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ABSTRACT

IS research on participant's motivation[1] in Knowledge Management System have paid relatively limited attention to the effect of diversifying the technological artifacts while they focused more on identifying the generic motivational factors that apply across the varying contexts. However, the manifest success of disruptive collaboration system outside of the corporate boundaries such as Wikipedia calls for our extended attention to the motivational factors that may not be emergent without the provision of context and artifacts that challenge the assumptions made by KMS within the organizational setting.

Through the online survey of 100 Wikipedians, this study evaluates the effect of one novel construct (i.e., socio-cognitive conflict) proposed by Cress and Kimmerle (2008) as an example of such emergent motivation made explicit by maneuvering specific design of collaboration system which otherwise would remain immaterial. In parallel, the analysis also explores the generic motivational constructs the effects of which have been extensively studied within organizational contexts but not sufficiently examined outside of such boundaries.

KEYWORDS

Collaboration, Knowledge management, Knowledge sharing, Cognitive conflict, Wiki, Wikipedia

INTRODUCTION

Knowledge Management has been of particular relevance to IS research due to the significant position of Information Technology in expediting and materializing the organizational knowledge processes. Alavi et al.(2001) proposed a research framework containing 4 sets of such knowledge processes: knowledge creation, knowledge storage and retrieval, knowledge transfer, and knowledge application. Sambmurthy et al.(2005) discusses 3 types of knowledge management problem: the problem of knowledge coordination, knowledge transfer, and knowledge reuse. Despite the fact that each process or problem has its own domain of interest, all are connected to the practical question of how to extract and share the organizational knowledge that remains only in individual head.

"Knowledge acquisition bottleneck" is still an obvious challenge(Wagner 2007) and not much less then it was when Orlikowski lamented "despite the promise of knowledge management technologies, organizations are struggling to turn electronic networks into active discussion forums"(1992; Wasko 2005). The question of how to incentivize the knowledge contribution and knowledge sharing in an organization, therefore, has incessantly been a critical part of research questions concerning knowledge management and knowledge management system.

Social capital and social exchange theory have provided productive angles for IS researchers to develop insights to understand the contributing and collaborating behavior in organizational electronic networks (Kankanhalli et al. 2005; Majchrzak 2009; McLure-Wasko et al. 2005; Zmud et al. 2005). Majority of such research, therefore, seem to aim for a parsimonious set of constructs representing generic-motivational dimensions that would be applicable to determine the general patterns observable from majority of people using some standard form of electronic knowledge management systems and within typical corporate environments. As such, the role of some major constructs such as reputation, reciprocity, identification, and the intrinsic motivation on contribution activity have been widely explored by IS researchers from variety of corporate contexts.

While the overlapping set of such key independent variables are well founded on theoretically shared grounds and their conclusions are indeed in peaceful agreement, some of their applications in IS research are yet to be converged. One of many

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[1] In this research we draw the definition of motivation from Oliver et al. (2008) who defines it as a resource-allocation process through which individuals make decisions about how to allocate their time and effort across task. These resource-allocation-decisions, combined with the perceived benefits of allocating resources to a specific task, constitute a motivational force determining the direction, intensity, and persistence of efforts.

plausible causes for such disagreements is the overall insensitivity of the technological differences in which the individual motivation researches are situated. Majority of them pay little attention to what can be entailed by differentiating the specific aspects of the technological artifacts involved in the research. Ironically, the reason for general agreement in their conclusion seem to rely on the fact that the actual technological differences (e.g., the difference that may encourage or prevent some motivational traits that are not presumed in the given research) at the time of such research were, over all, not so significant on the contributing behavior of the subjects. This pattern of technical insensitivity appears to be reinforced by the implicit consensus within the IS researchers containing the target scope of research within the firm boundaries in which the technical variations among systems tend to be kept minimal.

Out of the organizational boundary, however, along with a group of innovative attempts under the rubric of "web 2.0", Wikipedia, taking a new mode of experimental online content production efforts, has demonstrated an explosive success[2] and puzzled people with its yet-to-be-explained collaboration structure built on a radical set of assumptions and expectations about people's behavior. An increasing number of research papers covering wide range of topics on wiki and Wikipedia are continuously produced by numerous interdisciplinary circles. The sheer breadth of research being conducted around wiki is impressive. As an illustration, here are a few examples: social software for collaboration and work group processes, wiki user experiences, usability, and discourse analysis, reputation systems, quality assurance processes, scalability-social and technical wiki technologies and implementations, translation and multilingual wiki content, educational applications, wiki for non-textual media, semantic wiki and so forth (WikiSym 2009).

Not surprisingly, there are many practical attempts to directly apply the "wiki-way" for variety of purposes from within and without organizational setting in many different cultures. For example, a growing number of U.S companies use wiki technologies for intranets, project management and documentation, distributed meeting coordination, bug tracking, help desk, and CRM to name a few (Majchrzak et al. 2006). Not all such attempts, however, come to fruition (Te'eni 2009). Clearly, such organizational efforts to adopt wiki paradigm would be better guided if the success mechanisms reported in such open-content collaboration platform, proliferated far outside of the organizational boundary, were more actively examined by the IS research community.

Many of unsuccessful explorations that are focused on how to apply the wiki style and wiki coverage for various purposes in practice seem to be founded on some set of "expected" behavioral patterns of the potential participators rather than "proven" patterns. Compared to those on open source software development communities(Raymond 2001), the study on motivation structure of open content development community seem to be less comprehensive and less agreed upon. The theoretical explanations for the success mechanism of such disruptive mode of collaboration are far from conclusive. It is not unusual to encounter the puzzled looks commenting on the wiki and Wikipedia;

> "As it grows and becomes ever more influential, its operating logic remains a mystery. A favored saying among Wikipedia's contributors is: "The problem with Wikipedia is that it only works in practice. In theory, it can never work"." (NY Times Jan 06, 2008)

We, IS researchers, "need to push ourselves in understanding what is different about wikis-in terms of affordance, functionalities, and behavioral use patterns-compared to existing collaborative technologies" (Majchrzak 2009). Clearly, uncovering illusive motivational aspects of mass-collaboration system will help in enriching IS toolkits with better insights for designing effective knowledge sharing environments for varying organizational missions and contexts. While the "knowledge acquisition challenges" (Wagner 2007) persists, Wikipedia may offer an attractive alternative path to investigate to crack the "knowledge acquisition bottleneck" (Ibid).

While it is important to take a firm theoretical basis to evaluate the new phenomena, some of the illusive factors might be better understood by taking fresh perspectives that allow relaxed assumptions on how people collaborate and why. In this respect, we conjecture that there are many types of human motives that remain inactive until they are selectively stimulated by specific maneuvering of the system scenarios, and can be intentionally re-directed to the designated tasks: collaboration in this case. And we further conjecture that the available combinations of such maneuverings have become sufficiently magnified due to the flexibility that IT technologies have to offer. We will call the resulting motivations conducive to the collaboration task as emergent-motivation in contrast to the generic-motivation that exists without regard to the stimulation of technological artifacts. Clearly, identifying such emergent-motivation in relation with associated IT artifacts is an important

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[2] Despite the wide spread suspect and criticism preaching the risks inherent in Wikipedia such as inaccuracy, dubious motives of contribution, uncertain expertise, volatility that hinders being cited, no cite of independent sources, and uneven distribution of content coverage, web traffic to Wikipedia has skyrocketed, increasing nearly 8,000 percent, or unique visitor from 700,000 to 56,000,000 per month, from April 2003 to April 2008. (http://www.nielsen-online.com/pr/pr_080514.pdf)

step toward designing better way of collaborating that would help to resolve the persisted knowledge management bottleneck issue.

As an evidence of emergent-motivation observable in a particular collaboration system, 'socio-cognitive conflict'(Cress et al. 2008) within the context of Wikipedia is taken to be explored in this research. This construct, extending Piaget's notion of equilibration(1977)in cognitive process, is proposed to be a critical driving force of contribution activity especially salient when it interacts with stimuli associated with wiki-specific system design. Though the relative effect-size of such motivation is subject to empirical tests, the existence of psychological stimuli, as a necessary condition for the expected socio-cognitive conflict, appear to be plausible because some of the most frequent narratives sketched by many case-studies conducted on Wikipedian community support the existence of such emotions.

By testing whether and how much of the contributor's motivation can be explained by this particular construct the effect of which emerges from the particular scenario of collaboration system, this study intends to highlight the significance of the innovative fit between the emergence of particular human motivation and a specific aspects of knowledge management system.

We believe that the IS research in KMS can benefit from extending its current research boundaries beyond the intra-firm setting and taking more note of the impact driven by variations in designing technological artifacts because such extension would includes more novel approaches and more practical implications for improvement. Based on this belief, this research evaluates the effect of one novel construct (socio-cognitive-conflict) in parallel with those of theoretically well founded motivational constructs which have been widely explored by IS research.

In the following section, we will review the 5 generic constructs that have been widely examined as the key motivators for online contribution for KMS in IS research and set up hypotheses expected to be effective in the context of Wikipedia where both of the two conditions (i.e., the boundary of collaboration and the variation of technology involved) are relaxed. We will, then, reflect on the potential importance of threshold-motivators for the success of KM efforts. The discussion about the emergent-motivation and socio-cognitive conflict will be presented to set up relevant hypotheses. The research methods and expected contribution will follow.

THEORETICAL DEVELOPMENT

Reputation

In inter and intra organizational setting, social capital theory and social exchange theory have generated dominant perspectives to predict individuals' contribution of knowledge to electronic network of practice(McLure-Wasko et al. 2005). Reputation and network centrality are found to be the main drivers for contribution to electronic networks in a study conducted in the professional community (Ibid). "People contribute their knowledge when they perceive that it enhances their professional reputations, when they have the experience to share, and when they are structurally embedded in the network" (Ibid) Although, some data evidenced that the importance of the reputation may vary depending on the types and norms of organization[3], the increased reputation and respect earned through the recognition of individual expertise and contribution has been generally recognized as the key motivator of online contribution. (Constant et al. 1994; Kollock 1999)

Evidences supporting the positive effect of reputation on knowledge creation are also well documented in research of the open-content collaboration in extra organizational setting. Bringing in the notion of "credibility", a term that overlaps with reputation, Forte et al (2008) argue that the incentive system that motivates contributions to Wikipedia resembles that of the scientific community. Just as what motivates scientist is a sense of credibility (Latour et al. 1986), the core of the Wikipedian motivation also is the notion of credibility (Ibid). Based on in-depth interviews conducted with 22 Wikipedians, Forte et al (2008) conclude that despite the stark difference from scientific communities on the attribution of authorship, Wikipedia authors recognize one another within their community and often claim ownership of articles and the Wikipedia community is

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[3] Indeed, when examined in general public organizations, the importance of reputation (tested as 'image'-the perception of increase in reputation) was not statistically significant (Kankanhalli et al. 2005). Though Kankanhalli hypothesizes, in the same study that, as with other extrinsic benefits such as reciprocity, the need for reputation might be mitigated when the pro-sharing norm is prolific, it is not supported by the data.

firmly moored to credibility as in the scientific community(Forte et al. 2008). Anthony et al. (2005) also recognize reputation as the major motivation for committed Wikipedians[4].

Hence, we hypothesize;

> H1a: Reputation is positively associated with engagement in open content collaboration.

Self Enhancement

Many researches across disciplines(Kankanhalli et al. 2005; McLure Wasko et al. 2000; Nov 2007; Schroer et al. 2009) share relatively strong consensus on the positive impact of self enhancing satisfaction coming directly from the contribution activities such as the enjoyment from helping others and feeling of higher self esteem on contribution behavior. "People participate and help others because participation is fun, and helping others is enjoyable and brings satisfaction" (McLure Wasko et al. 2000). Basing on 151 survey responses from active Wikipedians, Nov(2007) lists the 4 key motivations that have significant correlations with higher engagement all of which compose the dimensions close to Self Enhancement : Fun (Editing Wikipedia is fun), Understanding(Editing Wikipedia allows me to gain a new perspective on things), Enhancement(Editing in Wikipedia makes me feel needed), and Protective (By editing Wikipedia I feel less lonely).

Therefore we hypothesize;

> H2a: Self Enhancement is positively associated with engagement in open content collaboration

Reciprocity

Reciprocity refers to a well established human tendency to maintain equitable relations by expecting to be reciprocated and to reciprocate.(Blau 1964; Kankanhalli et al. 2005; Olivera et al. 2008) Zmud et al. conclude with their survey results that "an individual's attitude toward knowledge sharing is driven primarily by anticipated reciprocal relationships regarding knowledge sharing and the subjective norm regarding knowledge sharing"(Zmud et al. 2005). The impact of reciprocity on Knowledge Management is strongly moderated by the community norms. Kankanhalli et al.(2005) show evidence that reciprocity for knowledge contribution to shared EKR(Electronic Knowledge Reservoir) is not a prominent motivator where the pro-sharing norms are strong whereas it is a stronger predictor for contribution where pro-sharing norms are weak. In such context, they point out that when the community norm demands "knowledge contributors can share their knowledge without the need for extrinsic benefits such as reciprocity" (Ibid)

Interpreting similar dissociation between expectation of reciprocity and level of contribution, Wasko et al.(2005) suggest the increased proportional importance of the generalized reciprocity in electronic network tends to weaken the salience of the reciprocity in collaborative behavior ; "one possible explanation is that network-based interactions may be generalized rather than dyadic, and direct reciprocity is not necessary for sustaining collective action. In contrast to personal exchanges between two individuals where there is an expectation of direct reciprocity, reciprocity in electronic networks of practice may be generalized" (McLure-Wasko et al. 2005; Teigland et al. 2002)

The sense of reciprocity as motivator is not directly tested in most of motivation research focused on Wikipedia. However, as it can be reasonably assumed that the knowledge sharing is the prevalent norm of the Wikipedian community and its reciprocal relationship can be reasonably assumed to be more generalized than those in most of the inter-organizational settings.

As such, we hypothesize;

> H3a: Reciprocity is NOT associated with engagement in open content collaboration

Identification

Identification is defined as "the perception of similarity of values, membership, and loyalty with the organization" (Johnson et al 1999, Kankanhalli et al. 2005). Research suggest that members who strongly identify themselves with their group are

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[4] Anthony et al (2005) recognize reputation along with the commitment to the community as a vital source of motivation, although their major thesis is to emphasize the paradoxical evidences that show the unexpectedly high reliability of the contribution made by the vast number of anonymous one-time contributors, "Good Samaritans", who are not yet even in a position to perceive the reputation as any reason to contribute.

more likely to be active in knowledge sharing. Group identification reinforces "the frequency of cooperation and provides a far better explanation than self- interest approaches for understanding cooperative behavior" (Faraj et al. 2001; Lewicki et al. 1996). Identification has been frequently reported as one of the major predictors of knowledge contribution (Anthony et al. 2005; Faraj et al. 2001) or at least regarded as an important moderating variables in predicting the knowledge sharing behavior within an organization(Kankanhalli et al. 2005). Especially within open source developer communities, the significance of identification is even more emphasized (Hertel et al. 2003).

Group identity, as well as reputation, is often regarded as an undeniable incentive for overcoming the dilemma inherent in public goods even within the context of highlighting the factors unique in Wikipedia such as low barriers to entry and low cost of contribution as critical in gaining insights for designing new wave of collaboration systems (Anthony et al. 2005; Benkler 2008). Bryant et al also support this notion by illustrating how the process of identification acts as the essential underpinning of Wikipedian community; "As they moved toward fuller participation, participants adopted a caretaker role with respect to some collection of articles. Over time, these collections grow. Eventually, Wikipedians identify with the community as a whole, adopt the goals of building a sound information resource, and see themselves as managers or creators."(2005).

On Wikipedian contribution, however, its impact is yet to be evidenced by more empirical studies. Group identification is often unaccounted for (Kuznetsov; Nov 2007) or explained with insignificant statistical supports(Schroer et al. 2009)[5].

Therefore, we expect;

> H4a: Identification is positively associated with engagement in open content collaboration

Intrinsic Motivation

Compared with the general acceptance of the positive impact of self enhancement on higher intrinsic motivation(Nov 2007; Von Hippel et al. 2003) and in turn higher engagement(Schroer et al. 2009), the impacts of extrinsic factors (reputation, reciprocity and organizational reward) on intrinsic motivation are often regarded questionable and, therefore, need to be conditionally acknowledged depending on the cultural and contextual contingencies. (i.e., organizational reward is effective only when the subject's identification with the community is strong enough (Kankanhalli et al. 2005))

Wasko et al.,(2000) take note of the potentially negative effect of extrinsic motivators. They warn that "system based on extrinsic rewards quickly turn moral obligation into acts of self-interest, and could potentially destroy the open provisioning of knowledge in a community" (Ibid). Research also provides some evidence in an Asian corporate setting that supports for "a felt need for extrinsic rewards may very well hinder-rather than promote-the development of favorable attitudes toward knowledge sharing(Zmud et al. 2005)".

However, this suspected negative correlation between extrinsic motivators (e.g., status, approval, passing grades, or monetary rewards (Deci 1972)) and intrinsic motivations may have to be evaluated by a "person's perception of locus of causality of his behavior".(Ibid) According to Deci, it is only when one's self perception of the reason for performing task shifts from one to the other that such negative association emerges. "There are at least two aspects to any external reward, a controlling aspect and information or feedback aspect. The controlling aspect leads to a decrease in intrinsic motivation by changing the perceived locus of causality while the feedback aspect leads to an increase in intrinsic motivation by increasing the person's sense of competence and self-determination."(Deci 1972)

Given the autonomous characteristic of participating in Wikipedian community, the perceived extrinsic motivators such as reputation, reciprocity, or community feedback and any type of recognition is less likely to contain controlling aspects but more likely to have informational or feedback aspects than most of the knowledge contribution context within an organizational setting. Therefore we hypothesize that accumulating the, typically non-monetary, external reinforcement for the contribution activity as Wikipedians, whether that originates from natural feedback from community members or from the more organized administrative recognition, will not have notable negative association with the intrinsic motivation. Rather, the feedback aspect of such motivators will enhance the Wikipedian's sense of competence and self-determination, and consequently reinforce the intrinsic motivation.

Hence, we hypothesize;

> H1b: Reputation is positively associated with intrinsic motivation in open content collaboration

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[5] In the recent study on Wikipedian motivations (Schroer et al 2009), the effect of identification on engagement failed to reach significance despite a significant zero-order-correlation shown between them.

H2b: Self Enhancement is positively associated with intrinsic motivation in open content collaboration

H3b: Reciprocity is positively associated with intrinsic motivation in open content collaboration

H4b: Identification is positively associated with intrinsic motivation in open content collaboration

Cognitive conflict as a main motivation of wiki contributors

Extending Piaget's model of equilibration, Cress and Kimmerle propose that "people engage in contributing wiki because of cognitive conflicts"(2008). The equilibration theory explains how people try to balance between the environmental information and their prior knowledge.

According to Piaget (1967, 1980), when cognitive conflict or disequilibrium is recognized, such recognition motivates people to resolve the conflict. Piaget refers to this process of resolving conflict ''equilibration, a process of self-regulation that maintains a balance between ''assimilation'' and ''accommodation.'' (Lee et al. 2003) Assimilation of new information refers to a process of adding or integrating information from environment into individual knowledge set in quantitative manner, while accommodation of individual knowledge refers to a result from interaction made between the new information and individual in a way that the new information changes their knowledge qualitatively. Crass and Kimmerle make an interesting extension on this originally individual process. "Accommodation and assimilation do not only take place internally (in people's cognitive systems) but also externally (in the social system wiki)". In junction with Lumann's social theory of internalization and externalization, the (individual) cognitive conflict in cognitive learning is now re-interpreted as "social" cognitive conflict.

If the information is not in line with prior knowledge this incongruity causes a cognitive conflict. In resolving such conflict in wiki setting, they argue that, four different forms of learning and knowledge building are distinguished: internal assimilation (quantitative individual learning), internal accommodation (qualitative individual learning), external assimilation (quantitative knowledge building), and external accommodation (qualitative knowledge building). This "co-evolution" between wiki and cognitive system of individuals constitute the foundation of collaborative knowledge building. As such, "the incongruity between people's individual knowledge and the wiki's information is the motor of the system's development" (Ibid).

Although, this theoretical argument has not gone through sufficient empirical tests except for those of the originator group themselves(Cress et al. 2008; Harrer et al. 2008), we find this argument particularly attractive because we have encountered difficulties to locate an appropriate independent variable from the extant research that could represent the persistent testimonies that take up majority of interview scripts of Wikipedians. Such lack of construct has been particularly embarrassing because those testimonies are the most frequent yet most unique class of comments in describing what initiated them to contribute at the first place.;

> "Well that's wrong, I will change that"(Participant 3)
> "I noticed how slim the railroad-related content was, so I started adding to it." (Participant 9)
> "I kept rechecking Wikipedia until decided that it was definitely missing certain things and since I had an
> opportunity to contribute, why not do it?" (Participant 8) (Bryant et al. 2005)

Hence, we hypothesize;

> H5: Cognitive Conflict is a main motivator for initiating knowledge contribution in open content collaboration

According to Cress and Kimmerle (2008), medium level of perceived incongruity between an individual' knowledge and the information provided by a wiki cause cognitive conflicts which in turn activate the equilibration process. Since such equilibration process, composed of either internalization or externalization, is ultimately aimed at resolving the conflict, if there is any such individual behavior, it would be highly related with the intrinsic motivation rather than with any other extrinsic drivers.

Hence, we hypothesize;

> H6: Cognitive Conflict is positively associated with intrinsic motivation in open content collaboration

However, as the engagement level of a Wikipedian increases, the perception of her role within the Wikipedian community tends to be more proactive and holistic. They are more concerned about the community and the project as a whole.(Bryant et al. 2005) On the one hand, they may encounter more frequent cognitive conflict in protecting hundreds of their 'own' articles in their watch list. On the other hand, those matured may now take more proactive and comprehensive job driven by the more explicit and stronger generic-motives that may go far beyond the level of motivational force that cognitive conflict may generate and perceive such emergent-motivation relatively immaterial.

> "To a writer getting something "published" and reviewed in an environment that is more likely to correct your mistakes than reject your stuff might have a certain appeal" (Participant 8)
> "I contribute because I have something to say which might be of interest to other people" (Participants 1)
> "I believe in the integrity of the project. I want to see it succeed" (Participants 3) (Bryant et al. 2005)

Therefore, we hypothesize that the net effect of the cognitive conflict is indeterminate.

> H7: Cognitive Conflict is NOT associated with engagement in open content collaboration

Crass and Kimmerle proposed that the activation of equilibration process is a function of two variables: size of incongruity and level of valence an individual has on the subject matter. Given the size of incongruity, "the higher the valence, the higher the perceived cognitive conflict and the more interest people would feel" (Cress et al. 2008; Krapp 1999) Although, our current research design does not measure the size of incongruity and the valence level each individual has on each topic as independent variables, we can reasonably expect that given the size of incongruity the average level of valence individual feel each subject is proportional to the level of identification, reciprocity, reputation and self enhancement each individual attach to his or her contribution.

Therefore, we hypothesize that all 4 key variables are positively associated with cognitive conflict level.

> H8a: Identification is positively related with cognitive conflict in open content collaboration

> H8b: Reciprocity is positively related with cognitive conflict in open content collaboration

> H8c: Reputation is positively related with cognitive conflict in open content collaboration

> H8d: Self Enhancement is positively related with cognitive conflict in open content collaboration
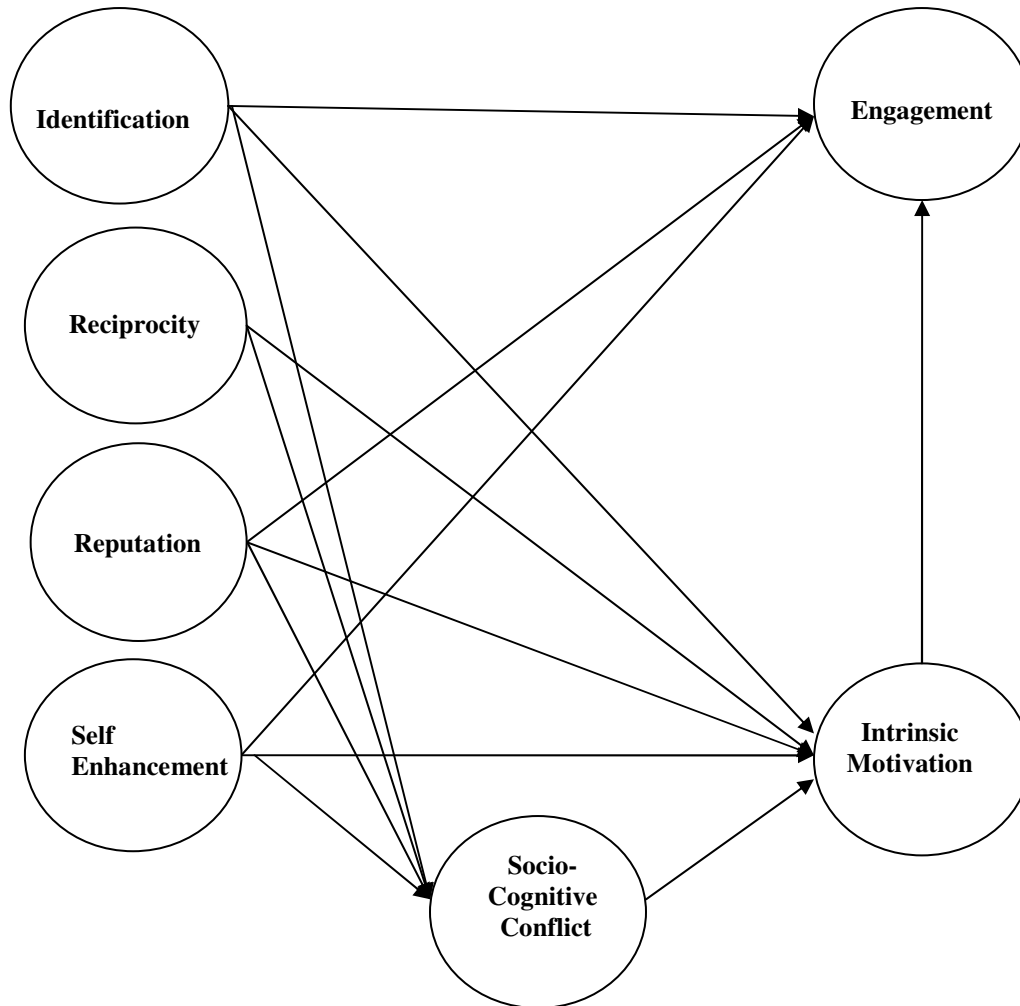
RESEARCH MODEL

Figure 1 Research Model

RESEARCH METHOD

An online survey of 120 English Wikipedians will be conducted using the instrument developed or adapted from related research (Appendix.1 The detailed illustration of the instrument will be available upon request).The contact to the potential subjects will be made randomly through their individual "talk" pages nested in Wikipedia website. Following the confirmatory factor analysis, Structural Equation Modeling technique will be applied to estimate and analyze the nomological relationships using Lisrel 8.8.

EXPECTED CONTRIBUTION

Although we examine the magnitude of the effect of cognitive-conflict in parallel with the major conventional axes of constructs in knowledge sharing literature, the central purpose of this research is testing the effectiveness of adding a constructs potentially related with emergent-motivation that would not be activated without the provision of certain scenario of particular collaboration systems.

As it is not our intention to come up with a comprehensive model of wiki-motivation, our current model may not free from the specification issues(Kline 2004) and may overestimate some of the independent variables due to the exclusion of potentially significant factors. However we believe that the framework adopted in this research efficiently recognize the relative significance of one of the unique motivational wiki-factors that contribute to activate "the exploitation of untapped productive resources"(Anthony et al. 2005)

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