Knowledge Management in Communities of Practice: Research Review and Prospects Post-print

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Abstract

[Purpose/Significance] In the knowledge economy era, effective corporate knowledge management is crucial. Communities of practice, as an important knowledge management tool, have received widespread attention. Conducting a review and outlook of research on community-of-practice-based knowledge management can provide references and a basis for knowledge management research and practice.

[Method/Process] Using CiteSpace software, this study conducts keyword co-occurrence analysis of community of practice research literature and performs content analysis on core research literature to reveal the current research status and future development trends of community-of-practice-based knowledge management.

[Results/Conclusion] Communities of practice originate from the demands of the knowledge economy era for corporate knowledge management, situated learning, and practice-based learning. Utilizing communities of practice to promote corporate knowledge management can enhance innovation capability, responsiveness, core competitiveness, and work efficiency. To fully leverage the efficacy of community-of-practice-based knowledge management, factors at three levels—organization, community, and individual—must be considered simultaneously.

Full Text

Preamble

Knowledge Management Based on Communities of Practice: Literature Review and Prospect

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Abstract

[**Purpose/Significance**] In the knowledge economy era, effective management of organizational knowledge is crucial. Communities of practice have gained widespread attention as an important knowledge management tool. Reviewing and prospecting research on knowledge management based on communities of practice can provide references and foundations for knowledge management research and practice. [**Method/Process**] This study employs CiteSpace software to conduct co-occurrence analysis of keywords in communities of practice research literature and performs content analysis of core research documents to reveal the current status and future development trends of knowledge management based on communities of practice. [**Result/Conclusion**] Communities of practice originated from the demands of enterprise knowledge management, situated learning, and practice-based learning in the knowledge economy era. Utilizing communities of practice to promote enterprise knowledge management can enhance organizational innovation capacity, responsiveness, core competitiveness, and work efficiency. To fully leverage the effectiveness of knowledge management in communities of practice, it is essential to simultaneously consider factors at three levels: organization, community, and individual.

Keywords: communities of practice; knowledge management; organizational learning; situated learning; knowledge mapping

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In the knowledge economy era, knowledge has become a critical factor for productivity growth and core competitiveness enhancement in enterprises and organizations. How to achieve knowledge sharing and management across departments, organizations, and even nations has emerged as an important research question. Communities of practice represent a vital approach to knowledge management and organizational learning. Over the past two to three decades, communities of practice have become a significant research topic in fields such as knowledge management, professional learning, and teacher education, with numerous researchers both domestically and internationally publishing extensive academic monographs and research papers. Revealing the international research status and future development trends of knowledge management based on communities of practice holds substantial implications for research on online communities of practice and knowledge management in China.

1 Bibliometric Analysis

This study selected the Web of Science Core Collection as the source for literature retrieval, which provides fundamental data on important academic literature regarding communities of practice research. Using title search with the

query: ("communit* of practice*") across all years, 801 relevant documents were retrieved. These records were selected for data analysis, including their citation lists, which constitute the knowledge base for the 801 communities of practice research documents. CiteSpace can help clarify development trends and directions in communities of practice research through co-citation and cited-reference analysis, revealing the intellectual structure of its knowledge base. Over the past two decades, both the annual number of publications and citations on communities of practice research have shown a linear upward trend, with annual publications exceeding 60 since 2010 and citations surpassing 1,400 in 2015. This indicates that academic attention to communities of practice research has remained high and increased year by year, with particularly rapid growth in the last five to six years.

Co-occurrence analysis of keywords in communities of practice research using CiteSpace can uncover popular research themes and general trends over the years, as keywords provide a concise summary of a document's research content. The keyword co-occurrence analysis of the 801 retrieved documents is presented in [Figure 1: see original paper]. Each circle represents a keyword node, and each square represents a subject term node. Node size indicates co-occurrence frequency, while connection colors represent the year of first co-occurrence. Nodes employ a ring structure, with colors indicating years (refer to the timeline at the top of the figure) and ring thickness showing annual frequency. Nodes surrounded by purple indicate high betweenness centrality, suggesting their critical role in the development of communities of practice research. The top 10 nodes with highest betweenness centrality are shown in .

[Figure 1: see original paper] illustrates that recent popular research themes include online communities, virtual communities, knowledge sharing, joint enterprises, knowledge management, mutual engagement, best practices, professional development, knowledge translation, practice enlightenment, and legitimate peripheral participation. In terms of keyword frequency, the most frequent keywords are communities of practice, knowledge, management, innovation, knowledge management, and network, indicating these themes have received considerable attention. Keywords with highest betweenness centrality include knowledge management, performance, innovation, network, organization, knowledge, model, and enterprise, suggesting they play more critical roles in knowledge transfer within communities of practice and represent core themes in this research field. Based on keyword and subject term co-occurrence analysis, communities of practice research primarily revolves around enterprise knowledge management, knowledge, management, innovation, network, and professional development, with enterprise knowledge management and performance being the most central themes. Therefore, this paper systematically reviews knowledge management research based on communities of practice and prospects future development directions.

2 Value and Significance of Communities of Practice for Knowledge Management

The concept of communities of practice was first proposed by E. Wenger et al., who defined them as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" [1]. The concept can be traced back to Wenger's 1991 work on situated learning, originally referring to people's participation in an activity system where they share understandings about what they are doing and what that means for their lives and communities [2]. This definition provided a sociological foundation for later commercial organizational arrangements. Scholars employed the communities of practice concept to reflect how knowledge is created and flows among groups of people. Although communities of practice were not initially designed specifically for knowledge management, they have profoundly influenced the knowledge management research field. Wenger's own understanding of communities of practice has evolved over time, from initially viewing them primarily as spontaneous forms of social learning to later considering them organizational tools for more effective management of knowledge workers. Enterprises can design and cultivate these organizational structures to enhance their competitiveness, thereby initiating research and practice on communities of practice as a specific organizational arrangement to strengthen knowledge management capabilities [1]. In 2004, E. Wenger et al. further emphasized the important position of communities of practice in knowledge management, arguing that they form the foundation of all knowledge strategies and proposing a cyclical model of knowledge management based on communities of practice. E. Bolisani and E. Scarso reviewed the position of communities of practice in knowledge management research, characterizing three main elements: (1) domain—the area of knowledge that brings the community together; (2) community—the people related to the domain, their relationships, and boundaries; and (3) practice—the body of knowledge, methods, tools, stories, and documents that members share and develop together [3].

M. T. Chu et al. emphasized the need to connect organizational culture, business strategy, and knowledge management, and to measure the performance of knowledge management systems for best practices. Communities of practice are accepted as best practices that differ from organizational structures when implementing knowledge management. Using communities of practice as a method to link business strategy and knowledge management design can make them a mainstream approach for group learning and innovation within enterprises. As enterprises increase in scale, scope, and complexity, regular participation of community members in sharing and learning based on common interests can improve organizational performance. They designed a communities of practice model for knowledge management to address issues of organizational culture, business strategy, and performance measurement. Communities of practice hold business strategic value at different levels: operator, project/department, and

organization/company. For operators, communities of practice help them access best or latest ideas, acquire knowledge faster, share more effectively, and know who is doing what. For projects or work groups, they enable access to new methods and theories, faster problem-solving, improved learning efficiency for new employees, and minimized repetition and reinvention. At the organizational and corporate levels, communities of practice enhance enterprise innovation, application, capability, and efficiency. They also designed an evaluation system for communities of practice from perspectives including leadership, motivation mechanisms, member interaction, and complementary assets [4].

Numerous studies have examined the effectiveness of communities of practice as knowledge management and sharing tools. They create a favorable environment for knowledge creation and sharing in business companies and institutions, improving the efficiency of existing practices. For example, at Siemens, engineers from different units exchange technical knowledge on building improved automation systems; at Oracle, software developers discuss and share data processing techniques to build better-performing databases. This cross-organizational boundary knowledge exchange has an intrinsic connection with the shared motivation for learning together. Moreover, communities of practice provide an environment that facilitates easier knowledge reuse, faster response to customer needs, and reduced learning cycles for new members. G. Probst and S. Borzillo found that using communities of practice to exchange tacit knowledge can reduce new employee learning time [5-6].

Knowledge sharing through communities of practice helps solve problems. K. S. Retna and P. T. Ng found that mutual engagement among community members facilitates consultation, solution provision, and new knowledge acquisition. Consequently, individuals facing problems can examine information from different sources and respond appropriately to clients [7]. M. Corso et al. analyzed the case of Chrysler, which faced shutdown due to competition with other major automakers under the influence of traditional manufacturing culture. The company established technical clubs with informal meetings among engineers, designers, production workers, and managers, believing that communities of practice strategies could promote learning processes and knowledge flow within communities and disseminate ideas among members while reducing substantial costs from repeated errors [8].

The growth of knowledge-intensive industries and global service demands has made knowledge and intellectual capital a company's most important assets. Refined and systematic management of these assets is essential for survival in 21st-century competition. Generally, companies employ two different knowledge management strategies: one uses information dissemination technology to codify knowledge and store it in databases and archives accessible and reusable by internal personnel; the other involves tacit knowledge utilization, which requires shared meaning systems and mental models to understand knowledge—a personalization process emphasizing the importance of social networks and cultivating shared values and norms for managing tacit knowledge. The former fo-

cuses more on knowledge storage, while the latter emphasizes how knowledge is shared and exchanged through social networks [9-10]. D. Canavan et al. argued that corporate strategies mainly include two types: product portfolio strategy and artistic capability strategy. The former delivers standard products within budget and time constraints, while the latter develops strong and recognizable artistic styles [11].

Building on discussions about the relationship between corporate strategy and knowledge management strategy, J. Bashouri and G. W. Duncan proposed a framework for guiding corporate and knowledge management strategies through communities of practice. Participants in communities of practice consider information communication technology, lessons learned, best practices, storytelling, dialogue, and conversation as appropriate tools for knowledge sharing within communities. These tool combinations reflect an appropriate balance between personalization and codification, adapting to enterprises' product organization or artistic capability strategies. Information technology enables internal groups to collaborate across disciplines and functions, while documenting lessons learned and best practices can expand community knowledge. Social knowledge sharing tools such as storytelling, dialogue, and conversation provide facilitation and support for information technology applications in product portfolio strategy companies, while also helping build social capital, promote collaboration, and improve communication among community members [12]. A. Macpherson explored the position of communities of practice in translating corporate strategy into practice, empirically demonstrating that communities of practice are a reliable management tool for strategy implementation. The analysis revealed how communities of practice are used in business to gain traction for achieving strategic goals, which is primarily influenced by three key factors: leadership and governance structures, meaningful ways for members to participate and interact with others, and their identity and sense of belonging [13].

In summary, communities of practice play an important role in promoting enterprise knowledge management and sharing. They facilitate knowledge creation, circulation, management, and application at three levels: employee, community, and corporate enterprise. For participating employees, communities of practice promote knowledge sharing and creation, enabling faster access to knowledge and ideas, reducing adaptation time to new work, and documenting personal lessons learned and best practices for dissemination through the community. Through member participation, communities gradually develop their specific knowledge domains, promote member learning processes and social identity formation, and achieve both codification and personalization strategies, helping build enterprise knowledge bases based on communities of practice and facilitating knowledge creation, sharing, and flow. For business companies, using communities of practice for knowledge management can enhance product and service innovation capacity, improve responsiveness to customer needs and external competition, elevate employee quality and core competitiveness, increase work efficiency, reduce costs from repeated errors, and help build corporate knowledge bases while promoting the realization of corporate and knowledge

management strategies.

3 Factors Influencing the Effectiveness of Knowledge Management in Communities of Practice

Although communities of practice are increasingly important in enterprise knowledge management and many companies show strong interest, their effectiveness remains questioned, and they often fail to achieve predetermined knowledge management goals, with frequent failure cases. Therefore, it is necessary to summarize lessons from previous research and practice to provide references for enterprises to develop appropriate community-based knowledge management programs. Overall, successfully building communities of practice for knowledge management requires both organizational support in management structure and resources, as well as motivating member participation and encouraging their involvement in community knowledge construction, exchange, and sharing. Numerous studies have examined how to design and build communities of practice and their effectiveness, success, and failure factors.

G. Probst proposed ten success criteria for communities of practice: adhering to strategic goals, dividing goals into sub-themes, forming governance committees composed of sponsors and community leaders, having sponsors and leaders who control best practices, regularly providing external expertise to communities, promoting access to networks within and between organizations, leaders assuming driver and facilitator roles, overcoming hierarchy-related pressures, providing measurable performance to sponsors, and demonstrating outcomes to members. Major factors that may cause failure include lack of a core group, low-level one-to-one interactions among members, rigid capabilities, lack of community recognition, and inability to concretely represent practices [6].

3.1 Organizational Level Factors

M. Corso et al. proposed a model of communities of practice to depict the evolutionary path of business practice communities in knowledge management processes and the dynamic roles of organizational commitment and personnel participation. They found that high levels of commitment from both organizations and members are related to the effectiveness of communities of practice in supporting learning and knowledge management. Creating a community of practice requires individual participation from enterprises or departments, and each community has different evolutionary paths and speeds. When community viability manifests in the combination of organizational commitment and member participation, supporting community development means promoting and maintaining commitment from both sides. Communities of practice evolve from one quadrant to another to win commitment from the other party, using appropriate levers: communities use promotion levers to obtain new resources to enhance effectiveness, while corporate organizations can use incentive levers to increase member input and participation [8]. M. Thompson noted that the

cultivation and maintenance of communities of practice are influenced by multiple factors, including both low-level and high-level parameters for structural intervention, and that communities of practice also have epistemological parameters. The authors theoretically explained the interrelationship between organizational structure and members' epistemological activities in communities of practice, arguing that any organizational intervention in communities of practice should first attempt to determine the structural nature of the proposed intervention to assess its likelihood of success [14].

A. Aljuwaiber reviewed literature on knowledge sharing through communities of practice in business organizations, focusing on potential obstacles, solutions, and influencing factors. He noted that in today's knowledge economy, many business institutions prioritize communities of practice for implementing knowledge management activities. Three organizational factors—senior management, structure, and culture—significantly influence the intentional establishment of communities of practice in business organizations [15]. First, senior management plays a crucial role in the success or failure of community activities. However, senior managers often struggle to evaluate the benefits of providing resources to communities of practice because they are basically informally defined. Communities of practice are typically approved by senior management through governance committees but are self-managed, self-controlled, and self-goaled by community members. Current literature remains uncertain about how senior management can support communities of practice without controlling them [16-17]. H. Annabi et al. argued that both senior management and employees need to recognize the importance of communities of practice to organizational enterprises [18]. Second, traditional hierarchical organizational structures can no longer meet knowledge economy requirements. Recent research indicates that contemporary companies need less centralized structures, more open work environments, and encouragement of informal meetings and exchanges between different departments. K. S. Retna and P. T. Ng explored key factors for successful community development, finding that free communication, good interaction, and collaboration at all organizational levels help promote community activities and significantly impact employee performance and corporate achievement [7]. M. Corso et al. argued that for communities of practice to be recognized by companies, they need to prove themselves as positive entities with systematic structures [8]. H. Annabi et al. contended that to enhance community power, enterprises must match their communities of practice with appropriate organizational entities and resources and orient them toward specific business goals. Defining clear roles for communities of practice within corporate structure helps achieve business objectives [18]. S. Yamklin and B. Igel suggested that communities of practice should be integrated with formal organizational structures so that staff consider community participation part of their job responsibilities and can participate without hesitation [19].

Although knowledge management advocates promoting internal knowledge sharing, culture can become a major obstacle to effective knowledge sharing [20]. L. Dube et al. also found that organizational and cultural contexts define char-

acteristics that support or hinder community success during initiation stages. Therefore, using communities of practice to promote knowledge management and sharing requires appropriate organizational cultural contexts [21]. K. Siau et al. studied how national cultures affect knowledge sharing types, such as knowledge dissemination and acquisition, finding that power distance and individualism/collectivism are major national cultural factors influencing knowledge sharing in communities of practice. The impact of organizational culture on knowledge management and sharing in communities of practice has received increasing attention from academia and business environments [22].

3.2 Individual Level Factors

Another level influencing knowledge sharing and management in communities of practice involves member contribution, input, and participation. Members' knowledge sharing behaviors are influenced by their attitudes and intentions toward knowledge sharing. S. Jeon and Y. Kim et al. integrated theories including the theory of planned behavior and motivation theory to analyze factors affecting members' knowledge sharing behaviors, finding that although both extrinsic and intrinsic motivational factors positively influence attitudes toward knowledge sharing, intrinsic motivational factors have greater influence [23].

A. Ardichvili et al. conducted qualitative analysis on employees' motivations and barriers to participating in knowledge sharing within communities of practice, finding that knowledge flows more easily when employees view knowledge as a public good for the entire organization. However, even when they prioritize organizational interests, they may still be unwilling to contribute knowledge due to fears of criticism or misleading other members. Eliminating these barriers requires developing various types of trust, including knowledge-based and institution-based trust [24]. K. Zboralski argued that prerequisites for knowledge sharing in communities of practice remain under-researched. Her empirical research revealed the role of community member motivation in promoting participation, the importance of community leadership, and the impact of management support. Community leadership plays a central role in interaction quality within communities, particularly the leader's ability to motivate interaction and mastery of community topics strongly influences interaction quality. Interaction quality is relatively less affected by management support, but interaction frequency primarily depends on active management support. Knowledge workers participating in communities of practice require more intrinsic goal motivation, but they need mutual encouragement to communicate, such as an active and supportive community leader who is an expert in the community's domain, and appropriate management support like an incentive environment and organizational culture that promotes knowledge sharing [25].

M. Hemmasi et al. found that communities of practice can improve employee work performance by sharing perspectives, knowledge, and best practices. Loyal membership and active participation in community activities enhance the ability of communities of practice to improve participants' work performance. Factors

including members' sense of identity and emotional connection with peers in the community, the impact of community participation on their own work, and their cognitive evaluation of overall effectiveness can predict their satisfaction with the community of practice experience [26].

In summary, although communities of practice emphasize self-management and self-development, organizational-level parameters or factors in corporate enterprises significantly influence community construction, maintenance, and development. Companies that establish clear strategic goals, change rigid hierarchical structures, build open work environments, and foster free cultural contexts can improve knowledge management effectiveness and interaction quality and frequency in communities of practice. Meanwhile, the establishment, maintenance, and sustainable development of communities of practice depend on corporate investment in resources, personnel, and knowledge, as well as management support. Community leadership, epistemology, business goals, interaction quality, and frequency also affect knowledge management efficiency and effectiveness. Member input and participation are prerequisites for community existence and development. Existing research shows that members' participation in knowledge sharing is primarily influenced by intrinsic motivation, trust in knowledge and peers, loyalty to the enterprise, proactive participation, perceived effectiveness of communities of practice in improving individual or corporate performance, and attitudes toward community identity and emotion. For enterprises, they must not only provide resource investment and institutional-cultural environment guarantees for communities of practice but also motivate employees' intentions to participate in community activities. Therefore, organizational factors directly influence community creation, maintenance, and sustainable development while also indirectly affecting communities through individual member factors. Their mutual influence relationships are illustrated in [Figure 2: see original paper], where organizational and individual member factors marked with "+" have been empirically confirmed to positively influence the efficiency and quality of knowledge management based on communities of practice. Arrows represent mutual influence relationships, showing that organizational institutional factors promote knowledge management effectiveness in communities of practice and positive influencing factors for member participation. Additionally, communities of practice are also influenced by individual member factors.

4 Construction and Operation Methods of Communities of Practice

Over the past decades, many international companies and enterprises have designed, constructed, and applied communities of practice based on E. Wenger et al.'s theoretical models. For instance, the World Bank uses communities of practice to promote knowledge production, collection, dissemination, and application, effectively facilitating corporate strategy implementation. Companies like IBM and HP use communities of practice to promote employee communication and dialogue, achieving the dissemination and inheritance of knowl-

edge, skills, and experience, and effectively developing employees' professional expertise. These successful cases of community construction and operation in renowned companies provide highly valuable insights for research and practice. Building on J. Lave and E. Wenger's theoretical foundations and referencing practical application cases, O. Serrat et al. proposed a 5D model for community of practice design and sustainable maintenance, comprising five stages: Discovering, Dreaming, Designing, Documenting, and Disseminating, as shown in [Figure 3: see original paper]. The Discovering stage involves exploring relationships with the community through personal narratives. The Dreaming stage integrates personal narratives into community stories centered on common goals and mutual engagement. The Designing stage develops business processes for the community. The Documenting stage involves documenting participation, learning, and knowledge. The Disseminating stage involves disseminating and reconnecting community learning. To achieve this complete knowledge management process, an appropriate community of practice system platform must be built to support members in better sharing knowledge, perspectives, and goals, and to improve the speed and efficiency of knowledge exchange and reflection to facilitate practical problem-solving. The architecture of such an exchange platform should include components such as content, tools, tags, and social network applications [27]. This model details the process of using communities of practice for professional exchange and knowledge management, describes the system platform and technical architecture needed to achieve community goals, and provides clear guidance for enterprises planning and implementing communities of practice, as well as for organizational managers and community members participating in community activities and managing practical knowledge. This holds important reference value for today's theory and practice of building and sustaining communities of practice to promote organizational knowledge creation, exchange, and management.

5 Future Research Prospects

Although knowledge management research based on communities of practice has accumulated substantial results over years of development, both communities of practice and knowledge management have made considerable advances in their respective practical domains in recent years, particularly in technological applications where revolutionary changes have occurred. Initially, communities of practice were built on face-to-face interactions among members in real life, and much classical theory on communities of practice was established based on research and practice of such physical environment-based real communication. Since the 21st century, online technologies, especially the widespread application of social networking sites, have shifted community activities to online cyberspace, which not only expands the environment of communities of practice but also changes knowledge exchange patterns. Traditional knowledge management theories based on communities of practice can no longer adapt to the technological environment development of communities of practice. Therefore, future research should emphasize the construction, verification, and develop-

ment of knowledge management theories for communities of practice based on Web 2.0.

In terms of technology, communities of practice have continuously applied various new technologies, including mobile technology, Internet of Things, ubiquitous computing, and virtual reality technology. These technologies make the connection between physical and virtual environments closer, increasingly blurring the boundaries between them, and integrating real workplaces with virtual online exchange environments into a whole. This greatly improves knowledge exchange efficiency, shortens the cycle of applying knowledge to work practice and converting practical experience into community knowledge, and enables faster resolution of various problems in work practice. Particularly, the application of modern big data technology, intelligent technology, and adaptive technology will enhance the intelligence and personalization levels of communities of practice, enabling them to construct and identify user models based on behavioral data from member participation, provide personalized interfaces, information, and knowledge services, and facilitate self-organization and self-evolution of community knowledge bases. This will change the roles and positions of traditional community leaders, organizers, and opinion leaders. Therefore, how to effectively integrate and apply various emerging technologies to improve the efficiency, effectiveness, and efficacy of knowledge management and exchange in communities of practice will be an important future research direction.

Regarding research methods, current research on communities of practice is primarily qualitative, mainly employing case studies and speculative analysis, with relatively few quantitative studies. Research content focuses primarily on community design, maintenance, and knowledge management significance. Systematic research on knowledge management and sharing mechanisms in communities of practice, members' psychological and behavioral mechanisms for participation, and corporate management and governance mechanisms for communities of practice remains relatively lacking. Therefore, more empirical research is needed to deeply understand the dynamic relationships among communities of practice, corporate organizations, employees, and knowledge management.

6 Conclusion

This paper reviews research literature on knowledge management based on communities of practice, finding that utilizing communities of practice to promote enterprise knowledge management significantly impacts improving enterprise innovation capacity, responsiveness to external environments, core competitiveness, and work efficiency. For employees, communities of practice can promote knowledge sharing and creation, enabling faster access to knowledge, ideas, lessons learned, and best practices, improving individual work efficiency and career development. Many large, well-known companies and enterprises have invested substantial resources in creating and developing communities of practice. However, the informal and ambiguous nature of communities of practice definitions increases the difficulty of creation and operation and limits their effectiveness.

This study also identifies that factors influencing community success include organizational factors, individual member factors, and community-specific factors. Based on this analysis, we propose an influence model for knowledge management effectiveness in communities of practice, introduce a community design and maintenance model, and prospect future research directions, hoping to provide decision-making guidance and practical foundations for domestic companies using communities of practice for knowledge management, and references for knowledge management research based on communities of practice.

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Note: Figure translations are in progress. See original paper for figures.