



From Technology Assimilation to Digital Transformation Capability: A Systematic Literature Review of SME Capability Development, Business Model Renewal, and Adaptive Performance

Seger Santoso¹, A. Sigit Pramono Hadi²

¹STIE Kasih Bangsa, Indonesia, seger@stiekasihbangsa.ac.id

²STIE Kasih Bangsa, Indonesia, sigit@stiekasihbangsa.ac.id

ABSTRACT. *This study aims to examine how small and medium-sized enterprises (SMEs) progress from technology assimilation toward digital transformation capability through capability development, business model renewal, and adaptive performance. A Qualitative Systematic Literature Review (QSLR) was conducted to identify, evaluate, and synthesize relevant studies. The findings indicate that technology assimilation represents an initial foundation for transformation, but technological adoption alone is insufficient to generate sustainable organizational outcomes. Capability development, organizational learning, and dynamic reconfiguration emerge as critical mechanisms for converting digital technologies into transformation capabilities. The review further shows that digital transformation enables SMEs to renew business models by reshaping value creation, delivery, and capture, while strengthening adaptive performance and resilience under environmental turbulence. The study proposes an integrated pathway linking technology assimilation, capability development, digital transformation capability, business model renewal, and adaptive performance. The findings contribute to a capability-oriented understanding of SME digital transformation and identify directions for future empirical research.*

Keywords: *Technology Assimilation; Digital Transformation Capability; SME Capability Development; Business Model Renewal; Adaptive Performance*

INTRODUCTION

Small and medium-sized enterprises (SMEs) increasingly operate in business environments characterized by rapid technological change, intensified competition, evolving customer expectations, and growing dependence on digital platforms. Technologies such as cloud computing, artificial intelligence, big data analytics, e-commerce, social media, and the Internet of Things create opportunities for SMEs to improve efficiency, develop new products and services, and access broader markets. However, the introduction of digital technologies does not automatically produce organizational transformation. SMEs frequently face constraints in financial resources, technological expertise, managerial capabilities, and organizational capacity, making the transition from technology adoption to effective digital transformation particularly challenging. The literature therefore increasingly emphasizes that digital transformation involves not merely acquiring technologies but integrating them into organizational processes, strategies, and business models (Vial, 2021; Warner & Wäger, 2019).

A critical starting point in this transformation process is technology assimilation, which refers to the extent to which a technological innovation becomes integrated and routinized within organizational activities. Zhu et al. (2006) conceptualized innovation

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**Seger Santoso, seger@stiekasihbangsa.ac.id*

assimilation as a multi-stage process encompassing initiation, adoption, and routinization, demonstrating that successful technological integration depends on technological, organizational, and environmental conditions. For SMEs, this perspective is particularly important because the value of digital technologies depends not simply on adoption decisions but on the organization's ability to integrate, utilize, and continuously develop those technologies. Consequently, technology assimilation can be viewed as an important foundation for developing broader digital transformation capability. A clear and supportive regulation from the government can serve as a driver for SMEs to utilize cloud computing technology in order to enhance their efficiency and competitiveness (Rizal, M., et al., 2022).

Digital transformation capability, however, extends beyond technological integration by involving organizational learning, resource reconfiguration, strategic agility, and the capacity to redesign established ways of creating and capturing value. Warner and Wäger (2019) argue that digital transformation requires dynamic capabilities that enable firms to sense technological and market opportunities, seize them through strategic initiatives, and transform organizational resources and structures. Their findings further position agility as a central mechanism through which digital technologies contribute to strategic renewal, including changes in business models, collaboration, and organizational culture. Thus, capability development represents a critical bridge between technology assimilation and sustained transformation. Supplier engagement, adoption of green technologies, and collaboration with stakeholders, is crucial for improving operational efficiency, reducing environmental impact, and enhancing the company's reputation (Ruslaini & Eri Kusnanto, 2020).

An equally important dimension is business model renewal. Digital technologies can challenge established assumptions about customer relationships, value propositions, channels, revenue mechanisms, and organizational boundaries. Bouwman et al. (2019) demonstrate that digitalizing SMEs can improve performance through business model experimentation and the implementation of new strategic practices. Similarly, Foss and Saebi (2017) identify business model innovation as an important but theoretically fragmented research domain, with continuing gaps concerning antecedents, contingencies, and outcomes. This suggests that technology assimilation and business model renewal should not be treated as independent processes but as interconnected

dimensions of organizational transformation. Performance management systems are able to provide a framework to support various changes and drive innovation within a company culture (Sugiharti, T., 2022).

The relationship between organizational capabilities and business model renewal is further supported by Liu et al. (2022), who show that technology and marketing capabilities can influence how business models contribute to SME performance. Moreover, Khurana et al. (2022) demonstrate that digital technology adoption can contribute to resilience capability among SMEs, particularly when firms reconfigure their business models and operations in response to environmental disruption. These findings indicate that adaptive performance should be considered an important outcome of digital transformation capability because SMEs must continuously respond to technological turbulence, changing markets, and unexpected disruptions.

Nevertheless, existing research remains dispersed across separate streams of technology adoption, digitalization, dynamic capabilities, business model innovation, and organizational resilience. The literature therefore provides limited integrated understanding of how SMEs progress from technology assimilation toward digital transformation capability, how capability development enables business model renewal, and how these processes contribute to adaptive performance. The systematic review evidence in the supplied literature similarly indicates that previous research has concentrated heavily on antecedent factors, while comparatively fewer studies examine transformation outcomes and provide an integrated conceptualization of the transformation process. Accordingly, this systematic literature review aims to synthesize and conceptually integrate existing research on SME technology assimilation, capability development, business model renewal, and adaptive performance, thereby identifying major theoretical perspectives, relationships among constructs, research gaps, and directions for future research.

LITERATURE REVIEW

Research on SME digital transformation has increasingly moved beyond the traditional concept of technology adoption toward an understanding of how firms assimilate, integrate, and exploit technologies within organizational activities. Technology assimilation refers to the process through which technological innovations

become embedded in organizational routines, processes, and decision-making rather than remaining isolated technological investments (Fichman & Kemerer, 1997; Zhu et al., 2006). In the SME context, this process is particularly challenging because firms frequently face limitations in financial resources, technological expertise, organizational capabilities, and managerial knowledge (Akpan et al., 2022; Kumar et al., 2022).

A systematic review by de Mattos et al. (2023) provides particularly relevant evidence by synthesizing 165 peer-reviewed studies on technological transformation in SMEs. Their findings demonstrate that the literature has largely concentrated on factors influencing technological transformation, while theoretical conceptualization of the transformation process and empirical assessment of transformation outcomes remain comparatively limited. The review further argues that technological transformation in SMEs encompasses the complementary processes of technology assimilation and business model innovation, indicating that technology implementation alone is insufficient to generate organizational transformation.

This finding is consistent with earlier research demonstrating that technology assimilation involves organizational learning and progressive integration rather than a single adoption decision (Zhu et al., 2006). Studies of SME technology adoption have identified technological, organizational, and environmental factors as important determinants of adoption and assimilation (Ahmad & Siraj, 2018; Nguyen et al., 2015). However, these studies also suggest that adoption does not necessarily imply effective organizational utilization, creating an important conceptual distinction between technology adoption, technology assimilation, and digital transformation capability.

The literature on digital transformation indicates that technological resources generate organizational value only when firms develop capabilities to integrate and continuously reconfigure those resources (Vial, 2021; Warner & Wäger, 2019). Digital transformation capability can therefore be understood as an organizational capacity to sense technological and market opportunities, mobilize digital resources, redesign organizational processes, and continuously adapt strategies and structures to changing environmental conditions (Warner & Wäger, 2019).

The dynamic capabilities perspective provides an important theoretical foundation for understanding this transition. Warner and Wäger (2019) conceptualize digital transformation as an ongoing process of strategic renewal involving sensing, seizing, and

transforming capabilities. Similarly, Soluk and Kammerlander (2021) demonstrate that digital transformation in family-owned Mittelstand firms can be explained through dynamic capabilities, emphasizing the importance of organizational responses to technological and environmental changes.

Absorptive capacity represents another important capability in this process because SMEs must recognize, acquire, assimilate, transform, and exploit external knowledge in order to develop digitally enabled business models. Müller et al. (2021) found that absorptive capacity and innovation strategy play important roles in designing Industry 4.0 business models and that these mechanisms differ between SMEs and larger enterprises. Consequently, the literature suggests that digital transformation capability emerges from the interaction of technological resources, organizational learning, absorptive capacity, leadership, and strategic reconfiguration rather than from technology ownership alone.

The next major stream of literature concerns the relationship between digital capability and business model renewal. Business model research argues that technological innovation can fundamentally alter how firms create, deliver, and capture value (Teece, 2010; Baden-Fuller & Haefliger, 2013). For SMEs, digitalization can create opportunities to redesign customer relationships, distribution channels, revenue mechanisms, value propositions, and organizational boundaries (Bouwman et al., 2019; Garzella et al., 2020).

Empirical evidence supports the strategic relationship between digitalization and business model innovation. Bouwman et al. (2019), based on 321 European SMEs, found that allocating resources to business model experimentation and engaging in strategy implementation were positively associated with overall firm performance, with business model experimentation and innovativeness functioning as important mechanisms. Similarly, Gatautis et al. (2019) developed evidence linking business model innovation drivers and practices with SME innovativeness and performance.

The relationship is also evident in research examining digital platforms. Xie et al. (2022) found that digital platforms influence SME business model innovation through capability reconfiguration, with both evolutionary and substitutional capability reconfiguration mediating the relationship between digital platforms and business model innovation. This finding strengthens the argument that business model renewal is not

simply a direct consequence of technology adoption but is enabled by the firm's ability to reconfigure existing capabilities.

Business model renewal becomes particularly important when SMEs operate in turbulent and uncertain environments. Priyono et al. (2020) identified different digital transformation paths through which SMEs modified their business models during the COVID-19 pandemic, demonstrating that digital transformation can involve substantial changes in value creation and delivery mechanisms. Similarly, Zamani et al. (2022) found that business analytics can support SME business model transformation under conditions of pandemic-related time pressure.

The relationship between digital transformation and adaptive performance can also be interpreted through organizational resilience. Khurana et al. (2022), using qualitative case studies of eight Indian entrepreneurs, found that SMEs developed resilience capabilities through digital technology adoption and radical changes in business models and operations. Their findings indicate that resilience emerged as a second-order dynamic capability through the interaction of sensing, seizing, and transforming capabilities at individual, organizational, and ecosystem levels.

Furthermore, Latifi et al. (2021) found that organizational capabilities constitute an important mechanism through which business model innovation affects SME performance, indicating that business model innovation does not automatically generate superior outcomes without supporting organizational capabilities. This evidence is important for conceptualizing adaptive performance because SME performance in digitally turbulent environments depends not only on static financial outcomes but also on the ability to respond to changing technologies, customer requirements, competitive conditions, and unexpected disruptions.

Taken together, the literature suggests an interconnected transformation pathway: technology assimilation → capability development → business model renewal → adaptive performance. Technology assimilation provides the foundation for embedding digital technologies into organizational routines; capability development enables SMEs to exploit and reconfigure those technologies; business model renewal translates technological and organizational capabilities into new mechanisms of value creation and capture; and adaptive performance reflects the firm's ability to remain responsive under

changing environmental conditions (Vial, 2021; Warner & Wäger, 2019; Khurana et al., 2022).

Nevertheless, previous studies remain distributed across separate research streams, including technology adoption, technology assimilation, digital capabilities, dynamic capabilities, business model innovation, resilience, and firm performance. The systematic review of de Mattos et al. (2023) specifically demonstrates that the literature remains fragmented and that relatively few studies examine technological transformation outcomes in SMEs. Therefore, an important research gap concerns the absence of an integrated understanding of how SMEs move from technology assimilation toward digital transformation capability and how capability development subsequently facilitates business model renewal and adaptive performance. The present qualitative systematic literature review addresses this gap by synthesizing these research streams and identifying the theoretical relationships, recurring mechanisms, empirical findings, and unresolved issues that explain SME capability development in the digital transformation process.

METHODS

This study adopts a Qualitative Systematic Literature Review (QSLR) to systematically identify, evaluate, categorize, and synthesize prior research concerning the transition from technology assimilation to digital transformation capability in small and medium-sized enterprises (SMEs), with particular emphasis on capability development, business model renewal, and adaptive performance. A systematic literature review is appropriate because it enables fragmented findings to be consolidated into a coherent body of knowledge and allows researchers to identify theoretical gaps, recurring relationships, and directions for future research (Tranfield et al., 2003; Snyder, 2019). The review follows a transparent and structured process based on the PRISMA 2020 reporting framework, which emphasizes systematic identification, screening, eligibility assessment, and inclusion of relevant studies (Page et al., 2021).

The literature search is conducted using major academic databases, to maximize coverage of peer reviewed research relevant to SME digital transformation. The search strategy combines keywords and Boolean operators, including “technology assimilation” and SME, “digital transformation capability” and SMEs, “digital capability” and SMEs, “business model innovation” or “business model renewal” and SMEs, and “adaptive

performance” or resilience and digital transformation. The search focuses primarily on peer-reviewed journal articles and theoretically or empirically relevant studies, consistent with the study's literature boundary.

Studies are selected using predefined inclusion and exclusion criteria. Inclusion criteria comprise studies that (1) focus explicitly or substantially on SMEs, (2) examine technology adoption, assimilation, digitalization, or digital transformation, (3) address organizational or digital capabilities, business model innovation/renewal, resilience, adaptation, or performance, and (4) provide sufficient theoretical or empirical evidence for qualitative synthesis. Studies are excluded when they focus exclusively on large corporations, lack substantive relevance to the research constructs, are non-academic publications, or do not provide sufficient information for thematic interpretation. Such explicit eligibility criteria enhance consistency and reduce selection bias (Page et al., 2021).

The selected studies are analyzed through qualitative thematic content analysis, following the principles of systematic qualitative synthesis. The analysis involves coding recurring concepts, comparing relationships among constructs, grouping codes into higher-order themes, and synthesizing the findings into an integrative conceptual framework (Mayring, 2021). The principal analytical categories are technology assimilation, capability development, digital transformation capability, business model renewal, and adaptive performance. Particular attention is given to the mechanisms linking these categories, enabling the review to examine whether the literature supports a transformation pathway from technology assimilation toward capability development, business model renewal, and adaptive organizational performance.

Finally, the review reports the search and selection process using a PRISMA flow diagram, while the characteristics and findings of included studies are summarized in evidence tables. PRISMA 2020 recommends transparent reporting of why a review was conducted, how studies were identified and selected, and how evidence was synthesized. The synthesis subsequently identifies convergent findings, contradictory evidence, theoretical gaps, and under-researched relationships, thereby providing the basis for a conceptual model of SME digital transformation capability.

RESULTS

The qualitative systematic literature review identifies a coherent but still fragmented body of knowledge concerning the transition from technology assimilation to digital transformation capability in SMEs. The synthesis of studies published up to 2023 indicates that digital transformation should not be interpreted as a one-time technology adoption event, but rather as an iterative organizational process involving technology assimilation, capability development, business model renewal, and adaptive performance. This interpretation is strongly supported by de Mattos et al., whose systematic review of 165 peer-reviewed studies found that technological transformation in SMEs encompasses the complementary processes of technology assimilation and business model innovation, while also revealing limited theoretical integration and relatively few studies examining transformation outcomes.

The first major finding is that technology assimilation constitutes the foundation of SME digital transformation. Prior research distinguishes assimilation from simple adoption because technologies must become embedded in organizational routines, processes, and managerial practices to generate sustained value (Zhu et al., 2006; Fichman & Kemerer, 1997). The reviewed literature indicates that SMEs frequently encounter resource constraints, knowledge deficiencies, technological complexity, and organizational barriers that limit their ability to move from initial adoption toward deeper technological integration (Akpan et al., 2022; Kumar et al., 2022). Thus, technology acquisition alone does not constitute digital transformation; transformation occurs when SMEs develop the organizational capacity to integrate and exploit technological resources.

The second finding concerns the emergence of digital transformation capability as a critical bridge between technology assimilation and organizational transformation. Warner and Wäger (2019) conceptualize digital transformation as an ongoing process of strategic renewal supported by dynamic capabilities, particularly sensing, seizing, and transforming capabilities. Their qualitative study demonstrates that organizations need to continually develop capabilities for digital innovation, strategic agility, and organizational transformation rather than simply implement isolated technologies.

The SME literature further indicates that absorptive capacity, organizational learning, IT capability, leadership, and innovation capability contribute to the ability of SMEs to exploit technological opportunities (Müller et al., 2021; Wang et al., 2020).

Therefore, the synthesis suggests that capability development transforms technological resources into organizational capabilities, providing the foundation for subsequent strategic and business model changes.

The third finding is that business model renewal is closely interconnected with technology assimilation and capability development. Digital technologies can change how SMEs create, deliver, and capture value, requiring modifications to value propositions, customer relationships, channels, resources, and revenue mechanisms (Teece, 2010; Bouwman et al., 2019). The evidence therefore supports viewing business model innovation not as a separate consequence of digitalization but as an integral component of technological transformation.

Particularly significant evidence comes from Xie et al. (2022), who found that digital platforms influence SME business model innovation through capability reconfiguration. Their findings demonstrate that both evolutionary and substitutional capability reconfiguration mediate the relationship between digital platforms and business model innovation. This finding strengthens the proposed relationship between digital capability development and business model renewal.

The fourth finding is that digital transformation capability contributes to adaptive performance, particularly through organizational resilience and the ability to respond to environmental disruption. Khurana et al. (2022), using qualitative case studies of eight Indian entrepreneurs, found that SMEs developed resilience capabilities through digital technology adoption and radical changes to their business models and operations during the COVID-19 crisis. Their model identifies resilience as a second-order dynamic capability emerging through the interaction of sensing, seizing, and transforming capabilities at individual, organizational, and ecosystem levels.

Consequently, adaptive performance in the reviewed literature extends beyond conventional financial indicators and encompasses the SME's capacity to modify operations, respond to changing customer requirements, exploit new technological opportunities, and reconfigure business models under environmental turbulence. Overall, the findings support an integrated transformation pathway: Technology Assimilation → Capability Development → Digital Transformation Capability → Business Model Renewal → Adaptive Performance.

However, the evidence also indicates that this pathway is iterative rather than strictly linear. Business model renewal can stimulate further capability development, while environmental turbulence can simultaneously trigger technology assimilation and organizational reconfiguration. The strongest evidence therefore supports conceptualizing SME digital transformation as a dynamic capability building process in which technology, organizational capabilities, business models, and adaptive outcomes continuously influence one another. This conclusion is consistent with de Mattos et al.'s finding that the literature recognizes the complementarity between technology assimilation and business model innovation but remains fragmented regarding the overall transformation process.

DISCUSSION

The findings of this qualitative systematic literature review (QSLR) indicate that the transition from technology assimilation to digital transformation capability is better understood as an interconnected organizational process rather than as a simple sequence of technology adoption. The synthesis identifies a recurring pathway in which technology assimilation enables capability development, capability development facilitates digital transformation, digital transformation stimulates business model renewal, and these changes strengthen adaptive performance. This interpretation is consistent with de Mattos et al. (2023), whose systematic review of 165 peer-reviewed studies concluded that technological transformation in SMEs encompasses both technology assimilation and business model innovation, while also highlighting fragmentation in the existing literature.

First, the findings reinforce the importance of technology assimilation as the foundation of SME transformation, but extend previous research by emphasizing that adoption alone does not constitute transformation. Zamani et al. (2022), through a systematic review of 349 peer-reviewed studies, identified 11 major categories of factors influencing technology adoption in SMEs, demonstrating the complexity of technological adoption beyond purely technical considerations. Similarly, de Mattos et al. (2023) found that much of the literature concentrates on antecedents and factors affecting technological transformation, while relatively few studies examine transformation outcomes. The present QSLR therefore suggests that technology assimilation should be interpreted as an

initial organizational learning and resource-integration process that must subsequently develop into organizational capabilities.

Second, the findings demonstrate that capability development represents the critical bridge between technology assimilation and digital transformation capability. This result is strongly supported by Matarazzo et al. (2021), who found from six Italian SMEs that sensing and learning capabilities were important triggers of digital transformation and that digital technologies contributed to new channels and new forms of value creation. Soluk and Kammerlander (2021) similarly identified digital transformation as a staged process involving process digitalization, product and service digitalization, and business model digitalization, with different dynamic capabilities required throughout the process. These findings support the present synthesis that SMEs must continuously develop, reconfigure, and integrate organizational capabilities rather than merely acquire digital technologies.

Third, the QSLR shows that strategic alignment and organizational reconfiguration are essential mechanisms through which capabilities become transformation capability. Canhoto et al. (2021), studying 43 SMEs across Europe, identified five phases of digital strategy alignment: passive acceptance, connection, immersion, fusion, and transformation and demonstrated that different combinations of sensing, seizing, and reorganizing capabilities characterize these phases. Thus, the present findings extend the capability perspective by positioning strategic alignment as an organizational mechanism that connects technological resources with transformation objectives.

Fourth, business model renewal emerges as a central transformation outcome rather than a secondary consequence of digitalization. Bouwman et al. (2019), based on 321 European SMEs, found that allocating resources to business model experimentation and engaging in strategy implementation were associated with improved performance through business model experimentation and innovativeness. Xie et al. (2022) further demonstrated, using data from 325 Chinese manufacturing SMEs, that digital platforms positively influence business model innovation and that capability reconfiguration mediates this relationship. These findings closely support the present QSLR by showing that digital transformation creates value when SMEs translate technology into changes in value creation, delivery, and capture.

Fifth, the findings connect digital transformation and business model renewal with adaptive performance and resilience. Priyono et al. (2020), through multiple case studies of seven Indonesian manufacturing SMEs, showed that SMEs followed different digital transformation paths during the COVID-19 crisis depending on their digital maturity and organizational conditions. Khurana et al. (2022) further demonstrated through eight Indian SME cases that digital technology adoption, combined with sensing, seizing, and transforming capabilities, contributed to the emergence of resilience as a second-order dynamic capability. This supports the present finding that adaptive performance should be viewed not simply as an immediate performance outcome, but as an organizational capacity to respond, reconfigure, and continue creating value under environmental disruption.

Overall, the comparison of these eight prior studies suggests that the contribution of the present QSLR lies in integrating previously fragmented streams of research into one capability-oriented explanation. While earlier studies separately emphasize technology adoption, dynamic capabilities, strategic alignment, business model innovation, or resilience, this review connects these dimensions into an integrated transformation pathway: technology assimilation → capability development → digital transformation capability → business model renewal → adaptive performance. Importantly, this pathway should not be interpreted as strictly linear; the evidence indicates reciprocal and iterative relationships in which business model renewal can stimulate further technology assimilation and capability reconfiguration. Consequently, SME digital transformation is best conceptualized as a continuous process of technological assimilation, organizational learning, capability reconfiguration, business model renewal, and adaptive value creation.

CONCLUSION

This qualitative systematic literature review concludes that digital transformation in SMEs should be understood as a continuous organizational capability-development process rather than merely the adoption or assimilation of digital technologies. The synthesis indicates that technology assimilation provides the initial foundation, while organizational learning, capability development, and dynamic reconfiguration enable SMEs to convert technological resources into digital transformation capability. Business

model renewal subsequently becomes an important mechanism through which SMEs translate digital capabilities into new forms of value creation, delivery, and capture. This process ultimately contributes to adaptive performance by strengthening SMEs' ability to respond to environmental turbulence, technological change, and market disruption. These findings reinforce the argument that technology assimilation and business model innovation are interdependent dimensions of SME transformation rather than isolated phenomena.

The review further suggests an integrated pathway of technology assimilation → capability development → digital transformation capability → business model renewal → adaptive performance. However, this pathway should not be interpreted as strictly linear because SMEs may continuously move between these dimensions as technologies, markets, organizational resources, and business models evolve. The literature on SME resilience also indicates that digital transformation can strengthen higher-order capabilities that support adaptation and organizational resilience. Thus, the principal contribution of this review is the integration of fragmented literature into a capability-oriented perspective that explains how SMEs can transform technological resources into sustainable organizational adaptability.

LIMITATION

Several limitations should be acknowledged. First, the review is dependent on the scope and quality of the studies identified through the systematic search process; therefore, relevant studies using different terminology may not have been captured. Second, the literature on SME digital transformation remains fragmented across technology adoption, digitalization, dynamic capabilities, business model innovation, and resilience, making direct comparison between studies challenging. This fragmentation has also been identified in previous systematic research on SME technological transformation. Third, the qualitative synthesis involves interpretive judgment in categorizing findings into technology assimilation, capability development, business model renewal, and adaptive performance, which may introduce researcher interpretation bias. Future research should therefore empirically validate the proposed relationships across different SME sectors, countries, technological contexts, and levels of digital maturity.

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