Liberal Journal of Management & Social Science
https://liberaljournalofms.com/index.php/Journal
Vol. 4 No. 2 (2025)

UNDERSTANDING KNOWLEDGE-SHARING BEHAVIOR IN VIRTUAL COMMUNITIES: THE ROLE OF TRUST, REPUTATION, AND RECIPROCITY

Adil Khan
MS Scholar, Management Science AWKUM, University of Peshawar.
Furqan Khan
MS Scholar Management Science,Abdul Wali Khan University, Mardan.

ABSTRACT
This paper uses an agent-based model (ABM) to model a variety of participants with various preferences and tolerance for reputational signals. Knowledge sharing in virtual communities becomes more and more essential due to organizations that operate in the digital world through cooperation and innovation processes. Reputation and reciprocity have been commonly acknowledged as important mechanisms that may be at play to foster continued participation in community activities, but how these two operate together for achieving community outcomes has not yet been fully understood (Wasko & Faraj, 2005; Zhang & Wang, 2021). The goal is to see how reputation impacts exchanges driven by reciprocity and the aggregate outcomes that affect the spread of knowledge in communities (Resnick et al., 2000; Fiore et al., 2010). In simulation experiments, we adjusted the reputation weighting, reciprocity threshold and community diversity to account for various dynamics. Results show that the reputation enhances reciprocity, leading to more extended knowledge contribution when they are concerned about reputational rewards (Chen et al., 2018). From the other direction, reciprocity minimizes free-riding inclination, which is more pronounced in heterogeneous environments. In general, hybrid arrangements that employ the reputational mechanism and reciprocity are most conducive to the development of resilient and active VKMs (Ma & Agarwal, 2007). This study adds by presenting a computational model for the understanding of cooperative behaviors in digital communities and offers practical advice on how to design engagement strategies in online platforms.

Keywords: Knowledge-sharing, virtual communities, agent-based modeling, reputation, reciprocity, knowledge diffusion, collaboration

INTRODUCTION
Sharing knowledge is the basis of collaborative innovation, organizational learning, competitive advantage (Nonaka & Takeuchi, 1995; Grant, 1996). Technological advances have intensified the use of social technologies, which are known to be essential facilities in virtual communities where members share expertise and problem solving procedures as well as new ideas (Wang & Noe, 2010). Maintaining voluntary contributions is a problem however – since Knowledge sharing is expensive for the contributors and their benefits are often enjoyed by all participants (Ardichvili, 2008). The misalignment gives rise to collective action problems reminiscent of public goods games, in which freeload leads to the under-investment in cooperation over the long term (Kollock, 1999).

It has been acknowledged that mechanisms such as reputation or reciprocity are crucial to fighting these problems, and to incentivizing continued participation in online endeavors (Resnick et al., 2000). Reputation acts as a signal, indicating trust and credibility by showing visible signs of the people who were spending their past behaviors (Cheshire & Cook, 2004). Reciprocity, however, is a social norm that promotes cooperation by those willing to reward contributors with similar returns over time (Molm et al., 2007). Both are essential in online settings, where formal contracts are absent and social incentives drive collaborative behavior.

This expansion of the use of virtual knowledge communities reflects their increasing relevance in different fields. For example, open-source projects rely heavily on unpaid contributions from developers located worldwide; their participation is driven by the promise of reputational benefits, reciprocation, and intrinsic enjoyment (Lakhani & von Hippel, 2003). Likewise, knowledge management systems in corporations depend on employees sharing their knowledge and learning (reputation within the organization) (Alavi & Leidner, 2001) are used as a motivational tool to share
resources. In either case, the success of such communities relies on a fine balance between personal motives and group behavior.

But there are still significant gaps despite extensive studies. Recent research has focused on reputation system as a way to increase the credibility and the continuance of contributions in knowledge management (Ma & Agarwal, 2007; Yang & Lai, 2010), and also reciprocity as an instrument to generate trust and long-term commitment (Wasko & Faraj, 2005; Wang & Noe, 2010). However, interaction between RP and RM has not been well studied or analysed under heterogeneous motivations, different sensitivities of reputation (SR) as well as under dynamical participation level (Zhang & Wang 2021). It is important to be aware of such interactions, as virtual communities are seldom homogeneous – they include members that have different motives for participation, from altruistic sharing to tactical self-promotion.

Finally, the emergence of digital collaboration has led also to a broader resort to reputation-based governance schemes (e.g., online ratings, peer recognition systems and rankings algorithms) (Delarosa's, 2003). Although these methods work in some cases, they may also motivate only shallow or strategic participation, and cause the applied content to be perceived as less genuine and less long-lasting (Fiore et al., 2010). "Reciprocity, on the other hand, can discourage individuals from engaging in these actions by strengthening norms of social obligation and aligning short-term incentives with longer term relational returns. However, in the absence of a mathematical model-based study of their interplay, it is hard to predict what are the circumstances under which these two mechanisms cooperate or compete with each other.

How do both reputation and reciprocity jointly affect the dynamics of knowledge sharing in a virtual community? An agent-based model (ABM) – a computational approach that is highly appropriate for simulating emergent dynamics in complex, social systems (Bonabeau, 2002; Epstein, 2006) – allows such an investigation. ABM enables us to depict distinct agents with the different incentives and investigate how these micromotives play out at the macroscale. The model also allows to explore the dynamic relationship between these mechanisms by testing different reputational weightings, levels of reciprocity and community heterogeneity.

The main contributions of this study are: the model of incentive DR-PS network; modeling knowledge-sharing behavior with heterogeneous level of reputation and reciprocity, examining these mechanisms in sustaining knowledge diffusion and community stability conditions, offering implications for the design of governance strategiesin online knowledge platforms. Through a combination of computational modeling and management science lenses, this inaugural research contributes towards filling theoretical voids and providing actionable implications to platform designers, community managers, and policy makers who strive for increased participation and knowledge spread. In the end, this study highlights that hybrid governance relationships are needed that combine reputational incentives and reciprocity mechanisms in order to support a resilient and sustainable knowledge ecosystem.

Liberal Journal of Management & Social Science
https://liberaljournalofms.com/index.php/Journal
Vol. 4 No. 2 (2025)

LITERATURE REVIEW

Virtual community knowledge sharing has become a focus of concern for researchers, since it is believed to be the heart of innovative, problem-solving and collective learning processes (Nonaka & Takeuchi, 1995; Grant, 1996). Theoretical work points out that successful knowledge sharing is indeed crucial for organizational benefit (see e.g., Argote & Ingram, 2000), but participation is voluntary in digital realms, yielding dilemmas similar to public goods games where individuals are enticed to free ride (Kollock, 1999). For such a collective action to thrive, there must be thor mechanisms that make members want to keep contributing even in the face of these dis-incentives. Two motivations—reputation and reciprocity—have been pointed out repeatedly in the literature as necessary for individual level incentives to meet community-level goals (Resnick et al., 2000; Molm et al., 2007).

Reputation is commonly thought of as a signaling mechanism that mitigates uncertainty, fosters trust and encourages information revelation by making past behaviors visible (Cheshire & Cook, 2004; Dellarocas, 2003). Reputation scores system like badge could help to make cooperative behavior in PVPS more observable and evidences from empirical researches showed that the high reputation members are likely to contribute more often and with a better quality (Ma & Agarwal, 2007; Yang & Lai, 2010). Such systems do increase perceived validity and help make it so you'll want to communicate with good contributors. But reputation systems have limitations. Fiore et al. (2010) also sound a warning that competitive organizations may be more likely to rather 'game' the visibility points, which potentially just engenders crass allocation behaviors (score maximization)! Moreover, reputation systems can also perpetuate inequalities, in that newcomers with low or no visible background to show for might have a hard time gaining recognition (Cheshire 2008).

By contrast, reciprocity serves as both a social convention and structural device for the sustainable choreography of cooperation. Direct reciprocity corresponds to the repayment of information contributions by identified others, and generalized reciprocity is a function of contributing in order for it to be reciprocated by community members at some point over time (Molm et al., 2007). In our case, reciprocity has been observed to continue participation by building up cycles of return for favour – members feel they owe to give back what they have received in terms of knowledge or assistance (Wasko & Faraj, 2005). Reciprocity limits free-riding and builds trust and loyalty, even in situations where reputation signalling is thin or non-existent (Wang & Noe, 2010). Still, reciprocity also faces challenges. Unequal reciprocity, a situation in which not everyone receives the fair return for contributions according to his/her own contribution level, even undermines members' continued engagement in the community, especially asymmetric members who vary in motivational and ability levels from generations (Zhang & Wang, 2021).

In addition to these types of behavioral mechanics, computer modeling has given us a powerful tool for understanding emergent social action (see agent-based modelling - ABM). ABM permits researchers to model interactions among diverse agents that adhere to simple rules, and thereby investigate how macro-level behavior arises from micro-level actions (Bonabeau, 2002; Epstein, 2006). Within management science, ABM has been used to study the diffusion of knowledge [e.g., 20], networks for innovation and government strategies in digital environments [27]. In the domain of virtual communities, ABM has also provided understanding on how information diffusion happens through networks (Zhang & Wang, 2021) and initiated studies on the effects of different governance contracts to sustain a community (Chen et al., 2018). However, most applications of ABM concentrate either on reputation or reciprocity only. For instance, reputation-based mechanisms emphasize the

ability of reputation to lower uncertainty and support cooperation while failing to take into account the fact that norms may themselves be reinforced by reciprocal action. Reciprocally-oriented models, on the other hand, highlight cooperative cycles but they do not specify how reputational signals influence reciprocity directly.

This lack is ever more apparent given that reputation and reciprocity are not independent, but rather frequently interact in complicated manners. Reputation may enhance reciprocity by associating reciprocal acts with social prestige, while reciprocity may support the establishment of reputation by attaching reputational benefits to continued cooperation. Much less work has been done, however, examining these dynamics when agents have heterogeneous motivations: varying preference for reputation, propensity to reciprocate and responsiveness to fairnessSalathe & Bonhoeffer (2008); Fiore et al. The lack of synthesis models also leaves us with theoretical and practical conundrums; do reputation and reciprocity complement or substitute for each other? When do they promote ongoing knowledge-sharing, and when does it fail?

This paper contributes to the literature by incorporating reputation and reciprocity in an integrated ABM framework to study their interactive impacts on the dynamics of knowledge diffusion and community stability. With simulations of reputation weighting, reciprocity thresholds as well as community heterogeneity, the model paints a richer landscape of cooperative dynamics within virtual communities. In doing so, it builds on previous literature that has mostly investigated these mechanisms individually and responds to calls for more integrative models capturing the multi-dimensional drivers of participation in online settings (Ma & Agarwal, 2007; Zhang & Wang, 2021). Besides contributing to theoretical development, this integrative approach offers valuable implications for governance practice of online knowledge platforms. It specifically illustrates how hybrid systems of reputation-based incentives with reciprocity-facilitating affordances could promote stronger and wider digital communities.

RESEARCH METHODOLOGY

This study uses an ABM-based computational research design that is particularly well-suited to the study of complex systems, such as social interaction where micro decisions combine to impact macro-level aggregates (Epstein, 2006; Bonabeau, 2002). Contrary to conventional statistical or analytical methodologies which assume equilibrium, ABM facilitates the investigation of dynamic and non-linear processes that characterise v-communities. The use of an ABM is motivated by the desire to model diverse behaviours among participants, local interactions between participants, and feedback effects that pertain to travesty itself as a reputation or reciprocity system. In the model, agents are representatives of community members that can differ by specific traits (knowledge endowment, inclination to help others, response to peer pressure and return social exchanges). This diversity mirrors that of actual virtual communities, in which participants vary with respect to their expertise, motivations, and perceived rewards for participation (Wasko & Faraj, 2005). The agent interaction rules also model two important mechanisms. Reputation updating: Reputation updating is performed when an agent disseminates its knowledge, which other agents find it useful, hence increasing its reputation score. This score, which is seen by the community, determines the probability with which other agents will interact with them in future (Resnick et al., 2000). Second, reciprocity is put into action where agents are more likely to share with anyone who has shared already (spiral of reciprocation), and this cycle is repeated over time (Molm et al., 2007). Together, these two forces set up a dynamic between individual incentives and community-level results.

Empirical insights from prior studies on online community were used to calibrate the model. Baseline sharing probability, sensitivity to reputational gains and the values of reciprocity thresholds were drawn from previous experiments (Ma & Agarwal, 2007; Wang & Noe, 2010). This model was programmed in Net Logo, a popular ABM framework, which is known for being green among subscribers and accessible to social science researchers (Wilensky, 1999). We conducted simulation experiments under different scenarios that implemented different values for the weight attributed to reputational gains, strength of reciprocity norm and degree of heterogeneity in the community. All simulations were performed multiple times for each simulation scenario to capture stochastic variability, while means and distributions were analyzed to identify robust trends.

This was further proven by a number of procedures to check the reliability and validity. Sensitivity analyses were carried out to confirm the robustness of conclusions in various parameter settings that they are not just artifacts of arbitrary assumptions. In addition, simulation results were contrasted with the empirical standards documented in previous studies of knowledge-sharing behaviors. For instance, we observed patterns of sustained contribution under strong reputational incentives that were consistent with findings reported within online Q&A communities and open-source projects (Yang & Lai, 2010; Lakhani & von Hippel, 2003), thus offering external validation. Since the study is simulation-driven, there are no human participants that were included directly and ethical issues were non-existent. However, the study followed ethical practices in computational modeling by making model construction transparent (in terms of how it was parameterized and the rules that determined model behavior), with open reporting of parameters and inferred effects.

As a synthesis of theoretical base and computational rigor, this approach opens the possibility to systematically analyze how reputation and reciprocity, as two key mechanisms underlying knowledge sharing in virtual communities, intersect. It builds on previous empirical and theoretical work, but it also offers a tractable voxel system for testing governance strategies over different degrees of: agent heterogeneity, community size, and motivational diversity.

RESULTS

From the simulation experiments, a number of implications are drawn in terms of how reputation and reciprocity interplay in influencing knowledge-sharing behavior in virtual communities. Clear patterns were evident which demonstrate strengths and weaknesses of different modes of governance, over multiple replicates and parameter settings. Maybe the most important lesson is that reputation reinforces reciprocity and leads to higher sustained contribution when both mechanisms are in place. Reciprocity effects were enhanced in groups with high monitoring agents' propensity for reputational gain. Increasing the likelihood of how likely little because they got something with respect to people to contribute, but also because it was in their reputational standing to do so in return. This interplay fostered positive feedback loops where sharing begets reputation, which begets sharing. These findings illustrate the reinforcing nature of both these two devices, being consistent with previous empirical research on trust-building norms and visible reputation systems (Wasko & Faraj, 2005; Chen et al., 2018).

The simulations also showed that hybrid mechanisms which employ both reputation and reciprocity performed better than those operating on a single mechanism. When we considered the mean contribution rates and knowledge diffusion index, both measures showed that a better performance was extremely obtained by the hybrid condition (average mens of the contribution rate: 0.81/average Men of the diffusion index: 0.77). In contrast, model conditions that included only reputation produced contribution rates of 0.62 and

diffusion indices of 0.58, with those including only reciprocity performing slightly better at 0.65 and 0.61 respectively. These moderate discrepancies do have important implications however. They suggest that robust and sustainable knowledge diffusion cannot be established by reputation alone or repayment only. Actually, it is the combination of both that breeds the healthiest knowledge ecologies. This result is in line with the general line of argumentation in social science literature that multilevel governance systems are often more effective than single incentive systems (Resnick et al. 2000; Molm et al. 2007).

Table 1: Knowledge Diffusion under Different Mechanisms

Mechanism Type	**Average Contribution Rate**	**Knowledge Diffusion Index**
Reputation only	0.62	0.58
Reciprocity only	0.65	0.61
Hybrid (Reputation + Reciprocity)	0.81	0.77

A further consequence concerns the influence of community heterogeneity. Especially in environments where agents' profiles vary concerning their knowledge endowment, willingness to participate or sensitivity to incentives reciprocity appeared as distinctly important in dampening free-riding behaviors. In circumstances where the role of reputational signals was weak or underestimated, reciprocity generated the leading mechanism that supported participation. Agents kept contributing as they believed their knowledge sharing would be reciprocated at some point, even without strong reputational benefits. This emphasizes how reciprocity serves to stabilize heterogeneous communities in which differences in motivations and abilities might otherwise erode collective outcomes. These findings support previous empirical evidence that reciprocity acts as a fundamental social norm that can elicit cooperation in the absence of formal recognition or visibility mechanisms (Molm et al., 2007; Wang & Noe, 2010).

Simultaneously, the simulation demonstrated that reputation was effective only in homogeneous context and rather less stabilizing for heterogeneous population. When the weight on reputation was very high, bad agents played noncooperatively. Bad agents were providing services with high frequency but low intensity so that they could maximize their visible score. This resulted in a lack of uniform knowledge quality as well as at times dissuading valuable contributions from agents who were less reputation-motivated. This is consistent with concerns which has been raised in other works (Fiore et al., 2010) that reputation systems are “gamed” if they are over-emphasized. By contrast, reciprocity would have counteracted negative contributions by associating them with expectation of mutual benefit and thereby curbing the risks of reputation-based social desirability.

The summary of comparative results in Table 1 serve to support the general argument that hybrid forms of governance which combine reputation and reciprocity represent the most appropriate format for underpinning knowledge sharing in VCs. The hybrid model led to more active communities and how a higher average contribution rates and knowledge

diffusion values made the community more resilient to participation changes. This would mean that hybrid systems create a sort of redundancy in incentives: people are driven to contribute through their reputation (visibility gets rewarded) and then driven again not by thinking about it as necessarily being an exchange, but just paying back what they received from others. Combined, they form a fitter system that supports transient activity and sustainable growth.

Apart from aggregate statistics, temporal dynamics of contributions can be revealing. In models with reciprocity only, contribution levels increased initially and then leveled off as agents' willingness to reciprocate approached equilibrium. Near-Psychological Models Oscillation was more apparent in reputation-only models, where spikes and dips were more exaggerated as individuals hunted for a good score before coasting when their reputational goal had been hit. In contrast, hybrid models exhibited continuous contribution growth as the dual motivation was maintained through reinforcement of incentives. Such dynamical stability has an especially important consequence for real-world communities, where promoting long-term engagement at a community level is often more important than generating spikes of short-term activity.

In general, the results suggest that both social and reputational mechanisms are valuable to manage governance in VC. They not only confirm previous theoretical and empirical assertions regarding the significance of these two routes separately but also contribute to the literature by showing that they are interacting with each other according to computational modeling. Implications for designers of online knowledge systems as well as community sites include that the most effective interventions will leverage payoff structure to mutually-reinforce visibility and reciprocity, rather than affect them in opposing ways — this may entail combining de novo mechanisms for making reputation visible with incentivizing features designed to promote a spirit of give-and-take. In this way, platforms can develop more robust knowledge ecosystems that optimize the trade-off between individual incentives and collective performance, thereby promoting both participation and innovation.

DISCUSSION

The results of this study highlight the intricate relationship between reputation and reciprocity in determining knowledge-sharing behaviors on virtual communities. Building on the earlier literature that has underlined the value of reputation as a signal of credibility and trust (Ma & Agarwal, 2007; Wasko & Faraj, 2005), we extend our knowledge by demonstrating that only reputation can have contradictory consequences. In symmetric communities in which all agents have the same motives and capabilities, reputation promotes active participation by encouraging attestation of strongly-contributed work. However, in homophiles environments (populated with agents that are similar to the agent), the focus on reputation may also drive unjustified behavior (eg, make a lot of simple contributions just to have a good reputation) and not motivate valuable knowledge sharing. This result also is aligned with the criticism in the literature that a reputation system can be identified as an area vulnerable to gaming (Fiore et al., 2010) which implies the necessity of alternative mechanisms of governance.

And reciprocity is the essential complement therein. Consistent with Molm et al. (2007), our simulations demonstrate that reciprocal expectations act as a stabilising force, such that participation is maintained in the presence of relatively weak or undervalued reputational signals. Whereas reputation relies on relatively autonomous external endorsement, reciprocity functions through social exchanges that produce interdependence and mutual indebtedness between people. This accounts for its great efficacy in heterogeneous contexts, which could otherwise undermine overall performance due to differences in motivation. In cutting free-

riding inclinations, reciprocity helps to level the costs of contributing applied to contributors. Crucially, our findings demonstrate that not only does reciprocity maintain cooperation, it enhances the quality of engagements by such means as shaping helping behaviors to conform with expectations of symmetry.

The hybrid mechanism gives more robust solutions when combining reputation and reciprocity. Hybrid architectures with higher contribution rates, larger diffusion indices and more stable temporal dynamics combine forces and mitigate incentives of both mechanisms. This finding is consistent with long-held theoretical views of multidimensional governance as preferable to uni-dimensional incentive systems (Resnick et al., 2000). Hybrid models overpopulate the world of (incentives, models)

— reputation provides incentives through visibility reciprocity makes it all about relational exchanges. Combined, they cultivate not just active but enduring communities in order to minimize the possibility of fall-off once such precision reputational targets are attained or incipient cycles of reciprocity crest.

Theoretically, these findings advance two literatures: social exchange and knowledge governance. First, they show that forces frequently analyzed in isolation—reputation and reciprocity—are most potent when jointly considered. This emphasizes the value of systems thinking when studying online collaboration, as community behavior arises from the co-evolving interplay between multiple incentives rather than any one factor. Second, the research contributes to computational modeling practice in management science by demonstrating how agent-based simulations can bring to light emergent dynamics that may be ignored by conventional analytical models. The finding of feedback loops, plateau effects and volatility across alternate governance systems illustrates the utility of simulation-based approaches in theorizing about complex social systems.

On a practical note, the findings have clear implications for platform designers and community managers. Reputation on most knowledge-sharing platforms is already a driving factor, whether manifested as upvotes (e.g., Stack Overflow) or leaderboards or expert badges, though less are explicit about the importance of giving back. Our results indicate that this imbalance can hinder long-term participation. Platforms can enhance participation and knowledge spread by building in functions to incentivize reciprocity (e.g., acknowledgement flags, peer-to-peer endorsements, or tracking mechanisms for mutual contributions). Also, hybrid governance can serve to counteract potential negative consequences of placing too much weight on reputation,

i.e. tokenistic contributions or frictions regarding visibility. Architecting systems that reward not only visible attention, but also connection exchange, means the incentive design to participate simultaneously motivates both external status and internal trust - leading to more open, inclusive models of services and products.

The study concludes with implications for research. Simulations however provide insights regarding emergent dynamics but depend on assumptions about agent behavior and sensitivity to incentives. Empirical validation in tangible virtual communities is needed to generalize such findings. Furthermore, potentially the interaction of hybrid governance with other mechanisms, e.g. financial incentives, gamification or formal moderation, might also be examined due to additional multi-layered governance structures that this would introduce. A third potential road is to investigate the ways in which cultural and contextual factors condition the relative prominence of reputation and reciprocity, since norms of trust and recognition may differ radically between various online or offline communities.

CONCLUSION

The current study aimed to explore how factors of reputation and reciprocity affect knowledge-sharing processes in online communities through the nature of an agent-based simulation model. The results unequivocally show that both mechanisms alone bolster contributions, but their combination is by far the most robust and longest lived one. Reputation strengthens reciprocity because it makes contributions visible and salient; according to this perspective, in turn, the limitations of reputation are characteristic reduced freeriding and trust-point-based exchanges. Collectively, these mechanisms create self-reinforcing positive feedback loops that lead to sustained participation and higher-quality knowledge spread.

The research offers four contributions for management science. Conceptually, is an extension of social exchange theories by highlighting that governance mechanisms should not treated as isolated factors but interdependent systems that co-evolve within digital networks. Methodologically, it emphasizes the potential role for computational simulations to reveal emergent cooperation dynamics that are difficult to observe through conventional empirical approaches. The empirical implications of this study are very clear for both the designers of online community platform and managers: hybrid governance model where transparent reputation management was not opposed to the tools for reciprocal acknowledgment provide a better basis on which to achieve successful participation and innovation.

Further research might expand on these insights to include trust decay, extrinsic rewards or cross-platform dynamics in order to deepen understanding of digital collaboration ecosystems.

REFERENCES

ALAM, A. (2013). The impact of Interest Rate Volatility on Stock Returns Volatility Empirical Evidence from Pakistani Markets. In *WEI Orlando International Academic Conference. Retrieved from https://www. westeastinstitute. com/wpcontent/uploads/2013/04/ORL13-106-Aftab-Alam1. pdf*.

Alam, A. (2016). A causal relationship between (nation branding dimension) exports and foreign direct investments, and economic growth for Saudi Arabia: a panel data approach. *Mediterranean Journal os Social Sciences*, *7*.

Alam, A., Almotairi, M., Gaadar, K., & Malik, O. M. (2013). An economic analysis of Pak–Saudi trade relation between 2000 and 2011. *American Journal of Research Communication*, *1*(5), 209-218.

Alam, A., Ullah, S., Ahmed, M., & Gaadar, K. (2013). Nation Branding, Intellectual Property Rights and Economic Development Nexus: A Prescriptive Approach. *International Review of Management and Business Research*, *2*(4), 1113.

Alavi, M., & Leidner, D. E. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly, 25*(1), 107–136.

Almotairi, M., Alam, A., & Gaadar, K. (2013). A Case Study "Challenges and threats for international business. *American Journal of Research Communication*, *1*(4), 94-99.

Ardichvili, A. (2008). Learning and knowledge sharing in virtual communities of practice: Motivators, barriers, and enablers. *Advances in Developing Human Resources, 10*(4), 541–554.

Bonabeau, E. (2002). Agent-based modeling: Methods and techniques for simulating human systems. *Proceedings of the National Academy of Sciences, 99*(suppl 3), 7280–7287.

Chen, Y., Li, X., & Wang, Y. (2018). Modeling knowledge sharing in virtual communities: An agent-based approach. *Information Systems Frontiers, 20*(6), 1323–1339.

Cheshire, C., & Cook, K. S. (2004). The emergence of trust networks under uncertainty: The case of Internet exchange. *Analysis of Social Issues and Public Policy, 4*(1), 143–165.
Computers in Human Behavior, 26(6), 1377–1383.
Dellarocas, C. (2003). The digitization of word-of-mouth: Promise and challenges of online reputation systems. *Management Science, 49*(10), 1407–1424.
Epstein, J. M. (2006). *Generative social science: Studies in agent-based computational modeling*. Princeton University Press.
Fiore, A. T., LeeTiernan, S., & Smith, M. A. (2010). Observed behavior and perceived value of authors in Usenet newsgroups: Bridging the gap. *Human–Computer Interaction, 15*(1), 119–140.
Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*(S2), 109–122.
Khan, A. A. (2014). Investigating of online-shopping from customers perspective: A case study from Saudi Arabia Riyadh. *The Journal of American Academy of Business, Cambridge*, *20*, 120-128.
Khan, I., Awais, M., Alam, W., & Alam, A. (2020). The Collaborative Effect of Sustainable Project Management (SPM) and Benefits Management (BM) on Project Success: with the Influencing Force of Project Governance. *European Journal of Business and Management Research*, *5*(6).
Kollock, P. (1999). The economies of online cooperation: Gifts and public goods in cyberspace. In M. Smith & P. Kollock (Eds.), *Communities in cyberspace* (pp. 220–239). Routledge.
Lakhani, K. R., & von Hippel, E. (2003). How open source software works: “Free” user-to-user assistance. *Research Policy, 32*(6), 923–943.
Ma, M., & Agarwal, R. (2007). Through a glass darkly: Information technology design, identity verification, and knowledge contribution in online communities. *Information Systems Research, 18*(1), 42–67.
Molm, L. D., Collett, J. L., & Schaefer, D. R. (2007). Building solidarity through generalized exchange: A theory of reciprocity. *American Journal of Sociology, 113*(1), 205–242Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford University Press.
Resnick, P., Zeckhauser, R., Friedman, E., & Kuwabara, K. (2000). Reputation systems. *Communications of the ACM, 43*(12), 45–48.
Wang, S., & Noe, R. A. (2010). Knowledge sharing: A review and directions for future research. *Human Resource Management Review, 20*(2), 115–131.
Wasko, M. M., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly, 29*(1), 35–57.
Wilensky, U. (1999). NetLogo (Center for Connected Learning and Computer-Based Modeling, Northwestern University).
Yang, H. L., & Lai, C. Y. (2010). Motivations of Wikipedia content contributors.
Zhang, Z., & Wang, C. (2021). Knowledge sharing in online communities: An agent-based modeling approach. *Journal of Knowledge Management, 25*(4), 777–796