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**Chief Editor:**  
Ahmad Tootoonchi  
College of Business  
Frostburg State University  
101 Braddock Road  
Frostburg, Maryland 21502  
Tel: 301-687-4740  
Email: [Tootoonchi@frostburg.edu](mailto:Tootoonchi@frostburg.edu)

**Editor:**  
Margaret A. Goralski  
The Lender School of Business  
Quinnipiac University  
275 Mount Carmel Avenue  
Hamden, Connecticut 06518-1908  
Tel: 203-421-4840  
[margaret.goralski@quinnipiac.edu](mailto:margaret.goralski@quinnipiac.edu)

**Managing Editor:**  
Robert A. Page  
School of Business  
Southern Connecticut State University  
New Haven, CT 06515  
Tel: 203-392-6139  
[Pager1@southernct.edu](mailto:Pager1@southernct.edu)

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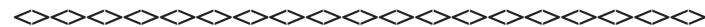
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## **Editorial Note**

The spring 2010 issue of the *Journal of International Business Disciplines* is presented to academics and professionals around the globe with the hope of further development of our collaborative efforts for a brighter future for all.

I would like to express my appreciation to the President of Frostburg State University, Jonathan Gibralter; Board of Directors of the International Academy of Business Disciplines; and my distinguished colleagues who serve on *JIBD* Editorial Board, for making this publication possible.

My special thanks to Margaret Goralski, editor; Louis Falk, web coordinator; Reza Eftekharzadeh, IABD VP for Administration and Finance; and Robert Page, managing editor, for their outstanding contribution towards completion of this task.

The Editorial Board members and I hope that you enjoy reading this issue, and assure you of our commitment to continuously publishing high quality scholarly papers in the future issues of *JIBD*.

Ahmad Tootoonchi, Chief Editor  
*Journal of International Business Disciplines*

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## **NOT JUST THE BEST YEARS OF MY LIFE: PERSONAL GROWTH IN HIGHER EDUCATION**

Michael K. Coolsen, Shippensburg University  
mkcool@ship.edu

Madoka Kumashiro, Goldsmiths University of London  
m.kumashiro@gold.ac.uk

Keith A. Quesenberry, West Virginia University  
kquesen1@mix.wvu.edu

### **ABSTRACT**

Our conception of product affirmation depicts a product as “sculptor” of the consumer’s ideal self, similar to how a relationship partner can help us achieve our aspirations and goals. We performed two studies to look at the role of higher education as a product in affirming a consumer’s ideal self. We found that product affirmation for undergraduate students and alumni (with the university as the product that affirms the ideal self of the student/alumnus) leads to increases in the experience of various positive emotions, the acquisition of various positive traits, and positive evaluations of the university. Additionally, we found that product affirmation effects were more pronounced and robust in one’s personal ideal-self domain than in one’s professional ideal-self domain. Practical implications, study limitations, and future directions are discussed, as well as preliminary findings from a follow-up experiment using a sample of graduate students.

### **INTRODUCTION**

Product affirmation describes the process in which a product brings out important aspects of a consumer’s ideal self. Our conception of, and subsequent support for, product affirmation was a reaction to the mixed evidence regarding self-image congruence models in the current consumer behavior literature. We make the argument that products which affirm the consumer’s ideal self (i.e., product affirmation) exert significantly more powerful effects on a consumer’s emotions, personality, and product evaluations than products which verify or enhance one’s self-concept (alternatively labeled as “product verification” and “product enhancement” respectively). That is, products that bring out a consumer’s ideal self (product affirmation) have significantly more positive influences in that consumer’s life and elicit significantly more favorable product evaluations than products that match a consumer’s actual self (product verification) or products that a consumer’s peers tend to favor (product enhancement). For example, I can buy one of three suits, each of which matches one of the three types of self-concepts mentioned above (ideal, actual, and enhanced selves). One expensive suit expresses and brings out my desire to be

elegant and sophisticated (my ideal self), a second cheaper suit matches my modest financial status (my actual self), and a third trendy suit lines up with what my friends prefer (my enhanced self). Our work suggests and supports the notion that the elegant and sophisticated suit that brings out my ideal self will have a more positive influence in my life and be evaluated much more favorably by me compared to the cheaper suit that reflects my actual modest financial status and the trendy suit that my friends prefer.

It does not seem to be a stretch at all to conceptualize a college or university as a “suit” that one presents to the rest of the world. We can select, pay for, and use a college or university as much as any other product, as higher education provides benefits for the money we pay. We show off our college or university in many ways, whether others see it on our resumes, on a t-shirt or sweatshirt we wear, or on a bumper sticker on the back of our cars. In many ways, a college or university represents the ultimate expression of our educational consumption. As such, we set out to apply the investigation and generalization of product affirmation effects in the consumption domain of higher education. Two studies were initially conducted to test such a proposition.

## **BACKGROUND**

### **Affirmation Processes in the Context of Romantic Relationships**

Our current research program regarding product affirmation is rooted in the close relationships research domain. Drigotas and his colleagues developed a model of partner affirmation in ongoing close relationships (Drigotas, Rusbult, Wieselquist, & Whitton, 1999). These authors proposed that the process of behavioral confirmation (Darley & Fazio, 1980; Hilton & Darley, 1991; Snyder, Tanke, & Berscheid, 1977) is likely to be quite powerful in the context of ongoing close relationships, in that close partners exert strong and frequent impact on one another across diverse behavioral domains. Accordingly, over time in close relationships, each person is likely to exert considerable impact on the other’s “self”—on the other’s traits, values, and behavioral tendencies. To the extent that the confirmation process aligns with each person’s ideal self, each is likely to enjoy movement toward his or her ideal self, and the relationship will flourish. Affirmation describes the extent to which the partner’s perception of the self and his/her behavior aligns with the individual’s ideal self. Such affirmation is termed the “Michelangelo Phenomenon.” Affirmation has been shown to yield enhanced personal well-being and couple well-being (Drigotas, 2002; Drigotas et al., 1999; Kumashiro, Rusbult, Wolf, & Estrada, 2006; Rusbult, Finkel, & Kumashiro, in press; Rusbult, Kumashiro, Kubacka, & Finkel, 2006).

### **Empirical Evidence for Affirmation in Consumer Behavior**

The process of affirmation seems more intuitive in the context of a romantic relationship than in the context of consumer behavior. In order to make such a conceptual and contextual jump, one must be willing to accept that a consumer and a product or brand can have an interdependent relationship in which each exerts powerful effects on the other. Indeed, Susan Fournier in her prominent 1998 Journal of Consumer Research article put out such a call to researchers to use close relationship theories in psychology to understand the dynamic relationship between consumer and brand, conceptualizing the brand as an animated and active partner to the

consumer. To this extent, substantial research has demonstrated insightful application of close relationship theories to consumer behavior (e.g., Aaker, Fournier, & Brasel, 2004; Aggarwal, 2004; Coolsen, 2005; Coolsen, Brandt, & Herbst, 2006; Coulter, Price, & Feick, 2003; Park & Macinnis, 2006).

Directly related to the concept of product affirmation previously mentioned, this program of research recently pitted product affirmation effects on a consumer's emotions, personality, and product evaluations against product verification effects and product enhancement effects through a series of experimental designs (Coolsen & Kumashiro, 2009; Coolsen & Pitek, 2007). Results of these experiments yielded strong and consistent support for product affirmation effects on a consumer's emotions, personality, and product evaluations and decidedly weaker and inconsistent product verification and product enhancement effects. That is, products aligned with the consumer's ideal self were evaluated more favorably and brought about more positive changes in the consumer's emotions and personality (e.g., feeling confident, attractive, and happy as a result of owning/using the product) compared to products aligned with the consumer's non-ideal self. Alternatively, analyses did not exhibit parallel support for products aligned with the consumer's actual self (product verification) or products aligned with the consumer's enhanced self (product enhancement).

## **STUDIES 1 & 2: PRODUCT AFFIRMATION EFFECTS IN HIGHER EDUCATION**

### **Generalization of Product Affirmation Effects to Higher Education**

The studies presented here in this paper served to test and generalize our concept of product affirmation to a specific consumer setting—higher education in which potential students, current students, and alumni represent the “consumers” and the university, college, etc. provide the service of higher education. That is, we conceptualize a relationship between consumer (e.g., current student) and product (e.g., university) in the context of higher education, and thus, we propose that product affirmation would exist between student and university. Higher education is obviously branded and marketed just like other products. We often talk about being proud alumni of universities and colleges, we purchase branded clothes, key chains, flags and license plates, and we secure higher educational credit cards. For many people the university or college they attend becomes a part of their identity and affects how they perceive themselves and others view them. Alumni groups share personal and professional experiences that define and unify members. Again, we propose that the university or college that appears on one's resume, sweatshirt, or car can serve to affirm the ideal self.

To initially test the existence of product affirmation in higher education, we conducted two studies. One study used a sample of undergraduate students and the second study used a sample of university alumni. In line with previous product affirmation findings, we hypothesized that consumers' perceptions of movement toward their ideal selves facilitated by the service of higher education would be associated with positive changes in the consumer's emotions, personality, and self-concept and favorable product evaluations of the institution of higher education.

## **Participants**

For Study 1, thirty-four participants (25 men, 9 women) in undergraduate business administration classes at a university in Pennsylvania satisfactorily completed the study. These participants were 21.41 years old on average, had completed an average of 3.32 years as an enrolled student of the university, and most were Caucasian (97% Caucasian, 3% other). For Study 2, forty participants (21 men, 19 women) who were alumni from the same university in Pennsylvania satisfactorily completed the study. These participants were 46.90 years old on average and all were Caucasian.

## **Questionnaires**

All participants in Studies 1 and 2 completed questionnaires describing themselves, their attitudes regarding their ideal selves and respective movement, their respective university in (from) which they were enrolled (graduated), and the association between the two. Because previous research regarding affirmation processes has taken into account the perspective of different ideal-self movement domains (Coolsen, Kumashiro, & Rusbult, 2008), we included two self-ideal domains specific to consumers of higher education: professional ideal self and personal ideal self.

### ***Professional Ideal-Self Movement***

Participants were first asked to complete questions about their professional ideal selves. First, they answered the following essay-format question: “In this part of the questionnaire, you are going to think about your professional aspirations, such as obtaining and being successful in your ideal profession (e.g., a doctor, writer, an executive, a social worker, etc.). Using the space below to describe in your own words, how do you see your ideal self in terms of professional aspirations?” They then answered the following question using a nine-point categorical scale (“-4” = I have moved further from my ideal self, “0” = I have not changed, “+4” = I have moved closer to my ideal self): “Indicate whether you’ve moved closer to, or have moved further away from, your ideal self (or not changed at all) in terms of your professional aspirations as a result of the time you have spent at [their respective university].”

### ***Personal Ideal-Self Movement***

After the professional ideal self questions, participants then answered similar questions about their personal ideal selves: “In this part of the questionnaire, you are going to think about your personal traits, such as becoming kinder to people, being more socially active, being very athletic, being more supportive in relationships, adhering to moral/religious values, etc. Using the space below to describe in your own words, what does your ideal self look like in terms of personal traits?” They then answered a nine-point categorical scale (similar to the one described above for the professional ideal self) measuring personal ideal self movement as a result of the time spent at their respective university.

### ***Attitudes Regarding the Respective University***

After completing basic demographic questions, participants finished the questionnaire by completing a series of Likert-type scales (“0” = do not agree at all, “4” = agree somewhat, “8” = agree completely). Using the measures in our previous product affirmation work and findings, participants were asked to rate their agreement of the extent to which they would feel more confident, lovable, attractive, excited, anxious, relaxed, disappointed, happy, annoyed, and successful as a result of their time at their respective university (e.g., “Overall, I believe my time at [my university] has made me more confident”). The final set of Likert-type scale items measured agreement to the following questions: “I am proud to be a student/graduate of [my university]”; “In general, I speak well about [my university] to others”; and “I often recommend [my university] to others as a school to attend.”

### **Operational Hypotheses**

As previously mentioned, we have found that product affirmation of a consumer’s ideal self exerts powerful effects on a consumer’s emotions, personality, and self-concept. In particular, products aligned with the consumer’s ideal self bring about positive changes in the consumer’s emotions, personality, and self-concept and are evaluated favorably. In Studies 1 and 2, product affirmation was operationally measured as a student’s/alumnus’ movement closer to his/her ideal self (professional and personal ideal selves) as a result of the time spent at his/her respective university. Therefore, we offered the following hypotheses for these two studies:

#### ***Hypothesis #1***

Movement closer to one’s ideal self (for both the professional and personal ideal selves) as a result of the time spent at his/her respective university would exhibit significantly positive correlations with agreement ratings that a student/alumnus feels more positive emotions/personality traits/self-concept traits as a result of the time spent at his/her respective university (i.e., more confident, lovable, attractive, excited, relaxed, and happy).

#### ***Hypothesis #2***

Movement closer to one’s ideal self (for both the professional and personal ideal selves) as a result of the time spent at his/her respective university would exhibit significantly negative correlations with agreement ratings that a student/alumnus feels more negative emotions/personality traits/self-concept traits as a result of the time spent at his/her respective university (i.e., less anxious, disappointed, and annoyed).

#### ***Hypothesis #3***

Movement closer to one’s ideal self (for both the professional and personal ideal selves) as a result of the time spent at his/her respective university would exhibit significantly positive correlations with agreement ratings for the following three product evaluation items: being proud of the university, speaking well about it to others, and often recommending it to others as a school to attend.

## Results: Descriptive Statistics and Simple Correlational Analyses

Table 1 summarizes the descriptive statistics for: (a) the measures of professional and personal ideal-self movement, (b) agreement ratings that a student/alumnus feels more emotions/personality traits/self-concept traits as a result of the time spent at his/her respective university, and (c) agreement ratings for being proud of the university, speaking well about it to others, and often recommending it to others as a school to attend. Table 2 summarizes the zero-order correlations of professional/personal ideal-self movement with the remaining measures listed in Table 1. (It should be noted that the zero-order correlations of professional self-ideal movement with personal self-ideal movement in Studies 1 and 2 were significantly positive; for Study 1:  $r = .53, p < .01$ ; for Study 2:  $r = .58, p < .01$ .)

**TABLE 1. DESCRIPTIVE STATISTICS (STUDIES 1 AND 2)**

|  | Undergraduate<br>Sample |      | Alumni<br>Sample |      |
|--|-------------------------|------|------------------|------|
|  | M                       | SD   | M                | SD   |
| Professional ideal-self movement                                   | 2.03                    | 1.38 | 1.78             | 1.72 |
| Personal ideal-self movement                                       | 2.06                    | 1.41 | 1.69             | 1.36 |
| [My university] has made me more confident                         | 5.71                    | 1.31 | 5.77             | 1.90 |
| [My university] has made me more lovable                           | 4.09                    | 1.85 | 3.30             | 2.74 |
| [My university] has made me more attractive                        | 3.82                    | 2.19 | 2.94             | 2.43 |
| [My university] has made me more excited                           | 4.74                    | 2.26 | 3.84             | 2.77 |
| [My university] has made me more anxious                           | 5.50                    | 2.00 | 1.53             | 1.83 |
| [My university] has made me more relaxed                           | 3.62                    | 1.94 | 3.65             | 2.72 |
| [My university] has made me more disappointed                      | 3.18                    | 1.70 | 1.03             | 1.60 |
| [My university] has made me more happy                             | 4.85                    | 1.72 | 4.74             | 2.95 |
| [My university] has made me more annoyed                           | 3.62                    | 1.99 | 0.95             | 1.87 |
| [My university] has made me more successful                        | 6.06                    | 1.67 | 5.97             | 2.01 |
| I am proud to be a student/graduate of [my university].            | 5.47                    | 1.66 | 6.89             | 1.71 |
| In general, I speak well about [my university] to others.          | 5.44                    | 1.94 | 7.26             | 1.63 |
| I often recommend [my university] to others as a school to attend. | 4.56                    | 1.94 | 5.39             | 2.64 |

Measures of professional and personal ideal-self movement employed a nine-point categorical scale; “-4” = I have moved further from my ideal self, “0” = I have not changed, “+4” = I have moved closer to my ideal self. All remaining measures above employed a nine-point Likert-type scale; “0” = do not agree at all, “4” = agree somewhat, “8” = agree completely.

**TABLE 2. ZERO-ORDER CORRELATIONS (STUDIES 1 AND 2)**

|   | Undergraduate<br>Sample                |                                    | Alumni<br>Sample                       |                                    |
|---|--|------------------------------------|--|------------------------------------|
|   | Professional<br>Ideal-Self<br>Movement | Personal<br>Ideal-Self<br>Movement | Professional<br>Ideal-Self<br>Movement | Personal<br>Ideal-Self<br>Movement |
| <i>[My university] has made me more:</i>                              |  |                                    |  |                                    |
| Confident   | .51**                                  | .60**                              | .30                                    | .49**                              |
| Lovable   | .19                                    | .18                                | .22                                    | .48**                              |
| Attractive  | .45**                                  | .34                                | .19                                    | .51**                              |
| Excited   | .50**                                  | .46**                              | .26                                    | .61**                              |
| Anxious   | .37*                                   | .26                                | -.13                                   | .25                                |
| Relaxed   | .53**                                  | .63**                              | .26                                    | .56**                              |
| Disappointed  | -.22                                   | -.26                               | -.28                                   | .03                                |
| Happy   | .41*                                   | .52**                              | .16                                    | .53**                              |
| Annoyed   | -.34                                   | -.46**                             | -.40*                                  | -.05                               |
| Successful  | .58**                                  | .68**                              | .30                                    | .59**                              |
| I am proud to be a student/graduate<br>of [my university].            | .26                                    | .42*                               | .30                                    | .52**                              |
| In general, I speak well about [my<br>university] to others.          | .29                                    | .58**                              | .25                                    | .25                                |
| I often recommend [my university]<br>to others as a school to attend. | .25                                    | .47**                              | .47**                                  | .52**                              |

\*\*p &lt; .01. \*p &lt; .05.

***Support for Hypothesis #1***

Assessing support for Hypothesis #1, Study 1 yielded significantly positive correlations of both professional ideal-self movement and personal ideal-self movement with most (five of the seven total) of the positive emotions/personality traits/self-concept traits as a result of the time spent at the respective university. Study 2 yielded significantly positive correlations of personal ideal-self movement with all of the seven positive emotions/personality traits/self-concept traits; however, Study 2 did not yield significantly positive correlations of professional ideal-self movement with any of the seven positive emotions/personality traits/self-concept traits.

### ***Support for Hypothesis #2***

Assessing support for Hypothesis #2, Studies 1 and 2 yielded significantly negative correlations of professional ideal-self movement (in Study 2 only) and personal ideal-self movement (in Study 1 only) with only one (“more annoyed”) of the three total negative emotions/personality traits/self-concept traits. (It should be noted that Study 1 (only) yielded a significantly positive correlation of professional ideal-self movement with feeling more anxious).

### ***Support for Hypothesis #3***

Assessing support for Hypothesis #3, Study 1 yielded significantly positive correlations of personal ideal-self movement with all three of the product evaluation items, and Study 2 yielded significantly positive correlations of personal ideal-self movement with two of the three of the product evaluation items. Alternatively, only one of the six possible correlations assessed across Studies 1 and 2 for professional ideal-self movement was significantly positive (with the “often recommend” item in Study 2 only).

## **Results: Exploratory Simultaneous Regression Analyses**

During the design of these studies, we did not create any specific hypotheses regarding substantial differences in product affirmation effects between one’s professional-self movement and one’s personal-self movement—we simply attempted to take into account the perspective of different ideal-self movement domains in previous work regarding affirmation processes the Michelangelo Phenomenon (Coolsen, Kumashiro, & Rustbult, 2008). However, upon discovering our findings mentioned above, it seemed appropriate to probe in an exploratory fashion the apparent pattern of product affirmation effects in the context of these studies (i.e., higher education as a product category). That is, the simple correlational analyses across both studies suggested stronger product affirmation effects for personal ideal-self movement compared to professional ideal-self movement. Such potential implications would seem profound for marketing strategies in higher education, so we performed a series of exploratory simultaneous regression analyses to ascertain the unique contribution of each domain of movement in predicting both the positive changes in the consumer’s emotions, personality, and self-concept and favorable product evaluations.

Tables 3 (for Study 1) and 4 (for Study 2) present a summary of simultaneous regression analyses using the two domains of ideal-self movement (professional and personal) to predict the various emotions/personality traits/self-concept trait items and the product evaluation items. (Because of the exploratory nature of these regression analyses, no interaction effects were examined.) Scanning the two tables, it becomes readily evident that the number of significant associations of ideal-self movement with the various emotions/personality traits/self-concept trait items and the product evaluation items is significantly greater in the domain of one’s personal ideal self (with fifteen significant associations) compared to the professional ideal-self domain (with only two significant associations). Thus, it would seem that product affirmation effects may be more pronounced and robust in the domain of one’s personal ideal self compared to the domain of one’s professional ideal self among consumers of higher education.

**TABLE 3. SIMULTANEOUS REGRESSION ANALYSES FOR STUDY 1**

|   | <u>Predictor Variables</u>                    |   |                       |
|---|---|---|-----------------------|
|   | Professional<br>Ideal-Self<br><u>Movement</u> | Personal<br>Ideal-Self<br><u>Movement</u> | <u>R</u> <sup>2</sup> |
|   | $\beta$                                       | $\beta$                                   |                       |
| <u>Outcome Variables</u>  |   |   |                       |
| <i>[My university] has made me more:</i>                              |   |   |                       |
| Confident   | .26   | .46**                                     | .41**                 |
| Lovable   | .13   | .12                                       | .05                   |
| Attractive  | .37   | .15                                       | .21*                  |
| Excited   | .35   | .27                                       | .30**                 |
| Anxious   | .32   | .09                                       | .14                   |
| Relaxed   | .27   | .49**                                     | .45**                 |
| Disappointed  | -.12  | -.19                                      | .08                   |
| Happy   | .18   | .43*                                      | .30**                 |
| Annoyed   | .14   | -.39*                                     | .22*                  |
| Successful  | .30*  | .52**                                     | .53**                 |
| I am proud to be a student/graduate of<br>[my university].            | .06   | .39                                       | .18                   |
| In general, I speak well about [my<br>university] to others.          | -.02  | .59**                                     | .33**                 |
| I often recommend [my university] to<br>others as a school to attend. | .01   | .47*                                      | .22*                  |

\*\*p &lt; .01. \*p &lt; .05.

**TABLE 4. SIMULTANEOUS REGRESSION ANALYSES FOR STUDY 2**

|   | <u>Predictor Variables</u>                    |   |                       |
|---|---|---|-----------------------|
|   | Professional<br>Ideal-Self<br><u>Movement</u> | Personal<br>Ideal-Self<br><u>Movement</u> | <u>R</u> <sup>2</sup> |
|   | $\beta$                                       | $\beta$                                   |                       |
| <u>Outcome Variables</u>  |   |   |                       |
| <i>[My university] has made me more:</i>                              |   |   |                       |
| Confident   | .04   | .46*                                      | .24**                 |
| Lovable   | -.04  | .50**                                     | .23*                  |
| Attractive  | -.15  | .60**                                     | .28**                 |
| Excited   | -.08  | .65**                                     | .37**                 |
| Anxious   | -.37  | .45                                       | .16                   |
| Relaxed   | -.04  | .58**                                     | .31**                 |
| Disappointed  | -.42  | .27                                       | .13                   |
| Happy   | -.17  | .62**                                     | .30**                 |
| Annoyed   | -.54**  | .25                                       | .21*                  |
| Successful  | -.04  | .61**                                     | .35**                 |
| I am proud to be a student/graduate<br>of [my university].            | .01   | .51**                                     | .27**                 |
| In general, I speak well about [my<br>university] to others.          | .15   | .17                                       | .08                   |
| I often recommend [my university] to<br>others as a school to attend. | .32   | .34                                       | .34**                 |

\*\*p < .01. \*p < .05.

## DISCUSSION AND CONCLUSIONS

### Practical Implications

Given our simple correlational analysis and exploratory regression analysis findings, the practical implications for product affirmation seem significant and far-reaching in the product

category of higher education. In particular, such product affirmation findings may have profound implications for marketing and brand positioning strategies. Both professional and personal ideal-self domains indicated beneficial associations of consumer ideal-self movement with favorable product experiences and evaluations, supporting our original hypotheses for product affirmation effects in a higher education setting. These findings indicate that messages and images promoting the school should focus on the ideal-self traits of their students, alumni, and potential applicants. Traditionally, one might associate such messages and images with consumers being studious, receiving academic recognition, and ultimately gaining successful professional careers. But when our exploratory regression analysis findings are taken into account, an interesting implication is revealed that seems to contradict traditional assumptions about higher education communications.

An important practical insight comes from the stronger effect indicated in the personal ideal-self domain compared to the professional ideal-self domain. This is somewhat counter-intuitive to popular opinion that schools are chosen on the strength of their academic programs and their ability to prepare students for the professional ranks. If our exploratory findings are valid and reliable (which future research efforts could attempt to support), they seem to indicate that students may be more interested in how they can grow and develop personally at a school. Everyone may have anecdotal evidence of this when his/her own child, or a friend's child, is accepted into different schools. One school may clearly be stronger in academics, yet the student chooses the other school because it fits better with his/her personal aspirations.

Such an insight would seem to have many direct marketing strategy implications for all consumers of higher education: potential applicants, current students, and school alumni. Schools of higher education should consider a more balanced approach in marketing communications, emphasizing both the professional and the personal growth opportunities for consumers. For example, in addition to professional messages, images of groups of friends enjoying themselves in student centers, showing school pride and spirit at a sporting event, attending a concert or show at the school performing arts center, etc. could pay significant dividends among various higher education consumer groups. Beyond marketing communications, this balance between personal and professional ideal-self movement could also apply to university publications, announcements, press releases, Web sites, etc. For example, a concerted effort should be taken to balance announcements and press releases between professional/academic achievement and personal offerings and improvements. Personal ideal-self messages may actually hold more impactful, emotional appeal in higher education—instead of typical vignette-style advertisements emphasizing academic accreditation and credentials, perhaps institutions of higher education need to bring to life the friendships and mentor relationships people develop in college that last a lifetime.

The importance that consumers attach to personal ideal-self growth can be seen in the recent rise in popularity of social media on the internet. According to a recent Pew Internet study (Jones & Fox, 2009), users ages 12-32 are more likely than older users to read other people's blogs and to write their own; they are also considerably more likely than older generations to use social networking sites such as Facebook, MySpace, and Twitter. These younger generations use personal blogs to update friends on their lives, and they use social media websites to keep track of, and communicate with, friends. Alternatively, older generations use the internet less for

socializing and entertainment and more as a tool for information searches, emailing, and buying products. This trend in integration of personal and professional lives can be seen in the corporate sector as more and more businesses are seeking ways to market their products via social media Web sites. Higher education could also leverage these new media vehicles to communicate their personal growth opportunities. In the same way that Zappos.com has employees on Twitter, colleges and universities could designate student leaders that “tweet” about the campus activities, relationships and other personal growth opportunities.

Additionally, Search Engine Marketing (SEM) strategies could be adjusted to include search terms that emphasize the personal ideal-self growth consumers may be looking for in a college or university. Google Ad words could be purchased for search terms such as “dorm life” as well as “academic excellence.” Click-through rates could then be monitored—lower performing search terms can be weeded out and new search terms could be added in an effort to optimize the search-term purchases. Dividing the search-term purchases in half between personal and professional terms would set up a situation where you could compare the performance of each ideal-self domain. In a similar way, Search Engine Optimization (SEO) strategies could add personal ideal-self growth terms to college or university Web site front pages and meta-tags to improve search engine performance.

### **Study Limitations and Future Directions**

There do seem to be many various future directions for this program of research. Because we drew from samples at one specific university, there is the distinct possibility that product affirmation effects in the different self-concept realms (e.g., personal vs. professional ideal self) could be moderated by the type of university/college or even the type of degree program. That is, variables such as prestige of the school and the curriculum/level of degree program could affect the influence and strength of product affirmation effects in various ideal-self domains. For example, it is possible that we found comparably stronger product affirmation effects in the domain of one’s personal ideal self due to the type of school from which we obtained our sample. The institution at which we ran our studies is state-funded and has a wide variety of degree programs for students. Would students at private institutions and/or “specialty” schools renown for a particular curriculum or degree program (e.g., engineering schools) yield stronger product affirmation effects in the domain of personal ideal self?

A related direction to explore would seemingly involve a sample of students that we did not include in our two studies mentioned above—namely, graduate students. Generally, graduate students are in a different stage of life compared to undergraduate students and may have already achieved significant movement towards their ideal personal selves. A smaller percentage of the general population enters graduate school and their motivations could likely be more oriented towards professional ideal-self growth. Graduate students are, by definition, older and many have established careers and even families. Even for the younger demographic, the rigorous academic and financial demands of graduate school may place personal growth on hold while professional development requires a greater focus. Alternatively, alumni may benefit from a perspective of having achieved significant movement towards both their ideal personal and professional selves. Alumni may have the ability to look fondly on their undergraduate

experience and remember the professional and personal growth they achieved at their alma mater.

### ***Preliminary Results: Follow-Up Experiment with Graduate Student Sample***

Such sampling considerations facilitated our design of a follow-up study. Considering the findings in Studies 1 and 2, we designed a third study to experimentally pit personal ideal self affirmation effects against professional ideal self affirmation effects in higher education among graduate students. Employing a 2 X 2 between-subjects factorial design, with personal ideal-self movement (no movement vs. movement) as the first factor and professional ideal-self movement (no movement vs. movement) as the second factor, a total of 68 participants were asked to consider one of four different fake advertisements for a fictitious school (“Lindon University”): (1) “Move toward your ideal personal life—Lindon University, Move Personally” (personal ideal-self movement condition); (2) “Move toward your ideal professional life—Lindon University, Move Professionally” (professional ideal-self movement condition); (3) “Move toward your ideal personal and professional life—Lindon University, Move Personally & Professionally” (personal and professional ideal-self movement condition); (4) “Stay who you are—Lindon University, Stay” (no ideal-self movement condition). Each fake advertisement was designed to experimentally prime the perception of each ideal-self movement condition in the 2 X 2 factorial design. After priming participants to consider a university that helps (or does not) students move toward their personal or professional (or both) ideal self (i.e., product affirmation), they then completed measures of their attitudes about the fictitious Lindon University similar to the dependent variables used in our initial two studies above involving undergraduate students and alumni (see “*Attitudes Regarding the Respective University*” section above).

Preliminary findings of this experiment seem to indicate somewhat less pronounced and robust product affirmation effects across the various dependent measures; there were significant product affirmation effects (main effects and interaction effects) for approximately half (five out of ten) of the measures for the experience of various positive emotions and the acquisition of various positive traits (as a result of attending Lindon University), but there were no significant product affirmation effects for any of the product evaluation measures. In characterizing the significant product affirmation effects among this graduate student sample, such effects seemed more pronounced in the professional ideal-self domain compared to the personal ideal-self domain.

Considering such preliminary findings of our follow-up experiment, the moderating effects of different variables (such as type and level of higher education degree sought) in each ideal self domain on product affirmation would need to be investigated to achieve “a full picture” for marketing strategy. For example, results across our studies mentioned here might suggest that advertising and promotional strategy should be different for undergraduate students and alumni vs. graduate students. As we have suggested, personal ideal-self movement may be more influential to undergraduate students and alumni than to graduate students, whereas professional ideal-self movement might be more of the goal for graduate students.

In conclusion, product affirmation seems to be “alive and well” within the higher education setting. The challenge for marketers of such schools is to promote and bring out their consumers’ personal and professional ideal selves. Our findings indicate that such efforts can substantially benefit and enhance the relationship between school and consumer.

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## **DETERMINING CHURN DRIVERS IN MOROCCAN TELECOM SECTOR**

Nicolas Hamelin, Al Akhawayn University  
N.Hamelin@aui.ma

Amani Nassali, Al Akhawayn University  
A.Nassali@aui.ma

Talha Harcar, Pennsylvania State University at Beaver  
tdh13@psu.edu

### **ABSTRACT**

This paper investigates churn behavior within the Moroccan telecom sector. The Moroccan telecommunication sector is considered one of the most developed telecom sectors in the African region and one of the most developed economic forces in the country. The privatization of the market, new services, the emergence of new operators, as well as the changing socio-economic factors have contributed to a change in attitude of Moroccan consumers over the past few years. In this study, high churn rate of over 21% has been measured and the mechanism behind customer churn has been examined. Causes of customer churning were investigated through a survey of 500 respondents conducted in Morocco's two most important cities. Logistic regression identified a clear correlation between customer churning behavior and customer personal characteristics, operator services, and the mobile phone characteristics.

### **INTRODUCTION**

The Moroccan telecom sector is highly competitive, with three operators present. It is considered one of the most developed telecom sectors in the African region and one of the most developed economic forces in the country. The strong performance of the telecom sector is the result of many ambitious reforms that were undertaken by the government to reform and modernize the sector. The activity is highly privatized and concentrated between three major players. The transformation of the sector was undertaken in 1997 under the reign of Late Majesty King Hassan II by the law of 24- 96. The changes consist of the separation of postal and telecommunications services, the separation of regulatory and operational activities and the liberalization of the telecommunications sector.

The first reform has given birth to two separate entities: a telecommunication entity called Maroc Telecom (Itissalat Al Maghrib) and a postal-services entity called Postes Maroc (Barid Al Maghrib). Under the same law, the National Regulatory Agency of telecommunication, (Agence National de Reglementation des Telecommunication [ANRT], 2007), was created as the

legislative structure in charge of regulating the Telco's sector. It is a legal and public institution with financial autonomy reporting to the prime minister.

Liberalization and privatization processes were the main measures carried out to accompany the development and the expansion of the sector. The sector witnessed a substantial growth with over 20 million subscribers in 2007, for a penetration rate of 65.66% (ANRT, 2007). The liberalization process, which started in 1999, has opened the sector to public telecommunication operators. Itisallat Al Maghrib has changed its brand name to become known as Maroc Telecom. It is 51% owned by Vivendi Universal. The sector was also opened to international competition. In 1999, a Spanish / Portuguese consortium won the bid for the second GSM license, as of November 2009, Spain's Telefonica SA (TEF) and Portugal Telecom SGPS SA (PT) have agreed to each sell their stakes in Meditel. Meditel is now 100% Moroccan owned. The latest entrant in the sector is Wana corporation; a company belonging to ONA, the most important economic holding in the kingdom.

## **MOBILE SEGMENT IN MOROCCO**

Since the introduction of the first cellular mobiles to the Moroccan market in 1989, mobile telephony has grown to become the most developed segment in telecommunication market, posting high growth rates and generating high profits. The fixed-line segment has been losing territory to the mobile phone sector, which has seen a rapid increase in subscribers especially after the introduction of Meditel. Maroc Telecom is the leading company in the industry. Its market share in terms of customers is 66.54% with more than 13 million subscribers compared to 33.46% for Meditel with over 6 million customers (ANRT, 2007). No official statistics are reported for the 3<sup>rd</sup> operator, Wana Corporation regarding number of customers or market share. The prepaid segment is more developed than the postpaid segment with over 18 million customers choosing prepaid services out of the 20 million customers.

## **OBJECTIVE OF THE STUDY**

Customer churning intention is generally hard to predict because of the multiplicity of factors involved. Nevertheless, with increasing churn rates, it has become a necessity for Telco's companies to understand customers' values and requirements so that the intensity of churn can be reduced. The main purpose of this study is to determine the factors that make subscribers churn from one telecom operator to another. Is churning related to the subscribers' income? Is it related to the companies' tariffs or product offerings? Or, what other factors may explain customer churning behavior?

Two main research questions are addressed in this paper:

- What are the main triggers that explain customer churning? This question aims at determining the most important factors that customers consider as the main weak points about their carrier that make them switch to another operator.
- Is there a relationship between personal characteristics and churn decisions? We try to identify the personal characteristics that are associated with churn behavior such as gender, age, income, and education level.

## LITERATURE REVIEW

Many authors and scholars have addressed this issue in their studies and tried to bring definitions, identify causes and generate solutions for this phenomenon. In this section, different points will be discussed, mainly: cost of churn, type of churn, the main churn drivers and churn management activities. Churn behavior is a common problem faced by telecom companies; it reduces the profitability and hurts the brand image of the company. Liberalization of the market has enlarged the number of operators and increased competition. It is the customer who makes the deliberate choice of selecting the service provider among the existing ones. In this context, Lu (2002) advanced that customers exercise their right to choose among the existing providers and thereby switch from one company to another.

For Kon (2004), “The churn occasion occurs when the quality of her experience falls below a certain threshold either relative to competition (comparison churn) or relative to her own expectations (frustration churn)” (pp. 2, 3). Geppert (2003) defines churning as “the movement of customers from provider to provider in search of better and cheaper products and services” (para. 2). For Richeldi and Perrucci (2002), customers become churers when they suspend their subscription and move to the next competitor.

Churning behavior is synonym to customer turnover. Another definition is given by Neslin, Sunil, Wagner, Junxiang and Mason (2006); they define customer churn as “the propensity of the customer to cease doing business with a company in a given period of time” (para. 1). In this context, Ghosh (2007) introduces the cross-buying concept, while Eppen, Ward, A. H., Ward, R. and Kipp (1991), advance that customers who signed up for more than one service within a single company tend to be more loyal than those who contract for one service. This cross-buying behavior increases the loyalty and reduces churn attitude.

### **Cost of Churning**

Customer churning, customer migration or customer loss, as it is called, has been treated as a main concern because of the different costs associated with it. When customers change their current service provider to another, costs are imposed to the losing company and not on the customers. Ken (2006) argues that the highly competitive nature of the telecommunication sector and the absence of a differentiation strategy in terms of products and services offered are what make subscribers churn from one company to another. Customers are always looking for innovative and original products; if their actual provider cannot meet their needs, their loyalty and retention are in question. As disloyalty increases, churn rate tends to rise, leading to minimization of the firm’s value. Churn is considered a “profit killer.” As the customer base decreases, the revenues associated go down.

According to statistics, the global telecommunication industry is recording huge losses that amount to billions of dollars due to churning. The rule of thumb known by marketers is that it costs 5 times more to acquire a new customer than to retain the existing one. So, it is preferable for companies to not lose the path of their existing customer base and focus on actions and measures to reduce churn. Sometimes, a new customer may churn before the company recovers the whole acquisition costs (Xevelonakis, 2004).

Defecting customers damage the brand name of their previous service provider, especially when unsatisfied customers tell others about their bad experience (Nemec, 2001) and complain about the company to numerous friend and acquaintances (Kumra, 2006).

## Churn Drivers

A number of researchers and academics have studied factors that cause churn. It is important to investigate why customers are leaving before selecting the appropriate churn-reduction mechanisms. For Fox and Poje (2002), better price is the main factor but not the “prevailing reason”; i.e. offering lower price does not necessarily mean higher customer loyalty. They also reveal that customers churn to the competitor who best matches their needs in terms of service features, quality, technology and service quality. The probability that a subscriber will change the actual carrier depends on the satisfaction level reached in addition to factors related to service attributes including call quality, tariff level, handsets, brand image, and income. In addition to these service attributes, Kumar (2007) has indicated that the transparency level of any company is highly associated to customer satisfaction. When a specific firm adopts transparent marketing, communicates transparent tariffs and makes information available, it increases the customer confidence and therefore their satisfaction.

Geppert (2003) summarizes in his article the most important factors explaining the churn attitude:

- Price: Higher prices than those of competitors, changing fees constantly or lack of transparency regarding services and products provide customers with high incentives to switch.
- Customer service quality: The manners with which services and products are delivered to customers play a crucial role in their satisfaction. Lack of reliability, responsiveness and availability of staff would drive the customers to terminate their relationship with the actual provider.
- Payment Loopholes: “Customers may attempt to ‘game the system’ by generating high usage volumes and avoiding payment by constantly churning to the next competitor” (Geppert, 2003, para. 6).
- Lack of responsiveness: No response to customer complaints or no answer to their problems lead to poor service and therefore to ending the contract.
- Privacy concerns: Any attempt to use personal information for specific purposes or to divulge it to other parties could break the relationship. Companies have the responsibility and the duty to keep all information they have about their customer secret and not to use it for communication or telemarketing purposes.
- Lack of features: Customers are always looking for innovative and original products. Customers will churn if their actual carrier is unable to provide them with what they need, when and where they need it.
- New technology or new products introduced by competitors: customers could switch companies if the next competitor introduces new products, launches new services or brings new technology never used before to the market.
- New competitors enter the market: offering interesting incentives and attractive offers may cause some customers to churn.

- Billing or services disputes: Continuous billing errors, incorrect payment or disputes about services can lead to customer churning.

Another important point to mention as a churn driver is the absence of switching costs when a customer makes a decision to cease business with its current telecom operator. Switching costs are barriers preventing customers from changing service provider; without them, churners can easily switch between the various service providers.

## **Churn Management**

Since it is difficult to detect the potential churners, it is necessary for the Telco firms to take the necessary actions to identify those with the intention to churn before they solidify their act and lead to profit decrease. Customers switch easily when the competitors offer what they consider to be in their best interest. Mutanen (2006) pointed out that customer lifetime value is a valuable asset for business life. Customers have to feel a strong affiliation with the company so they can continue doing business with it. The idea here is that the more involved they feel, the less likely customers are to churn. Brodsky (2006) stated, “Winning is not just about closing the sale. You win when you close the sale and also lay the foundation for a good relationship that will allow you to keep the customer for a long, long time” (para. 1). The Telco firm has to focus on customer retention rate rather than sales volume it wants to achieve; since without customer base, no sales volume can be recorded.

Richeldi and Perrucci (2002) advanced that “Churn management has emerged as a crucial competitive weapon, and a foundation for an entire range of customer-focused marketing efforts” (p. 4, para. 2). Churn management helps the company categorize the customer base into loyal customers and customers with probability of churn. Specific attention is given to the customer records in terms of expenses, call frequency, usage of company’s services, and avoidance of payment and so forth. Echambadi (2006) suggests developing retention strategies as churn management techniques. Carriers must ensure that customers are not only satisfied but are also deriving value from this relationship: the Telcos should accompany the customer along the buying process and ensure that they are using and enjoying the service. Weiland (2006) proposes loyalty programs as a way to reduce churn behavior. Rewarding the loyal customers who spend more will, no doubt, reduce their propensity to churn. The reward could take the form of fidelity points, bonuses, gifts, free subscription fees and other forms. Risky customers could be targeted with specific campaigns and promotions.

## **Hypothesis Development**

The literature review has shown that churning behavior is the result of three main factors. These factors are grouped in three categories which are: organization, products and personal characteristics.

### ***Organizational characteristics***

By organizational factors we refer to the churn drivers that are embedded in companies’ features. We have identified these factors as: (1) tariffs, (2) coverage network quality, (3) frequency of

billing errors, (4) customer service quality, (5) transparency, (6) technical assistance, (7) privacy concerns, (8) diversity of promotions and (9) reactivity to complaints (Fox & Poje, 2002; Geppert, 2003; Kumar, 2007; Nemec, 2001; Xevelonakis, 2004).

*Tariffs:* Fox and Poje (2002) advanced that one factor that pleases customers is their ability to make purchases at affordable tariffs. The gain for any customer is the lower price he or she has to pay in exchange of high quality products. A company that is capable of satisfying this concern will not face as severe churn rate as a company that charges higher prices.

*Coverage network quality:* Bad quality coverage is associated with different technical problems that the company's infrastructure might face (Geppert, 2003) and affect the success of communication; like problems with antennae, inability to receive or make calls and so forth. As long as the client does not face this kind of problem, he or she will have fewer propensities to churn.

*Frequency of billing errors:* Billing errors consist of reporting inaccurate charges and significant errors in customers' bills. In most of the cases, subscribers are overpaying. The errors could either come from the carriers or the customers' banks. Geppert (2003) argues that if customers have experienced frequent billing errors while as clients to a specific company, there is higher probability that a churn decision will be taken.

*Customer service quality:* Telecom operators as service providers are highly judged by the quality of their customer service. According to Xevelonakis (2004), if the service is not good enough, if the employees do not serve clients in the best way and if the clients are not well informed about products or service, they can easily switch to the competition.

*Transparency level:* The lack of transparency we are talking about is the choice of operators to not communicate full information about prices, products and services to their customers, including incomplete information about price, terms and conditions of service (Kumar, 2007). It includes: lack of transparency about tariffs, lack of transparency about products or service and misleading advertising.

*Technical assistance:* Nemec (2001) defines poor technical assistance as the inability of carriers to offer help and facilitation when and where it is needed. Examples of technical problems that subscribers are facing are: cuts and interruptions in communications, bad sound quality or difficulty starting communications or reception. If this type of problem occurs frequently, it will increase the probability for subscribers to switch.

*Privacy concerns:* telecom operators should ensure the respect for privacy of their customer base (Geppert, 2003). Any disclosures of personal information degrade loyalty.

*Reactivity to customer complaints:* Geppert (2003) and Fox and Poje (2002) advanced that the lack of responsiveness to customers request is not a good practice to keep the customer satisfied and therefore loyal. Telecom operators with high responsiveness and reactivity have less customer churn.

*Frequency and diversification of the promotions:* The ANRT has identified that diversified, frequent, interesting promotions are a successful way to gain customer acceptance and satisfaction. This satisfaction could lead, if well maintained and developed, to customer retention and therefore customer loyalty.

### **Personal characteristics**

Studies have shown that personal characteristics play a major role in brand loyalty. Therefore, income, age, education level, gender and profession (social ranking) affect churn decision for a specific customer (Evanschitzky & Wunderlich, 2006; Jinhadra & Singh, 2005; Madden, Savage, & Neal, 1999; Snijder & Heijden, 2007; Sharp, 2005).

**Income:** Studies have shown that low-income subscribers are more likely to churn (Madden et al., 1999). Low-income customers are always looking for the better price/ quality combination. If subscribers find the prices charged not competitive, they will easily switch to the competitor. On the other hand, the high-income group is less price-sensitive and difficult to please; they want to churn for other reasons than price charged. We expect that higher income households are also less likely to churn.

Gender: advanced that gender plays a crucial role in consumer behavior. Men behave differently than women. Women are more difficult to please than men. Decisions are made on distinct bases. Females are shown to be more loyal than men. For the cellular market, Snijder and Heijden (2007) found that women have a higher switching rate because their purchase decision is based on more information than a man's decision. Therefore, it is interesting to let gender moderate switch intentions.

Age: For Jinhadra and Singh (2005), it is a rule of thumb known by marketers that younger consumers have less well-formed brand preferences and can be swayed into becoming loyal to another brand. Older consumers are believed to have already settled into buying habits that cannot be shifted, and are hence assumed to be brand-loyal. On the other hand, Sharp (2005) suggests that age has no significant impact on brand loyalty. Churning has to do with the number of brands competing in the industry and the practices they use to attract customers.

Education level: Evanschitzky and Wunderlich (2006) has advanced that highly educated people usually engage more in information gathering and use more information prior to decision making, while less well educated people rely on less information. We expect, therefore, that better educated consumers seek alternative information about a specific company, apart from their satisfaction level, whereas less well educated consumers see satisfaction as an important key information signal on which to base their purchase decision.

### **Products Characteristics**

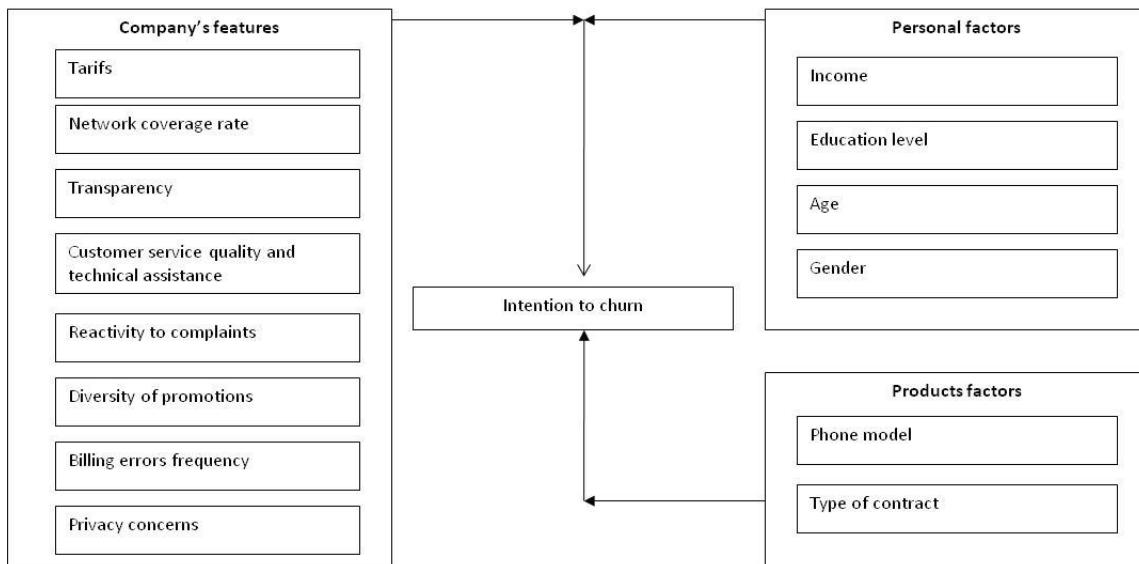
Product features play a major role in preventing customers from churning. As long as the operator offers what customers are interested in terms of product quality, features and originality, the churn rate could be reduced (Fox & Poje, 2002; Weiland, 2006).

Phone model: Mobiles are no longer used for function but also for fashion. Clients rely on their operators to provide them with the latest models (Fox & Poje, 2002) and new technologies to keep up with the latest trend in telecommunication movements. We hypothesized here that if new, interesting and original models are offered, there is less tendency to churn.

Type of contract: Weiland (2006) advanced that prepaid customers, not locked in any contract with the operator, have the higher propensity to churn. This segment is characterized by its volatile nature as well as the anonymous identity of its customer base.

## CONCEPTUAL FRAMEWORK OF THE MODEL

From the literature review above, the following conceptual framework could be developed. In this framework, the main triggers are grouped into three categories potentially linked to churning intention.



**FIGURE 1. CONCEPTUAL FRAMEWORK OF THE RESEARCH**

## METHODOLOGY

### Survey Instrument

A survey was designed to test the potential churning factors given above and questionnaires were administered face to face to respondents in the capital city Casablanca. A first pilot study was conducted in the city of Fez with 30 respondents randomly selected. Only interval questions were used to compute this reliability test. The “Cronbach Alpha” was calculated to be 0.733, which indicates that the questionnaire is reliable.

## **Sample Selection**

Since we are investigating churning intention, customers having two or more operators were not considered in this study. The questionnaire was distributed to 450 people in Casablanca. Casablanca was chosen since the majority of subscribers are concentrated in the Rabat/Casablanca region. In telecom jargon, this area is known as “Golden Area.”

## **Subscription**

Among the total number of respondents, Maroc Telecom subscribers are the highest proportion among the respondents (42%), followed by Meditel customers (40.1%) and Wana customers (17.9%). These numbers are consistent with the actual market structure identified earlier (telecom overview: market size for both operators). Of the total respondents, 21.1% have already switched to another Telecom carrier while 78.9% have remained with the same operator.

## **Time of Previous Subscription**

The analysis of this information will help us measure the degree of loyalty of subscribers. It is known that the longer the period a customer keeps doing business with the same provider, the more his or her loyalty increases.

We observed that among the 93 churners, 39 subscribers have contracted services with their previous operators for less than 1 year. Twenty-nine subscribers have remained with their previous operator from 1 to 2 years, and 15 subscribers have kept their operator for a period from 2 to 3 years, 4 churners remained with their initial service provider for 3 to 4 years, and only 6 subscribers had a long affiliation with their carriers.

## **Satisfaction Level of Subscribers**

More than half of the subscribers interviewed are satisfied with the nature of service provided by their telecom carrier. 33.6% of clients claim to be totally satisfied, 58.7% are satisfied, while 5.9% are unsatisfied with the current services and only 1.8% are totally unsatisfied with their current mobile phone operator.

## **Subscribers Intending to Churn**

Among the 441 respondents, 31.1% of subscribers express their willingness to switch operator, compared to 68.9% who have no intention to churn (Table 1).

**TABLE 1. RESPONDENTS INTENTION TO CHURN INTENTION TO CHURN**

| <b>Intention to<br/>churn</b> | <b>Frequency</b> | <b>Percent</b> |
|-------------------------------|------------------|----------------|
| Yes                           | 137              | 31.1           |
| No                            | 304              | 68.9           |
| Total                         | 441              | 100.0          |

The total number of potential churners is 137, which is more than the number of unsatisfied customers (116) identified.

From table 2, we observe that not only dissatisfied clients are willing to switch but also those with a high satisfaction level are interested in churning. Indeed, 25 very satisfied subscribers would be willing to switch operator, as well as 69 satisfied clients. On the other hand, 21 unsatisfied customers have no intention to churn and 1 totally unsatisfied customer rejects the idea of churning. We can classify these subscribers as: satisfied switchers, dissatisfied switchers, satisfied loyal or dissatisfied loyal.

**TABLE 2. LEVEL OF SATISFACTION AND CHURN INTENTION**

|                     | Change of operator |     | Total |
|---------------------|--------------------|-----|-------|
|                     | No                 | Yes |       |
| Totally unsatisfied | 1                  | 22  | 23    |
| Unsatisfied         | 72                 | 21  | 93    |
| Satisfied           | 143                | 69  | 212   |
| Very satisfied      | 88                 | 25  | 113   |
| Total               | 304                | 137 | 441   |

### Type of Contract

As the market structure reveals, prepaid segments dominate over the post paid segment. It is also the case for our research which indicates consistency with the actual Moroccan market: 81.4% of the respondents fall into prepaid segments, while 18.6% are within the postpaid segment.

### Demographic Profile of the Respondents

- Gender: among the total respondents; 42.2% are women and 57.8% are men. The official statistics about Moroccan population reveal that there are more women than men (50.7% and 49.3% respectively). This discrepancy can be explained by the fact that men were more willing to participate in the survey than women.
- Age: 40.8% of the total respondents are between 21 and 30 years, 29.9% are between 31 and 40 years, 13.6% are between 41 and 50 years. Those aged below 20 years count for 13.4% and those aged more than 51 years count for 2.3%. According to the official census, the highest proportion of the Moroccan population fall into the group of 15-24 and 25-60 (31.2% below the age of 14, 60.7% between 15 and 59 and 8.1% more than 60 years) (Haut Commissariat au Plan, 2004).
- Education level: among the total respondents 38.3% have baccalaureate (high school) degree, 27.9% have license degree or equivalent, 14.5% have their secondary school. Those with master or doctorate count for 8.4% and 3.2% respectively. Subscribers with no education count for 5%, those with primary school background count for 2.3%.

Subscribers with other degree count for 0.5%. Since the questionnaire was distributed in Casablanca (urban area), the majority of the participants fall within the educated population. According to the 2004 statistics, 24.5% of the Moroccan population has completed only their secondary school, 15.2% have their baccalaureate, and 8.7% are pursuing their university studies (Haut Commissariat au Plan, 2004).

### **Personal Characteristics of the Potential Churners**

- Gender: 59.1% among those who revealed their intention to churn are male.
- Age: 51.8% of the future chuners are between the age of 21 and 30 years. The second highest proportion takes place within the 31 to 40 age group. Subscribers with age exceeding 40 years show less interest in changing.
- Education level: Subscribers with license or baccalaureate degrees showed the highest propensity to churn (46% and 25.5%, respectively). Subscribers with no education or primary education show the least interest to switch to another operator.
- Income: lower income groups (<1500 Moroccan Dirham (DH)) are the subscribers (36.4%) that are most likely to churn, followed by the subscribers (24.8%) within the 1501 to 3000DH income interval. Subscribers with an income of more than 7000 DH show the least likelihood to churn.

### **Determining the Reasons for Not Churning**

Respondents gave the following reasons for their intention not to switch from one operator to another.

- The inability to conserve the same number when switching is the prevailing reason (26.1%) that inhibits customers from switching to another operator. It is worth mentioning that the ANRT approved the portability of numbers in March 2007, but due to some technical problems and tariff negotiations between operators, customers were unable to use this service until May, 2007. In addition, few customers were informed about the new service.
- Professional reasons are the second important reason (23.6%) that inhibits subscriber churn. In most cases, the employee is using the operator chosen by his company.
- In the third place, we have found other factors especially personal reasons as another explanation for their decision to remain with the same operator (14.7%).
- Debt level accumulated by the subscriber is also an important factor (12.7%) limiting the churn behavior. Telecom operator will not end the relationship with this type of client until they settle their bill. In addition, subscribers keep the relationship going to avoid legal action from their provider.
- Loyal customers that spend months or years to collect bonus points are also more reluctant to churn (12.7% of all chuners).
- Subscribers engaged in long term contracts with the carrier are the kind of clients that want stability and permanence of relationship. Churn will rarely occur (only 10.2% of all chuners).

One dependant variable (Y) is used, to delineate the subscriber intention to churn; Y=1, if the respondent reveals his churn interest, Y=0, otherwise. For this case, two types of independent variables were used in the logistic regression: scale and dummy variables.

- Dummy variables: Dummy variables included in the analysis are: gender (1=male, 0=female) and type of contract (1=prepaid, 0=postpaid).
- Scale variables: Interval scale data used in the analysis are: tariffs, coverage quality, transparency, privacy, billing-error frequency, customer service quality, technical assistance, promotions, reactivity to complaints and mobile models. Respondents were given a 5 point Likert scale to assess their perception for each factor. Education level of the respondents is also a scale variable. The categories range from 1-illiterate to 8 -post graduate degree holder. Each scale increase represents an average increase of 3.5 years in education level of subscribers. The variable was constructed to identify the relationship between the education levels and churn attitude. Income is also a scale variable used, the scale ranges from receiving the lowest (category 1) to the highest income (category 8). Each scale increase represents an approximate increase of 2000DH in subscribers' income. This variable was included to see whether income of customers affects their decision to churn. Age of the respondent is another variable used in the analysis. Each scale increase represents a 10-year increase in subscribers' age. This variable was constructed to see whether there is a relationship between age of the subscriber and churning intention.

## THE MODEL

Three models were developed. In the first model, we intend to correlate the binary dependant variable "intention to churn" to the following organizational factors: tariffs, coverage network quality, frequency of billing errors, transparency level, quality of customer service, technical assistance, mobile models, reactivity to complaints, promotions and privacy. The second model investigates intention to churn as a function of products' characteristics (type of contract and mobile models). In the third model, we will try to detect whether personal characteristics have an effect on churn decision (age, income, education level, and gender). We use logit units for each of the models. Moreover since we have a set of independent variables that are measured at different scales or in different units, we should use standardized logistic regression so as to be able to compare the strength of the relationship between the dependent variable and the various independent variables.

The first model can be developed as follows:

$$P = \alpha + \beta_1(\text{tar}) + \beta_2(\text{cov}) + \beta_3(\text{err}) + \beta_4(\text{transp}) + \beta_5(\text{ser}) + \beta_6(\text{tech}) + \beta_7(\text{priv}) + \beta_8(\text{comp}) + \beta_9(\text{pro}) + \epsilon$$

Where tar= tariffs, cov= coverage network quality, errors= the frequency of errors, transp =transparency level, tech= technical assistance, priv= privacy, pro= promotions, comp= response to complaints and mod= model phones,  $\epsilon$ = error

The second model is expressed as:

$$P = \alpha + \beta_1(\text{mod}) + \beta_2(\text{typ}) + \epsilon$$

Where model= mobile model and type= type of contracts and  $\epsilon$ = error

And the third model as:

$$P = \alpha + \beta_1(\text{age}) + \beta_2(\text{inc}) + \beta_3(\text{edu}) + \beta_4(\text{gen}) + \epsilon$$

Where age= age of the subscriber, inc= income, edu= education level and gen= gender and  $\epsilon$ = error

## Verifying Multicollinearity

The multicollinearity in the logistic regression is the result of strong relationships between independent variables. The existence of multicollinearity could cause large standard errors and therefore, affect hypothesis testing results. Multicollinearity may also result in wrong signs and magnitudes of regression coefficient estimates, and consequently in incorrect conclusions about relationships between independent and dependent variables. The first step is to check for possible correlation between the proposed independent variables. A correlation matrix detects the variables with strong correlations. Variables that are highly correlated should be dropped from the model.

## RESEARCH RESULTS

### Regression Model Based on Organizational Characteristics

Before presenting the model, it is necessary to verify the multicollinearity between these independent variables. As shown in the table (Table 3) below, no strong correlations are observed between variables. Hence, all the predictors are included in the model.

**TABLE 3. MULTICOLLINEARITY TABLE FOR ORGANIZATIONAL FACTORS**

|                        | tariffs | coverage | errors | service | transparency | technical | privacy | complaints | promotions |
|------------------------|---------|----------|--------|---------|--------------|-----------|---------|------------|------------|
| tariffs                | 1       |          |        |         |              |           |         |            |            |
| coverage quality       | -0.0477 | 1        |        |         |              |           |         |            |            |
| billing errors         | 0.0173  | 0.3996   | 1      |         |              |           |         |            |            |
| customer service q     | -0.1178 | 0.4414   | 0.5066 | 1       |              |           |         |            |            |
| transparency           | 0.0456  | 0.0439   | 0.0499 | 0.0222  | 1            |           |         |            |            |
| technical assistance   | -0.0955 | 0.2864   | 0.4181 | 0.4489  | 0.0596       | 1         |         |            |            |
| privacy                | 0.0183  | 0.2521   | 0.4602 | 0.3089  | 0.0678       | 0.4683    | 1       |            |            |
| response to complaints | -0.0176 | 0.3317   | 0.2365 | 0.2374  | 0.0737       | 0.294     | 0.421   | 1          |            |
| promotions             | 0.0092  | 0.2968   | 0.293  | 0.2087  | 0.0856       | 0.318     | 0.4622  | 0.4146     | 1          |

Based on the Stata output, the estimation of the model is summarized in the table below (Table 4):

**TABLE 4. STATA OUTPUT FOR ORGANIZATIONAL FACTORS**

| Intention to churn | b        | P> z  | %     |
|--------------------|----------|-------|-------|
| Tariffs            | 0.4324   | 0     | 54.1  |
| Coverage           | 0.15352  | 0.182 | 16.6  |
| Errors             | 0.13147  | 0.297 | 14.1  |
| Transparency       | 0.38487  | 0.001 | 46.9  |
| Service            | -0.11517 | 0.389 | -10.9 |
| Privacy            | 0.29023  | 0.015 | 33.7  |
| Promotions         | 0.68056  | 0     | 97.5  |
| Complaints         | 0.16661  | 0.119 | 18.1  |
| Technical          | 0.31575  | 0.014 | 37.1  |

With  $b$  = raw coefficient,  $P>|z|$  = p-value for z-test and % = percent change in odds for unit increase in X.

Since the  $p<0.05$  ( $\text{Prob} > \text{chi2}=0.000$ ), the overall model is statistically significant. We have 99.5% confidence that at least one of the independent variables contributes to the prediction of the churn behavior.

Coverage, billing errors, customer service quality and response to complaint: Since the p value  $>0.05$ , we conclude with 99.5% confidence that there is not enough evidence of a relationship between the churn decision and network coverage quality, billing error and customer service quality, tariffs, transparency, technical assistance, privacy and promotion. Since the p value is  $<0.05$ , there is a significant relationship between churn intention and these dependant variables. A one unit increase in standard deviation in operators' tariffs, holding constant the other variable, increases the standard deviation of churning by 54.1%, and similarly, one unit increase in transparency, technical assistance, privacy, and promotion will lead to an increase in churn intention of 46.9 %, 37.1%, 33.7%, and 97.5% respectively.

### **Churn Intention and Product Characteristics**

From the correlation matrix we do not observe strong correlation between the two variables. So, both variables might be used to predict churn behavior. The model is summarized in the table below (Table 5):

**TABLE 5. STATA OUTPUT FOR PERSONAL CHARACTERISTICS**

| Churning intention | b       | P> z  | %     |
|--------------------|---------|-------|-------|
| Model              | 0.10593 | 0.131 | 11.2  |
| Contract           | 0.72178 | 0.017 | 105.8 |

Significance of the model: The model is statistically significant since the  $p<0.05$  ( $\text{Prob} > \text{chi2} = 0.0140$ ). We are 99.5% confident that at least one of the explanatory variables contributes significantly to the prediction of the outcome. Mobile models: since the p value is greater than 0.05, there is not enough statistical evidence of a correlation between phone model and customer intention to churn. Type of contracts: Since the p value is  $< 0.05$ , there is a significant relationship between churn intention and type of contract of the subscribers. The standardized coefficient of the variable suggests that as customers move from postpaid to prepaid segments, intention to churn increases by 105.8%

### **Churn Attitude Explained by Personal Characteristics**

The correlation matrix does not report strong correlations between predictors. Hence, all the explanatory variables are included in the model. Based on Stata output, the 3<sup>rd</sup> model is summarized in the table below (Table 6):

**TABLE 6. STRATA OUTPUT FOR PERSONAL CHARACTERISTICS**

| Churning intention | B        | P> z  | %     |
|--------------------|----------|-------|-------|
| Age                | -0.23262 | 0.041 | -20.8 |
| Education level    | 0.04962  | 0.59  | 5.1   |
| Income             | -0.28283 | 0     | -24.6 |
| Gender             | 0.1591   | 0.462 | 17.2  |

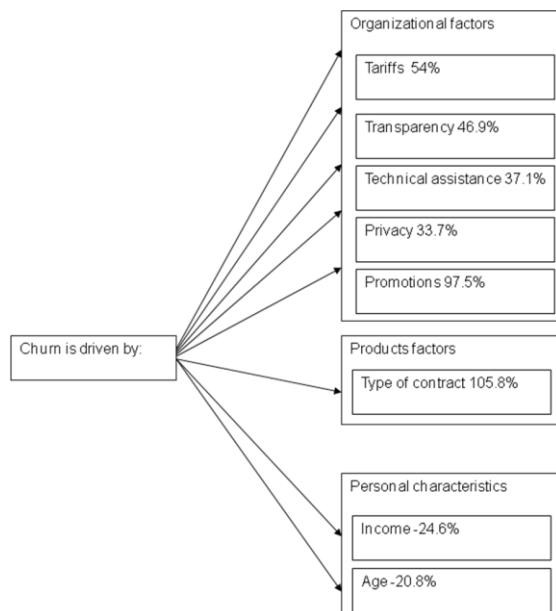
Significance of the model: The model is statistically significant since the  $p<0.05$  ( $\text{Prob} > \chi^2 = 0.000$ ). At least, one of the four independent variables contributes to the prediction of the model. Regarding gender and Education level we find that since  $P > 0.05$  there is not enough statistical evidence to say that these variables contribute to churn intention.

Age: Using a 0.05 significance level, there is enough evidence to say that age contributes significantly to the prediction of churn behavior. The negative sign of the standardized coefficient implies that a 1-unit increase of standard deviation of age decreases the standard deviation of churning by 20.8%, holding constant the other variables.

Income: Using a 0.05 significance level, with 99.5% confidence, we conclude that there is a relationship between the churn decision and the income of subscribers. For every unit increase in standard deviation of the income, the standard deviation of churning decreases by 24.6%.

### Model Summary

The results stated above can be summarized in the following chart:



**FIGURE 2. MODEL SUMMARY OF CHURN DRIVERS**

## **CONCLUSIONS, IMPLICATIONS AND LIMITATIONS OF THE RESEARCH**

The primary purpose for this paper was to determine the main triggers of churn attitude in the Moroccan telecom sector, also to verify whether the personal characteristics of a specific subscriber influences the churn decision. We have uncovered a positive relationship between the churn attitude and some of the organizational factors. Most obviously, subscribers' intention to churn is linked to perceived difference in tariffs between operators, although communication price is not free and controlled by the national regulatory agency of Telecom sector (ANRT). Transparency level of operators is also an important churn driver; clients have lost their confidence in their current telecom operator either because of misleading advertising or opaque information about tariffs and services. Subsequently customers are more likely to choose a competitor promoting a higher level of transparency.

The findings of the research have shown that the quality of coverage network, customer service quality, response to complaints and billing-error frequency had no statistically significant impact on customer intention to churn. The possible explanation for this is that customer service is not highly used by customers except for information requests or posting complaints, or it may also be that customers do not find service an issue with their operator. Furthermore, Moroccan customers are new to customer support and are unlikely to expect much support from their operator. The insignificance of network coverage as a churn factor can be explained by the fact that the survey was distributed in a major urban area with 100% coverage by the 3 operators. Billing errors are not related to churning since the billing system adopted by the operators is similar (under the control of ANRT).

Technical assistance, degree of privacy respect and diversity of promotions were identified as main churn drivers. Subscribers are not satisfied with the degree of technical assistance provided by their Telco's operator. In general the service is poor; at best customers are given little feedback about the problem faced or their query is not answered at all. This can be attributed to an important lack of technicians to whom sales people can refer customers. Privacy is also a churn factor. Customers are often submitted to repeated unsolicited commercial text or voice messages due to the fact that operators have communicated customers' personal information to affiliate companies for marketing purposes. One may also conclude that the frequency and diversity of the promotions offered by the current telecom operators are perceived as insufficient by their customers and are often a reason to churn to a different operator.

The results of the survey have revealed that mobile models do not affect the churn decision; although some phone models can only be found at a specific operator, phone model is not reason enough for churning. Not surprisingly, prepaid customers are more likely to churn than postpaid customers.

Concerning the personal characteristics of subscribers, the results have revealed that only the age and the income of subscribers are associated with churn attitude. The increase of the subscribers' income does not push them to churn, but, on the contrary, to add another mobile card from other operators. On the other hand, young customers are more likely to churn than older ones.

## **Implications of the Research**

Increasing the satisfaction level has to be set as a priority for all firms. By this satisfaction, we refer to enhancing customer service quality, improving the customer-based approach and offering customer-oriented services. A strong and reactive response service system will build a good interactive communication relationship between both sides and make customers more at ease, hence increasing their trust and loyalty. Mobile operators, to increase retention rate, should create attractive reward programs that compensate current and loyal customers.

In addition, defining a transparent communication plan is the best way to remedy the lack of transparency. These plans must address the right and clear information that subscribers need to know to accomplish their purchases. This information should stipulate the accurate price a subscriber has to pay for a specific service or product. Also, conditions and term of usage for a service should be communicated clearly.

Above all, specific attention should be given to the “risky subscribers;” mobile operators must detect their dissatisfaction factors and try to convert them into loyal customers. A client with fraudulent actions is considered as risky; a customer that has high frequency of complaints is also judged as a risky customer. Developing profiles of risky customers could be done using demographic and geographic attributes as well as service usage patterns.

The real differentiation between operators will be no longer based on price cutting or technology but will be associated with the capability of the carrier to: deliver high quality service, keep subscribers informed, respond to customer requests or complaints, and deliver faster services.

## **Limitations of the Study**

The limitations of the study are the following:

- Information was difficult to access (questionnaires developed before, churn rate for Meditel);
- The study was limited to Casablanca area;
- The results could not be generalized to the whole Moroccan population;
- Analysis of data concerning subscribers with 2 mobile cards is not included because of time; and
- Factor analysis to determine which factors are important was not used

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## A CONTINUOUS MARKOV CHAIN MODEL FOR ESTIMATING ECONOMIC RETAIL MORTGAGE PORTFOLIO SIZE

Morsheda Hassan, Wiley College, Marshall, Texas  
morshedat@yahoo.com

Chang Liu, SouthernWest University of Finance and Economics, China  
changliu0826@gmail.com

Raja Nassar, Louisiana Tech University, Ruston, LA  
ran1@suddenlink.net

### ABSTRACT

In this study, a continuous Markov Chain model is used for modeling the size of retail loans in prepayment, past due, and default states. Prepayment and past due states describe the payment status of a loan. The default state is defined as charge-off on the loan due to bankruptcy, death, or other causes. As such, the model uses the economic status of the loan, rather than the accounting assets status. On the other hand, the book amount of a bank's credit portfolio on its financial statement seldom reflects its real economic status due to the nature of bookkeeping, which only provides a static snap-shot of a bank's operation result. Furthermore, the book amount fails to give the management a true picture of the portfolio pool, which is a function of its contraction and is based on past due rate, default rate, and prepayment rate. To remedy this situation, a stochastic model based on a continuous time Markov Chain is used to analyze contraction and extension, which give a true economic picture of a bank's credit portfolio and, thus in turn, facilitate the pricing of the bank's securities.

### INTRODUCTION

A bank portfolio's real volume, which is measured as the notional volume considering the risks associated with it, is of crucial interest to risk professionals because it could provide a buffer against credit risk events and is one of the basic criteria for evaluating credit operation performance. As a result, analysis of a portfolio's volume should be consistent with the definition of economic assets. The portfolio's assets listed on a bank's book are not necessarily of the same volume after taking credit risk into account. Thus, a dynamic snapshot of the portfolio's true status (taking quantity, as well as quality, into consideration) is crucial for daily credit risk management. Quality refers to the ability of a portfolio to stay in or transit back to the current state (that is a loan is neither past due nor prepaid).

Hence, the economic asset is the true amount of the portfolio that is generating interest income and providing the shield against some credit catastrophes. The recent sub-prime mortgage crisis is a verification of the above dual characteristics of the credit analysis.

The structure of this study is organized as follows: Section one provides a review of studies using Markov models to perform credit analysis. Section two gives a theoretical derivation of the portfolio economic assets model based on continuous Markov chains. Section three provides an empirical application of the model and section four concludes the study and proposes future studies.

## LITERATURE REVIEW

Stochastic process methodology has played a significant role in credit asset management. As summarized by White (1993), Markov decision models have been mainly used in 18 areas, including (1) Finance and Investment, (2) Insurance, and (3) Credit Analysis. Of the 98 papers discussed by White, 9 papers relate to finance and investment, 2 to insurance, and 2 to credit analysis. This survey is by no means comprehensive, but it reveals the fact that Markov chains have been used extensively to analyze financial data.

Cyert, Davison, and Thompson (1962) developed a finite stationary Markov chain model to predict uncollectible amounts (receivables) in each of the past due category. This classic model is referred to as the CDT model. The states of the chain ( $S_j$ ,  $j = 0, 1, 2, \dots, J$ ) were defined as normal payment, past due, and bad-debt states. The probability  $P_{ij}$  of a dollar in state  $i$  at time  $t$  transiting to state  $j$  at time  $t+1$  is given as

$$P_{ij} = \frac{B_{ij}}{\sum_{m=0}^J B_{im}} \quad (1)$$

where  $B_{ij}$  is the amount in state  $S_j$  at time  $t+1$  which came from state  $S_i$  in the previous period.  $S_t = S_0 Q^t$  is the vector whose  $j$  th component is the amount outstanding for the  $j$  th past due category at the beginning of the  $t$  th period for  $t = 1, 2, \dots$ . Here,  $Q$  is a sub-matrix, in the transition probability matrix  $P_{ij} = \begin{bmatrix} I & O \\ R & Q \end{bmatrix}$ , which includes transition probabilities among the set of transient states.

The model of Cyert, Davison, and Thompson (1962) was criticized by Corcoran (1978) who claimed that the representativeness of the transition probability could be affected by the “dominancy of large accounts.” Therefore, he suggested grouping the accounts according to their size, and then a transition matrix for each group was provided by an exponentially smoothed matrix:  $A_j = 0.8T_j + (1-0.8)A_{j-1}$ , where  $A_j$  is an exponentially smoothed matrix for month  $j$  and  $T_j$  is the transition matrix for month  $j$ .

Kuelen, Spronk, and Corcoran (1981) published their study on the CDT model and claimed that there was a flaw in the model because it failed to consider the partial payments for accounts due. By using the “total balance method,” CDT understated the collection, and thus overestimated bad debts. A simple remedy, other than model structure modification, was to treat the partially paid amount and the remainder balance separately. As a result, an exact agreement with total receipts and aging could be achieved.

According to Thompson (1965), one of two important related tests for a bank’s credit asset from the lender’s point of view is the possibility of the loan getting into trouble, which means the probability of being in a past-due or even charged-off state. Another test is the extent of loss in the case of being in trouble. This could mean two things: (1) the recovery from collateral in the case of being charged off, or (2) the ability for an individual to bring himself back on track. Also, in the same paper, Thompson provided evidence supporting his claim that the business cycle and the macroeconomic situation are probably the most significant factors affecting change in bank credit.

Raj, Kirkham, and Clarke (1979), by assuming that new customers behave in a way similar to existing customers, implemented a Markov Model:

$$y(t) = \sum y(t-1)p_{ij} + u(t), i, j = 1, 2, \dots, r; t = 1, 2, \dots, T \quad (2)$$

where  $y(t)$  is the observed liability shares of deposit-taking institutes at time  $t$ ,  $p_{ij}$  is the Markov transition probability from state  $i$  to state  $j$ , and  $u(t)$  is a disturbance term to analyze the growth rates of Canadian deposit-taking institutes because of the implication of the Bank Act in 1967. The authors showed that the model was appropriate whenever growth was dominated by macro economic factors and technical innovations.

By taking economic factors into account, Grinold (1983) used a finite Markov chain model to analyze a firm’s market value if the firm follows an optimal policy in state  $(x, y)$  at time  $t$ , where  $x$  is the condition of the firm, and  $y$  is the condition of the overall economy. He assumed that a change in state is governed by a stationary transition function. For instance, if the state is  $y(t-1)$  at time  $t-1$ , then it will be  $y(t)$  at time  $t$  with probability  $\pi[y(t)y(t-1)]$ . However, to calculate  $V_i^k$ , he used dynamic programming because direct computation could be very time-consuming.

Jarrow, Lando, and Trumbull (1997) applied continuous and discrete time Markov chains to describe the default behavior of zero-coupon bonds within a time interval  $\eta_t (0 \leq t \leq \tau)$ . Furthermore, the default state was defined as an absorbing state. Again, the purpose was to price the bond based on analysis of credit risk spread. Similar approaches have been adopted by Lieberman (1972) and Zipkin (1993). Lieberman used a Markov chain to model decision-making for credit card application approval. The states of the chain were  $n+1$  paid-up states and one default state. The model assumed that the amount of dollars moved from one state to another follows a Markov chain process. On the other hand, Zipkin adopted a simpler model of interest

rate, based on a discrete-time, finite-state Markov chain, to evaluate mortgage-backed securities. Glennon and Nigro (2005) used the survival analysis approach to measure the default risk of a small business. They adopted the Cox Proportional Hazard model. By using a discrete-time hazard procedure, they found that the default risk peaked in the second year after initiation, increased during the medium-maturity season, and declined thereafter.

Hurd and Kuznetsov (2007) introduced a conditional Markov Chain model, based on stochastic factors such as the interest rate and recovery rate, for credit default analysis. Their model, as claimed by the authors, can provide computational effectiveness with increased flexibility.

A parsimonious and flexible multivariate Markov Chain model to capture the dependency of transitions of ratings of credit risky entities has been proposed by Ching, Siu, L-m Li, T. Li, and W-K Li (2007) with an effective and flexible algorithm. The model, as well as the algorithm, reduces considerably the number of parameters. Similarly, algorithm has been implemented by Siu, Ching, Fung, and Ng (2005) to achieve a better risk measurement for credit risk.

A continuous Markov Chain model and algorithm have been used by Crommelin and Eijnden (2006) for simulation of molecular dynamics and of atmospheric flows and by Donatelli, Haddad, and Sproston (2006) for the Continuous Stochastic Logic, or CSL, when the measure of interest depends on the execution path.

## CONTINUOUS TIME MARKOV MODEL

In the continuous time Markov Chain model, let  $S_j$  denote a past due state , corresponding to the number of days past due. The loan normally requires monthly payment. If a loan is 30 days past due, denote it by state  $S_1$ . State  $S_2$  refers to 60 days past due and state  $S_3$  represents a loan that is more than 91 days past due. Let  $R_3, R_4$  be the states of prepaid defined as  $R_3 = (X_t - Y_t) / B_t > 50\%$ ,  $R_4 = (X_t - Y_t) / B_t < 50\%$  , respectively, where  $X_t$  is the actual payment at month  $t$  and  $Y_t$  is the scheduled payment at month  $t$ . One can see that state  $R_3, R_4$  is defined as the extra payment over the scheduled payment, which measures how much of the loan balance (or size) has been made as a current one- time payment.

Classification of the states of the Markov Chain into past due and prepayment states as well as default states is presented in Table 1.

**TABLE 1. DEFINITIONS OF THE DIFFERENT STATES OF THE MARKOV CHAIN**

| Past Due and Prepayment States |                               | Default States $R_k$  |              |
|--------------------------------|-------------------------------|-----------------------|--------------|
| $S_j, j = 0, 1, 2, 3$          |                               | $R_k, k = 1, 2, 3, 4$ |              |
| $S_0$                          | No more than 30 days past due | $R_1$                 | Sold by Bank |

|       |                            |       |   |
|-------|----------------------------|-------|---|
| $S_1$ | 31 days – 60 days past due | $R_2$ | All other charge-off reasons                      |
| $S_2$ | 61 days – 90 days past due | $R_3$ | Prepayment of more than 50% of the remaining loan |
| $S_3$ | More than 91 days past due | $R_4$ | Prepayment of less than 50% of the remaining loan |

The salient feature of this model is the evaluation of loan asset behavior over time, which is more informative than the traditional accounting financial reports.

First, we define the time interval to be  $(0, t), t < \infty$ . The transition intensities between different states can be defined as (Chiang, 1980):

$v_{ij}\Delta t = \Pr \{ \text{an individual in state } S_i \text{ at time } \tau \text{ will be in state } S_j \text{ at time } \tau + \Delta t \}$ , where  $i \neq j; i, j = 0, 1, 2, 3; i \neq j$

$\mu_{ik}\Delta t = \Pr \{ \text{an individual in state } S_i \text{ at time } \tau \text{ will be in state } R_k \text{ at time } \tau + \Delta t \}$ , where,  $i = 0, 1, 2, 3$  and  $k$  refers to the default states,  $k = 1, 2, 3, 4$ .

Furthermore, we assume that the intensities  $v_{ij}$  and  $\mu_{ik}$  are independent of time. Thus, we are concerned here with a time homogenous Markov Chain.

If an individual stays in its original state, its intensity is defined as  $v_{ii} = -(v_{ij} + \sum_{k=1}^4 u_{jk})$ ,

$i \neq j, i, j = 0, 1, 2, 3, k = 1, 2, 3, 4$ . By this definition, it is obvious that

$1 + v_{ii}\Delta t = \Pr \{ \text{an individual in state } S_i \text{ at time } \tau \text{ will be in state } S_i \text{ at time } \tau + \Delta t \}$ .

Within any single time interval,  $\{\tau, \tau + \Delta t\}$ , V is the prepayment and past due intensity matrix, while U is the default intensity matrix:

The matrix of transition intensities between the S-states (prepayment and past due states) is given by the V matrix in Figure 1. Also, the U matrix in Figure 1 represents the transition intensities from the S-states to the default states:

$$V = \begin{bmatrix} S_0 & S_1 & S_2 & S_3 \\ S_0 & v_{0,0} & v_{0,1} & 0 & 0 \\ S_1 & v_{1,0} & v_{1,1} & v_{1,2} & 0 \\ S_2 & v_{2,0} & v_{2,1} & v_{2,2} & v_{2,3} \\ S_3 & v_{3,0} & v_{3,1} & v_{3,2} & v_{3,3} \end{bmatrix} \quad U = \begin{bmatrix} R_1 & R_2 & R_3 & R_4 \\ R_1 & \mu_{0,1} & \mu_{0,2} & \mu_{0,3} & \mu_{0,3} \\ R_2 & \mu_{1,1} & \mu_{1,2} & \mu_{1,3} & \mu_{1,4} \\ R_3 & \mu_{2,1} & \mu_{2,2} & \mu_{2,3} & \mu_{2,4} \\ R_4 & \mu_{3,1} & \mu_{3,2} & \mu_{3,3} & \mu_{3,4} \end{bmatrix}$$

**FIGURE 1. TRANSITION INTENSITIES WITHIN THE S-STATES (V MATRIX), AND FROM THE S-STATES TO THE ABSORBING STATES (U MATRIX)**

Because  $R_k$  is an absorbing state, there is no transition from an R to an S-state. Also, for a past due state, transition lies only between neighboring states. This result is obvious since within one month, a loan with no past due payment cannot have a two-month due payment.

## TRANSITION PROBABILITIES

Let  $P_{ij}(\tau, t) = \Pr \{ \text{an individual in state } S_i \text{ at time } \tau \text{ will be in state } S_j \text{ at time } t \}, i, j = 0, 1, 2, 3$ . By definition, we have

$$\begin{aligned} P_{ij}(t, t + \Delta t) &= v_{\gamma j}(t) \Delta t \\ P_{jj}(t, t + \Delta t) &= 1 + v_{jj}(t) \Delta t \end{aligned} \quad (3)$$

$$P_{ij}(\tau, t + \Delta t) = P_{ij}(\tau, t) P_{jj}(t, t + \Delta t) + \sum_{\gamma \neq j} P_{i\gamma}(\tau, t) P_{\gamma j}(t, t + \Delta t) . \quad (4)$$

By substituting Eq. (3) in Eq. (4) and rearranging, we have

$$\begin{aligned} \frac{P_{ij}(\tau, t + \Delta t) - P_{ij}(\tau, t)}{\Delta t} &= P_{ij}(\tau, t) v_{jj}(t) \Delta t + \sum_{\gamma \neq j} P_{i\gamma}(\tau, t) v_{\gamma j}(t) \\ \Rightarrow \lim_{\Delta t \rightarrow 0} \frac{P_{ij}(\tau, t + \Delta t) - P_{ij}(\tau, t)}{\Delta t} &= \sum_{\gamma \neq j} P_{i\gamma}(\tau, t) v_{\gamma j}(t) \\ \Rightarrow \frac{\partial}{\partial t} P_{ij}(\tau, t) &= \sum_{\gamma \neq j} P_{i\gamma}(\tau, t) v_{\gamma j}(t); i, j = 0, 1, 2, 3 \end{aligned} \quad (5)$$

Equation (5), the Kolmogorov Forward Differential Equation, and its solution is given (Chiang, 1980) as

$$P_{ij}(0, t) = \sum_{l=0}^3 \frac{A'_{ij}(\rho_l)}{\prod_{\substack{m=-3 \\ m \neq l}}^3 (\rho_l - \rho_m)} e^{\rho_l t}, i, j = 0, 1, 2, 3 \quad (6)$$

Here,  $A'_{ij}$  is the characteristic matrix of  $V'$ , the transpose of the intensity matrix  $V$ , defined by

$$A'_{ij} = (\rho I - V'), \quad (7)$$

where  $\rho_l$  = Eigenvalue of the intensity matrix  $V$ .

For an individual in  $S_i$  at time 0, let  $e_{ij}(t)$  = the expected duration of stay in  $S_j$  during the interval  $(0, t), j = 0, 1, 2, 3$ . In terms of our process,  $e_{ij}(t)$  evaluates the expected duration of the loan before default occurs. This expected duration,  $e_{ij}(t)$ , can be expressed (Chiang, 1980) as

$$e_{ij}(t) = \int_0^t P_{ij}(\pi) d\pi \quad (8)$$

$$e_{ij}(0,t) = \sum_{l=0}^3 \frac{A_{ij}'(\rho_l)}{\prod_{\substack{j=0 \\ j \neq l}}^3 (\rho_l - \rho_j) \rho_l} (e^{\rho_l t} - 1), \quad i, j = 0, 1, 2, 3 \quad (9)$$

## A MARKOV MODEL FOR ECONOMIC ASSETS ANALYSIS

In any time interval, the size (balance) of a portfolio is a function of contraction and extension. For the purpose of this study, contraction refers to any process that causes a reduction in credit assets. On the other hand, extension is defined as any process that causes an increase in portfolio size.

What makes a prepayment state absorbing is the fact that a prepayment cannot be deducted from the next scheduled payment. For normal operation, one expects the bank's credit assets to be in state  $S_0$ . The following three reasons validate the classification of prepayment as an absorbing state:

1. The prepaid loan amount (extra payment besides the scheduled normal payment) cannot serve as a buffer for future payment.
2. The prepaid loan amount cannot be refunded by the bank.
3. The prepaid loan amount reduces the overall portfolio balance permanently.
4. The prepaid loan amount cannot be used to calculate the interest payment for the next period of time.

Please note that, at any point in time, the state of no more than 30 days past due,  $S_0$ , refers to a health state, and we expect most of a bank's credit assets to stay in this state for normal operations.

The purpose of this Markov model is to analyze the portfolio size (or balance) for a bank within a time interval  $(0, t)$ . This fact implies the evaluation of the value after taking potential risks into account, instead of the accounting amount based on the bank's financial statement. The model can provide a true snap-shot at any given time  $\xi$  within a time interval  $(0, t)$  for the management, and also fundamental information for investors in a trading period interval  $(0, t)$ . The model has the following assumptions:

1. A transition an individual might make in the future is independent of those made in the past.
2. Individuals do not have equal probability of default, which depends on the specific debt structure, liquidity requirement, and risk taking ability.
3. The bank is under normal operation where the rate of approval of loan applications is assumed to follow a Poisson process.

For each  $\tau, 0 \leq \tau < t$ , a change in the population size of each state  $S_i$  during a single time interval  $(\tau, \tau + \Delta t)$  occurs based on the following probabilities:

$\lambda_i \Delta t$  = Probability that state  $S_i$  ( $i = 0, 1, 2, 3$ ) increases by 1 during a single time interval  $(\tau, \tau + \Delta t)$ . It is assumed that  $\lambda$  (the intensity of the Poisson process) is independent of time.

$v_{ij}(\tau) \Delta t$  =  $\Pr \{ \text{one individual will move from state } S_i \text{ to state } S_j \text{ during the time interval } (\tau, \tau + \Delta t), i, j = 0, 1, 2, 3 \}$

$\mu_{ik}(\tau) \Delta t$  =  $\Pr \{ \text{an individual will move from a non-absorbing state } S_i \text{ to one of the absorbing state } R_k \text{ during } (\tau, \tau + \Delta t), i = 0, 1, 2, 3, k = 1, 2, 3, 4 \}$ .

The intensity  $v_{ii}$  that an individual stays in its original state in the time interval  $(\tau, \tau + \Delta t)$ , is defined as  $v_{ii} = -(v_{ij} + \sum_{k=1}^4 u_{jk}), i \neq j, i, j = 0, 1, 2, 3, k = 1, 2, 3, 4$ . By this definition, it is obvious that  $1 + v_{ii} \Delta t = \Pr \{ \text{an individual in state } S_i \text{ at time } \tau \text{ will be state } S_i \text{ at time } \tau + \Delta t \}$ . Within any single time interval,  $\{\tau + \Delta t\}$ , V is the non-absorbing intensity matrix, while U is the absorbing intensity matrix as shown in Figure 1.

Due to the fact that the R states are absorbing, there is no transition from U to V or among the R-states in U.

It is obvious that an increase in a portfolio's size within a small time interval  $\{\tau, \tau + \Delta t\}$  could be regarded as the result of only the migration process. As a result, the portfolio size at any given time  $t$  can be expressed as

$$X(t) = Y(t) + Z(t) \quad (10)$$

$$X(t) = \begin{pmatrix} X_0(t) \\ X_1(t) \\ X_2(t) \\ X_3(t) \end{pmatrix}, Y(t) = \begin{pmatrix} Y_0(t) \\ Y_1(t) \\ Y_2(t) \\ Y_3(t) \end{pmatrix}, Z(t) = \begin{pmatrix} Z_0(t) \\ Z_1(t) \\ Z_2(t) \\ Z_3(t) \end{pmatrix}$$

where  $X_i(t), i = 0, 1, 2, 3$  is defined as the portfolio size in each of the states,  $s_0, s_1, s_2, s_3$  at time  $t$ .  $Y_i(t), i = 0, 1, 2, 3$  refers to the portfolio size in state  $i$  at time  $t$  that survived from the original portfolio in state  $i$  ( $i = 0, 1, 2, 3$ ) at time zero, and  $Z_i(t), i = 0, 1, 2, 3$  stands for the portfolio size in state  $i$  at time  $t$  as a result of immigration during the interval  $(0, t)$ . One can argue that  $Y_i(t)$  is affected both by contraction and extension, while  $Z_i(t)$ , a pure incremental factor, is merely an extension process.

The extension process is composed of:

1. Immigration or increase in the portfolio size because of approved new applications for

- a particular loan offered by a bank.
2. Birth or increase in the value of the original portfolio at time 0 because of the passage of time.

For simplicity, however, we will consider only immigration in this study. That is, we consider approval of a new loan as the only factor that plays a role in the extension process. On the other hand, the contraction process is triggered by three factors:

1. Prepayment, or the additional payment for a loan besides the schedule payment, reduces the portfolio size prematurely.
2. Default, causing the elimination of the default loan amount from the portfolio, is considered as another contraction force.
3. Transition, an individual moving from an original state to another state.

Thus, letting  $m_i$  be the portfolio size at state  $i, i = 0, 1, 2, 3$ , at any time  $\tau, 0 \leq \tau \leq t$  the expected portfolio value is given by

$$E[X_j(t)] = \sum_{i=0}^3 m_i p_{ij}(0, t) + q_j(t), i, j = 0, 1, 2, 3 \quad (11)$$

and, the variance is given by

$$V[X_j(t)] = \sum_{i=0}^3 m_i p_{ij}(0, t)[1 - p_{ij}(0, t)] + q_j(t), i, j = 0, 1, 2, 3 \quad (12)$$

where,  $p_{ij}(0, t)$  is the probability of being in state  $j$  at time  $t$  given that the process was in state  $i$  at time zero.

$$p_{ij}(0, t) = \sum_{l=0}^3 \frac{A'_{ij}(\rho_l)}{\prod_{\substack{m=0 \\ m \neq l}}^3 (\rho_l - \rho_m)} e^{\rho_l t}, i, j = 0, 1, 2, 3 \quad (13)$$

as obtained from the solution to the Kolmogorov Forward Differential Equation:

$$\frac{\partial}{\partial t} p_{ij}(\tau, t) = \sum_{\gamma \neq j} p_{i\gamma}(\tau, t) v_{\gamma j}(t), i, j = 0, 1, 2, 3 \quad (14)$$

Also,  $q_j(t)$  is the expected portfolio size in state  $S_j$  at time  $t$ , and is given by

$$q_j(t) = \sum_{i=0}^3 \int_0^t \lambda_i \cdot p_{ij}(\tau, t) d\tau$$

$$\begin{aligned}
&= \sum_{i=0}^3 \int_0^t \lambda_i \cdot \sum_{l=0}^3 \frac{A'_{ij}(\rho_l)}{\prod_{\substack{m=0 \\ m \neq l}}^3 (\rho_l - \rho_m)} e^{\rho_l(t-\tau)} d\tau, \\
&= \sum_{i=0}^3 \sum_{l=0}^3 \lambda_i \frac{A'_{ij}(\rho_l)}{\prod_{\substack{m=0 \\ m \neq l}}^3 (\rho_l - \rho_m)} (e^{\rho_l t} - 1), j = 0, 1, 2, 3
\end{aligned} \tag{15}$$

Here,  $\lambda_i$  is the immigration rate to state  $S_i$  and  $A'_{ij}$  is the  $ij^{th}$  element of the characteristic matrix of  $V'$ , the transpose of the intensity matrix  $V$ , defined by

$$A'_{ij} = (\rho I - V)', \tag{16}$$

where  $\rho_l$  = eigenvalue of the intensity matrix  $V$ .

## APPLICATION

Data were provided by a local bank in Ohio, operating in Ohio, Michigan, Kentucky, and Indiana. By using its monthly paid retail mortgage loan for 16 consecutive months, from April 2005 to September 2006, one can demonstrate the applicability of the continuous time model.

For a continuous-time Markov Chain, an element  $v_{ij}$  of the transition matrix  $V$ , is given by the following equation:

$$v_{ij} = \frac{d}{dt} P_{ij}(c_{ijt}, t) |_{t=0}, i \neq j, i, j = 0, 1, 2, 3, t = 1, 2, 3, \dots, 16, \tag{17}$$

where  $P_{ij}(c_{ijt}, t)$  stands for the 5<sup>th</sup>-order polynomial used to fit the observed transition probabilities from the data over time.  $c_{ijt}, i, j = 0, 1, 2, 3, t = 1, 2, 3, \dots, 16$ . The polynomials are approximated by the Lagrange numerical method. For instance, using MATLAB 7.0<sup>®</sup> Release 14.

The diagonal elements of the intensity matrix  $V$  and  $U$  are given by

$$v_{ii} = -(v_{ij} + \sum_{k=1}^4 u_{ik}), i \neq j, i, j = 0, 1, 2, 3, k = 1, 2, 3, 4 \tag{18}$$

where  $u_{ik} = \frac{d}{dt} P_{ik}(r_{ikt}, t) |_{t=0}, i = 0, 1, 2, 3, t = 1, 2, 3, \dots, 16$ . Thus, we obtained the following  $V, U$  transition intensity matrices as presented in Figure 2:

$$V = \begin{bmatrix} -0.9962 & 0.1141 & 0.0909 & 0 \\ 0.2513 & -1.0263 & 0.2986 & 0.1849 \\ 0.0526 & 0.3008 & -0.9606 & 0.3426 \\ 0.0904 & 0.1416 & 0.3512 & -0.9231 \end{bmatrix}$$

$$U = \begin{bmatrix} 0.0126 & 0.0125 & 0 & 0 \\ 0 & 0.0245 & 0.1214 & 0 \\ 0 & 0.1745 & 0.0215 & 0 \\ 0 & 0.1842 & 0.0047 & 0 \end{bmatrix}$$

**FIGURE 2. INTENSITY MATRICES V AND U**

Hence, one can estimate, from Eq (6) and Eq (9), the transition probability matrix  $P_{ij}(0,1)$  and the expected duration of stay in state  $j$  (given that the process started in state  $i$ ) during the interval  $(0,1)$ ,  $e_{ij}(1), i, j = 0, 1, 2, 3$ . These are given in Figure 3:

$$P_{ij}(0,1) = \begin{bmatrix} 0.7842 & 0.1141 & 0.0624 & 0.0774 \\ 0.1456 & 0.5748 & 0.0944 & 0.0641 \\ 0.0874 & 0.1457 & 0.5247 & 0.0451 \\ 0.1047 & 0.0347 & 0.0974 & 0.2473 \end{bmatrix}$$

$$e_{ij}(0,1) = \begin{bmatrix} 0.8947 & 0.0784 & 0.0142 & 0 \\ 0.1249 & 0.5006 & 0.1471 & 0.0009 \\ 0.0972 & 0.1001 & 0.4478 & 0.4781 \\ 0.0019 & 0.0133 & 0.1404 & 0.2874 \end{bmatrix}$$

**FIGURE 3. TRANSITION PROBABILITY MATRIX AND EXPECTED DURATIONS OF STAY IN STATE J (STARTING IN STATE I) IN THE INTERVAL (0, 1)**

For instance,  $P_{2,1}(0,1) = 0.1456$  represents the probability that a loan in the 2-month past due state will transit to the 1-month past due state during the time interval  $(0,1)$ . On the other hand,  $e_{2,1}(1) = 0.1249$  represents the mean time in months of stay in the 1-month past due state (given that the loan started in the 2-month past due state at  $t = 0$ ) in the time interval  $(0,1)$ . The numbers in the matrix  $e_{ij}(0,1)$  represent the percentage of time the process stays in a state in the unit interval  $(0, 1)$ . Therefore,  $e_{ij}(0,30)$  is the estimated duration for each of the states in the interval of  $(0, 30)$ , or one month.

## ECONOMIC ASSETS

In this subsection, we will use the model to approximate the stochastic retail mortgages portfolio size of the Ohio bank. Let  $X(t)$  be the total stochastic retail mortgage portfolio size at time  $t$ . Its expected value can be expressed as

$$E[X(t)] = \sum_{j=0}^3 E[X_j(t)], j = 0, 1, 2, 3 , \quad (19)$$

where  $E[X_j(t)]$ , the expected portfolio size belonging to state  $j$ , is given in Eq (11). The following set of equations was used in applying the algorithm provided by MathCAD.

$$\begin{aligned} E[X_j(t)] &= \sum_{i=0}^3 m_i p_{ij}(0, t) + \sum_{i=0}^3 \int_0^t \lambda_i \cdot p_{ij}(\tau, t) d\tau, \\ p_{ij}(0, t) &= \sum_{l=0}^3 \frac{A'_{ij}(\rho_l)}{\prod_{m=0, m \neq l}^3 (\rho_l - \rho_m)} e^{\rho_l t}, i, j = 0, 1, 2, 3 \end{aligned} \quad (20)$$

Where  $m_i$  is the retail mortgage portfolio size belonging to state  $i$  in thousands of dollars at time 0 or April 2005, given in Fig 4, and  $\lambda_i$  is the immigration rate at time  $t$ , which is estimated by Eq. (21) below.

Using the bank database, we estimated the  $M = \{m_i\}$  vector as shown in Figure 4, in thousands of dollars:

$$\begin{array}{cccc} S_0 & S_1 & S_2 & S_3 \\ m = (68428.91 & 292.79 & 267.11 & 62.31)^T \end{array}$$

**FIGURE 4. RETAIL MORTGAGE DISTRIBUTIONS IN THOUSANDS OF DOLLARS AT TIME 0**

The estimation of the immigration rate is given by the following method. For simplicity, we assume that the immigration intensity or increment rate is homogeneous over time ( $\lambda_i(t) = \lambda_i$ ). Let  $f_{\lambda_i}$  be the 5<sup>th</sup> order polynomial function for  $\lambda_i$  from the one step immigration dollar amount at time  $t$ ,  $i_t$ . Thus, by taking the first-order derivative of the function  $f_{\lambda_i}$ , evaluated at time  $t = 0$ , we obtain the immigration intensity

$$\begin{aligned} \lambda_i &= \frac{df_i(\lambda_{t,i})}{dt} \Big|_{t=0}, t = 1, 2, \dots, 16, i = 0, 1, 2, 3 \\ \lambda_{t,i} &= \left\{ \begin{pmatrix} \lambda_{1,0} \\ \dots \\ \lambda_{1,3} \end{pmatrix}, \begin{pmatrix} \lambda_{2,0} \\ \dots \\ \lambda_{2,3} \end{pmatrix}, \dots, \begin{pmatrix} \lambda_{16,0} \\ \dots \\ \lambda_{16,3} \end{pmatrix} \right\} \end{aligned} \quad (21)$$

where  $\lambda_{t,i}$  is the retail mortgage immigration rate between period  $t$  and period  $t - 1$  in state  $i$ .

Using the same approach as in figure 2, we estimated the transition intensity matrices, V and U as shown in Figure 5:

$$V = \begin{bmatrix} -0.9674 & 0.1584 & 0.1002 & 0 \\ 0.3047 & -0.9912 & 0.2784 & 0.1748 \\ 0.0614 & 0.2947 & -0.7843 & 0.1978 \\ 0.1047 & 0.1687 & 0.3314 & -0.9047 \end{bmatrix}$$

$$U = \begin{bmatrix} 0.0784 & 0.0087 & 0 & 0 \\ 0 & 0.0144 & 0.0014 & 0.0241 \\ 0 & 0.1547 & 0 & 0.0078 \\ 0 & 0.1574 & 0 & 0.0003 \end{bmatrix}$$

**FIGURE 5. TRANSITION INTENSITY MATRICES FOR STOCHASTIC ASSETS**

Please note that in figure 2, the matrix V and U were calculated by observing the number of accounts transited, while in figure 5, we used the observation of transited loan amounts. We believe that the observation method in figure 5 would fit better in the study of economic portfolio size.

Letting  $InTran(0,t)$  be the portfolio assets distribution from internal transition and immigration and  $ExTran(0,t)$  be the loan balance transited from a non-absorbing state to any absorbing state, we have the following results as shown in Figure 6

$$\begin{array}{cccc} S_0 & S_1 & S_2 & S_3 \\ InTran(0,t) = (3478.21 & 223.7 & 312.09 & 107.45)^T \\ R_1 & R_2 & R_3 & R_4 \\ ExTran(0,t) = (20.14 & 35.14 & 85.87 & 102.8)^T \end{array}$$

**FIGURE 6. INTERNAL ASSETS AND IMMIGRATED ASSETS DISTRIBUTIONS OVER STATES**

As one month is the usual measure period of banks, by letting  $t = 30$ , we can estimate  $A_{monthly}$ , the stochastic assets of the monthly paid retail mortgage assets in thousands of dollars, by the following equation:

$$\begin{aligned} A_{monthly} &= \sum_{i=0}^3 [InTran_i(0,30) - ExTran_i(0,30)] \\ &= \$3,877.5 \end{aligned} \tag{22}$$

## CONCLUSION

The above models will allow the bank management to analyze its loans characteristics in any reasonable interval. The following matrices are obtained by letting  $t = 30$  in Figure 7:

$$P(0,30) = \begin{bmatrix} 0.7841 & 0.1765 & 0.0014 & 0.0784 \\ 0.2147 & 0.6574 & 0.2011 & 0.0991 \\ 0.0874 & 0.1043 & 0.5471 & 0.2457 \\ 0.0741 & 0.0471 & 0.1140 & 0.3284 \end{bmatrix}$$

$$e(0,30) = \begin{bmatrix} 1.8715 & 0.0147 & 0.0782 & 0.0011 \\ 0.1478 & 0.5871 & 0.2478 & 0.0741 \\ 0.2144 & 0.3212 & 0.5478 & 0.1247 \\ 0.0012 & 0.0314 & 0.5421 & 0.4478 \end{bmatrix}$$

**FIGURE 7. TRANSITION PROBABILITY (0, 30)**

The value for  $P_{3,3}(0,30)$  means that the probability of staying in a 3-month past due state for 30 days is 0.3284. Also,  $e_{3,3}(30)=0.4478$  tells us that, during the interval (0,30), staying in 3-month past due state is only 0.86326 unit of time. Furthermore, one can see that a small value for  $P_{i,j}(0,t)$  is usually accompanied by a small value for  $e_{i,j}(t)$ , which is what one expects based on banking experience.

As can be seen, there is a large difference between the retail mortgage's book amount on the bank's financial statement and the estimated stochastic amount which take into consideration the prepayment, past due, and default after one month. The latter is often of most interest to the outside investors because this is the real assets amount that could be used to buffer the liability due to the customer's deposit. In most cases, it could be used to evaluate the bank's operation efficiency as well as its bankruptcy potential.

The above model used only the occurrence frequencies of each state and did not consider the loan asset. Future work may consider the loan asset in developing a model for risk management in the banking industry.

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## **DETERMINING THE EFFECT OF INTERNATIONAL STUDENT ASSIMILATION ON ACADEMIC AND PROFESSIONAL SUCCESS: AN EXPLORATORY ANALYSIS**

Paul A. Fadil, University of North Florida  
pfadil@unf.edu

### **ABSTRACT**

Thirty-five Colombian and thirty-five Japanese foreign exchange students were analyzed to determine which group was more completely assimilated into the United States (US) "college" culture. Subsequently, their satisfaction with academic outcomes was explored to determine the effect of this cultural assimilation on students' perceptions. Results indicate that while both the Colombian and Japanese student sojourners closely align with their US counterparts on the dimensions of Power Distance and Uncertainty Avoidance, the Colombian student sojourners also assimilated on the Individualism/Collectivism dimension. As expected, when directly compared and contrasted, the Colombian students assimilated to US culture more easily than Japanese students. Finally, it was determined that although a strong relationship exists between culture and academic perceptions, it was not in the predicted direction, as both the Colombian and Japanese exchange students had higher positive perceptions of the US higher education system than the US students themselves.

### **INTRODUCTION**

The trend of globalization in the university environment has led to the realization and creation of several new educational issues (Nasri, 1993). Increased multinationalism has meant increased interaction between faculty and students from different cultures (Adler, 1983; Nesdale & Mak, 2003; Rutherford, 1994; Waxin, 2004). Previously culturally isolated and homogenous peoples like the Russians (Galchenko & Van de Vijver, 2007), Turkish (Arends-Tóth & Van de Vijver, 2004), and Japanese (Fadil, 1997), now interact on a daily basis with persons, ideas, and products from scattered parts of the globe, thus activating a process of cultural adaption to their new environment (Berry, 1990; Ferarro, 1995; Ward, Leong & Low, 2004).

As universities continue to grow, expand, and serve the needs of a dynamic student body, many have sought to play an increasingly significant international role by forging many international bilateral exchange agreements (Sam, 2001; Sarkodie-Mensah, 1992). This trend toward internationalization has led to a more culturally diverse student body with the numbers of degree-seeking international students and single year foreign exchange students increasing over the last ten years (Nasri, 1993; Sam, 2001). These global educational alliances combined with the increasing international

enrollments at universities makes the academic adaptation of foreign students on US campuses an increasingly important matter (Cox & Blake, 1991).

A considerable amount of research has shown that the adaptation of foreign students to US culture and instructional techniques is a very important and timely issue (Arends-Tóth & Van de Vijver, 2004; Lukas, 1989; Poortinga & Van Hemert, 2001; Rutherford, 1994; Selvadurai, 1991-1992; Zimmerman, 1995). Although attributes such as persistence, assertiveness, self-motivation, articulate verbal communication, and achievement-orientation are valued both academically and professionally in the United States (Accounting Education Change Commission [AECC], 1990), many foreign students who seek educational opportunities in the U.S. are never introduced to these "professional success attributes" until they begin college in the United States. The effective integration of these international students into the academic curriculum is not only essential for institutional growth and international progression, but also for the future retention of highly qualified foreign students.

The lack of cultural assimilation of international students into any academic setting will have far-reaching consequences for both the students and their respective institutions (Arends-Tóth & Van de Vijver, 2004; Galchenko & Van de Vijver, 2007; Hirshman, 1982). The inability of foreign students to adapt to American university teaching methods negatively influences such important educational outcome variables as: overall academic satisfaction (Charles & Stewart, 1991), the application of business skills (Shackleton & Ali, 1990), the employment of professional success attributes in the workplace (Shackleton & Ali, 1990), and the retention and recall of theoretical principles for further study in graduate academic settings (Henderson & Shibano, 1990).

This paper addresses significant empirical and theoretical issues in cross-cultural student assimilation. The first goal is to empirically ascertain whether culture has a significant effect on individual values (as proposed by Hofstede in 1980). The second issue is to empirically determine whether these values, manifested in two U.S.-based sojourner student groups (Japanese and Colombian), are more closely aligned with their modern cultural (the Anglo-dominated US culture) or their traditional cultures (Japanese or Colombian). The third aim is to empirically establish which of these two cultures of students adapt more easily, the Hispanic (Colombian) international students or the Asian (Japanese) international students. The final objective is to determine whether the foreign students' level of cultural adaptation or retention affects their perceptions of important educational outcome variables.

Whereas past studies have been content to simply identify the differences that exist between cultures (Chance, 1965; Gordon, 1964, 1978; Meade, 1970; Padilla, 1980; Shackleton & Ali, 1990; Wong-Rieger, 1982, 1984), this study seeks to show how these differences impact international students. By determining which cultural dimensions adapt more readily to a new cultural environment, management professors should successfully augment their instructional effectiveness to meet the needs of all the students in a multicultural classroom.

## LITERATURE REVIEW

### Culture

Few concepts in anthropology have as many different and competing definitions as culture. One of the most accepted definitions of culture comes from Kroeber and Kluckhohn (1952):

Culture consists of patterns, explicit and implicit, of and for behavior acquired and transmitted by symbols, constituting the distinctive achievement of human groups, including their embodiment of artifacts; the essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values.... (p. 181)

Culture is just beginning to be accepted as an observable, tangible aspect of human behavior manifested in social interactions, but resting on symbolic frameworks, mental programs and conceptual distinctions in people's minds. The literature indicates that people react differently when interacting with members of other cultures than they do with members of their own culture (Bochner & Perks, 1971; Nesdale & Mak, 2003; Shaw, 1990). Personal differences are often exaggerated and disagreements consistently occur when members of diverse cultures are repeatedly confronted with interpersonal situations (Pulakos & Wexley, 1983). During international exchanges, barriers to communication and misunderstanding are more likely to arise when dealing with intercultural behavior (Graham, 1985). The misconceptions that occur between people of different cultures are due to their divergent cognitive views of the world and society (Shaw, 1990). The impact of these cultural differences on perceptions and cognitive views can be attributed to deeply manifested, culturally-specific values.

### Values

Values have been the most heavily researched cultural constructs in the international literature (Nicholson, 1991). According to Kluckhohn and Strodtbeck (1961), values are the central tenets of culture. They define a value as that which is explicitly or implicitly desirable to an individual or group; and which influences the selection from available modes, means and ends of action. Values are held both consciously and unconsciously (Kluckhohn & Strodtbeck, 1961). Brown (1976) describes cultural values as conceptualizations that define what is right or wrong, or motivational drives that specify preferences. In general, cultural values are: (1) Something that is shared by all or most members of social groups; (2) Something older members try to pass on to younger members; and (3) Something, as with morals, laws and customs, that shapes behavior or structures one's perceptions of the world (Brown, 1976).

### Empirical research on cultural values

Cross-cultural investigations of values have sparked an ongoing debate between those who believe that educational issues are governed by universal principles, the 'culture-free' approach; and those who argue that these situations are governed by a relative culture, the culture-specific thesis (Shackleton & Ali, 1990). A seminal study from the culturalist perspective was conducted by Hofstede (1980, 1980a). Hofstede collected data from over 100,000 IBM employees located in 40

different countries in an empirical search for the value dimensions over which cultures vary. Through a factor analytical treatment of country value measures, Hofstede derived four cultural dimensions related to basic anthropological and societal issues (Hofstede, 1980).

The first value dimension was labeled Power Distance. This was defined as "the extent to which the less powerful members of institutions and organizations accept that power is distributed unequally" (Hofstede, 1980, p. 45). The second value dimension was classified as Uncertainty Avoidance. This was defined as "the extent to which people feel threatened by ambiguous situations, and have created beliefs and institutions to avoid them" (Hofstede, 1980, p. 45). The third value dimension was labeled Individualism versus Collectivism. One end of this bipolar continuum, Individualism, was defined as "the extent to which people look after only themselves and their family"; whereas, the other end, Collectivism, was defined as "a situation in which people belong to ingroups or collectives which are supposed to look after them in exchange for their loyalty" (Hofstede, 1980, p. 45). The final value dimension was labeled Masculinity-Femininity. Masculinity was defined as "a situation in which the dominant values in society are money, success, and things"; while Femininity was defined as "a situation in which the dominant values are caring for others and the quality of life" (Hofstede, 1980, p. 46).

The classifications of cultural values delineated by Hofstede (1980) have been examined repeatedly by other researchers (The Chinese Culture Connection, 1987, Ng et al., 1982; Hofstede & Bond, 1984; Shackleton & Ali, 1990) and further validation has been achieved. By locating these cultural values on a four factor map, this seminal work has enabled the operationalization of the complex construct of culture, and contributed to the foundation necessary to eventually build a theoretical structure for explaining cross-cultural differences (Bond &Forgas, 1984). Based on these empirical successes in a traditionally abstract area of analysis, Hofstede's dimensions are viewed as a valid instrument for the measurement of cultural values for the present study.

Dorfman and Howell (1988) refined Hofstede's cultural scales, bringing them from the ecological level of analysis to the individual level of analysis. They enhanced the construct validity of the measurement instrument and established improved reliabilities on each individual value scale (Nicholson, 1991). In their study, the Cronbach's Alpha coefficient for the value scales range from a low of 0.57 for Individualism-Collectivism to a high of 0.78 for Masculinity-Femininity. Because Dorfman and Howell's (1988) culture scales provide one of the more refined and valid measures of the cultural value dimensions, this scale is employed for the present study.

## **Values and Educational Outcomes**

The educational importance of recognizing and understanding these value differences lay directly within the educational experience itself. For instance, a student who is highly individualistic may have inherent problems with group projects; or a student who has a high power distance may never approach a professor with a question, no matter how confused he/she may be. If a student's educational goal is to learn, and a professor's goal is to facilitate learning, then it is imperative that all barriers, tangible or intangible, be addressed and dealt with in order to enhance the learning process. Conflicting value structures are examples of these obstacles that could affect a student's educational experience and his/her post-educational life (Shaw, 1990).

In the current study, these post-educational issues are measured by specific outcome variables. Factors such as knowledge, skill, and professional orientation transcend any major and form the basis of the proposed educational outcome variables (AECC, 1990). These education outcome variables include: students' perceived satisfaction with their academic careers; students' perceived ability to apply their managerial skills; students' perceived ability to apply professional success attributes; and students' perceived retention and recall of theoretical principles. This study focuses on the effects of cultural assimilation and retention of these outcomes.

## HYPOTHESES

Research has previously shown that other factors in addition to culture may significantly influence values (Chiswick, 1977; Hofstede, 1980; Wong-Rieger & Quintana, 1987). These values include: gender, age, type of school attending (i.e. regional vs. national vs. junior college), and international exposure. Although these variables may have an influence on value adaptation, this effect should be quite minor. According to Laurent (1986), culture has three times more influence on the shaping of educational assumptions and values than any other personal or situational characteristics. Even with this empirical evidence, it is important to include these independent variables in any cultural analysis so we can truly pinpoint the effect of culture. So, although we fully expect culture to have a greater effect than gender, age, school type and international exposure, these factors must be included in our analysis. Thus, based on the predicted effects of the independent variable (culture) on the dependent variables (the four value dimensions), the first and second hypotheses are derived.

- H1:** Membership in the Japanese student, U.S. student or Japanese international student cultures will have a significant influence on the variation of Hofstede's four values: power distance, uncertainty avoidance, individualism-collectivism and masculinity-femininity.
- H2:** Membership in the Colombian student, U.S. student or Colombian international student cultures will have a significant influence on the variation of Hofstede's four values: power distance, uncertainty avoidance, individualism-collectivism and masculinity-femininity.

Wong-Rieger and Quintana (1987) posited that Asians seemed to maintain a strong ethnic orientation even when relocated and exposed to the effects of another culture (not just the United States). Due to the homogenous nature of their respective cultures, when placed in foreign lands, Asians tend to seek out people who are most similar to them and form many Eastern sub-cultures within a given dominant culture. The numerous Chinese "ghettos" or "Chinatowns" around the world stand as a true testament to the strength and pervasiveness of this culture. In many conceptual evaluations, researchers have marveled at the ability of Japanese companies to get US workers to play by "Japanese Rules" (Adler, 1996). Their position was strongly reinforced by empirical evidence when they discovered that in Oklahoma, Southeast Asians were far less assimilated than their Hispanic counterparts (Wong-Rieger & Quintana, 1987). Wong-Rieger and Quintana's (1987) empirical study provides the foundation for the third hypothesis.

- H3:** The Colombian international students will become more assimilated to the U.S. culture than the Japanese international students.

Subsequent to these interactions, it is proposed that the level of value retention or assimilation will directly affect the perceptions of educational outcome variables of the Colombian-sojourners and the Japanese sojourners. As previously stated, these educational outcome variables include students' perceived: satisfaction with their academic careers; ability to apply their managerial skills; ability to apply professional success attributes; and retention and recall of theoretical principles. According to Berry (1990) and Sam (2001), the difficulties encountered by international students during their cross-cultural educational experience are compounded by the assimilation process and their inherent need to maintain their cultural identity.

In an ideal world, educational outcome factors would be equally achievable by both foreign and domestic students regardless of the cultural adaptation that takes place. However, because divergent cultural values act as a perceptive screen between the international student and American instructional methods (Pulakos & Wexley, 1983; Shaw, 1990), it is proposed that the students who adapt at a higher level, or who don't have to adapt at all (i.e. Americans), will perceive their educational outcome factors in a more positive light. Those students who retain most of their traditional culture will regard their educational outcomes from a more negative perspective. These students will tend to see the educational values of the host country so different from their own that they will, in many cases, actually rebel.

This position is taken utilizing the culture shock literature and understanding that assimilation into a culture to the point where one can work within the tenets of the culture to gain what one needs out of the culture takes about 5 years (Adler 1996; Ferraro, 1995). Since most of these foreign students have been in the United States much less than this period of time, it is assumed that they will struggle to gain what they need from the American culture and thereby exhibit frustration. It is only over a period of time (approximately 5 years) that their frustration subsides and they become bicultural (Ferraro, 1995). The extension of the culture shock literature to foreign exchange students provides the logical basis and argument for the final hypotheses.

- H4:** Membership in the U.S., Colombian international or Japanese international cultures will have a significant influence on the variation of the four educational outcome variables: academic satisfaction; skill application; application of professional success attributes; and retention and recall of theoretical principles.

- H4a:** U.S. students will perceive the educational outcomes in the most positive light.

- H4b:** Colombian international students will perceive the educational outcomes in a more positive light than Japanese international students, but from a more negative perspective than U.S. students.

- H4c:** Japanese international students will view their educational outcomes from a more negative perspective than both the Colombian international students and the US students.

## SAMPLING AND METHODOLOGICAL ISSUES

### Sample

For this analysis, culture was operationalized using an individual's country of birth. The Japanese were represented by Japanese students in Japan and the Colombians by Colombian students in Colombia. The Japanese international students and the Colombian international students were represented by Japanese and Colombian students who had been studying in the United States for between two to four years. U.S. students were represented by American traditional students studying at a southeastern regional university.

The subjects used for this study across all samples were senior level business students enrolled in Managerial Policy classes in their respective institutions. Each of the samples had 35 subjects except for the Japanese sample which had 34. Missing values in these samples were identified and subsequently case-wise deleted. Descriptive statistics appear below in Table 1.

TABLE 1. DESCRIPTIVE STATISTICS

|                                    | CULTURES |          |           |                         |                        |
|------------------------------------|----------|----------|-----------|-------------------------|------------------------|
|                                    | American | Japanese | Colombian | Colombian International | Japanese International |
| <b>n</b>                           | 35       | 34       | 35        | 35                      | 35                     |
| <b>National Schools</b>            | 46%      | 91%      | 64%       | 46%                     | 100%                   |
| <b>Age: Over 20</b>                | 54%      | 91%      | 41%       | 83%                     | 86%                    |
| <b>Female</b>                      | 60%      | 43%      | 47%       | 51%                     | 46%                    |
| <b>No International Experience</b> | 57%      | 40%      | 47%       | 40%                     | 48%                    |

*Note.* All subjects sampled across all cultures were business majors in their senior year of college. Thus, there was no variation on the "College Major" variable or the "School Year Classification" variable.

### Instrumentation

In order to determine the level of assimilation of the Japanese and Colombian foreign students, their cultural values were directly compared against values of members of their traditional culture (Japanese and Colombian respectively) and against values of members of their present culture (American). Data for this study was collected through an anonymous questionnaire. The survey consisted of three separate sections. In the first section, demographic questions including age, gender, international exposure and school type were asked. The second section consisted of the

Dorfman and Howell (1988) cultural value scale. The final stage addressed each of the four educational outcome variables previously mentioned.

The questionnaire was developed in English and then translated into Spanish and Japanese by bilingual associates. Both versions were then back-translated into English by separate bilingual associates. The back-translated survey was then compared to the original English version to ensure that any cross-cultural biases or misinterpretations were eliminated (Brislin, 1970).

## **Analyses**

Three separate MANCOVA'S were run, one for each cultural analysis: the Japanese cultural analysis; the Colombian cultural analysis; and one to test the effects of cultural assimilation on the four aforementioned educational outcome variables. The effects of gender, age, school type, and international exposure were controlled by using these variables as covariates. Again, their employment as control variables has been empirically validated by Chiswick (1977), Hofstede, (1980), and Wong-Rieger and Quintana (1987).

## **RESULTS**

The general premise guiding this research (and directly stated in Hypotheses 1 and 2) was that there would be a significant relationship between culture and Hofstede's four values for both cultural samples. Due to this guiding proposition, the relationship of culture and the covariates to each of Hofstede's variables for both analyses were examined.

### **Japanese Cultural Analysis**

For the Japanese analysis, culture was significant at the overall level, as well as at the univariate level when directly tested for each cultural dimension: Masculinity-Femininity, Individualism-Collectivism, Power Distance, and Uncertainty Avoidance (see Table 2 below). Even though the subjects' school type (national or regional institution) had an overall effect, only the Masculinity/Femininity dimension was significantly affected by this covariate. The subjects' age also affected the Masculinity/Femininity Dimension. All analyses were done at the 0.05 level of significance

**TABLE 2. JAPANESE INTERNATIONAL STUDENT ANALYSIS**

| <b>OVERALL MANCOVA RESULTS:</b>    |  | <b>F-Statistic</b> | <b>p-value</b> |
|------------------------------------|--|--------------------|----------------|
| Culture                            |  | 148.87             | 0.00           |
| Age                                |  | 2.37               | 0.06           |
| School Type                        |  | 3.03               | 0.02           |
| Gender                             |  | 0.57               | 0.69           |
| International Exposure             |  | 0.97               | 0.65           |
| <b>UNIVARIATE ANCOVA RESULTS:</b>  |  |                    |                |
| <i>Individualist/Collectivist:</i> |  |                    |                |
| Culture                            |  | 237.36             | 0.00           |

|                        |      |      |
|------------------------|------|------|
| Age                    | 0.47 | 0.49 |
| School Type            | 3.61 | 0.06 |
| Gender                 | 0.65 | 0.42 |
| International Exposure | 0.78 | 0.38 |

|                                       |        |      |
|---------------------------------------|--------|------|
| <b><i>Uncertainty Avoidance:</i></b>  |        |      |
| Culture                               | 284.99 | 0.00 |
| Age                                   | 0.00   | 0.98 |
| School Type                           | 0.27   | 0.61 |
| Gender                                | 0.14   | 0.71 |
| International Exposure                | 0.69   | 0.41 |
| <b><i>Power Distance:</i></b>         |        |      |
| Culture                               | 143.45 | 0.00 |
| Age                                   | 0.00   | 0.19 |
| School Type                           | 0.27   | 0.85 |
| Gender                                | 0.14   | 0.34 |
| International Exposure                | 0.69   | 0.53 |
| <b><i>Masculinity/Femininity:</i></b> |        |      |
| Culture                               | 40.10  | 0.00 |
| Age                                   | 7.46   | 0.01 |
| School Type                           | 8.25   | 0.00 |
| Gender                                | 0.36   | 0.55 |
| International Exposure                | 0.09   | 0.77 |

A look at the pairwise comparisons shows significant differences between the Japanese students and the American students on all four of the cultural dimensions (see Table 3 below). Of these cultural dimensions, the Japanese international students are in accordance with the American students on Uncertainty Avoidance and Power distance, while lining up with the Japanese on Individualism-Collectivism. Regarding Masculinity/Femininity, the Japanese international students are significantly more masculine than even their Japanese counterparts, who are, in turn, significantly more masculine than the American students.

**TABLE 3. PAIRWISE COMPARISONS FOR JAPANESE INTERNATIONAL STUDENTS**

|                                   | CULTURES          |                   |                   |
|-----------------------------------|-------------------|-------------------|-------------------|
|                                   | American          | Japanese          | Japanese<br>Int'l |
| <b>Individualism/Collectivism</b> | 1.38 <sup>b</sup> | 4.11 <sup>a</sup> | 4.04 <sup>a</sup> |
| <b>Uncertainty Avoidance</b>      | 1.92 <sup>b</sup> | 4.02 <sup>a</sup> | 1.80 <sup>b</sup> |
| <b>Power Distance</b>             | 1.81 <sup>b</sup> | 3.65 <sup>a</sup> | 1.76 <sup>b</sup> |
| <b>Masculinity/Femininity</b>     | 2.29 <sup>a</sup> | 1.72 <sup>b</sup> | 1.50 <sup>c</sup> |

*Note.* <sup>a, b, c</sup> Numbers followed by the different letters indicate significant differences.

## Colombian Cultural Analysis

In the Hispanic study, culture also accounted for a significant amount of the overall variance across all four of the cultural dimensions (see Table 4 below). The subjects' international exposure was also significant in the overall test; however, in univariate testing, it only had a significant effect on the Masculinity/Femininity dimension. In addition, while the covariates of age and gender accounted for a significant amount of the variance for the Individualism/ Collectivism dimension, they were not significant in the overall test.

**TABLE 4. COLOMBIAN INTERNATIONAL STUDENT ANALYSIS**

| <b>OVERALL MANCOVA RESULTS:</b>    |  | <b>F-Statistic</b> | <b>p-value</b> |
|------------------------------------|--|--------------------|----------------|
| Culture                            |  | 138.15             | 0.00           |
| Age                                |  | 1.70               | 0.16           |
| School Type                        |  | 1.33               | 0.26           |
| Gender                             |  | 1.71               | 0.16           |
| International Exposure             |  | 3.01               | 0.02           |
| <b>UNIVARIATE ANCOVA RESULTS:</b>  |  |                    |                |
| <i>Individualist/Collectivist:</i> |  |                    |                |
| Culture                            |  | 479.33             | 0.00           |
| Age                                |  | 4.15               | 0.04           |
| School Type                        |  | 3.11               | 0.08           |
| Gender                             |  | 3.84               | 0.05           |
| International Exposure             |  | 1.47               | 0.23           |
| <i>Uncertainty Avoidance:</i>      |  |                    |                |
| Culture                            |  | 301.61             | 0.00           |
| Age                                |  | 2.26               | 0.14           |
| School Type                        |  | 0.42               | 0.52           |
| Gender                             |  | 0.83               | 0.37           |
| International Exposure             |  | 2.34               | 0.13           |
| <i>Power Distance:</i>             |  |                    |                |
| Culture                            |  | 343.66             | 0.00           |
| Age                                |  | 2.63               | 0.11           |
| School Type                        |  | 3.15               | 0.08           |
| Gender                             |  | 0.86               | 0.36           |
| International Exposure             |  | 3.43               | 0.07           |
| <i>Masculinity/Femininity:</i>     |  |                    |                |
| Culture                            |  | 166.06             | 0.00           |
| Age                                |  | 0.22               | 0.64           |
| School Type                        |  | 0.00               | 0.95           |
| Gender                             |  | 1.57               | 0.21           |
| International Exposure             |  | 4.48               | 0.04           |

Pairwise comparisons for the Colombian study also delineated significant differences between Colombian students and the American students on all four cultural dimensions (see Table 5 below). The Colombian international students assimilated to the American culture on the Individualism/Collectivism, Power Distance, and Uncertainty Avoidance dimensions. However, they fell right in the middle of the Americans and Hispanics on the Masculinity/Femininity dimension, significantly different from both. In other words, the Colombian international students are significantly more feminine than the American students and significantly more masculine than their traditional Colombian counterparts.

**TABLE 5. PAIRWISE COMPARISONS FOR COLOMBIAN INTERNATIONAL ANALYSIS**

|                                   | CULTURES          |                   |                   |
|-----------------------------------|-------------------|-------------------|-------------------|
|                                   | American          | Colombians        | Colombians Int'l  |
| <b>Individualism/Collectivism</b> | 1.38 <sup>b</sup> | 4.45 <sup>a</sup> | 1.63 <sup>b</sup> |
| <b>Uncertainty Avoidance</b>      | 1.92 <sup>b</sup> | 4.52 <sup>a</sup> | 1.81 <sup>b</sup> |
| <b>Power Distance</b>             | 1.81 <sup>b</sup> | 4.41 <sup>a</sup> | 1.76 <sup>b</sup> |
| <b>Masculinity/Femininity</b>     | 2.29 <sup>c</sup> | 4.61 <sup>a</sup> | 3.79 <sup>b</sup> |

*Note.* <sup>a, b, c</sup> Numbers followed by the different letters indicate significant differences.

### Educational Outcomes

For the final analysis, a MANCOVA was run to determine the effect of cultural assimilation on the four pre-stated educational outcome variables: students' perception of academic satisfaction; students' perception of their ability to apply skills; students' perception of their ability to apply professional success attributes; and students' perception of their ability to retain and recall theoretical principles at later dates. In this analysis, culture was significant at both the overall and univariate level of analysis for all four educational outcomes (see Table 6 below). International exposure was also significant at the overall level of analysis, however, it accounted for a significant amount of the variance for the application of Professional Success Attributes, and the Retention and Recall of Theoretical Principles. Also significant at the univariate level, was school type for Academic Satisfaction and Skill Application, and age for Skill Application. As with the previous two MANCOVAs, all analyses were done at the 0.05 level of significance.

**TABLE 6. EDUCATIONAL OUTCOME ANALYSIS**

| OVERALL MANCOVA RESULTS: | F-Statistic | p-value |
|--------------------------|-------------|---------|
| Culture                  | 23.18       | 0.00    |
| Age                      | 1.60        | 0.16    |
| School Type              | 12.37       | 0.06    |
| Gender                   | 0.40        | 0.81    |
| International Exposure   | 2.66        | 0.04    |

| <b>UNIVARIATE ANCOVA RESULTS:</b>         |       |      |
|---|-------|------|
| <b><i>Individualist/Collectivist:</i></b> |       |      |
| Culture                                   | 46.15 | 0.00 |
| Age                                       | 0.30  | 0.58 |
| School Type                               | 3.82  | 0.05 |
| Gender                                    | 1.32  | 0.25 |
| International Exposure                    | 0.00  | 0.95 |
| <b><i>Uncertainty Avoidance:</i></b>      |       |      |
| Culture                                   | 60.93 | 0.00 |
| Age                                       | 5.36  | 0.02 |
| School Type                               | 4.24  | 0.04 |
| Gender                                    | 0.01  | 0.91 |
| International Exposure                    | 3.73  | 0.06 |
| <b><i>Power Distance:</i></b>             |       |      |
| Culture                                   | 48.62 | 0.00 |
| Age                                       | 0.26  | 0.61 |
| School Type                               | 1.27  | 0.26 |
| Gender                                    | 0.02  | 0.87 |
| International Exposure                    | 4.40  | 0.04 |
| <b><i>Masculinity/Femininity:</i></b>     |       |      |
| Culture                                   | 71.17 | 0.00 |
| Age                                       | 2.05  | 0.16 |
| School Type                               | 0.13  | 0.72 |
| Gender                                    | 0.02  | 0.89 |
| International Exposure                    | 4.15  | 0.04 |

The pairwise comparisons of this study derived significant differences across the educational outcome variables for the three cultures sampled (see Table 7 below). Across all four of the educational outcome variables: academic satisfaction, skill application, application of professional success attributes, and retention and recall of theoretical principles; the Colombian international students scored significantly higher than both the American and Japanese international students. The American students were significantly lower on three of the four categories than both of their sojourner counterparts, while the Japanese international students were right in the middle on all of the dimensions.

**TABLE 7. PAIRWISE COMPARISONS FOR EDUCATIONAL OUTCOME ANALYSIS**

|                              | <b>CULTURES</b>   |                        |                       |
|------------------------------|-------------------|------------------------|-----------------------|
|                              | <b>American</b>   | <b>Colombian Int'l</b> | <b>Japanese Int'l</b> |
| <b>Academic Satisfaction</b> | 2.05 <sup>c</sup> | 3.86 <sup>a</sup>      | 3.04 <sup>b</sup>     |
| <b>Skill Application</b>     | 2.57 <sup>b</sup> | 4.09 <sup>a</sup>      | 3.10 <sup>b</sup>     |

|  |                   |                   |                   |
|--|-------------------|-------------------|-------------------|
| <b>Professional Success Attributes</b> | 2.33 <sup>c</sup> | 3.98 <sup>a</sup> | 3.00 <sup>b</sup> |
| <b>Retention and Recall</b>            | 2.19 <sup>c</sup> | 4.14 <sup>a</sup> | 3.07 <sup>b</sup> |

*Note.* <sup>a, b, c</sup> Numbers followed by the different letters indicate significant differences.

## DISCUSSION

Based on these results, both hypotheses number 1 and number 2 are confirmed. These hypotheses state that culture would have an overall and direct effect on Hofstede's four cultural value dimensions: Individualism/Collectivism; Uncertainty Avoidance; Masculinity/Femininity; and Power Distance. Based on the results from the first two MANCOVAs (Table 2 and Table 4) culture had significant overall effects, and a direct effect on all of Hofstede's values. Therefore, for all five sets of students sampled, across both analyses, culture significantly influenced the subjects' individual values.

To determine whether hypothesis number 3 was supported, the pairwise comparisons for both analyses must be examined and then compared (Table 3 and Table 5). For the Japanese analysis, the Japanese international students adapted to the American student culture on two of the cultural continuums, Uncertainty Avoidance and Power Distance, while scoring close to their traditional Japanese counterparts on the Individualism/Collectivism and Masculinity/Femininity scales. The Colombian internationals fully adapted across all the dimensions except Masculinity/Femininity, where they scored in between the Americans and Japanese. Because hypothesis number 3 basically states that the Colombian internationals would adapt across more dimensions than the Japanese internationals, this hypothesis was also fully supported.

The final hypotheses state that culture would have a significant impact on the four educational outcome variables (academic satisfaction; skill application; application of professional success attributes; and recall of theoretical principles) and this influence would significantly affect the perception of these outcomes by the sampled students. In Table 6, the results indicate that culture had a significant overall and direct effect on the four stated outcome variables. Thus, hypothesis number 4 is directly supported.

The three sub-hypotheses, H4a, H4b, and H4c, predicted how positive each of the student cultures sampled would perceive the educational outcome variables. It was proposed, that because the Americans did not have to culturally assimilate to US university instruction, they would view the dependent variables in the most positive light, when compared to the other two sampled student groups. It was also proposed that because the Colombian internationals were hypothesized to be more assimilated than the Japanese internationals, they would perceive the educational outcomes more positively than the Japanese internationals, but more negatively than the American students.

The results of the final sub-hypotheses were the most startling results of this study. Table 7 illustrates the pairwise comparisons upon which these hypotheses are examined. Surprisingly, the Colombian international students perceived all four educational outcomes in a more positive light than the other two groups. In addition, the Japanese internationals scored significantly higher than the American

students on all of the dimensions except Skill Application, where their higher score was not significant. Therefore, none of the directional hypotheses (H4a, H4b, and H4c) were supported.

Because this study measured **perceptions** of educational outcomes, it could be conceived that maybe there is a greater cognitive dissonance level with internationals than with the Americans. The international students probably perceive that they would be much worse off in their home countries without their education, thus making them more appreciative and cognizant of the education's value. In the U.S., the opportunity to earn a higher-level education always exists, so the perception of its benefits may not be as powerful as in other countries, where the universities are scarce, the demands and prices are high, and their standards are unattainable by most of the population. This also increases the appreciation of an education, and minimizes the dissatisfaction that may occur in overcoming obstacles toward a college degree. In summary, although the order of the students' perceptions of the educational outcomes was not correctly predicted, it can be easily explained and understood within the cognitive context of the students' college experience.

## CONCLUSION

This study demonstrates that although culture has an effect on student assimilation and their perception of educational outcome variables, it may not necessarily be a negative one. Although numerous individuals have cried out for the integration of culturally-sensitive instructional methods in the business curriculum, this study clearly illustrates that international students' are quite satisfied with their education. While the level of cultural assimilation did have an effect on outcome satisfaction (i.e. Colombian internationals were more satisfied than Japanese internationals), it is the American students dissatisfaction with their education that universities will have a difficult time explaining.

More studies in this area should be conducted to provide additional evidence and context of the present study's findings. Only by varying nationalities, cultural values, covariates, or sample sizes can the full relationship between culture and educational effectiveness be determined. These avenues provide exciting opportunities for researchers who look to empirically study variables in a field that is still in its infancy.

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