all levels.
(3) Being inconsistent, or "… more primitive and more cultured, more destructive and more constructive, and crazier and saner than are average people" Barron (1963).
(4) Seeking freedom from conventions and habits
(5) Being action oriented with a focus on not just thinking of good ideas but acting on them.
(6) Ability to be aware of inner and outer worlds, in terms of where people are, whether they want to be there, where they do want to be, and how they are going to get there.
(7) Being responsible/responsive to his/her needs and to the world.
(8) Having a positive orientation that increases self-concept and confidence.
(9) Willing to take risks: Risk avoiding can result in a lack of growth, limited horizons, and a boring daily life.

Klein offers a 3-dimension model for identifying factors comprising individual creative behavior (Exhibit 1), including modes of behavior (e.g., cognitive), contents of behavior (e.g., ability to perceive), and processes of behavior (e.g., flexibility and elaboration).

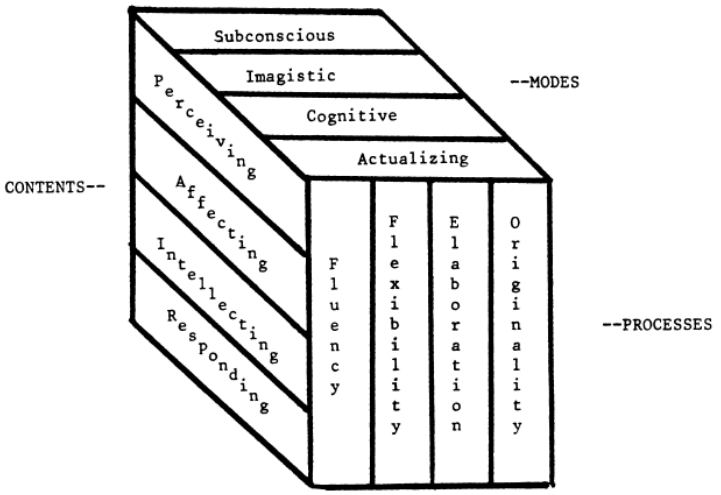

Exhibit 1*: Klein's Model of Creative Behavior (Klein, 1982)*

Glaveanu (2010) defines 'creativity' as capacity to bring about the new, especially the creative product, which is new, useful, appropriate or meaningful. He argues that creative expression is a form of cultural expression and, ultimately, one of the most illustrative forms of cultural participation. He uses Yin and Yang symbols to describe the interdependence of culture and creativity. "Culture is not only a resource but also a directing force." Therefore, "the 'richer' the contact with cultural elements, the more remarkable the creations." On the other hand, creativity is "the main engine behind cultural change and transformation."

Similar to others, Kronfeldner (2009) uses novelty (i.e., original, unexpected) and appropriateness (i.e., useful, adaptive concerning task constraints) in defining creativity. For her, novelty leads to "originality" and "spontaneity". The former explains why something must be novel in order to be a product of creativity. The latter answers why 'unexpected' and 'surprising' are needed. Further, Kronfeldner defines originality as a specific double causal independence - learning from others and learning from individual experience. "A potter is creative only if he does not copy the activities of others or an original pot [even the pot was made by himself]." However, "training in pottery does not make it the case that a trained potter cannot be creative." The

knowledge which the potter accumulated over the years [from others and himself] is necessary for him to be able to come up with the [new] idea as well as allows him to judge it appropriate.

Originality is not the only essential characteristic of creativity. When learning and experience diminish originality, there will still be spontaneity. Kronfeldner argues that creativity comes in degrees. Although a child obtains a lot of information from his teacher, as long as the teacher is not presenting the solution directly, "the child has to be creative to some degree." The teacher defines the problems and gives the child almost everything he needs but the teacher withholds the answer. "Creativity does not react to orders. It occurs spontaneously, if it occurs at all."

While many researchers still focus on creativity at the individual level, in the last two decades some focus has moved toward how organizations can develop and use it (Amabile, 1996; Amabile and Regina, 1999; Degraff & Lawrence, 2002; Napier and Nilsson, 2008; Paulus & Nijstad, 2003; Unsworth, 2001). Creativity increasingly has been considered a resource, potentially useful even beyond organizational competitiveness to include countries (Napier, Leonard, & Sendler, 2006) and communities as well (Florida, 2002, 2005; Kao, 2007).

With regard to organizations, in particular, elements of creativity include a *disciplined process and a culture that enhances it.* Napier and Nilsson (2008) describe three disciplines (i.e., 3D creativity) as critical for implementation of creativity. They include “out of discipline” thinking, “within discipline” expertise, and a “disciplined process.” First, out of discipline thinking involves looking beyond a discipline or field for ideas. Out of discipline thinkers absorb information from sources beyond their normal boundaries and fields and then seek to understand how the ideas might apply in their situation. Second, within discipline expertise focuses on how individuals become the best in their fields and then, with that fundamental expertise base, move onto thinking more creatively. The notion is that when the best in a field work (or compete) together, they can learn and improve faster from each other, allowing them to come up with new

ideas in the process. Third, a disciplined process means that organizations use routine and structure to allow more creativity.

Insight or aha moments. Insight or "aha moments" is typically defined as the *sudden awareness of a problem solution or understanding of some idea* (e.g., learning a language, realizing a life lesson). The process, which can be mapped, generally consists of several stages (Napier, 2010; Wallas, 1926). First, an individual (or in the case of a group moving toward a "collective aha moment") gathers or receives overwhelming amounts of information on the topic of interest or problem to be solved. This "sort stage" beings, then, with a sense of too much dispersed and unconnected information, and then moves into a period which involves chunking and sorting the information into understandable categories. At this point an insight – "connecting the dots" – may occur but if it does not, the next phase should begin. During the "spark stage," individuals and groups can use several techniques to generate the sudden awareness or understanding. Such techniques include, for example, looking at a problem "in reverse," or from an unusual angle, bringing together ideas from very different domains, and allowing for "simmering" or some time to pass when the "unseen mind" works subconsciously on the problem. Once insight occurs, a final "checking stage" to verify the result is critical to be sure that the aha moment lesson can be generalized beyond a single incident.

Serendipity. Finally, the concept of serendipity is similar to insight in that it typically involves integrating sometimes diverse ideas but there are distinct differences. Typical characteristics that emerge in the definition of serendipity are: (i) Unsought, unexpected, unintentional, unanticipated event or information;(ii) something out of the ordinary, surprising, anomalous, inconsistent with existing thought, findings or theory; and (iii) an alertness or capability to notice what others do not, to recognize, to consider, and to connect previously disparate or discreet pieces of information to solve a problem or find an opportunity.

Napier and Vuong (2012) reviewed literature on serendipity and its importance, conditions, the making process and raised the question of whether it could be developed as an

ability to recognize and leverage unexpected information to create value from it. Their definition of serendipity is an ability (that can be developed) to *notice, evaluate, and take advantage of unexpected information better or faster than competitors.* An important distinction is that information appears unexpectedly and only within the context of a problem or opportunity does it come together to create something of value. Further, the ability to notice the information is also key. Unexpected information appears regularly at the doorstep of individuals and organizations, but if it goes unnoticed, it never has the chance to be leveraged. Thus, the ability to notice, the ability to evaluate, and the ability to turn that information into something of value are key to the process.

Dimensions of national culture

Hosftede, in his oft cited classic *Culture's Consequences* (1980, 1984), used an existing data bank from IBM, to examine matched populations of employees in national subsidiaries in 64 countries. From the data, he introduced four dimensions of national cultures: (1) individualism vs. collectivism, (2) masculinity vs. femininity, (3) power distance, and (4) uncertainty avoidance. Following the results of the survey conducted by Michael Harris Bond and colleagues in 1991,[1] Hofstede added a fifth dimension to his model, long-term vs. short-term orientation, which was initially called Confucian dynamism. Hofstede's sixth dimension – indulgence versus restraint - resulted from Minkov's interpretation of World Values Survey (2007). For the discussion in this paper, we use Hofstede's six dimensions of national culture. His comparison of American and Vietnamese business people on the first-five dimensions appears in Exhibit 2.

[1] http://www.geerthofstede.nl/culture/dimensions-of-national-cultures.aspx

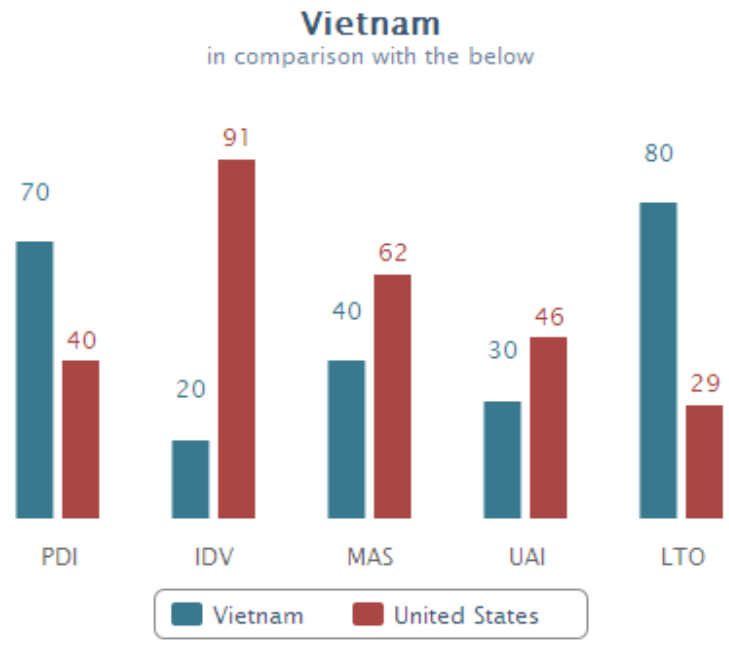

Exhibit 2: A Cultural Comparison of American and Vietnam Businesspeople

** Source: www.geert-hofstede.com, retrieved on Feb. 2, 2012*

In a collectivist setting, like Vietnam, widening a relationship base, which assumes a long term orientation, is one of the most important methods of building business competency and advantage, rather than professionalism, quality improvement, and product innovation. Napier and Thomas (2004) note that careful relation management is crucial to business success for foreign managers in transition economies. In addition, when the less powerful members of society accept and expect inequality, they have no motivation to change their position in the value chain. In other words, they are reluctant to either improve useful solutions or create new products. Thus, for Vietnamese business people and entrepreneurs, short-term orientation and uncertainty avoidance may be common and can prevent them from pursuing large value-creation endeavors (Kohl, 2007) and greatly affects the business interactions among Vietnamese and with foreigners. In addition, Vietnamese business people simply pursue busi dealings in ways that may seem baffling to foreigners, Napier & Vuong (2011) provide foreign businesspeople with examples of

some of those challenging ideas, such as understanding the notion of who does what during dealings, the use of 'seed capital,' the concept of "disguised entrepreneurs," different perspectives on human resource management, and the role of strategic partners. The authors also suggest the use of culture interpreters – that is professional consultants/consulting firms – to eliminate the cultural gaps and avoid misunderstanding.

Exploratory Research Questions

The literature review raises questions of what may affect selected aspects of human resource management within organizations. Specifically, we consider cross-cultural aspects and the capability to create business solutions or products over different stages of business development and offer three exploratory research questions as for this investigation:

a. What are the key elements in the relationships among cultures, creativity types and stages of corporate growth?
b. What methodology is useful to examine empirically those hypothetical relationships among the variables?
c. What can we learn from the empirical data and the validity of the insights and implications, for both research and business?

We address the first two questions in the Methodology and its subsections and the last one in the conclusion and implication section.

Methods of investigation

First, we draw upon research from several sources to generate propositions on various types of creativity (e.g., Napier & Thomas, 2004; Napier & Nilsson, 2008; Napier & Vuong, 2012). Drawing on such work, we selected three major elements or types of or approaches to

creativity: i) Creative Disciplines; ii) Aha-Moments; and, iii) Serendipity. They are nominally distinctive 'values' of a variable called 'creativity' in our model. Second, we wanted to examine cultural dimensions in relation to creativity and chose to examine three properties that capture our data sample, discussed in the next subsection. Those dimensions as **3-Rs**: i) **R**elationship-based value; ii) high **R**isk tolerance; and, iii) high reliance on **R**esources. And lastly, we chose to examine two major – and conceptually distinctive – stages of business development: i) entrepreneurship; and, ii) mature, well established business stages.

These eight different factors could help describe possible interactions between management issues of creativity, culture and period of development, which could also be regarded as three categorical variables.

While the theoretical appreciation could be straightforward, it is quite often that in specific locality and time we are not able to empirically verify a hypothetical proposition. Thus, the problem for 3 categorical variables as said above would be most likely a nontrivial one, even if a few or many of hypothetical relationships later turn out to be unsupported by empirical evidences. Logically speaking, for a specific data set, in our case drawn upon a group of Vietnamese businesses, a rejected hypothesis on a likely relationship will not automatically damage the model of interactions between the elements, but likely shows a possibility of variations in different samples over time, places and settings.

In terms of an empirical strategy for examining these theoretical arguments about relationships among creativity types, 3-R and stages or between pairs of any two of them, it is more sensible to look into statistical methods that deal with categorical data in nature. Also, given three variables as described above, our model of 3-way data set is adequate to reflect parsimonious relationships while not quite obvious to confirm any of these. Technical details of such a categorical data analysis – suitable for our task of considering this management problem – are offered in Agresti (2002) and Azen & Walker (2011). Details on estimation and inferences are provided in Stokes *et al.* (2000).

The essence of our empirical verification of relationships among the concerned variables is to set up relevant data set and subsets, then to seek evidence of independences vs. associations among variables, and covariate – when 3-way joint frequency tables are applicable – and examine statistical (in) significance of key factors present in our model. When we need to look deeper into the issues of magnitude of influences among elements, or groups of elements, in the model, a log-linear model is employed to provide for some better insights. Consequently, estimating parameters, constructing confidence intervals and confirming the meaning of factors in the model at desired level of statistical significance are at the heart of the test performance.

Although details for technical aspects of methods employed are beyond the scope of this paper, and in fact is a whole realm of statistics theory, a brief description of how these methods are used follows.

a. Analysis of association vs. independence using contingency tables:

Contingency tables are comprised of count data – such as in our table 3.1 – appearing as the so-called joint frequency, denoted as n_{ij} in a 2-way table (e.g., n_{12}=18 in table 3.4), or n_{ijk} in 3-way tables (n_{221}=28 in table 3.2). The value appears in a cell in the margins of the table is marginal frequency, which is a row/column total for one category of one variable. For each 2×2 table, row (column) total is noted n_{i+} (n_{+j}). Observed marginal probabilities are therefore p_{i+} = (n_{i+}/n_{++}) for rows, and likewise for column. Total number of observations is therefore denoted as n_{++}.

Independence (association) between categorical variables, using contingency tables of count data, is evaluated using odds ratio, with a key principle that if independence holds then true joint probability of a cell in the population satisfies:

$$\pi_{ij} = \pi_{i+}\pi_{+j},$$

which leads to the use of odds and estimated odds ratio for 2x2 table as follows:

$$\text{Odds} = \pi /(1-\pi),$$

$$\text{Odds ratio } (\theta) = (p_{11}/p_{12})/(p_{21}/p_{22}) = (n_{11}n_{22})/(n_{21}n_{22})$$

Inference for odds ratio is performed through the use of log odds ratio $\ln(\theta)$ and the constructing of confidence interval around the estimated log odds ratio, determined by: $\ln(\theta) \pm z_{\alpha/2}$ s.e.; where s.e. (standard error) of the log odds ratio is computed by:

$$\text{s.e.} = \sqrt{[(1/n_{11}) + (1/n_{12}) + (1/n_{21}) + (1/n_{22})]},$$

and z follows a standard normal distribution; α is the power of the test for determining the confidence interval of $(1-\alpha)$, usually 95%.

Our data set will be then examined for expected frequencies under the null hypothesis of statistical independence (H_0). The most common test statistic used is the likelihood ratio one, defined as:

$$G^2 = 2\sum_I\sum_J O_{ij} \ln(O_{ij}/E_{ij})$$

Which is chi-square statistic at $(I-1)(J-1)$ degrees of freedom.

Other related test statistics reported in this work include also Cochran-Mantel-Haenszel (CMH) and Breslow-Day for 3-way contingency tables. These are also χ^2 variables and both are evaluated to test against H_0 of statistical independence. Agresti (2002) and Azen & Walker (2011) provide accessible discussions on validity, technical details and applications of these.

b. Models employed for our examinations:

Our examinations take advantage of resulting relationships between natural log taking ln(lambda) of predicted outcome and level of the predictors, in a linear relationship:

$$g(E(Y)) = \ln(E(Y)) = \ln(\lambda) = \alpha + \beta(X)$$

normally called the log link function, which constitutes the Poisson regression model, a specific type of the generalized linear model (GLM) and is evaluated using maximum likelihood estimate (MLE).

The following equations will be estimated for our investigation on independence vs. association among categorical variables and between certain pairs of them. Equation (3.1) is referred to as homogeneous association specification and is used to verify the need of a three-way interaction term in an estimation model (i.e., the saturated model). Eqs. (3.1) to (3.4) are conditional associations, and the last one is for fitting to a statistical independence model.

Eq (3.1) $\log(\mu_{ijk}) = \lambda + \lambda_i^X + \lambda_j^Y + \lambda_k^Z + \lambda_{ij}^{XY} + \lambda_{ik}^{XZ} + \lambda_{jk}^{YZ}$

Eq (3.2) $\log(\mu_{ijk}) = \lambda + \lambda_i^X + \lambda_j^Y + \lambda_k^Z + \lambda_{ij}^{XY} + \lambda_{ik}^{XZ}$

Eq (3.3) $\log(\mu_{ijk}) = \lambda + \lambda_i^X + \lambda_j^Y + \lambda_k^Z + \lambda_{ij}^{XY} + \lambda_{jk}^{YZ}$

Eq (3.4) $\log(\mu_{ijk}) = \lambda + \lambda_i^X + \lambda_j^Y + \lambda_k^Z + \lambda_{ij}^{XZ} + \lambda_{jk}^{YZ}$

Eq (3.5) $\log(\mu_{ijk}) = \lambda + \lambda_i^X + \lambda_j^Y + \lambda_k^Z$

Coefficient λ's from these fittings need to be exponentiated for interpretation. When performing tests, related statistics – such as Wald and p-Value – are reported to gauge each parameter's significance. Following these estimations we need the log likelihood ratio G^2 chi-square statistic 'deviance change,' defined as:

$$G^2 = 2\sum O \ln(O/E),$$

where the sum is over all cells, O observed and E expected values; and the null hypothesis H0 states that the observed data fit the model, for selecting the best fitted model to explain our data set. Conventional levels of significance of 1, 5 and 10% are employed for evaluating estimated parameters.

One of the key issues, especially in Vietnam's transition economy, is quality of the data set(s) used in the work. The early treatment of raw data, which helps transform them into a data set useful and ready for a test performance, represents a critical work in our actual undertaking of this study.

3.3. Data

Our data set is comprised of 115 count data entries, with 60% of them being collected from various secondary sources, mainly journalistic articles on local major media. The remaining 40% come from our own observations and experiences in directly working with these entrepreneurs and businesspeople over the fairly long period of time, in many cases up to 15 years. The constructing of our major data set – presented in table 3.2 – is a main responsibility of one co-author, following criteria set by other two before hand. At the same time, frequent and random checks on quality of data entries are made by the other two to ensure the appropriateness and relevance to related theories in creativity, entrepreneurship and business culture.[2]

Every data entry has one corresponding individual record. The record consists of raw information and table (3.1) as follows.

Table 3.1. Individual Record

Id	:	*Fixed, as same as the Id in the data sheet*
Name	:	*Name of the person*

[2] Data set is available upon direct request to the corresponding author at qvuong@ulb.ac.be

Company	:	*Name of institution (if any)*
Industry	:	*Field of business*
Year of Business	:	*Number of years in doing the business*
Attributes	:	
[*Select only one based on stage of business development*]		
- Entrepreneur	:	*Start-up, household/family business, uncertainty of future growth*
- Businessperson	:	*Well established, sustainable growth, widely recognized brand*
[*Select only one based on type of creativity]*		
- Creativity	:	*A process of creating values following somewhat industrial disciplines*
- Aha	:	*A solution*
- Serendipity	:	*An unexpected outcome*
[*Select only one based on source of creativity]*		
- Relationship	:	*Reliance on personal relations*
- Risk Tolerance	:	*Tendency of the businessman to take higher risks*
- Resources	:	*Availability of resource or ability to mobilize resource*
Sources: *There are stories/articles about the person. Original information and data can be in either English or Vietnamese.*		

While defining a person is an entrepreneur or businessperson we consider what he/she is at present. In some records, the raw information provides stories about people at the beginnings of their business life. In other words, the stories describe them as entrepreneurs. However, we define those people businessperson because they are now running well-established enterprises whose brand and reputation are widely recognized.

It is believed that when people are faced great difficulties – those of dead or survived decisions, they are forced to be creative or else. In light of this, creativity is supposed to appear suddenly – e.g., a 'big-bang' economic reform. In the case of Vietnam, Vuong *et al.* (2011) argue that despite of economic difficulties in late 1970s and 1980s reform policies have created and implemented gradually as a resulted of the country's leaders' entrepreneurial process.

And we arrive at the following table 3.2, which clearly indicates that the 'stage of development' variable is now regarded as a covariate, with two different values of E

(entrepreneurship) and B (well established business) at each, two 3×3 partial tables are constructed with 52 and 63 count data points, respectively.

Table 3.2

The 3×3×K data structure

with K=2 representing the covariate of stage of business development

		Entrepreneur (E)			
		Type of creativity			
		3-D Creativity	Aha!	Serendipity	
Source of creativity	Relationship	4	2	4	10
	Risk tolerance	6	6	5	17
	Resources	9	9	7	25
		19	17	16	52
		Businessperson (B)			
		Type of Creativity			
		3-D Creativity	Aha!	Serendipity	
Source of creativity	Relationship	12	0	1	13
	Risk tolerance	10	7	1	18
	Resources	16	10	6	32
		38	17	8	63

In another way of looking into the issues of relationships, we observe the rule of "simpler" means "more useful/insightful" and turn 3 types of creativity into 3 values of the

creativity dimension of our model space. Also, at the same time, we consider 'relationship' now part of a larger value of 'resources' which is true in many Asian economies, especially in those East Asian Confucianism system, and another important data set used in the work is 2×2×K, with K=3, and provided in the following table 3.3. Vuong & Tran (2009) and Vuong *et.al.* (2010) explain how business owners mobilize resources by exploiting relations in Vietnam. For instance, the more people they have relations with, the more trust they gain from the others and the easier for them to sell equity and ask for loans. In addition, in a transition economy, since many resources are controlled by the state, having relations with the government and the bureaucrats provide both public and private enterprises with competitive advantages.

Table 3.3

The 2×2×K data structure

with K=3 representing the covariate of sources for creativity

3-D Creativity				
		Stage of development		
		E	B	
Source	Risk tolerance	6	10	16
	Resources	13	28	41
		19	38	57
Aha! Moment				
		Stage of development		
		E	B	
Source	Risk tolerance	6	7	13
	Resources	11	10	21
		17	17	34
Serendipity				

		Stage of development		
		E	B	
Source	Risk tolerance	5	1	6
	Resources	11	7	18
		16	8	24

For these two important tables 3.2 and 3.3, it is quite straightforward to produce two corresponding 2-way data sets by ignoring the covariates, presented in table 3.4 (3×3) and 3.5 (2×2). Some additional analysis would later be performed to compare with results from the 3-way table examinations for more insights in section 4.

Table 3.4

The 3×3 structure between two categorical response variables reflecting creativity sources and cultural values

	3-D	Aha	Serendipity	
Relationship	16	2	5	23
Risk tolerance	16	13	6	35
Resources	25	19	13	57
	57	34	24	115

In fact, table 3.5 shows the simplest 2×2 structure but it could be telling in the general sense of creativity since now all three properties of 3-D, Aha! Moment and Serendipity are now merged into only one level of the covariate (K=1), while given fixed level of creativity it is worthwhile to see how stages of development and cultural values interact with each other.

Table 3.5

The 2×2 structure between two categorical response variables reflecting stages of business development and cultural values

	Entrepreneur	Businessperson	
Risk tolerance	17	18	35
Resources	35	45	80
	52	63	115

With these questions in mind, the next section provides some findings from tests performed on the data sets we derived from our primary and secondary data sources.

4. Empirical results

The following results are obtained through several separate statistical tests – namely tests on associations of categorical variables for some $X_i \times Y_j \times Z_k$ structures with I and J varying from 2 to 3, and K from 1 to 3; together with a log linear model estimation for fitting data with Poisson distribution, based on our data sample, using SAS system. We report only key statistics that helps derive substantial insights gained from the above sample.

4.1. A first look at a naiveté of equal likelihood

We first look at the table 3.3 where we do not care the distinction between stages of development – that means it does not matter much whether a firm is in its entrepreneurial phase or well established – and focus solely on 3 sources of creativity and 3 cultural values.

Before the test, we tend to think about a equally likely outcome for each value of each dimension of table 3.3, and now see that the marginal frequencies for the row and column vectors

now become: n_{i+}=(23, 35, 57) and n_{+j}=(57, 34, 24), respectively.[3] The first test is for these two vectors of values against the hypothetical guess of equally likely values employing the standard Pearson chi-square test statistic (Agresti 2002; Azen & Walker 2011). The outcome shows for two degrees of freedom (df=3−1=2), χ^2=15.53, leading us to reject our previous 'naiveté' on probabilities of each of 3-R or sources of creativity, since the statistic is much larger than critical value at df=2 being 5.99.

In fact, our previous guess was not all too bad, since although there is no support for such equal likelihood in the table 3.3, at the first fixed level of covariate 'stage of development' in table 3.1, we could observe at least the column vector of marginal frequencies (19, 17, 16) that looks quite promising candidate for our (1/3, 1/3, 1/3) hypothesis. And we now have χ^2=0.27 and could not reject our seemingly-naïve null hypothesis.

4.2. Independence versus homogeneous/partial associations among variables

For the 3×3×2 table, with covariate K representing stages of development, we now perform a test of homogenous association, controlling for each value of K (E or B), and we obtain the following interesting results:

Table 4.1

Summary of key statistic values for test on hypothesis of independence between 3-R and creativity sources (C/A/S)

Partial table of 3-R × C/A/S, controlling for	Stats.	df	χ^2	p-Value

[3] We need to provide one statistic for this since both vectors $\{n_{i+}\}$ and $\{n_{+j}\}$ represent quite similar values of constituting elements, except in different orders.

K= E	Likelihood Ratio	4	1.06	0.9011
	Size=52			
K= B	Likelihood Ratio	4	12.64	0.0132
	Size=63			

(*) Note: The χ^2 critical value at df=4, α=5% is 9.49.

For homogeneous association hypothesis, our examination reports that Cochran-Mantel-Haenszel (CMH) statistic $\chi^2 = 7.01$ (with p=0.14), and we could not reject the null hypothesis that basically the two partial tables for control of stage (entrepreneurship and business) have not shown evidence for significantly different structures. But, the test statistic for each of the 2-way tables provided in table 4.1 shows a significant difference for our control of stage. Specifically for 'entrepreneurship period' (E) the two dimensions of 3-R and creativity sources have shown statistical independence. But that is not the case with better established enterprises (B) where we see very clear evidence of conditional association between for the partial table of joint frequencies between Relation/Risk/Resources and 3D/Aha/Serendipity, because our likelihood ratio χ^2=12.64 is larger than the critical value 9.49 with 4 degrees of freedom).

Now that we look into table 3.2, whose 2×2×K structure enables us to compute the Breslow-Day chi-square test statistic for homogeneous association null hypothesis. Breslow-Day statistic is a chi-square and for our test it has df=(2−1)(2−1)(3−1)=2. Using, data provided in table 3.2 we get χ^2=1.09, much smaller than 5.99, which leaves p-Val equal to 0.58. We thus cannot reject the hypothesis of homogeneous association across values of our 'creativity covariate' at any conventional level of significance. In other words, in different properties of creativity, the conditional associations between Risk/Resources and phases of business are not significantly different, following results summarized in table 4.2, using mainly the likelihood

ratio test statistic (G^2 chi-square) for 1 degree of freedom; that is a corresponding critical value for χ^2=3.84 at the conventional 5% significance level.

Table 4.2

Summary of key statistic values for test on hypothesis of independence between 2-R and phase of development (E/B)

Partial table of 2-R × E/B, controlling for	G^2	p-Val.	Size	Outcome
3-D	0.17	0.68	57	Not rejected
Aha! Moment	0.12	0.72	34	Not rejected
Serendipity	1.09	0.30	24	Not rejected

(*) Note: χ^2 critical value at df=1; α=5% is 3.84

We could see also that for the overall sample, provided in table 3.4 with dimensions 2×2 – where we do not split the data set into different fixed levels of covariate following creativity value as in table 4.2 – the test result would most likely follow the same conclusion. In fact, we obtain a G^2 of 0.23 (sample size=115; df=1, α=5%) which could not reject the starting hypothesis of statistical independence among two variables describing values of cultures and phase of business development. This confirmation of independence with a 95% confidence between business phase and cultural values would mean that joint probabilities of the table 3.2 can be computed using the marginal probabilities following the rule of: $p_{ij}=p_{i+}p_{+j}=(n_{i+}/n_{++})(n_{+j}/n_{++})$.

4.3. Analysis of log-linear models for 3-way contingency tables

The three parsimonious log-linear specifications that we like fitting our data set to are equations 3.1, 3.2 and 3.3 specified in the subsection 3.2.

In fact, equations from 3.2 to 3.4 represent what are defined as conditional associations on X, Y and Z, respectively, while 3.2 is a specification for homogeneous association. Toward the end, we compare these to the saturated log-linear model for appraising goodness-of-fit for our data sets.[4]

Table 4.3

Summary of key test statistics for goodness of fit

for test on log-linear model independence vs. association among variables

Model	Deviance	No. of params	df	G^2	p-Val.
Saturated model	0.00	18	0	N/A(*)	N/A
Homogeneous association (3.1)	5.46	14	4(*)	5.46	0.243
Conditional association on 'stages'	13.69	10	8	8.23	0.084
Conditional association on 'cultures'	13.72	12	6	8.26	0.016
Conditional association on 'creativity'	5.83	12	6	0.83	0.660
Complete independence (3.5)	22.04	6	12	8.22(*)	0.013

(*) Note: N/A: not applicable; df: (3−1)(3−1)(2−1)=4; Deviance change test statistic: 8.22=(22.04−5.83);

In the table 4.3 no statistics on three other models on joint independence are reported. However, we do perform estimations to observe goodness of fit for our data set, and conclude that the above 6 estimations are sufficient to reach some meaningful insights for the investigation at hand.

[4] The saturated model adds the last term of 3-way interaction λ_{ijk}^{XYZ} to equation (4.1) for homogeneous association model.

The saturated model does not show better fit to data than our (3.1) due to insignificant G^2 statistic (deviance change) of 5.46 (df=4; p=0.24), so that the null hypothesis of H_0: λ_{ijk}^{XYZ} =0 is not rejected, thus a third-way interaction term should be eliminated from our selection of model for explanation. Similarly, the 'complete independence' model is also not the best fitting due to its deviance increase that reduces model fit to the (3.4) is significant at 5% level (G^2=8.22; df=6; p=0.013).

We now arrive at the fitting one, i.e., equation (3.4) – which implies conditional association among variables, controlling for creativity sources as the most parsimonious specification with complete estimates being provided in table A.1 (see the Appendixes). One 2-way term is significant at 1% level, which is the E×3D. This is quite close to what we observe from the homogeneous association specification fitting (3.2), provided in table A.2.

5. Final remarks

We are now able to offer some interesting insights derived from the above study of interactions between three categorical variables – in nature – as well as some thinking about further study of related management issues.

From the above transformation of principles of creativity and culture theories into specific data, the use of contingency tables of joint frequencies enables us to quantify qualitative assessment as count data, which are possible for an empirical strategy, and hence an actual investigative performance.

For the 3×3×K consideration, we conclude that splitting between entrepreneurship and well established phases of business development does matter. In the former, statistical independence is not rejected leading us to explain the relationship between the choice of creativity source and that of cultural values as independent, however with the latter, two-way association is the case.

However, with our reorganizing of the data set following the 2×2×K structure, that means when we regard 'relationship' value as part of the resources that a business would use, the 2-way association is not confirmed. We would think of this situation as follows. Although in terms of statistical techniques, the simpler is preferable, and in most cases more useful for our understanding, it is not always the best way to do that. This reflects the logic of a reality that researchers in both disciplines of creativity and culture research constantly split up different values in some way when pursuing research. One of such example is Hofstede has expanded his dimensions of cultural values from 4 in his 1980 work to 5 in 1991 and to 6 in 2010.[5] Still we expect that simpler structures may help since p-Value reported in table 4.2 vary quite large, and with other sets of data we may reach different conclusions.

The attempt of fitting our data set to different log-linear models is also providing a useful insight. Given a fairly modest data set (size=115), it is good enough to decisively select equation (3.4) to be the best fitted one. For this model – actually the 'simpler' one (more parsimonious) – fits the data as well as the homogeneous association equation (3.1). This result rejects the overall statistical independence among three dimensions of our consideration, namely sources of creativity, set of cultural values and phases of business development. In addition, we do capture at least one 2-way association term (E×3D) – whose coefficient is verified by a Wald statistic at 1% significance level – that helps explain well the distribution of our 3-way contingency table. Now

[5] http://geert-hofstede.com/national-culture.html

that we know at least in the entrepreneurship phase the creative disciplines would help explain the distribution of our data sample, the fact that shows the importance of the 3-D aspect of creativity as described in Napier & Nilsson (2008). In fact, the homogeneous association estimation also offers the same conclusion as in table A.2.

We also learn from the above results that the most significant category among all creativity methods employed in Vietnamese enterprises has been the observation of “creative disciplines” rules in the “entrepreneurial phase,” while in general those creative disciplines have played an important role in explaining the structure of data sample, for businesses in both stages of development in our consideration.

The exercise may also suggest that these structures could be used as an empirical strategy for comparing different data sets specific to different localities or times, at least we can think of its usefulness for East Asian emerging market economies, such as China, Indonesia, India, South Korea… where most of our data treatments and transformation and tests could be applied for comparable results.

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APPENDIXES

A.1. Estimation of equation (3.4)

Table A.1

Estimations for the most parsimonious log linear model using data in table 3.1

Parameter	df	Estimate	S.E.	χ^2	p-Value
Intercept	1	1.466[a]	0.400	13.42	<0.01
Phase – E	1	0.693	0.433	2.56	0.11
3-R – Relation	1	−0.956[c]	0.526	3.30	0.07
3-R – Risk	1	−0.773	0.494	2.45	0.12
Creativity – 3D	1	1.347[a]	0.457	8.68	<0.01
Creativity – Aha	1	0.785	0.492	2.54	0.11
Phase×Creativity – E×3D	1	−1.386[a]	0.516	7.21	<0.01
Phase×Creativity – E×Aha	1	−0.693	0.552	1.57	0.21
3-R×Creativity – Relation×3D	1	0.509	0.616	0.68	0.41
3-R×Creativity – Relation×Aha	1	−1.296	0.911	2.02	0.16
3-R×Creativity – Risk×3D	1	0.327	0.588	0.31	0.58
3-R×Creativity – Risk×Aha	1	0.394	0.611	0.42	0.52

(*) Note: a, c – statistically significant at 1% and 10% level;

A.2. Estimation of equation (3.2)

Table A.2

Estimations for the homogeneous association model using data in table 3.1

Parameter	df	Estimate	S.E.	χ^2	p-Value
Intercept	1	1.532[a]	0.409	14.02	<0.01

Phase – E	1	0.593	0.467	1.61	0.21
3-R – Relation	1	−1.077[c]	0.638	2.85	0.09
3-R – Risk	1	−0.950[c]	0.581	2.66	0.10
Creativity – 3D	1	1.3215[a]	0.452	8.56	<0.01
Creativity – Aha	1	0.772	0.486	2.52	0.11
Phase×3-R – E×Relation	1	0.183	0.534	0.12	0.73
Phase×3-R – E×Risk	1	0.258	0.447	0.33	0.56
Phase×Creativity – E×3D	1	−1.412[a]	0.520	7.37	<0.01
Phase×Creativity – E×Aha	1	−0.702	0.560	1.57	0.21
3-R×Creativity – Relation×3D	1	0.571	0.643	0.79	0.37
3-R×Creativity – Relation×Aha	1	−1.265	0.915	1.91	0.17
3-R×Creativity – Risk×3D	1	0.414	0.609	0.45	0.50
3-R×Creativity – Risk×Aha	1	0.437	0.617	0.50	0.48

(*) Note: a, c – statistically significant at 1% and 10% level;