MICHIGAN
ROSS SCHOOL OF BUSINESS

Working Paper

Identity Integration and Innovation

Chi-Ying Chen
University of Michigan
Department of Psychology

Jeffrey Sanchez-Burks
Stephen M. Ross School of Business
at the University of Michigan

Fiona Lee
Stephen M. Ross School of Business
at the University of Michigan

UNIVERSITY OF MICHIGAN

Identity Integration and Innovation

Chi-Ying Cheng

Jeffrey Sanchez-Burks

Fiona Lee

University of Michigan

*Authors contributed equally to this manuscript.

Abstract

Three studies examined the psychological antecedents and processes related to individual-level innovation. We propose that individuals who can integrate multiple social identities are better at combining knowledge systems associated with each identity, and thus exhibit higher levels of innovation. Three studies, each probing different types of social identities, provide evidence for this proposition. Study 1 showed that Asian American biculturals with high identity integration between their Asian and American identities exhibited higher levels of innovation in creating Asian-American fusion cuisine compared to biculturals with low identity integration. Study 2 showed that women engineers with high identity integration between their gender and professional identities were more innovative than those with low identity integration. Finally, Study 3 showed that innovation among faculty members with two disciplinary affiliations is similarly related to individual differences in identity integration between their disciplinary affiliations. These findings suggest that the psychological management of multiple identities affects individual innovation.
(Words: 150)

Key Words: Social Identity, Identity Integration, Innovation, Multiple Identities

Identity Integration and Innovation

In this article, we examine individual differences and cognitive processes that underlie how individuals innovate. Innovation refers to as the act or process of inventing or introducing something new and useful (Huber, 1991; Wegner, 1987; Kanter, 1983; West & Farr, 1990). The literature on innovation has focused on understanding how characteristics of the social context influence innovation. Among other things, research has documented how innovation can be influenced by the immediate social context (Chatman & Jehn, 1994), team interaction and diversity (Hackman, 1990; Nemeth, 1986; Swann, Kwan, Polzer, & Milton, 2003; Tannenbaum, Salas, & Canon-Bowers, 1996), and interpersonal interdependence (Chen, Liu, & Tjosvold, 2005). The research reported in this article contributes to this literature by examining how intra-individual psychological properties shape innovation. We focus on "identity integration"--or the perceived compatibility of multiple social identities (Benet-Martínez, Leu, Lee, & Morris, 2002; Roccas & Brewer, 2002)--as an individual difference that predicts how individuals bring together disparate knowledge structures in order to innovate.

Innovation: Novel Solutions from Recombined Existing Knowledge

In the research literature, innovation is commonly defined as the recombination of existing ideas or knowledge to create a new idea that is useful and practical. This perspective primarily comes from the work of organizational scholars and their research on group- and organizational-level innovation (Ancona & Caldwell, 1987). First, innovation entails the integration of different, existing ideas that initially appear unrelated or irrelevant to one another (Schumpeter, 1934; Weick, 1979). Organizational scholars who have studied innovation propose that the history of technological innovations is a history of "smart recombination"--combining old ideas in new ways rather than creating wholly new ideas (Hargadon, 2002; Hargadon & Fanelli, 2002). For example, the popular Apple iPOD MP3 player is not a completely new

technology, but a recombination of two existing technologies, the walkman and the computer hard drive. Although the knowledge systems underlying the iPOD may not be new, the synthesis of these knowledge systems is novel, resulting in an innovative product.

Second, innovations must be useful and applicable. In this sense, innovation is related to but distinct from creativity. Both concepts describe the generation of novel ideas. However, while creativity focuses on the generation of new ideas as an end to itself (Amabile, 1988; Van de Ven, 1986), innovation emphasizes the applicability of the new ideas to address practical problems (Kanter, 1983; West & Farr, 1989). For example, artists may strive to produce work as an expression of their creativity, whereas engineers design innovative products that are useful, marketable, or practical. Using the example above, even though the idea of the iPOD might be new, it would not be considered innovative had it not been perceived as useful, unique, or applicable. In short, innovation requires practical applicability.

Based on the notion that innovation entails the novel recombination of existing knowledge, past research has primarily examined how contextual structures that bring together different knowledge systems can facilitate innovation (Kanter, 1988). Knowledge is unevenly distributed in groups and social collectives. This is true in business organizations where employees in different departments (say, engineering and marketing) have different training, expertise, and access to different sources of information. This is also true within industries; for example, people who work in the computer industry have different knowledge and expertise than people who work in the electronics industry. There is evidence that frequent interactions and networks between departments or industries promote the "brokering" or inter-exchange of knowledge between these groups, which in turn facilitates innovation at the group and organizational level (Hargadon, 2002; Phillips, Mannix, Neale, & Gruenfeld, 2004).

We propose that a similar process of recombination and integration also may account for

innovation at the individual level. Rather than focusing on contextual structures that facilitate the recombination of knowledge systems between groups, this research examines individual attributes that underlie how individuals recombine, synthesize, and integrate existing knowledge structures. As we argue in the next section, individual differences in how multiple social identities are integrated may influence an individual's ability to recombine knowledge systems linked to these distinct identities, which in turn predicts how well and how much an individual can come up with innovative ideas. The next section reviews literatures on the relationship between knowledge structures and social identities, and on individual differences in the identity integration process.

Knowledge Systems and Social Identities

Just as knowledge is unevenly distributed across and between social groups, knowledge in different domains is not equally accessible within individuals. Specifically, knowledge systems are bundled with various social identities, and depending on which social identity is being activated, different knowledge systems are made accessible at different times (Fiske & Taylor, 1984). For example, an individual can be simultaneously a woman, a professor, a Buddhist, and a Latina; depending on which one of these social identities is activated, different knowledge systems come to the foreground (Spencer, Steele, & Quinn, 1999). Supporting this reasoning, Shih, Pittinsky, and Ambady (1999) primed Asian women for either their cultural (Asian) or gender (women) identity. When their gender identity was made salient, participants did worse on math tests and better on verbal tests compared to a control group; however, the reverse was true when participants' cultural identity was made salient (i.e., they did worse on verbal tests and better on math tests.)

Research on biculturals, or individuals with multiple cultural identities, further supports the idea that knowledge systems are associated with different social identities. In a series of

cross-cultural studies, Asian American biculturals were primed with Asian cultural icons (e.g., images of the Great Wall or a female Chinese opera singer) or American cultural icons (e.g., images of the statue of liberty or a cowboy) and then asked to complete an attribution task (Hong, Morris, Chiu, & Benet-Martínez, 2000). When participants' Asian identity was primed, their attributional styles reflected a prototypical Asian schema (i.e., they made more situational attributions); when their American identity was primed their attributional styles reflected a prototypical American schema (i.e., more internal attributions).

Together, this research shows that different knowledge systems or competencies become more accessible when the social identity associated with this knowledge is activated. Moreover, it demonstrates that individuals may not bring all the relevant knowledge to bear on a given task or situation if the corresponding identity is not activated. Even though one might theoretically possess the expertise or know-how to solve a problem, certain knowledge systems may not be accessible because the relevant social identity is not activated.

This can be especially problematic when identities associated with relevant knowledge systems are in conflict with one another. For example, if two social identities are perceived as incompatible, it might be particularly difficult to simultaneously activate both identities at the same turn, which in turn inhibits the ability to draw from the knowledge systems associated with each identity. In the next section, we show that individuals who are better at activating different and disparate social identities at the same time are more likely to have access to different knowledge systems simultaneously, which in turn facilitates the process of recombination, synthesis, and integration of dissimilar ideas that is necessary for innovation.

Identity Integration

There are several influential theoretical perspectives in the psychological literature that address how multiple social identities are managed. For example, Berry (1990) describes four

distinct strategies that describe how biculturals can manage their multiple cultural identities: assimilation (identification mostly with the dominant culture), integration (identification with both cultures), separation (identification largely with the ethnic culture), or marginalization (low identification with both cultures). Extending beyond cultural identities to social identities within any domain (e.g., gender, profession, race, etc.), Roccas and Brewer (2002) propose four general strategies individuals use to manage multiple social identities: intersection (for example, a white Christian will identify only with other white Christians), dominance (for example, a white Christian with a dominant religious identity will identify with other Christians), compartmentalization (for example, a white Christian identifies with either her racial or religious group depending on external cues), and merger (for example, a white Christian identities with whites and with Christians).

Roccas and Brewer (2002) suggest that individual differences in perceptions of the relationship between different social identities affect how multiple social identities are negotiated. This is of particular importance when people have social identities with conflicting values or norms. Individuals who identify strongly with being white and being a Christian may not have problems merging these identities, since they do not necessarily represent conflicting values. However, it might be more problematic to merge multiple identities when the two groups have fundamentally opposing values, expectations, and norms; for example, when individuals identify strongly with being gay and being Catholic, or being a woman and being in a highly male-oriented profession, or being an Asian and being an American.

Supporting this notion, there is evidence that biculturals vary on Identity Integration (II), an individual difference continuum measuring the degree to which two cultural identities are perceived as compatible or in opposition to each other (Benet-Martínez & Haritatos, 2005; Benet-Martínez, Leu, Lee, & Morris, 2002). Using self-reports to measure II, these studies

showed that biculturals with high identity integration (or high IIs) see the two identities as largely compatible and complementary. Not unlike those who adopt the "merger" strategy in Roccas and Brewer's (2002) conceptualization, high IIs do not find it problematic to identify strongly with both their cultural groups at the same time. In contrast, low IIs feel caught between the two identities and prefer to keep them separate, despite the fact that, like high IIs, they strongly identify with both cultures (Benet-Martínez et al., 2005). Like those who adopt the "compartmentalize" strategy, low IIs believe they can identify with one or the other cultural group at different times or different contexts, but not both at the same time. Similarly, women in male-dominated professions (such as business or engineering) also have been found to vary on gender-professional identity integration. High II female professionals perceive their gender and professional identities to be compatible, while low II female professionals see the two identities as fundamentally incompatible, and work hard to keep these identities separate (Sacharin & Lee, in review; Trahan, Lee, & Cheng, 2004). We propose that such individual differences in identity integration which we propose have implications for individual-level innovation.

Present Studies

Three studies test the proposition that identity integration predicts an individual's ability to innovate. Because those with high identity integration are better at accessing seemingly conflicting and disparate social identities simultaneously, they may be better at accessing and combining the knowledge systems associated with these social identities, and thus better at creating innovative ideas. Those with low identity integration, on the other hand, may be more likely to activate one social identity at a time, and therefore less likely to have access to disparate knowledge systems, resulting in lower levels of innovation.

We further propose that this effect--high IIs being more innovative than low IIs--will be evident only in tasks that require knowledge from the relevant social identities. That is, we do

not expect high IIs to be generally more innovative than low IIs. In summary, we predict an interaction effect between II and type of task on individual innovation. When the task requires the application of knowledge systems relevant to two conflicting social identities, high IIs will be more innovative that low IIs. When the task does not require the application of knowledge systems relevant to the two social identities, there will be no differences in innovation between high and low IIs. We test these predictions across two experiments and one field study, each study examining II with different combinations of social identities.

Study 1

In Study 1, we examine how identity integration between two cultural identities shapes innovation in creating recipes for "fusion cuisine." Fusion cuisine combines cuisines from two different cultures to form new dishes. Innovative fusion recipes not only are new combinations of traditional cuisines from different cultures, but also are appealing to customers--that is, the new idea is practical, useful, meets a need, and can be effectively applied to reach a desired goal. Given that individuals with high II between their two cultural identities can more easily access their identity-related knowledge systems simultaneously, they will be more innovative in this domain. In other words, we predict that biculturals with high II will be more innovative than biculturals with low II when generating recipes for fusion cuisine, but we predict no differences between high and low IIs when generating recipes that draw upon only one culture.

In Study 1, we used a within-subject design where Asian American participants were asked to create innovative fusion recipes under three conditions in counterbalanced order. In the first condition, they were given both Asian and American cooking ingredients; in this condition, we hypothesized that participants with high II will be more innovative than those with low II. In the second and third conditions, participants were only given Asian or American ingredients but not both; in these conditions, we hypothesized no differences in innovation between high and

low II Asian Americans.

Methods

Participants

Participants were 61 Asian Americans from a large university in the Midwest (23 males and 38 females, mean age = 24.04, SD = 4.82). 40 participants were first-generation biculturals who were born in East and Southeast Asian countries (Mainland China, Taiwan, Hong Kong, Macao, Singapore, Korea, or Japan) and have lived in North America for at least five years. 21 participants were second-generation biculturals whose parents (both mother and father) were first-generation immigrants from East and Southeast Asian countries. Based on preliminary analysis indicating no significant differences between the first- and second-generation samples on independent or dependent measures, these groups were combined in the subsequent analyses. Participants were recruited through campus fliers soliciting individuals who fit the criteria described. Participants received payment for their participation in this study.

Selecting Ingredients

To select Asian and American ingredients for the experimental tasks, we first asked 40 Asian Americans to list as many Asian or American cooking ingredients as possible, and then rank order the ingredients on how often each is used in cooking typical Asian or American cuisine. Averaging across these rankings, we picked the top 25 Asian and American ingredients. These ingredients were further evaluated by two independent coders (two Asian coders for the Asian ingredients, and two American coders for the American ingredients) to validate the items as ingredients unique to Asian or American cuisine. This process yielded 16 Asian ingredients (e.g., soybean sauce and wasabi) and 16 American ingredients (e.g., barbecue sauce and parmesan cheese).

Next, we created three different ingredient sets, with the actual jars, bottles, and boxes

arranged on trays: (1) Asian ingredients only, (2) American ingredients only, and (3) mixed with half Asian and half American ingredients. Each set had eight ingredients with equivalent ratings of how often each ingredient is used in traditional Asian or American cooking. In each set, we also included two commonly used ingredients in both Asian and American cuisines--salt and pepper. Overall, there were 10 ingredients in each ingredient set.

Procedure

Prior to the experimental task, participants completed the Bicultural Identity Integration Scale—Version 1 (BIIS-1) distance measure (see Benet-Martínez & Haritatos, 2005; Cheng, Lee, & Benet-Martínez, 2006).[1] The BIIS-1 distance measure contains four items that measure the degree of integration between mainstream and ethnic cultures: (1) I keep Asian and American cultures separate (reversed scored); (2) I feel "Asian-American" (i.e., hyphenated, a mixture of the two); (3) I am simply an Asian who lives in North America (i.e., I am an Asian who happens to live in the U.S.) (reversed scored); (4) I feel part of a combined culture. Participants rated each item on a scale of 1 (completely disagree) to 5 (completely agree). The four items were averaged to form a bicultural II composite score. A higher score on this scale indicates a higher level of integration of the two cultural identities, and thus higher II. The internal reliability of the four items was .66 (Cronbach's alpha). Following past research on II (Cheng, Lee, & Benet-Martínez, 2006) we used the scale midpoint (3) to divide the sample into high IIs ($M = 3.84$, $SD = .60$) and low IIs ($M = 2.20$, $SD = .33$, participants with a rating lower than 3 on the II scale were assigned as low II).

Next, the experimenter explained that the researchers were collaborating with a new local restaurant to better create innovative dishes. The participants' task was to create innovative dishes (creative, delicious, and popular) that would appeal to potential customers. In counterbalanced order, participants were shown one of three trays containing cooking ingredients

(a mix of Asian and American ingredients, Asian ingredients only, and American ingredients only). For each ingredient set, participants were asked to perform two tasks. The first task was to estimate the maximum number of innovative (new, delicious, and popular) dishes that could be created out of any combination of the ingredients from the ingredient set. The second task was to create a recipe of one innovative (new, delicious, and popular) dish from the ingredient set. Two coders rated the recipes generated by participants for innovativeness using three items: 1) This is a creative dish; 2) This is a delicious dish; and 3) This will be a popular dish. All three items were rated using a 5-point Likert scale (1 indicates *not at all* and 5 indicates *very much*). The internal reliabilities of the three items across the different conditions ranged from .61 and .79. The inter-rater reliability between the two coders is high ($r = .74$).

After completing these tasks, participants completed a survey about their gender, age, education, racial background, and parents' racial backgrounds. They also indicated their identification with Asian and American cultures (e.g., rate the strength of cultural identification with Asian and North American cultures by a scale from 1 (very weak) to 6 (very strong)), and their cultural competence in Asian and American cultures (e.g., language proficiency and usage, language media preference, acculturation attitudes, and cultural switching). Finally, participants were debriefed, compensated, and thanked for their participation.

Results

Preliminary analyses comparing estimates of dishes between the Asian-only and the American-only ingredient conditions revealed no significant differences, $F < 1$. These two conditions were therefore combined to form one single-ingredient condition.[2] A Multivariate Analysis of Variance (MANOVA) was conducted on participants' estimated number of innovative dishes with two independent variables--ingredient set (single vs. mixed) and II (high II and low II)--and two covariates--the level of identification with American and Asian cultures.

As hypothesized, there was a significant interaction effect between ingredient set and II, ($F(1,55)$ = 4.67, p = .035, η_p^2 = .078). As shown in Figure 1, high IIs estimated more dishes than low IIs for the mixed-ingredient condition (M = 6.50, SD = 4.22, and M = 4.14, SD = 1.23 respectively, $t(55)$ = 2.05, p = .044), but not for the single-ingredient condition (M = 6.30, SD = 2.83 for high IIs, and M = 5.39, SD = 2.06 for low IIs, $t(55)$ = 1.11, p = .27).

A Multivariate Analysis of Variance (MANOVA) was conducted on the innovativeness ratings of the recipes with two independent variables--ingredient set (single vs. mixed) and II (high II and low II)--and two covariates--the level of identification with American and Asian cultures. The MANOVA showed a significant interaction between ingredient set and II, $F(1,55)$ = 4.99, p = .030, η_p^2 = .092. This predicted interaction, shown in Figure 2, showed that high IIs exhibited higher levels of innovation than low IIs in the mixed-ingredient condition (M = 2.67, SD = .87 for high IIs, and M = 2.21, SD = .65 for low IIs, $t(55)$ = 1.82, p = .07), but not in the single-ingredient conditions (M = 2.96, SD = .64 for high IIs, and M = 2.85, SD = .69 for low IIs, $t(55)$ = .60, p = .55).

Discussion

Consistent with our hypothesis, this study showed that when performing a task that requires activating both Asian and American knowledge systems (creating dishes with both Asian and American ingredients), Asian Americans with high identity integration created more innovative dishes than Asian Americans with low identity integration. This was true for participants' estimations of the number of innovation dishes, as well as the rated innovativeness of participants' recipes. High and low IIs, however, did not differ in innovativeness for tasks that did not require activation of both Asian and American knowledge systems--i.e., creating innovative dishes using just Asian or just American ingredients. Thus, our findings cannot be attributable to high IIs being generally more knowledgeable, flexible, creative, or innovative than

low IIs. Rather it appears that high IIs are more innovative only when the task requires drawing on the knowledge systems that are relevant to their multiple cultural identities.

While Study 1 examined the integration of social identities within a single domain—culture—it is possible for identities to be integrated (or not) across different domains. For example, individuals might experience conflict between one's gender identity (e.g., being a woman) and one's professional identity (working in a male-dominated profession or a masculine-typed job). Study 2 examines II across two different domains--gender and profession. We propose that the same pattern of results we observed in the previous studies also will be evident when examining II across domains.

Study 2

Study 2 examines gender-professional identity integration among a sample moving into a professional field where innovation is part of the job. Specifically, we examined women enrolled in engineering schools, and how II relates to innovation in engineering tasks. There is evidence that, for women, a strong gender identity often conflicts with a strong professional identity. Being a woman is associated with being interpersonally oriented, while being a professional is associated with being task oriented (Deaux & LaFrance, 1998). Women often describe themselves as "not belonging," out of place," or "displaced" in the professional world, which contributes to a strong sense of internal conflict (Fournier & Kelemen, 2001; Hood & Koberg, 1994; London, 2004). This conflict between gender and professional identities is particularly acute in highly male-dominated professions such as engineering, where women obtained only 14.5% of the undergraduate degrees and only 6.8% of doctorates. Statistics aside, the dominant professional values in engineering, such as being aggressive, independent, non-emotional, and rational (Hood & Koberg, 1994; McIlwee & Robinson, 1992), diverge significantly from the stereotypical values associated with being a woman (Kanter, 1977). As such, women in

engineering may experience conflict between their gender and professional identities.

We hypothesize that individual differences between gender and professional identities will predict innovation--women who perceive their gender and professional identities as compatible will be more innovative in tasks that are relevant to both engineering and being a woman. Specifically, we predict that women with high gender-professional II will be more innovative than those with low II on a task that draws on knowledge associated with their gender identity and knowledge associated with their professional identity. However, we predict no differences between high and low IIs for tasks that do not draw from knowledge associated with both identities.

<div align="center">Method</div>

Participants

Participants were 110 female engineering students in a large Midwestern university (mean age = 21.40, SD = 2.79). All participants were majoring in engineering, having previously applied and been accepted to the School of Engineering. Participants were recruited in the student commons area, and were compensated with free pizza in exchange for their participation.

Procedure

Participants were given a survey with multiple parts. First, participants were asked to create an innovative cell phone device. Participants were asked to list as many new and interesting features as possible that would appeal to the target consumers, and to be as innovative as possible. In the first condition, the target population was gender-specific (i.e., women). In the second condition, the target population was non gender-specific (i.e., college students in general).

After completing the cell phone design task, participants completed a measure of gender-professional identity integration, that is, the perceived compatibility between being a

woman and being an engineer. This scale was modified from the II scale used in Study 1 and has been shown in a previous study to be a reliable measure of identity integration among female professionals (Sacharin & Lee, in review). The scale is composed of four items: (1) I am simply a woman working in engineering (reversed scored); (2) I keep everything about being a woman and being an engineer separate (reversed scored); (3) I am a female engineer; and (4) My identity is best described by a blend of both a woman and an engineer. Higher scores indicated higher level of gender-professional identity integration. The reliability of this scale is .50 (Cronbach's alpha).

<div align="center">Results</div>

Based on the mid-point (3) of the II scale, participants were divided into high II ($M =$ 3.94 and $SD = .50$) and low II ($M = 2.80$ and $SD = .31$) groups. High IIs perceived their gender and professional identities to be more compatible than low IIs. To measure innovativeness, two independent raters, blind to the purpose of this study, rated the innovativeness of each feature designed by the participants on a 5-point Likert scale (1 = not at all innovative, 5 = extremely innovative). The inter-rater reliability of the two raters was .84. The innovative scores of each of the features generated by a participant were averaged to form a single innovativeness score for each participant.

We conducted a 2 (II: High vs. Low) X 2 (Target: Gender-specific vs. Non Gender-Specific) between-subjects ANOVA on innovativeness. There was a significant main effect of task type ($F(1,104) = 11.48$, $p = .001$, $\eta_p^2 = .098$), indicating that overall participants showed higher levels of innovation when designing new cell phone features for non gender-specific targets ($M = 2.87$, $SD = .81$) than for gender-specific targets ($M = 2.51$, $SD = .53$). As predicted, the two-way interaction between the level of II and task type on the innovation ratings was significant, $F(1,104) = 4.49$, $p = .036$, $\eta_p^2 = .044$. As shown in Figure 3, when

designing new cell phone features for gender-specific targets (women), features generated by high IIs were rated as more innovative than those generated by low IIs ($M = 2.65$, $SD = .85$, and $M = 2.19$, $SD = .65$ respectively, $t(104) = 2.02$, $p = .037$). However, when designing new cell phone features for a non gender-specific targets (college students in general), there was no difference between high and low IIs ($M = 2.82$, $SD = .45$, and $M = 3.01$, $SD = .65$ respectively, $t(104) = -1.11$, $p = .31$). [4]

Discussion

In Study 2, we found that women engineering students with high II (or perceived their gender and professional identities to be compatible) were more innovative when they were asked to design a cell phone for women. However, the same difference was not apparent when they were asked to design a cell phone for college students. It appears that for tasks that require drawing on knowledge systems related to both their gender and professional identities, women with high II were more able to bring these knowledge systems to the task simultaneously, resulting in higher levels of innovation.

Study 2 extends Study 1 by going beyond integration of cultural identities to examine gender and professional identities. The bulk of past research on II has focused on bicultural identities; this study is the first we know of that has applied II to other identity domains. However, in Study 2, the II scale was less reliable (Cronbach's alpha = .50) than the II scale in Study 1 (Cronbach's alpha = .66). The cross-domain nature of Study 2 may contribute to the lower reliability of the II scale. While Study 1 explored conflict between identities within the same domain (culture), Study 2 examined conflict between different domains (gender and profession). It is possible that perceptions of conflict and compatibility are more complex in these cross-domain situations; for instance, women in male-dominated professions may be better able to ignore or suppress one identity (e.g., suppressing gender identity at work or suppressing

professional identity at home). This may lead to perceptions of lower conflict at times (because the "conflicting" identity is suppressed), but perceptions of heightened conflict at other times (because both identities are chronically separated). It should be noted that low reliabilities can be a problem because of increased risk in type 2 errors. In other words, had we failed to find support for our hypothesis, this could be a result of the low reliability of the II scale. Given that Study 2's results supported our hypothesis, the lower reliability of the II scale is of lesser concern.

Studies 1 and 2 examined innovation in short-term, experimental tasks in well-controlled conditions—creating fusion cuisine in Study 1 and designing cell phone features in Study 2. Study 3 uses a more ecologically valid context, using tasks in which participants are well trained and perform as part of their everyday work, that where excellent performance leads to meaningful and significant rewards. In Study 3, we examine individuals with disparate professional identities, and how professional identity integration--or perceptions of compatibility between their two professional identities--predicts innovation in the workplace.

Study 3

Study 3 is a naturalistic field study that examines how integration of different "disciplinary" social identities relates to innovation in academic research. In academia, it is not uncommon for researchers to identify with more than a single field or discipline. In this study, we focus on academics with doctorates in one discipline and an academic appointment in another (e.g., a sociology Ph.D. with an appointment in a business school). We suggest that these academics are likely to identify with two disciplinary identities--one in which they are trained and one in which they hold their primary academic appointment.

Different disciplines often have different norms (e.g., rules for determining authorship), expectations (e.g., criteria for promotion), and relevant knowledge systems (e.g., dominant literatures or theories from which research draws), and, as such, identification with two different

disciplines can be problematic for some of these interdisciplinary academics (Alison & Long, 1990; Allison & Stewart, 1974). We propose that individual differences in "disciplinary" II, or the perceived compatibility/conflict between the two disciplinary identities, may be related to research innovation.

In its most idealistic form, academic research values and encourages innovation, or the generation of new knowledge through the synthesis and integration of existing knowledge. This is best illustrated in Judson's (2005) detailed account of Francis Crick's and James Watson's discovery of the structure of DNA, arguably one of the most important academic discoveries of the past century. Judson argues that Crick's and Watson's discovery was largely based on their knowledge and integration of known findings from different fields such as biology and chemistry. Judson details how, through their professional networks with researchers working in different disciplines and on different problems, Crick and Watson saw findings suggestive of a double helix structure in others' work, and as a result came to their critical insight of the double helix. Judson argues that biochemistry, a new discipline that emerged from Crick's and Watson's discovery, has since created empirical and theoretical innovations far surpassing that of biology and chemistry. This underscores the idea that recombination and synthesis of previous knowledge is critical to academic innovation.

Drawing from this idea, we suggest that academics who are able to activate two disciplinary identities at the same time also are more likely to access different knowledge systems simultaneously. This should in turn lead to higher levels of innovation in their research. We therefore propose that academics with high levels of II (or those who perceive compatibility between the discipline in which they are trained and the discipline in which they are appointed) will be more innovative in their research than those with low II (or those who perceive conflict between the discipline in which they are trained and the discipline in which they are appointed).

Most academics understand that assessing academic innovativeness is not a simple task. A review of existing studies on academic performance showed that the most common way for measuring innovation is by counting the number of publications in peer-reviewed journals (Fox, 1983, 1992). Although the quantity of publications is not a perfect tool for assessing innovation--for example, there are scholars who publish relatively few but influential papers, as well as scholars who publish many papers that have marginal impact on their field of inquiry--researchers have argued that, generally, reviewers and editors of high-impact journals are reliable and valid judges of innovative research in their respective fields, and thus publications in these journals provide a reasonable proxy for academic innovation (Lee & Bozeman, 2005). (Unfortunately, other indices of academic innovation--such as citation counts or journal impact ratings--were not uniformly available, accurate, or updated in every discipline.) Accordingly, we used the number of peer-reviewed journal articles to measure academic innovation. All in all, we predict that high IIs will have more publications in peer-reviewed journals than low IIs.

Methods

Participants

Participants were faculty members from a large Midwestern research university who held appointments in departments different from the academic discipline in which they received their doctoral degrees. A preliminary search of faculty CVs across multiple schools and disciplines revealed that most cross-discipline appointments occur in schools of Business, Public Policy, Education, Social Work, and Kinesiology (rather than "basic" disciplines such as Psychology, Sociology, Anthropology, or Physics). Thus, we only sampled faculty from these schools in Study 3.

Measures

We adapted the II measure used in Studies 1 and 2 to form a disciplinary identity integration survey. The four items included in the scale include (where A refers to the department/field in which participants received their Ph.D.s, and B refers to the field of their primary faculty appointment): (1) My identity is best described by a blend of both A and B; (2) I keep everything about A and B separate (reversed scored); (3) I am a scholar of A and B; and (4) I am simply a scholar of A working in B (reversed scored). The four items were averaged to form a II composite (Cronbach's alpha = .70). Higher scores on this scale indicate a higher level of integration (or perceived compatibility) between the two disciplinary identities.

Procedure

Using publicly available information from the university's Web site that describes faculty members' background and/or provides their curriculum vitae, we identified 60 faculty members in the various schools above who have doctoral degrees outside their field of appointment. We sent an e-mail to these 60 individuals inviting them to complete the "disciplinary identity integration survey" (see section above). Forty-six faculty members (male = 30, female = 16) completed the survey (6.52% from Kinesiology, 15.22% from Education, 19.17% from Social Work, 19.57% from Business, and 39.13% from Public Policy; the higher number of respondents from the School of Public Policy can be attributable to the fact that almost all faculty members in this school had Ph.D.'s outside Public Policy). Overall, the response rate was 76.67%.

Next, we collected the current CVs of the 46 faculty members who responded with the completed II scale. Updated CVs were typically available on the Web; otherwise we requested CVs directly from the participants. We were unable to obtain current CVs from 14 participants, leaving 32 participants. From the CVs, we counted the number of articles published in peer-reviewed journals to serve as a measure of academic innovation.

Results

Based on the midpoint (3) of the II scale, we divided the 32 participants into high II ($M =$ 4.25, $SD = .44$) and low II ($M = 2.64$, $SD = .35$) groups, where high II indicates higher perceived compatibility between their PhD discipline and their appointment discipline. There was a positive correlation between publication number and II ($r(31) = .41$, $p = .021$), as well as between publication number and years after receiving Ph.D. ($r(31) = .78$, $p < .001$). However, there was no significant correlation between II and years after receiving Ph.D. ($r(31) = .17$, $p = .35$). Therefore, years after receiving Ph.D. were used as a covariate in the subsequent analyses.

A one-way ANCOVA with II as the independent variable and years after receiving Ph.D. as covariate was performed on number of publications in peer-reviewed journals. As hypothesized, the ANCOVA revealed a significant main effect of II, $F(1, 28) = 6.48$, $p = .017$, $\eta_p^2 = .19$. Controlling for years after receiving Ph.D., faculty with high II had more publications ($M = 26.55$, $SD = 13.20$) compared to faculty with low ($M = 14.82$, $SD = 12.17$).

General Discussion

Study 3 finds that, for faculty with a doctorate in one field and a primary appointment in a different field, academic innovation as indicated by publication rate is related to perceived integration between the two disciplinary identities. Complementing the results from Studies 1 and 2, Study 3 suggests that II is positively related to innovation in a realistic field setting.

The findings from the three studies provide support that individual differences in identity integration relate to innovation. Specifically, high levels of integration between two disparate social identities positively predict innovation in tasks relevant to the two identities. In Study 1, Asian Americans with high II exhibited more innovation when generating fusion cuisine than those with low IIs, but only when the task required them to use both Asian and American ingredients. In Study 2, female engineers with high II were more innovative than those with low

II, but only when designing new cell phone features for women rather than college students. In Study 3, interdisciplinary faculty members with high II had more peer-reviewed publications than those with low II.

Our findings suggest a plausible mechanism for individual-level innovation. Salient social identities affect the availability of identity-related knowledge domains. When different identity-related knowledge systems can be activated, recombined, and applied to a problem, innovation is more likely to occur. Furthermore, our results suggest that II is an important individual difference variable that moderates this process of innovation. It is important to note that, because there were no differences in innovation between high and low IIs when the task involves a single identity, high IIs are not just generally more innovative than low IIs, nor do they simply have more expertise. Having high II does not guarantee higher individual innovation; it depends on whether the task involves the relevant identity-related knowledge systems.

These findings suggest that increasing II can facilitate individual innovation. There is some evidence that II may be malleable. For example, when individuals recalled positive experiences related to their two identities, II increased. However, when negative memories were recalled, II decreased (Cheng & Lee, 2006). Thus, to the extent that positive experiences related to having multiple social identities can be brought to the fore--for instance, by bringing to mind positive associations related to being an Asian-American, an interdisciplinary scholar, or a female engineer--it might bring about higher levels of II and thus higher levels of innovation on certain tasks. This proposition has particular implications for helping minority groups better assimilate into the larger social organization. As mentioned, minorities such as new immigrants or entry-level women in male-dominated professions often experience conflict between their various identities. If they are mentored to focus on the positive aspects of their multiple identities rather than the hardships and struggles of being a minority member, they might be able to

achieve higher levels of innovation in domains where their multiple identities intersect.

Future Research

Several directions for future research emerge from this paper. We find that innovation is related to the integration between multiple social identities within a single domain (e.g., II between two cultural identities or two disciplinary identities) and across multiple domains (e.g., II between gender and professional identities). This speaks to the flexibility of II as a way of conceptualizing the perceived relationship between multiple social identities, regardless of the domain or the type of social identity. Indeed, our three studies show that using a simple adaptation of a single scale, II can be reliably measured across various social identity domains.

This further raises the question of whether single-domain II or cross-domain II has a stronger influence on innovation. One might argue that achieving a high level of II is more difficult in cross-domain than single-domain identities because the social identities appear more disparate in content, context, and relevance. As such, one might predict that a marketing executive having to solve an engineering problem (two disparate functional identities within a single domain) will be more innovative than a woman having to solve the same engineering problem (two disparate identities across domains). Alternatively, one might argue that achieving high II is easier in cross-domain identities because the separation of identity domains decreases the inherent conflict one experiences between the two identities. In this case, a woman solving an engineering problem may be more innovative because at work she can more easily "turn off" her gender identity than the marketing executive can "turn off" his functional identity.

Roccas and Brewer (2002) argue that the subjective representation of the interrelationships between an individual's multiple group identities is related to an individual's previous experience. Consistent with this argument, recent research has shown that how biculturals manage and integrate cultural identities is associated with the positivity of their past

bicultural experiences (Benet-Martínez & Haritatos, 2005). Specifically, Cheng and Lee (2006) found that biculturals had an increase in II after recalling positive bicultural experiences, and a decrease in II after recalling negative bicultural experiences. In sum, changing the salience of experiences appears to affect II. This has important implications for how II can be changed to affect innovation. The studies we report in this paper did not manipulate II, and as such we cannot make any causal statements about the relationship between II and innovation. But past research showing the malleability of II (depending on whether positive or negative events are recalled; Cheng & Lee, 2006) suggests that future research should experimentally manipulate II and measure changes in innovation. This will allow us to make stronger causal inferences about the direct effect of II on innovation, and to develop effective interventions to increase II in settings where innovation is critical.

Future work also is needed to further unpack the psychological mechanisms underlying individual innovation. We argued that high IIs are better at innovating because they are more able to integrate disparate knowledge systems associated with conflicting social identities. However, it is also possible that low IIs can access and recombine disparate ideas just as well as high IIs; but low IIs evaluate cross-identity knowledge as less practical and relevant, therefore disregarding them. As such, low IIs also come up with innovative ideas, but they might consider them unfeasible or unrealistic. To address this issue, future work should measure identity activation and/or knowledge accessibility in addition to innovation. For example, studies can measure high and low IIs' recall and recognition of identity-related items. Asian-American biculturals can be asked to recall what ingredients were in the ingredient set, and intrusion-errors (false recall of Asian or American ingredients) can be used as a measure of activation of Asian and/or American cultural identities and knowledge systems.

Emotion also can play a role in understanding the relationship between II and innovation.

Future research also should investigate how II relates to different emotions. We argued that II influences individual innovation via the cognitive route--specifically, II facilitates the simultaneous accessibility of disparate identity-related knowledge systems. But it is also possible that that II influences innovation via the emotional route. For example, high IIs might be better at accessing and experiencing disparate emotions, which in turn lead to more innovation. Indeed, recent research has shown that having ambivalent emotions--specifically, feeling both positive and negative emotions at the same time--increases innovation and creativity (Fong, 2006). Individuals with high II might have higher tolerance for ambiguity, which allows for integration of *both* disparate cognitions and disparate emotions (Roccas & Brewer, 2002).

Conclusion

In today's world where innovation rather than routine performance is a critical skill for success, it is important to understand how individuals innovate and the conditions which facilitate individuals' ability to innovate. Yet, innovation is not a well-examined process in the psychological literature. At the same time, organizational researchers have long examined how structures and policies affect organizational innovation, without delving into the mechanisms underlying how individuals innovate. Indeed, an organization's ability to innovate first begins with an individual coming up with a new idea. This paper seeks to fill this important gap in the psychological and organizational literature.

We draw on social identity theory to examine antecedents of individual-level innovation. We found evidence that high identity integration, or perceptions that multiple and conflicting social identities are compatible, positively predicts individual-level innovation. These findings suggest that the psychology underlying innovation is a fruitful field of research that can have theoretical implications for understanding how multiple identities are managed and negotiated, and practical implications for increasing individuals' capacity to innovate in their everyday lives.

References

Amabile, T. M. (1988). A model of creativity and innovation in organization. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 10, 123-167). Greenwich, CT: JAI Press.

Ancona, D. G., & Caldwell, D. (1987). Management issues facing new project teams in high technology companies. *Advances in Industrial and Labor Relations, 4,* 199-221.

Allison, P. D., & Long, J. S. 1990. Departmental effects on scientific productivity. *American Sociological Review, 39,* 596-606.

Allison, P. D., & Stewart, J. A. 1974. Productivity differences among scientists: Evidence for accumulative advantage. *American Sociological Review, 39,* 596-606.

Benet-Martínez, V., & Haritatos, J. (2005). Bicultural identity integration (BII): Components and psychological antecedents. *Journal of Personality, 73,* 1015-1050.

Benet-Martínez, V., Leu, J., Lee, F., & Morris, M. (2002). Negotiating biculturalism: Cultural frame switching in biculturals with oppositional versus compatible cultural identities. *Journal of Cross-Cultural Psychology, 33,* 492-516.

Berry, (1990). Berry, J. W. (1990). Psychology of acculturation. In J. Berman (Ed.), *Cross-cultural perspectives: Nebraska symposium on motivation* (201-234). Lincoln: University of Nebraska Press.

Chatman, J. A., & Jehn, K. A. (1994). Assessing the relationship between industry characteristics and organizational culture: How different can you be? *Academy of Management Journal, 35,* 522-553.

Chen, G., Liu, C., & Tjosvold, D. (2005). Conflict management for effective top management teams and innovation in China. *Journal of Management Studies, 42,* 277-300.

Cheng, C.-Y. & Lee, F. (2006). *What makes you become a high BII.* Paper presented at the

Society for the Psychological Study of Social Issues Biennial Conference, Long Beach, CA.

Cheng, C.-Y., Lee. F. & Benet-Martínez, V. (2006). Assimilation and contrast effects in cultural frame switching: Bicultural identity integration and valence of cultural cues. *Journal of Cross-cultural Psychology, 37,* 742-760.

Deaux, K., & LaFrance, M. (1998). Gender. In D.T. Gibert, S.T. Fiske, & G., Lindzey (Eds.), *The handbook of social psychology* (Vol. 1, 788-827). Boston: McGraw-Hill.

Drach-Zahavy, A., & Somech, A. (2001). Understanding team innovation: The role of team processes and structures. *Group Dynamics, 5,* 111-123.

Fiske, S. T. & Taylor, S. E. (1984). *Social cognition*. Reading, MA: Addison-Wesley.

Fournier, V., & Kelemen, M. (2001). The crafting of community: Recoupling discourses of management and womanhood. *Gender, Work and Organization, 8,* 267-290.

Fox, M. F. 1983. Publication productivity among scientists. *Social Studies of Science, 13,* 285-305.

Fox, M. F. 1992. Research productivity and the environmental context. In T. G. Whiston, & R. L. Geiger (Eds.), *Higher education: In United Kingdom and the United States* (103-111). Buckingham, England: SRHE and Open University Press.

Goes, J. B., & Park, S. H. (1997). Interorganizational links and innovation: The case of hospital services. *Academy of Management Journal, 40,* 673-696.

Hackman, R. (1990). *Groups that work (and those that don't): Creating conditions for effective teamwork*. San Francisco: Jossey-Bass.

Hargadon, A. B. (2002) Knowledge brokering: A network perspective on learning and innovation. Research in B. Staw, & R. Kramer (Eds), *Organizational behavior* (Vol. 21, 41-85). Greenwich, CT: JAI Press.

Hargadon, A. B. & Fanelli, A. (2002). Action and possibility: Reconciling dual perspectives of knowledge in organizations, *Organization Science, 13,* 290-302.

Hong, Y., Morris, M., Chiu, C., & Benet-Martínez, V. (2000). Multicultural minds: A dynamic constructivist approach to culture and cognition. *American Psychologist, 55*, 709-720.

Hood, J. N., & Koberg, C. S. (1994). Patterns of differential assimilation and acculturation for women in business organizations. *Human Relations, 47,* 159-181.

Huber, G. P. (1991). Organizational learning: The contributing processes and literatures. *Organization Science, 2,* 88-115.

Judson, H. F. (2005). *Eighth day of creation: The makers of the revolution in biology (25th anniversary edition).* Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.

Kanter, R. M. (1977). *Men and women of the corporation*. New York: Basic Books.

Kanter, R. M. (1983). *The change masters*. New York: Simon & Schuster.

Kanter, R. M. (1988). When a thousand flowers bloom: Structural, collective, and social conditions for innovation in organizations. In B. M. Staw and L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 21, 41-85). Greenwich, CT: JAI Press.

Lee, S., & Bozeman, B. 2005. The impact of research collaboration on scientific productivity. *Social Studies of Science, 35,* 673-702.

Levy, B. (1996). Improving memory in old age through implicit self-stereotyping. *Journal of Personality and Social Psychology, 71*, 1092-1107.

McIlwee, J. S., & Robinson, J. G. (1992). *Women in engineering: Gender, power, and workplace.* Albany, NY: State University of New York Press.

Nemeth, C. J. (1986). Differential contributions of majority and minority influence. *Psychological Review, 93,* 23-32.

Phillips, K. W., Mannix, E. A., Neale, M. A., & Gruenfeld, D. H. (2004). Diverse groups and

information sharing: The effects of congruent ties. *Journal of Experimental Social Psychology, 40,* 497-510.

Roccas, S. & Brewer, M. B. (2002). Social identity complexity. *Personality and Social Psychology Review, 6,* 88-106.

Sacharin, V., & Lee, F. (2006). *Identity in harmony: Identity integration and female business students' congruent and contrary reactions to identity primes*. Manuscript under review.

Schumpenter, J. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.

Shih, M., Pittinsky, T. L., & Ambady, N. (1999). Stereotype susceptibility: Identity salience and shifts in quantitative performance. *Research Report, 10*, 80-83.

Spencer, S. J., Steele, C. M., Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35,* 4-28.

Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist, 52*, 613-629.

Swann, W. B. J., Kwan, V. S. Y., Polzer, J. T., & Milton, L. P. (2003). Fostering group identification and creativity in diverse groups: The role of individuation and self-verification. *Personality and Social Psychology Bulletin, 29,* 1396-1406.

Tannenbaum, S. I., Salas, E., & Cannon-Bowers, J. A. (1996). Promoting team effectiveness. In M. A. West (Ed.), *Handbook of work group psychology* (503-529). New York: John Wiley & Sons.

Trahan, A., Lee, F., & Cheng, C.-Y. (2004). *Identity integration: Extending the model to the workplace.* Paper presented at American Psychology Association Conference, Honolulu, HI.

Tsai, W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position

and absorptive capacity on business unit innovation and performance. *Academy of Management Journal, 44,* 996-1004.

Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management Science, 32,* 590-607.

Wegner, D. M. (1987). Transactive memory: A contemporary analysis of the group mind. In I. B. Mullen, & G. R. Goethals (Eds.), *Theories of group behavior* (185-208). New York: Springer-Verlag.

Weick, K. E. (1979). Cognitive processes in organizations. In B. M. Staw (Ed.), *Research in organizational behavior* (Vol. 1, 41-74). Greenwich, CT: JAI Press.

West, M. A., & Farr, J. L. (1990). *Innovation and creativity at work: Psychological and organizational strategies.* Oxford, England: John Wiley & Sons.

Authors' Note

Authors contributed equally to this article. Chi-Ying Cheng, Department of Psychology, University of Michigan. Jeffrey Sanchez-Burks, Research Center for Group Dynamics, Institute for Social Research, University of Michigan**.** Fiona Lee, Department of Psychology, University of Michigan. Address correspondence to Chi-Ying Cheng, University of Michigan, Department of Psychology, 530 Church St, Ann Arbor, MI, 48109, E-mail address: chengcy@umich.edu.

Endnotes

[1] This measure is part of the longer Bicultural Identity Integration Scale—Version 1.

[2] All the reported analyses also were conducted keeping the Asian-only and American-only conditions separate. The pattern of results did not differ.

[3] All contrasts based on two-tailed significance test.

[4] The same results emerged when controlling for number of features generated.

Figure captions

Figure 1. Study 1: The two-way interaction of II and ingredient set on the estimated number of dishes.

Figure 2. Study 1: The two-way interaction of II and ingredient set on the rated innovation of recipes.

Figure 3. Study 2: The two-way interaction of II and type of task on rated innovativeness.

Figure 1. Study 1: The two-way interaction of II and ingredient set on the estimated number of
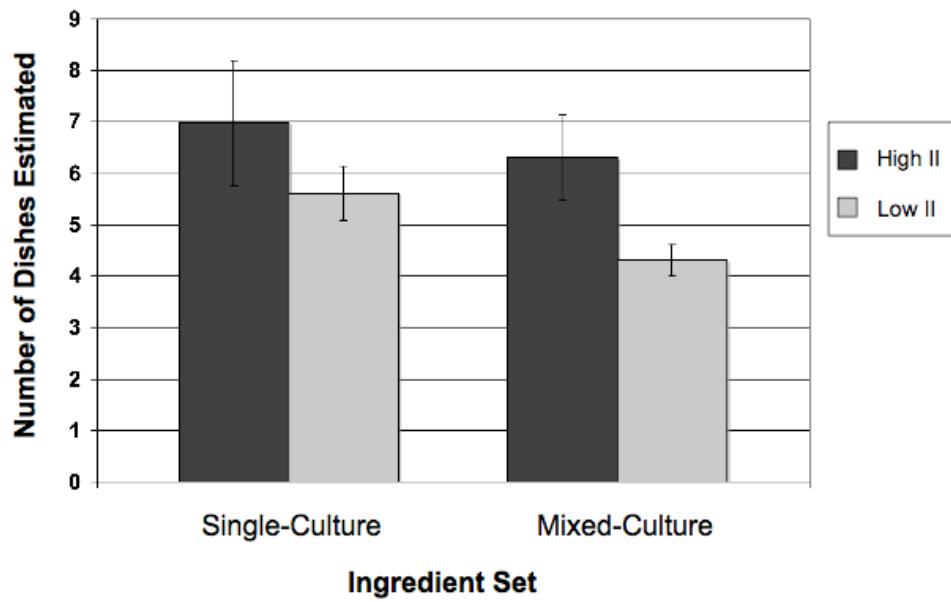
dishes.

Figure 2. Study 1: The two-way interaction of II and ingredient set on the rated innovation of recipes.
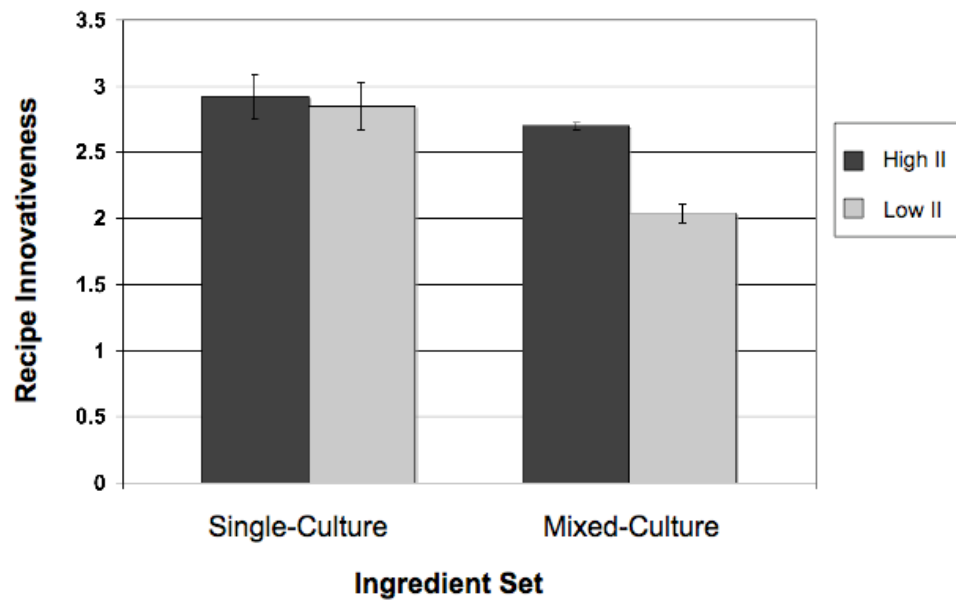
Figure 3. Study 2: The two-way interaction of II and type of task on rated innovativeness.