Exploring the nexus of institutional factors and regulatory focus in driving platform-based servitization and circular economy adoption

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ABSTRACT

Although digitalization has garnered considerable attention in service management literature, integrating a platform-based approach to boost circular economy (CE) practices remains relatively underexplored. Grounded in the institutional theory and regulatory focus theory, this paper investigates how institutional-level factors and regulatory focus (RF) foster platform-based servitization (PBS), driving CE practices in business firms. Using data drawn from a paper-based survey of 390 managers from 143 service firms in China, this study used the partial least square structural equation modeling (PLS-SEM) technique to analyze the data. The findings reveal that metaverse, network collaboration, and environmental disclosure significantly and positively impact fostering PBS. PBS, in turn, acts as a mediator, potentially influencing the implementation of CE practices in business firms. Further, promotion-RF positively moderates the relationship between fostering PBS in business firms and implementing CE practices, whereas preventive-RF negatively moderates this relationship. These findings provide actionable recommendations for managers and industry practitioners to formulate business strategies that fully harness the potential of promoting PBS and CE beyond purely technological benefits.

1. Introduction

Service is described as an intangible act provided by one entity to another without involving the transfer of ownership of any physical object [1, 2]. With the rapid technological progression, the service sector is constantly growing, contributing to the largest share of the global economy [1, 3]. Although this constant growth has benefited service industries, it has simultaneously made them more complex and challenging to survive [2]. For instance, with the advent of Industry 4.0, manufacturing firms are now actively exploring opportunities to embrace innovative service-focused business models such as *servitization* that efficiently address the demands of contemporary consumers, stakeholders, and society [4, 5]. *Servitization*, mainly focuses on shifting from selling products to offering bundles of customer-focused combinations of products, services, support, and knowledge to deliver enhanced customer value [2]. On the other hand, with mounting climate change issues, environmental concerns, and resource constraints, service industries are forced to implement circular economy (CE) initiatives as a means to promote sustainability [6].

Although the complex and interdisciplinary nature of services has become the central focus of recent service management literature [2, 3, 7], integrating the CE notion in service design and provision has been limited [8, 9]. However, accelerating the transition to CE practices is essential for businesses to be sustainable and competitive in resource-constrained modern markets [10]. Since the CE concept hinges on the prudent utilization of raw materials and the seamless flow of services within closed-loop systems [11], the efficacious adoption and practices of CE systems mandate business firms to formulate innovative business models, procedures, and protocols that prioritize enhanced value creation while simultaneously reducing resource consumption [11, 12]. Servitization provides an opportunity for business firms to minimize waste and maximize the lifespan of their products, including repairing and recycling, which is aligned with the principles of CE [6, 13].

With rapid technological advancements, adopting a digital platform-based approach has shown to be effective in facilitating business firms to foster servitization by connecting network actors and their resources in a more intelligent and value-adding manner, creating new opportunities for advanced service offerings [14]. By diversifying service portfolios and establishing robust networks with customers, suppliers, and other stakeholders, platform-based servitization (PBS) offers business firms an opportunity to create enhanced value [15]. However, on the other hand, as digital platforms involve multiple stakeholders, including inter- and intra-firm relationships [16], the increased complexity of the platform may introduce uncertainties in service delivery processes [14, 15].

Against this backdrop, some scholars argue that metaverse may facilitate fostering PBS in business firms by providing an opportunity to overcome the typical challenge of complexity in handling interrelationships within and across multiple stakeholders in a business ecosystem [17]. The term *"metaverse"* is derived from combining *"meta"* (meaning beyond) and *"universe"* [18]. The metaverse is a concept that offers an immersive experience through augmented reality technology, creating a digital replica of the real world and securely integrating virtual and physical environments into the economic system [19]. Some other scholars (e.g., [20, 21], taking a different viewpoint, argue that embracing the metaverse will not guarantee a smooth transition to PBS. Instead, the full potential of utilizing sophisticated technologies such as metaverse to promote PBS within business firms can be effectively realized only if such firms foster network collaborations among stakeholders [22].

Some opposite views argue that with the recent escalation of climate change issues and sustainability initiatives, environmental disclosure may be the primary reason business firms focus on fostering PBS [23, 24]. For instance, a country like China, renowned for its robust manufacturing sector, now places significant emphasis on the servitization and digital transformation of manufacturing and services firms as a means to implement CE practices [25].

Consequently, China has implemented a series of policies to foster a conducive development environment for this transformation. For instance, the 20th Party Congress report underscored the importance of developing service-oriented manufacturing, by providing manufacturing firms with intelligent, green, low-carbon, and efficient service systems [26].

As the above discourse indicates, PBS and CE represent two prominent trends jointly shaping the modern business landscape [6, 15]. However, contemporary service management literature is still in its infancy concerning integrating these two research streams, revealing significant gaps that need to be addressed [15]. First, while concepts such as metaverse, network collaboration, and environmental disclosure have gained prominence in the contemporary business world, existing service management literature has not comprehensively explored their interplay as determinants in fostering PBS as a transition path towards CE within the same study [3, 15].

Second, with the mounting pressure to be environmentally sustainable while fostering digital transformations, today, business firms are forced to foster PBS to implement CE practices successfully [14, 25]. As the regulatory focus theory (RFT) [27] explains, the role of regulatory focus can be a motivational predisposition that could moderate such an attempt [28]. However, this has not yet been fully explored in the service management literature [2]. Investigating the moderating role of regulatory focus in the relationship between fostering PBS for CE practices is essential, as it could provide novel insights into how different approaches to regulatory focus in business firms influence the appraisal of anticipated digital servitization outcomes.

Inspired by the gaps identified in prior literature, we seek to address the following research questions in this paper.

1. What are the critical determinants of fostering PBS in business firms, and how does PBS influence CE practices?
2. Does regulatory focus moderate the relationship between fostering PBS in business firms and implementing CE practices?

By addressing these two research questions, this paper makes three novel theoretical contributions to the service management literature, specifically focusing on fostering PBS and ensuring CE practices. First, by integrating the institutional theory (IT) [29] and the RFT [27], this study provides a more comprehensive theoretical conceptualization of how PBS can be fostered in business firms and how it paves the way for implementing CE practices. By doing so, this study adds to the service management literature by empirically validating the applicability of IT and RFT. It is a unique contribution, as the RFT is a theory seldom explored in service management literature [2]. Second, this study is one of the pioneering efforts in service management literature that empirically tests the intricate interrelationships among recent concepts such as metaverse, network collaboration, and environmental disclosure in the context of PBS and CE. Third, this paper contributes to service management literature by exploring how different approaches to regulatory focus in business firms influence CE adoption through fostering PBS. This is particularly significant as the RFT is rarely examined in service management literature, thus expanding our understanding in this domain [15].

Besides, the findings of this paper also provide vital practical implications for practitioners and managers. On the one hand, the PBS approach has been proven to be an efficient business strategy for conventional business firms to realize the full potential of digital servitization. During this transition, metaverse, network collaboration, and environmental disclosure are identified as crucial for fostering PBS in business firms. On the other hand, they need to understand that different approaches to regulatory focus moderate the relationship between fostering PBS for CE practices in business firms differently.

The rest of the paper is structured as follows. The following section focuses on the theoretical framework and the formulation of hypotheses. Next, the research methodology is presented, followed by a detailed discussion of research findings. The conclusion, implications, and future research directions are presented at the end.

2. Theoretical Background

2.1. The Circular Economy (CE) and Platform-based Servitization (PBS)

The CE concept focuses on optimizing resource efficiency and environmental performance by employing closed, slow, and narrow resource loops, thereby fostering sustainable business innovations [12]. In other words, the CE approach integrates the concept of *"end-of-life"* that goes beyond conventional 3R practices (e.g., reduce, reuse, and recycle) to maximize resource efficiency [1, 8]. In this way, transitioning to CE practices necessitates a comprehensive system change that entails crafting and implementing entirely new business models [6, 12]. This includes redefining how value is created, captured, and delivered to customers by reassessing their value and constructing efficient value chains using cost-effective and competitive platforms [1, 10].

The CE is attained via two principal mechanisms: closed-loop and open-loop circularity. Closed-loop circularity confines resource circulation to a designated supply chain or industry, emphasizing internal recycling, refurbishing, and take-back mechanisms. Conversely, open-loop circularity broadens resource utilization throughout supply chains and industries, facilitating enhanced flexibility and promoting resource exchanges beyond conventional limits [30, 31]. However, implementing a CE approach poses challenges, and if poorly executed, it can lead to significant costs [1, 12]. Prior literature has shown several hurdles to CE implementation exist at various levels in business firms, including the value chain, socio-technical, employee, and institutional levels [1, 8]. For instance, on the one hand, a lack of operational frameworks and understanding of the CE model and processes delays the uptake of CE adoption and practices [6, 12]. On the other hand, it is considered challenging to identify specific institutional-level factors that effectively enhance circular business models, optimizing resource efficiency and value generation [8, 32].

In parallel with the development of CE practices, the scholarly discourse on servitization is increasingly shifting its attention to utilizing the potential of digital platforms in business contexts [3, 33]. With rapid technological progression, digitalization has emerged as a critical enabler for designing new servitization business models such as PBS, which facilitates the introduction of flexible service offerings that change over time to continually meet customers' fluctuating needs sustainably [15]. The PBS, in the context of digitalization, involves continuously optimizing a value proposition in real-time, leveraging accurate data availability and sophisticated data analysis techniques [34]. PBS can further facilitate open-loop circularity by linking many stakeholders on a common platform. These platforms dismantle conventional barriers and promote inter-industry interaction by enabling resource-sharing connections, leasing frameworks, and cross-industry material reuse [35]. Additionally, it enables CE practices by leveraging digital technology to shift focus from mere manufacturing and selling products to understanding customer preferences and transforming relationships based on insights gained from data analysis [14, 34]. For example, PBS facilitates the redistribution of underutilized resources across various industries, aligning with CE principles and enhancing resource efficiency on a larger scale. This approach emphasizes PBS's transformative and scalability capabilities in promoting open-loop circularity, especially within intricate industrial ecosystems.

Despite the widespread realization of the urgent need for sustainable business practices and the widespread adoption of digital platforms that enhance transparency in process efficiency and resource utilization [6], the extent to which PBS stimulates CE practices remains poorly understood in extant service management literature [3, 15]. To date, there has been a lack of systematic exploration into fostering PBS within business firms, leveraging recent technological developments to implement CE practices based on rigorous theoretical underpinning [15]. Therefore, we decided to integrate IT with RFT in this paper to address this void in prior literature by exploring the critical determinants of fostering PBS in business firms and how PBS influences CE practices.

2.2. Institutional Theory (IT)

The IT conceptualizes institutions as resilient social structures that provide high stability and meaning to social life. Scott [36] theoretical framework conceptualization of IT posits that institutions can be categorized into three distinct yet interconnected pillars: regulative, normative, and cultural-cognitive. These pillars operate independently and synergistically and contribute to the resilience of the social structure [36, 37]. These pillars manifest through their respective indicators, encompassing rules, norms, and beliefs that influence social behavior [36, 37].

As IT emphasizes, institutions are governed by rules arising from deliberate agency-based decisions and unconscious processes [38]. Generally, institutions evolve from the regulative pillar, which primarily involves conscious decisions, to the culturally cognitive pillar, where decisions are predominantly unconsciously adopted [37, 38]. Different schools of thought prevail in prior literature when studying institutions emphasizing various aspects [39, 40]. For instance, in economic studies, where actors are typically viewed as agents actively shaping institutions, the focus often lies on the regulative pillar. Conversely, early sociology scholars emphasized the role of normative systems in imposing constraints on social behavior.

The IT has recently gained prominence in explaining initiating sustainability activities at both the firm and individual levels [41]. Prior literature suggests that the institutional environment plays a dual role, both supporting and inhibiting the adoption and transition to a CE [42]. For example, the regulatory system within an institutional environment can help a CE by penalizing wasteful practices and incentivizing circularity. However, it can also hinder CE efforts by, for instance, restricting the reusing and recycling of some resources. Consequently, to gain a more nuanced understanding of the role of regulatory focus of a business firm facilitating the adoption of PBS and EC practices, it is decided to merge IT with the RFT in this paper.

2.3. Regulatory Focus Theory (RFT)

Regulatory focus theory (RFT), introduced by Higgins [27], is a motivational theory that extends the basic hedonic principle, asserting that people are driven to seek pleasure and avoid distress. In this theory, Higgins [27] proposed two distinct hedonic self-regulatory frameworks that govern individuals' pursuit of pleasure and aversion to pain: one characterized by a promotion focus (pro-RFT) and the other by a prevention focus (pre-RFT). Individuals oriented towards promotion are driven by success and attainment. They perceive goals as aspirations and desires driven by the pursuit of pleasure to attain these goals [43]. Individuals oriented towards prevention prioritize commitments and safety.

Empirical evidence has firmly established the conceptually orthogonal nature of these two dimensions of regulatory focus [44, 45]. Therefore, individuals and business firms can simultaneously experience high levels in both focuses, exclusively in one focus or neither focus [43]. Additionally, regulatory focus operates independently across three levels of motivational abstraction: system, strategic, and tactical [46].

The RFT has gained increasing popularity in management and organizational psychology literature [43, 46], proving invaluable in helping scholars comprehend motivated behavior within work settings. Although adopting digital platforms and PBS has necessitated a strategic system change in business firms [34, 47], the RFT has been rarely employed by service management scholars yet [43].

3. The Conceptual Model and Research Hypotheses

Building on the above discourse, this paper used the combined strengths of the IT and RFT to develop the integrated conceptual framework shown in Figure 1.

Figure 1. Conceptual model

3.1. Metaverse as a Critical Determinant of PBS

Metaverse is often defined as a virtual reality space where users can interact with a computer-mediated environment and other users [18]. However, the metaverse transcends being merely an advanced user interface. It represents a convergence of virtual reality, augmented reality, artificial intelligence, and the Internet, with blockchain and Web 3.0 forming its backbone [20, 48]. In essence, the metaverse offers an immersive digital platform where business firms can interact in real time, not just with their employees or customers, but with all their stakeholders in the business environment that responds and evolves [17, 19].

This transformative potential of the metaverse adds a new dimension of servitization, promoting real-time interactive communication and response virtually connecting all stakeholders involved in the business ecosystem, thus improving effectiveness in service delivery [19]. Additionally, business firms can utilize the metaverse to provide virtual product demonstrations, training, and support, enhancing organizational responsiveness and customer loyalty [22]. From the IT viewpoint, we can argue that the metaverse fosters PBS in business firms, resulting in more dynamic, customer-centric, and interactive business ecosystems. Consequently, relying on the prior literature and IT, we hypothesize as follows:

H_1: *A business firm's metaverse can positively influence fostering PBS.*

3.2. Environmental Disclosure as a Critical Determinant of PBS

Environmental disclosure refers to the process of symmetrically conveying and exchanging information about a business firm's sustainability concerns with critical stakeholders and alliances of strategic relevance [40, 49]. According to the IT, business firms voluntarily utilize environmental disclosure as an approach to building sustainability in their practices and maintaining credibility within their respective markets [40, 50].

With the rapid technological progression, adopting a digital platform-based approach for fostering servitization has shown effective for business firms in ensuring sustainability by reducing resource consumption and promoting concepts like dematerialization [25, 51]. By adopting environmental disclosure policies and practices, business firms will aspire to promote socially and ecologically responsible services with the help of all stakeholders [51, 52]. Thus, we have enough evidence to hypothesize that introducing an environmental disclosure policy encourages sustainability practices within and across business ecosystems to foster PBS and ease the integration of introducing more sustainable services. We thus formulated the following hypothesis:

H_2: *A business firm's environmental disclosure can positively influence fostering PBS.*

3.3. Network Collaboration as a Critical Determinant of PBS

Network collaboration involves the collective and synchronized efforts of different stakeholders at all levels of a business firm to exchange information, accomplish shared objectives, and capitalize on each other's capabilities [53, 54]. Network collaboration can strengthen information processing and coordination capabilities across business firms, fostering enhanced interactivity [53] and thus can be considered a vital determinant of servitization.

The intertwining complexity of servitization and digital platforms necessitates a deep understanding of evolving changes that influence relationships with stakeholders and network dynamics [55, 56]. Consequently, recent literature recognizes an imperative to relook at PBS through a networking perspective, focusing on micro-level interactions among stakeholders in the business ecosystem [53, 55]. In this context, theoretically grounded in IT, we propose that integrating collaborative network practices into service-oriented business models can significantly enhance the development of PBS in business firms. Therefore, it can be hypothesized that:

H_3: *A business firm's network collaboration can positively influence fostering PBS.*

3.4. Mediating Effect of PBS

A business model delineates the detailed framework or structure governing how a business firm generates, disseminates, and acquires value [57]. In the era of Industry 4.0, the advent of technology exerts significant strain on the survival of business firms, compelling them to embrace CE practices and business models to be competitive [8, 58]. Consequently, extending product longevity through revitalizing business strategies and operational frameworks, including adopting progressive, service-centric business models such as PBS, has become a crucial priority for many business firms [6, 8].

PBS has been regarded as a seamless and unidirectional progression, facilitating conventional business firms to gradually transition from one extremity of the product-service continuum to the opposite end [58]. Recent scholarly works on digital servitization and CE (e.g., [15, 58] emphasized that business firms integrating PBS in their operations address legal requirements and stakeholder expectations of sustainability by pursuing CE objectives. Based on the preceding arguments, applying the IT theory perspective to digital servitization and CE practices implies that metaverse, network collaborations, and environmental disclosure policies and practices of business firms facilitate the implementation of CE practices within the business firms through fostering PBS [19, 51, 55]. Thus, proposing PBS as a mediating variable on the relationships between a business firm's metaverse, network collaborations, environmental disclosure, and implementation of CE practices makes sense. These works lay the foundation for us to posit that business firms that adopt PBS strategies augment their CE practices. Accordingly, we postulated that:

H_4: *A business firm that fosters PBS can positively impact the implementation of CE practices.*

3.5. Moderating Effect of Regulatory Focus

Prior literature emphasizes that the regulatory focus of a business firm influences its structure, employee behavior, and how it maintains relationships with other stakeholders [28, 46]. The two distinct approaches to regulatory focus, pro-RF and pre-RF, represent distinct motivational states [43].

Business firms that adopt the pro-RF approach motivate employees to satisfy their needs for career advancement, growth, and accomplishment [43]. When the promotion focus is high, employees are susceptible to positive outcomes and are willing to undertake even risky initiatives to achieve the specified targets [28]. Such initiatives help meet their desires for recognition and reputation in the workplace while enabling business firms to be competitive [28]. In contrast, business firms adopting the pre-RF approach favor employees who are more sensitive to potential adverse outcomes and thus fear making mistakes and errors [43]. In prevention-focused business firms, employees are more likely to maintain the current status quo by fulfilling their in-role obligations, duties, and responsibilities and thus avoid unexpected experiences [59].

In the context of this study, as the implementation of PBS and CE practices is inherently risky, business firms focused on prevention are inclined to hamper the advancement of these practices. Their emphasis on safety and risk aversion often slows progress in PBS and CE initiatives [60]. In contrast, promotion-focused business firms enthusiastically promote adopting PBS and CE practices [61], as firms like to experience risky initiatives. Even if prevention-focused business firms are forced to adopt PBS, they prioritize risk avoidance and adherence to regulations, guarantee that CE processes conform to regulatory standards, and minimize environmental issues [60]. This dual regulatory focus in business firms emphasizes incorporating CE practices in fostering PBS, promoting a harmonious approach that adheres to regulations. Based on these arguments, the following hypotheses are proposed:

H_{5A}: *A business firm's pro-RF positively moderates the relationship between fostering PBS in business firms and implementing CE practices.*

H_{5B}: *A business firm's pre-RF negatively moderates the relationship between fostering PBS in business firms and implementing CE practices.*

4. Methodology

4.1. Sample Selection and Data Collection

Despite China's substantial economic expansion in recent times, the country's rapid industrialization has resulted in rising sustainability concerns involving environmental deterioration and resource depletion [57]. Subsequently, China has been forced to prioritize and endorse CE practices as a core national strategy to address the conflicts between massive economic growth and mounting climate change issues [62]. The first Circular Economy Promotion Law in China was published in 2008 and became effective in 2009. It emphasizes the 3R strategies of reduce, reuse, and recycle. This inaugural policy paper utilizing the term 'circular economy' is widely recognized as a significant national framework for implementing CE in China. In 2018, the Circular Economy Promotion Law was revised and widened with a new strategic focus, establishing the creation of a comprehensive resource recycling system to achieve a moderately affluent society by 2020 [62, 63]. Consequently, China now places significant emphasis on fostering platform-based digital servitization in conventional business firms as a means of implementing CE practices [64]. Accordingly, China has attracted the attention of scholars (e.g., [64, 65] interested in studying PBS and CE, as it serves as an ideal test ground for obtaining highly relevant samples.

This paper adopted a paper-based cross-sectional survey administered to service firms in Shenzhen, China. We concentrated solely on service firms in Shenzhen, often called *"China's Silicon Valley"* because of its prominence as a hub for Chinese high-tech and service companies [66]. Shenzhen boasts the headquarters of many of these firms and pioneered the global deployment of an innovative framework, making it the first city worldwide to achieve this distinction [66]. Further, the workforce of Shenzhen possesses a high level of expertise and proficiency, especially in the fields of technology and services. Interacting with such a workforce guarantees high-quality data collection, as the participants are expected to know intimately about the concepts being investigated. Given its status as a pivotal economic center in China, the behaviors and trends observed in Shenzhen can have far-reaching ramifications and exert influence over other regions and industries. This enhances the significance and applicability of the findings obtained from the study sample.

Before the commencement of the main survey, in line with [67], a pilot test was conducted using a random sample of 39 managerial-level employees from 10 service firms in Shenzhen during the first three weeks of September 2023 workers to assess construct validity and reliability. After several attempts, 27 participants returned the completed questionnaires, following the initial recommendation by [68] to conduct a pilot study with a sample size ranging from 10 to 30. The pilot survey results indicated that the constructs were reliable, with Cronbach's $\alpha \geq 0.7$, and their statistical significance was more significant than 0.5, indicating validity.

Data collection was planned according to the participants' availability and preferences. Before collecting data, we identified 810 potential managerial-level employees for the survey from 270 service firms in the telecommunications, retail, and banking industries through purposive sampling. We contacted them via email or telephone to assess their interest in participating in our study. We then employed an in-person approach to collect data from 408 managerial-level employees identified from 143 service firms who voluntarily consented to participate. The sample size was in line with [69] and [70] , who emphasized that a minimum of 100-150 samples should be used to conduct a structural equation modeling (SEM) approach.

The data were collected over approximately five months, from October 15, 2023, to March 25, 2024, in three waves to ensure the comprehensiveness and representativeness of the sample. The first phase of data collection sought preliminary responses; however, the required sample size was not eventually achieved in this phase. Consequently, during the second and third waves, we sought support from colleagues in other organizations and academic networks to obtain the requisite respondent count, enabling the successful execution of the survey process. In the end, 18 questionnaires were excluded during the data entry phase because the respondents had not answered more than half of the survey questions. After eliminating these questionnaires, we obtained 390 valid responses, achieving an effective response rate of 95%, which is considered acceptable [71, 72]. Over 55 percent of the survey questionnaires were completed in the first wave, whereas 28% and 17% of the responses were collected in the second and third waves. Thus, to assess any potential differences between early and late respondents, adhering to [73] suggestion, a chi-square difference test ($\Delta\chi 2$) was performed. The findings indicate that no systematic differences exist between those responding in the three waves of data collection, confirming that non-response bias was not an issue.

4.2. Measurement Development

All variables were measured using well-tested measurement scales adapted from prior literature, using a 5-point Likert scale ranging from 1 = strongly

disagree to 5 = strongly agree. Metaverse was assessed using a three-item measurement scale adapted from [74], whereas network collaboration was evaluated using a three-item measurement scale adapted from [75]. Environmental disclosure was operationalized using a three-item measurement scale adapted from [40]. Both PBS and CE were measured by using three-item measurement scales adapted from [76], [1] and [77], respectively. Pro-RF and pre-RF were also operationalized using three-item measurement scales adapted from [78].

The questionnaire was initially created in English and then translated into Mandarin Chinese. We adopted back translation with the help of three native speakers in the questionnaire development process to ensure no meaning distortion will take place. Before finalizing the survey questionnaire, three subject experts were first provided with an overview of the key constructs and measurement scales used to operationalize these constructs to assess content validity. After incorporating the minor comments from the experts, the questionnaire was again tested with 16 potential respondents. This phase aimed to evaluate face validity by requesting participants to assess the appropriateness and clarity of the questionnaire items. Minor comments received from these two groups were incorporated into the final questionnaire design, improving the legibility of the survey instrument.

4.3. Common Method Bias

Considering this paper is based on self-reported data, the potential existence of common method bias could not be overlooked [79]. We employed two a priori remedies and one post-hoc procedural remedy to mitigate this risk and control for common method bias [80]. First, we ensured the confidentiality and anonymity of the respondents by refraining from collecting their personal details. Second, we conducted a pre-test with a sample of 16 managerial-level employees from 6 service firms to evaluate the clarity and face validity of the questionnaire. Based on their feedback, minor adjustments, primarily in wording, were integrated into the final questionnaire design. Finally, using the variance inflation factor (VIF) collinearity approach, we confirmed that common method bias is not a problem in this study as all values were below the 3.3 threshold value, as shown in Table 3 [80].

5. Findings

Table 1 provides an overview of the demographic composition of the respondents of selected 143 service firms. Many respondents held either a bachelor's or master's degree. As shown in Table 1, 49% of the respondents had experience ranging from one to five years, while the remaining 29% had more than five years of experience. Most of the service firms were from the telecommunications and retail industries, and in terms of size, most of these firms belong to the small category.

Table 1: Sample Demographics

An exhaustive review was conducted on the administered questionnaires to identify and analyze any errors or discrepancies. Additional measures were taken to meticulously eradicate missing variables, outliers, and multicollinearity to guarantee the integration of the derived factors into the statistical procedures. Next, the evaluation of the measurement and structural model using PLS-SEM was performed by assessing the validity and reliability of the indicators. PLS-SEM stands out as the most suitable data analysis technique in social sciences [81]. It is an effective technique to rigorously test theoretically driven hypotheses using empirical data collected through a questionnaire survey [82]. Further, the PLS-SEM is recently employed in research related to digital servitization and CE [52, 83, 84]. Construct validity is assessed by how accurately a set of items reflects the theoretical concept that the instrument aims to measure. It also analyzes the consistency of the measurement by examining its reliability features [71]. The construct validity was determined using standardized outer factor loadings (OL), average variance extracted (AVE), and construct reliability (CR). This paper used the bootstrapping approach to evaluate the structural model to estimate the t-statistics, p-values, and their corresponding statistical significance.

5.1. Measurement Model Assessment

The findings of the confirmatory factor analysis showed that the initial outer factor loading (FL) fell within the acceptable range of 0.660 to 0.939, with mean values varying between 3.52 and 4.06 and standard deviations from 0.73 to 0.92. Confirmation of convergent validity can be achieved when the C_α, CR, and AVE values are all above 0.5 and surpass the cut-off value. According to the findings presented in Table 3, all these conditions have been fulfilled in this study. The Fornell-Larcker criterion also confirmed the discriminant validity since it ensures that no off-diagonal component surpasses the corresponding diagonal element, which is necessary to satisfy this criterion [85].

Table 2. Items, Descriptive Statistics, and Factor Loadings

Table 3: Reliability and Validity Assessments

5.2. Structural Model Validation

In the next step, the bootstrapping procedure was used to evaluate the statistical significance of the route coefficients. A thorough analysis of the route coefficient and significance of the structural model is carried out by employing several statistical measures, including the confidence interval, standard error, and T-statistic, as described by [71]. Table 4 and Figure 2 depict the bootstrapped critical ratios, the coefficients of the variable routes, and the study's underlying assumptions.

The study results supported all the proposed hypotheses related to the direct effects of metaverse (H1: $\beta = 0.211$, p-value = 0.00), environmental disclosure (H2: $\beta = 0.284$, p-value = 0.000), network collaboration (H3: $\beta = 0.403$, p-value = 0.000) on fostering PBS. The hypothesis related to the impact of fostering PBS on implementing business firms is also supported (H4: $\beta = 0.365$, p-value = 0.000). Further, H5 is also supported, confirming the proposed mediating effect of PBS on the relationships between metaverse ($\beta = 0.077$, p-value = 0.001), network collaboration ($\beta = 0.147$, p-value = 0.000), environmental disclosure (0.104, p-value = 0.000), and implementing CE practices. In the presence of pro-RF as a potential moderator, a stronger correlation was found between fostering PBS and implementing CE practices by confirming H6B ($\beta = 0.075$, p-value = 0.000). As expected, it has been observed that H6A ($\beta = -0.089$, p-value = 0.000) is also supported, indicating that pre-RF negatively moderates the relationship between fostering PBS and implementing CE practices. These moderating results have been plotted in Figure 3, enhancing the clarity of these relationships.

Table 4: Path Analysis through PLS Bootstrapping

Figure 2: Path Analysis through SmartPLS 4.0 Bootstrapping

Figure 3: Plot showing Moderating Effects of pre-RF and pro-RF through PLS Algorithm

6. Discussion of Findings

Combining the IT and RFT, this paper develops a cohesive conceptual model to expand our understanding of how the interplay between institutional-level factors (e.g., metaverse, network collaboration, and environmental disclosure) and regulatory focus impact fostering PBS and implementing CE practices in business firms. In this attempt, we identified that institutional-level factors, namely metaverse, network collaboration, and environmental disclosure, positively and significantly influence the fostering of PBS, facilitating the implementation of CE practices. Thus, the first three hypotheses (H1, H2, and H3) are accepted. Aligning with [86] and [19], acceptance of H1 implies that utilizing the metaverse to augment PBS has the potential to facilitate implementing CE practices by encouraging sustainable behaviors within and across a business firm's whole services cycle. Consistent with [86], in this study, it was identified that the metaverse enhances collaborative product design, development, and service delivery by collaborating with all the stakeholders within and across the business ecosystem promptly.

Next, building on the insights of [51] and [52], the study findings underscored the pivotal role of a robust environmental disclosure policy in attracting increased stakeholder involvement and participation in fostering PBS and CE practices. Following a similar line of thinking as [56] and [55], the acceptance of H3 reveals that developing an atmosphere favorable to deploying PBS could be facilitated by meticulously establishing a collaborative

network among all stakeholders. This is because, by adopting a comprehensive and unified collaboration, business firms can bolster their competitive position in PBS provision and the long-term sustainability of their businesses [53, 55].

Additionally, this study contributes to extant service management literature by responding to the scholarly call to integrate the interrelationships between PBS and CE—two prominent trends that are increasingly shaping the contemporary business landscape. [6, 15]. By empirically validating H4 and H5, this will be one of the pioneering studies that explore the interplay between fostering PBS as a transition path toward CE within the same study [3, 15].

This study further distinguishes from prior servitization literature by investigating how regulatory focus influences the relationship between PBS provision and CE practices in two contrasting organizational contexts: pre-RF and pro-RF. The acceptance of H6A and H6B emphasizes that pro-RF positively influences this relationship, while pre-RF negatively affects this relationship. The positive moderating effect of pro-RF aligns with [61] findings, highlighting the importance of motivating and inspiring employees in business firms to create new products and services. Therefore, by adopting a pro-RF approach, business firms can encourage positive and productive dialogue about PBS and CE initiatives that can make great strides toward sustainability. Consequently, such business firms can draw in environmentally aware individuals, strengthening their overall CE approaches. On the contrary, in line with [60], the negative moderating effect of pre-RF alarms that employees in such business firms are more likely to be risk-averse and participate in low-level construal because of their cautious nature. Such business firms emphasize ensuring a steady output, mitigating production delays, and minimizing financial risks without initiating challenging and innovative solutions. This conservative attitude hinders business firms from fully embracing the full potential of PBS and CE.

6.2. Implications for Theory

The findings of this study contribute to extant service management literature in three vital ways. First, although PBS and CE represent two prominent trends jointly shaping the modern business landscape, contemporary service management literature is still in its infancy concerning integrating these two research streams [6, 15], revealing significant gaps that need to be addressed. By responding to the scholarly call to integrate the interrelationships between PBS and CE [6, 15], this will be one of the pioneering studies that explore the interplay between fostering PBS as a transition path toward CE within the same study.

Second, while concepts such as metaverse, network collaboration, and environmental disclosure have gained prominence in the contemporary business world, existing service management literature has not comprehensively explored their interplay as determinants in fostering PBS as a transition path towards CE within the same study [3, 15]. Instead, these concepts were previously studied separately in the existing literature without a rigorous theoretical foundation, resulting in scattered findings [19, 24]. Grounded in IT, this study makes a distinctive contribution by developing an integrated theoretical model that exclusively investigates metaverse, network collaboration, and environmental disclosure as determinants of fostering PBS in business firms.

Third, this paper extends the applicability of the RFT into the extant service management literature by investigating the moderating role of regulatory focus in the relationship between fostering PBS and CE practices in business firms. By doing so, this study makes a unique contribution, as the RFT is rarely examined in servitization literature [2, 15]. Most prior studies have investigated the role of regulatory focus on individual objectives pursuit and interpersonal relationships at the personal level [28, 87]. This paper fills this gap by conducting a comprehensive investigation into how different approaches to regulatory focus in business firms influence CE adoption differently through fostering PBS, considering two distinct forms of regulatory focus.

6.3. Implications for Practice

From a more practical viewpoint, our findings provide important insights for policymakers and industry practitioners to facilitate the effective fostering of PBS and CE practices for sustainable growth. First, given that embracing innovative frontier technologies, such as the metaverse, significantly stimulates the fostering of PBS in business firms [19, 20], managers must prioritize investments that focus on adopting these technologies and effectively integrating them into practices. Furthermore, to fully realize their potential, managers and industry practitioners should initiate business model innovations that facilitate network collaborations alongside embracing PBS and CE practices. It is also vital for policymakers to take proactive steps to mandate environmental disclosure, thereby facilitating business firms in their efforts to enhance competitiveness through the fostering of PBS and CE practices.

Second, the findings suggest that business firms that adopt PBS through effective collaborations within and across business ecosystems disrupt conventional business practices and market structures. More specifically, fostering PBS in business firms paves the way for implementing CE practices to reduce their environmental impact, generate new revenue streams, and enhance corporate reputation. However, business firms face challenges when fostering PBS to implement CE practices, including acquiring new skills and capabilities, adapting business models, and establishing new partnerships and collaborations. By proactively introducing more sustainable business model innovations, developing digital skills, capabilities, and relevant infrastructure, and integrating with new partners and networks, managers can realize the full potential of implementing PBS to promote CE practices.

Third, managers must also revamp their regulatory framework to create a healthy business environment that facilitates a smooth transition to PBS and CE by considering different approaches to regulatory focus. Since pre-RF enhances employee creativity [43], cultivating a creative atmosphere and accepting continuous improvement practices are essential. Therefore, it is recommended that managers not only prioritize individual factors that motivate creativity but also consider creating a healthy business environment that facilitates adopting innovative technologies and business models. By doing so, business firms can achieve a sustained competitive advantage over their competitors by accelerating the implementation of PBS and CE practices, which allow them to utilize resources efficiently while minimizing adverse environmental effects. However, as the findings indicate, managers should try to avoid the existence of pre-RF in business firms as it negatively correlates with the adoption of PBS and CE practices and can create difficulties in initiating those practices [43].

7. Conclusion, Limitations and Future Research

7.1. Conclusion

Based on the IT and RFT, this paper develops and empirically tests a conceptual model delineating the interplay between institutional-level factors (e.g., metaverse, network collaborations, and environmental disclosure) and regulatory focus on fostering PBS and implementing CE practices in business firms. Data drawn from a paper-based survey of 390 managers from 143 service firms in China reveals that metaverse, network collaborations, and environmental disclosure significantly and positively impact PBS, which acts as a mediator, potentially influencing the implementation of CE practices. Further, pro-RF positively moderates the relationship between fostering PBS in business firms and implementing CE practices, while pre-RF negatively moderates this relationship. As a concluding remark, this paper initiates a novel line of inquiry that integrates institutional and regulatory focus theories with service management literature.

7.2. Limitations and Future Research Directions

Future research should address a few limitations that exist in this paper. First, this study examined the interrelationships between institutional-level factors and regulatory focus on fostering PBS and implementing CE practices in business firms in Chinese service firms, restricting the generalizability of the findings. Therefore, future research should focus on conducting comparative studies in industries and geographical territories to enhance the applicability and context sensitivity of the findings. Second, this study employed a cross-sectional, quantitative research design to examine the proposed

interrelationships. While such a design provides useful insights into investigating these complex interrelationships at one single point in time, conducting additional research using a qualitative research design enables in-depth exploration of these interrelationships. Finally, although we focused on CE practices, we did not exclusively investigate the long-term sustainability effects that they can create. Therefore, future scholars should adopt a longitudinal research design and comprehensive sustainability perspective to assess the broader impacts of fostering PBS and implementing CE practices in business firms from social, economic, and environmental perspectives to formulate resilient business strategies.

References

[1] M. O. Erdiaw-Kwasie, M. Abunyewah, S. Yusif, and A. Erdiaw-Kwasie, "Does circular economy knowledge matter in sustainable service provision? A moderation analysis," *Journal of Cleaner Production,* vol. 383, p. 135429, 2023.

[2] S. Khanra, A. Dhir, V. Parida, and M. Kohtamäki, "Servitization research: A review and bibliometric analysis of past achievements and future promises," *Journal of Business Research,* vol. 131, pp. 151-166, 2021.

[3] O. Furrer, J. Yu Kerguignas, C. Delcourt, and D. D. Gremler, "Twenty-seven years of service research: a literature review and research agenda," *Journal of Services Marketing,* vol. 34, no. 3, pp. 299-316, 2020.

[4] Z. Jan *et al.*, "Artificial intelligence for industry 4.0: Systematic review of applications, challenges, and opportunities," *Expert Systems with Applications,* vol. 216, p. 119456, 2023.

[5] A. Guo, Y. Li, Z. Zuo, and G. Chen, "Influence of organizational elements on manufacturing firms' service-enhancement: An empirical study based on Chinese ICT industry," *Technology in Society,* vol. 43, pp. 183-190, 2015.

[6] R. Mora-Contreras, L. E. Torres-Guevara, A. Mejia-Villa, M. Ormazabal, and V. Prieto-Sandoval, "Unraveling the effect of circular economy practices on companies' sustainability performance: Evidence from a literature review," *Sustainable Production and Consumption,* vol. 35, pp. 95-115, 2023.

[7] J. L. Pallant, I. O. Karpen, and S. J. Sands, "What drives consumers to customize products? The mediating role of brand experience," *Journal of Retailing and Consumer Services,* vol. 64, p. 102773, 2022.

[8] S. Ghafoor, M. R. Hosseini, T. Kocaturk, M. Weiss, and M. Barnett, "The product-service system approach for housing in a circular economy: An integrative literature review," *Journal of Cleaner Production,* vol. 403, p. 136845, 2023.

[9] N. T. H. Nham, "Making the circular economy digital or the digital economy circular? Empirical evidence from the European region," *Technology in Society,* vol. 70, p. 102023, 2022.

[10] M. Kim, C. Lim, and J. Hsuan, "From technology enablers to circular economy: Data-driven understanding of the overview of servitization and product–service systems in Industry 4.0," *Computers in Industry,* vol. 148, p. 103908, 2023.

[11] J. Kirchherr, A. Urbinati, and K. Hartley, "Circular economy: A new research field?," *Journal of Industrial Ecology,* vol. 27, no. 5, pp. 1239-1251, 2023.

[12] C. T. de Oliveira and G. G. A. Oliveira, "What Circular economy indicators really measure? An overview of circular economy principles and sustainable development goals," *Resources, Conservation and Recycling,* vol. 190, p. 106850, 2023.

[13] R. Weeks and S. Benade, "The development of a generic servitization systems framework," *Technology in Society,* vol. 43, pp. 97-104, 2015.

[14] L. Shen, W. Sun, and V. Parida, "Consolidating digital servitization research: A systematic review, integrative framework, and future research directions," *Technological Forecasting and Social Change,* vol. 191, p. 122478, 2023.

[15] D. Leocádio, L. Guedes, J. Oliveira, J. Reis, and N. Melão, "Servitization in Digital Age: A Systematic Literature Review," *Procedia Computer Science,* vol. 232, pp. 2531-2539, 2024.

[16] K. Tajeddini and V. Ratten, "The moderating effect of brand orientation on inter-firm market orientation and performance," *Journal of strategic marketing,* vol. 28, no. 3, pp. 194-224, 2020.

[17] C. Zabel, D. O'Brien, and J. Natzel, "Sensing the Metaverse: The microfoundations of complementor firms' dynamic sensing capabilities in emerging-technology ecosystems," *Technological Forecasting and Social Change,* vol. 192, p. 122562, 2023.

[18] G. D. Ritterbusch and M. R. Teichmann, "Defining the metaverse: A systematic literature review," *Ieee Access,* vol. 11, pp. 12368-12377, 2023.

[19] H. Gao, A. Y. L. Chong, and H. Bao, "Metaverse: literature review, synthesis and future research agenda," *Journal of Computer Information Systems,* vol. 64, no. 4, pp. 533-553, 2024.

[20] Q. Li, L. Kong, X. Min, and B. Zhang, "DareChain: A Blockchain-Based Trusted Collaborative Network Infrastructure for Metaverse," *International Journal of Crowd Science,* vol. 7, no. 4, pp. 168-179, 2023.

[21] J. Wang, K. Zhang, K.-Y. Lin, and L. Feng, "A systematic review for organizing servitization by multi-actor collaborations: lenses, factors and outcomes," *Journal of Business & Industrial Marketing,* vol. 38, no. 4, pp. 828-851, 2023.

[22] P.-K. Chen, Y. Ye, and M.-H. Wen, "Efficiency of metaverse on the improvement of the green procurement policy of semiconductor supply chain–based on behaviour perspective," *Resources Policy,* vol. 86, p. 104213, 2023.

[23] S. I. Hallstedt, O. Isaksson, and A. Öhrwall Rönnbäck, "The need for new product development capabilities from digitalization, sustainability, and servitization trends," *Sustainability,* vol. 12, no. 23, p. 10222, 2020.

[24] F. Schiavone, D. Leone, A. Caporuscio, and S. Lan, "Digital servitization and new sustainable configurations of manufacturing systems," *Technological Forecasting and Social Change,* vol. 176, p. 121441, 2022.

[25] D. J. Langley, "Digital product-service systems: The role of data in the transition to servitization business models," *Sustainability,* vol. 14, no. 3, p. 1303, 2022.

[26] S. He, W. Wei, S. Ding, S. Zheng, and T. Niu, "Coevolution between science and policy: A systematic analysis on circular economy in China and worldwide," *Environmental Science & Policy,* vol. 139, pp. 104-117, 2023.

[27] E. T. Higgins, "Beyond pleasure and pain," *American psychologist,* vol. 52, no. 12, p. 1280, 1997.

[28] E. T. Higgins and F. Pinelli, "Regulatory focus and fit effects in organizations," *Annual Review of Organizational Psychology and Organizational Behavior,* vol. 7, no. 1, pp. 25-48, 2020.

[29] W. R. Scott, "Institutional theory: Contributing to a theoretical research program," *Great minds in management: The process of theory development,* vol. 37, no. 2, pp. 460-484, 2005.

[30] M. Geissdoerfer, T. Santa-Maria, J. Kirchherr, and C. Pelzeter, "Drivers and barriers for circular business model innovation," *Business Strategy and the Environment,* vol. 32, no. 6, pp. 3814-3832, 2023.

[31] A. Zhang, J. X. Wang, M. Farooque, Y. Wang, and T.-M. Choi, "Multi-dimensional circular supply chain management: A comparative review of the state-of-the-art practices and research," *Transportation Research Part E: Logistics and Transportation Review,* vol. 155, p. 102509, 2021.

[32] J. Gu, J. Wang, X. Shi, and X. Xu, "Investigating supply chain participants' circular economy action effects on firm financial performance from a stakeholder theory perspective," *Journal of Purchasing and Supply Management,* p. 100903, 2024.

[33] H. Jiang, J. Yang, and J. Gai, "How digital platform capability affects the innovation performance of SMEs—Evidence from China," *Technology in Society,* vol. 72, p. 102187, 2023.

[34] T. Paschou, M. Rapaccini, F. Adrodegari, and N. Saccani, "Digital servitization in manufacturing: A systematic literature review and

research agenda," *Industrial Marketing Management,* vol. 89, pp. 278-292, 2020.
[35] O. Blackburn, P. Ritala, and J. Keränen, "Digital platforms for the circular economy: exploring meta-organizational orchestration mechanisms," *Organization & Environment,* vol. 36, no. 2, pp. 253-281, 2023.
[36] W. R. Scott, "Approaching adulthood: the maturing of institutional theory," *Theory and society,* vol. 37, pp. 427-442, 2008.
[37] W. R. Scott, "Institutional theory: Onward and upward," *The Sage handbook of organizational institutionalism,* vol. 900, pp. 853-871, 2017.
[38] W. Scott, *Institutions and organizations: Ideas, interests, and identities*. Sage publications, 2013.
[39] H. Willmott, "Why institutional theory cannot be critical," *Journal of Management Inquiry,* vol. 24, no. 1, pp. 105-111, 2015.
[40] S. Lapologang and S. Zhao, "The impact of environmental policy mechanisms on green innovation performance: the roles of environmental disclosure and political ties," *Technology in Society,* vol. 75, p. 102332, 2023.
[41] M. A. Glynn and T. D'aunno, "An intellectual history of institutional theory: Looking back to move forward," *Academy of Management Annals,* vol. 17, no. 1, pp. 301-330, 2023.
[42] Q. Do, N. Mishra, C. Colicchia, A. Creazza, and A. Ramudhin, "An extended institutional theory perspective on the adoption of circular economy practices: Insights from the seafood industry," *International Journal of Production Economics,* vol. 247, p. 108400, 2022.
[43] D. Gutermuth and M. R. Hamstra, "Are there gender differences in promotion–prevention self-regulatory focus?," *British Journal of Psychology,* vol. 115, no. 2, pp. 306-323, 2024.
[44] L.-K. Cheng, H.-L. Huang, and S.-Y. Yang, "Attitude toward 5G: The moderating effect of regulatory focus," *Technology in Society,* vol. 67, p. 101795, 2021.
[45] W. Jiang, L. Wang, Z. Chu, and C. Zheng, "How does CEO regulatory focus matter? The impacts of CEO promotion and prevention focus on firm strategic change," *Group & Organization Management,* vol. 45, no. 3, pp. 386-416, 2020.
[46] T. Vriend, M. R. Hamstra, R. Said, O. Janssen, J. Jordan, and B. A. Nijstad, "Regulatory focus theory: Disentangling goals and strategies," *Applied Psychology,* vol. 72, no. 1, pp. 231-267, 2023.
[47] S. Chowdhury, M. Åkesson, and M. Thomsen, "Service innovation in digitalized product platforms: an illustration of the implications of generativity on remote diagnostics of public transport buses," *Technology in society,* vol. 65, p. 101589, 2021.
[48] M. Al-Emran and M. Deveci, "Unlocking the potential of cybersecurity behavior in the metaverse: Overview, opportunities, challenges, and future research agendas," *Technology in Society,* p. 102498, 2024.
[49] R. Fitriasari, "The impact of sustainability corporate governance on corporate environmental disclosure," *International Journal of Accounting & Finance in Asia Pasific (IJAFAP),* vol. 6, no. 1, pp. 70-81, 2023.
[50] M. Tran and E. Beddewela, "Does context matter for sustainability disclosure? Institutional factors in Southeast Asia," *Business Ethics: A European Review,* vol. 29, no. 2, pp. 282-302, 2020.
[51] N. B. Upadhayay, S. Rocchetta, S. Gupta, S. Kamble, and R. Stekelorum, "Blazing the trail: The role of digital and green servitization on technological innovation," *Technovation,* vol. 130, p. 102922, 2024.
[52] H. Q. Pham and P. K. Vu, "Unravelling the potential of digital servitization in sustainability-oriented organizational performance—Does digital leadership make it different?," *Economies,* vol. 10, no. 8, p. 185, 2022.
[53] L. S. Dalenogare, M.-A. Le Dain, N. F. Ayala, G. Pezzotta, and A. G. Frank, "Building digital servitization ecosystems: An analysis of inter-firm collaboration types and social exchange mechanisms among actors," *Technovation,* vol. 124, p. 102756, 2023.
[54] F. Li, W. Liu, and K. Bi, "Exploring and visualizing spatial-temporal evolution of patent collaboration networks: A case of China's intelligent manufacturing equipment industry," *Technology in Society,* vol. 64, p. 101483, 2021.
[55] E. Carloni and S. Galvani, "Actors, resources, and activities in Digital Servitization: a business network perspective," *Italian Journal of Marketing,* vol. 2024, no. 2, pp. 197-224, 2024.
[56] H. Gebauer, M. Paiola, N. Saccani, and M. Rapaccini, "Digital servitization: Crossing the perspectives of digitization and servitization," vol. 93, ed: Elsevier, 2021, pp. 382-388.
[57] J. Tian, W. Coreynen, P. Matthyssens, and L. Shen, "Platform-based servitization and business model adaptation by established manufacturers," *Technovation,* vol. 118, p. 102222, 2022.
[58] X. Fu, P. Ghauri, N. Ogbonna, and X. Xing, "Platform-based business model and entrepreneurs from Base of the Pyramid," *Technovation,* vol. 119, p. 102451, 2023.
[59] E. T. Higgins and S. Spiegel, "Promotion and prevention strategies for self-regulation," *Handbook of self-regulation: Research, theory, and applications,* pp. 171-187, 2004.
[60] M. Palmié, J. Boehm, C.-K. Lekkas, V. Parida, J. Wincent, and O. Gassmann, "Circular business model implementation: Design choices, orchestration strategies, and transition pathways for resource-sharing solutions," *Journal of cleaner production,* vol. 280, p. 124399, 2021.
[61] S. K. van Langen, C. Vassillo, P. Ghisellini, D. Restaino, R. Passaro, and S. Ulgiati, "Promoting circular economy transition: A study about perceptions and awareness by different stakeholders groups," *Journal of Cleaner Production,* vol. 316, p. 128166, 2021.
[62] R. Bleischwitz *et al.*, "The circular economy in China: Achievements, challenges and potential implications for decarbonisation," *Resources, Conservation and Recycling,* vol. 183, p. 106350, 2022.
[63] Y. Fan and C. Fang, "Circular economy development in China-current situation, evaluation and policy implications," *Environmental impact assessment review,* vol. 84, p. 106441, 2020.
[64] F. Yan, S. Yin, L. Chen, and F. Jia, "Complexity in a platform-based servitization: a complex adaptability theory perspective," *International Journal of Logistics Research and Applications,* vol. 27, no. 7, pp. 1092-1111, 2024.
[65] Q. Huang and P. J. Kumarasinghe, "Servitization and digital integration of manufacturing enterprises in China: Performance and strategic paths," *Journal of Infrastructure, Policy and Development,* vol. 8, no. 6, p. 5191, 2024.
[66] W.-M. To, P. K. Lee, and A. K. Lau, "Economic and environmental changes in Shenzhen—A technology hub in southern China," *Sustainability,* vol. 13, no. 10, p. 5545, 2021.
[67] L. Sürücü and A. Maslakci, "Validity and reliability in quantitative research," *Business & Management Studies: An International Journal,* vol. 8, no. 3, pp. 2694-2726, 2020.
[68] J. A. Teresi, X. Yu, A. L. Stewart, and R. D. Hays, "Guidelines for designing and evaluating feasibility pilot studies," *Medical care,* vol. 60, no. 1, pp. 95-103, 2022.
[69] R. B. Kline, *Principles and practice of structural equation modeling*. Guilford publications, 2023.
[70] S. K. Shah, T. Zhongjun, A. Sattar, and Z. XinHao, "Consumer's intention to purchase 5G: Do environmental awareness, environmental knowledge and health consciousness attitude matter?," *Technology in Society,* vol. 65, p. 101563, 2021.
[71] J. F. Hair Jr, M. Sarstedt, L. M. Matthews, and C. M. Ringle, "Identifying and treating unobserved heterogeneity with FIMIX-PLS: part I–method," *European Business Review,* 2016.
[72] S. K. Shah and T. Zhongjun, "Elaborating on the consumer's intention–behavior gap regarding 5G technology: The moderating role of the product market-creation ability," *Technology in Society,* vol. 66, p. 101657, 2021.
[73] J. S. Armstrong and T. S. Overton, "Estimating nonresponse bias in mail surveys," *Journal of marketing research,* vol. 14, no. 3, pp. 396-402, 1977.
[74] M. Al-Emran, "Beyond technology acceptance: Development and evaluation of technology-environmental, economic, and social sustainability theory," *Technology in Society,* vol. 75, p. 102383, 2023.

[75] R. R. Sinkovics and D. Kim, "The impact of technological, organizational and environmental characteristics on electronic collaboration and relationship performance in international customer–supplier relationships," *Information & Management,* vol. 51, no. 7, pp. 854-864, 2014.

[76] M. Abou-Foul, J. L. Ruiz-Alba, and P. J. López-Tenorio, "The impact of artificial intelligence capabilities on servitization: The moderating role of absorptive capacity-A dynamic capabilities perspective," *Journal of Business Research,* vol. 157, p. 113609, 2023.

[77] D. Mathivathanan, K. Mathiyazhagan, S. Khorana, N. P. Rana, and B. Arora, "Drivers of circular economy for small and medium enterprises: Case study on the Indian state of Tamil Nadu," *Journal of Business Research,* vol. 149, pp. 997-1015, 2022.

[78] D. K. Maduku, "How environmental concerns influence consumers' anticipated emotions towards sustainable consumption: The moderating role of regulatory focus," *Journal of Retailing and Consumer Services,* vol. 76, p. 103593, 2024.

[79] J. Wirtz, P. Xiao, J. Chiang, and N. Malhotra, "Contrasting the drivers of switching intent and switching behavior in contractual service settings," *Journal of Retailing,* vol. 90, no. 4, pp. 463-480, 2014.

[80] P. M. Podsakoff, S. B. MacKenzie, J.-Y. Lee, and N. P. Podsakoff, "Common method biases in behavioral research: a critical review of the literature and recommended remedies," *Journal of applied psychology,* vol. 88, no. 5, p. 879, 2003.

[81] A. Shuhaiber and I. Mashal, "Understanding users' acceptance of smart homes," *Technology in Society,* vol. 58, p. 101110, 2019.

[82] P. Guenther, M. Guenther, C. M. Ringle, G. Zaefarian, and S. Cartwright, "Improving PLS-SEM use for business marketing research," *Industrial Marketing Management,* vol. 111, pp. 127-142, 2023.

[83] F. Vendrell-Herrero, O. Bustinza, and M. Opazo, "Information technologies and product-service innovation," 2020.

[84] J. Williams, A. G. Prawiyogi, M. Rodriguez, and I. Kovac, "Enhancing circular economy with digital technologies: A pls-sem approach," *International Transactions on Education Technology (ITEE),* vol. 2, no. 2, pp. 140-151, 2024.

[85] S. K. Shah, J. Yuan, W. Wang, and J. Yuan, "Adoption of Bionic Soft Robots in Organizations: The Role of Information Disclosure and Government Support," *IEEE Transactions on Engineering Management,* 2024.

[86] P.-K. Chen, Y. Ye and X. Huang, "The metaverse in supply chain knowledge sharing and resilience contexts: An empirical investigation of factors affecting adoption and acceptance," *Journal of Innovation & Knowledge,* vol. 8, no. 4, p. 100446, 2023.

[87] D. L. Gamache, F. Neville, J. Bundy, and C. E. Short, "Serving differently: CEO regulatory focus and firm stakeholder strategy," *Strategic Management Journal,* vol. 41, no. 7, pp. 1305-1335, 2020.

Figure 1. Conceptual model

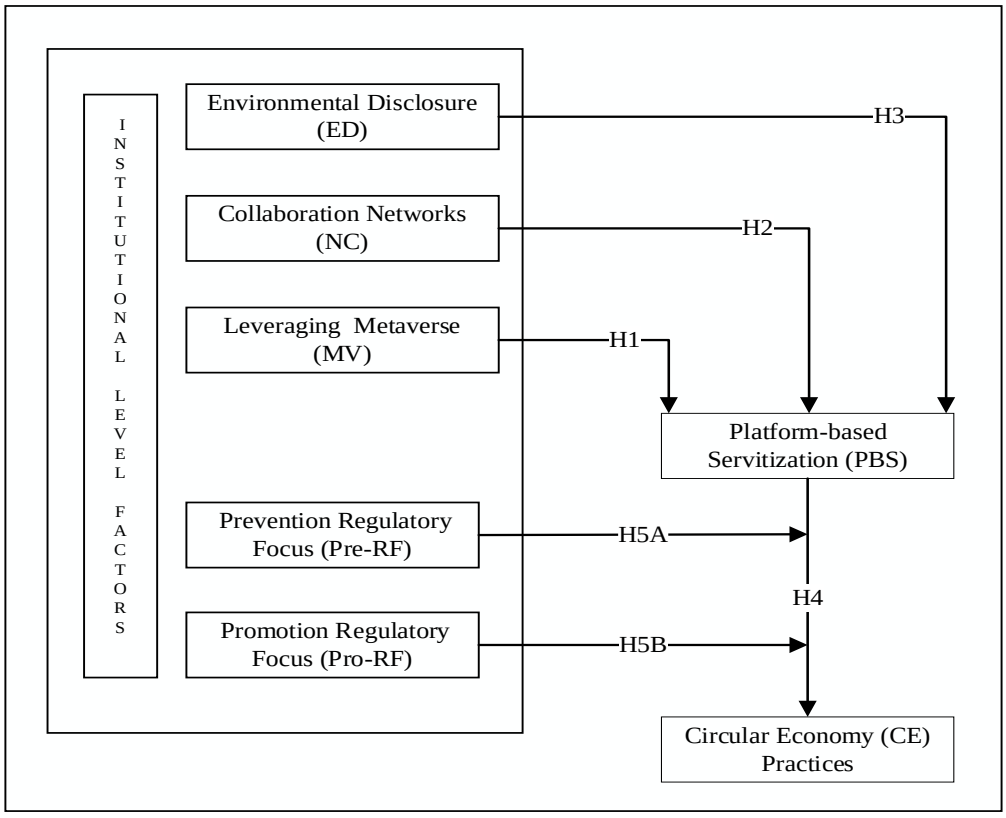


Figure 2: Path Analysis through SmartPLS 4.0 Bootstrapping

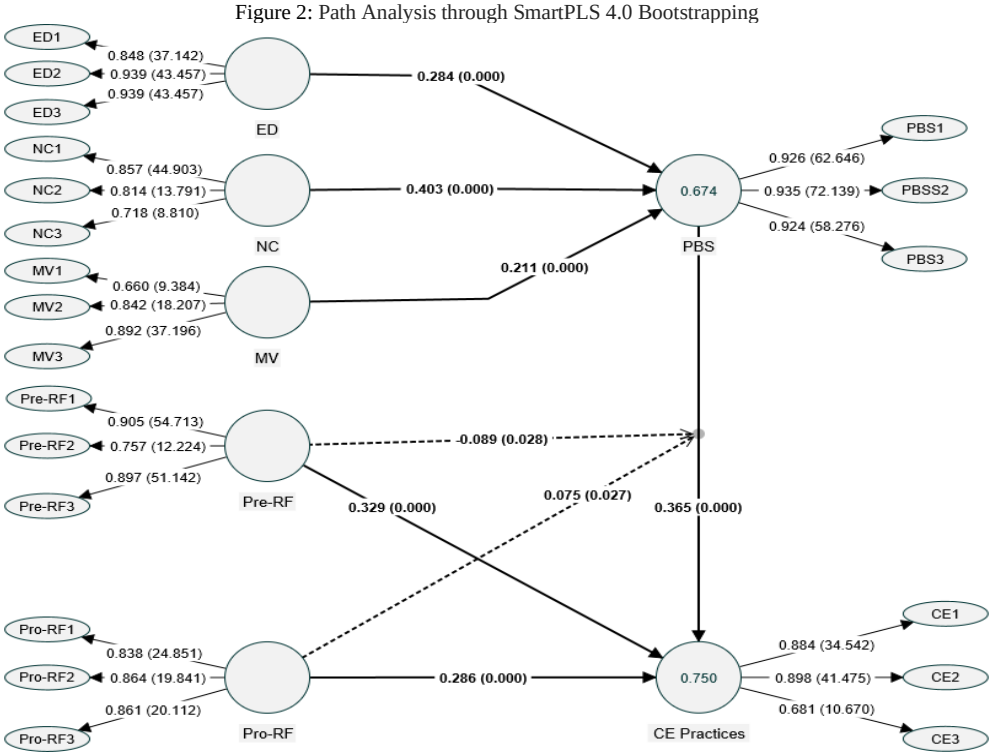
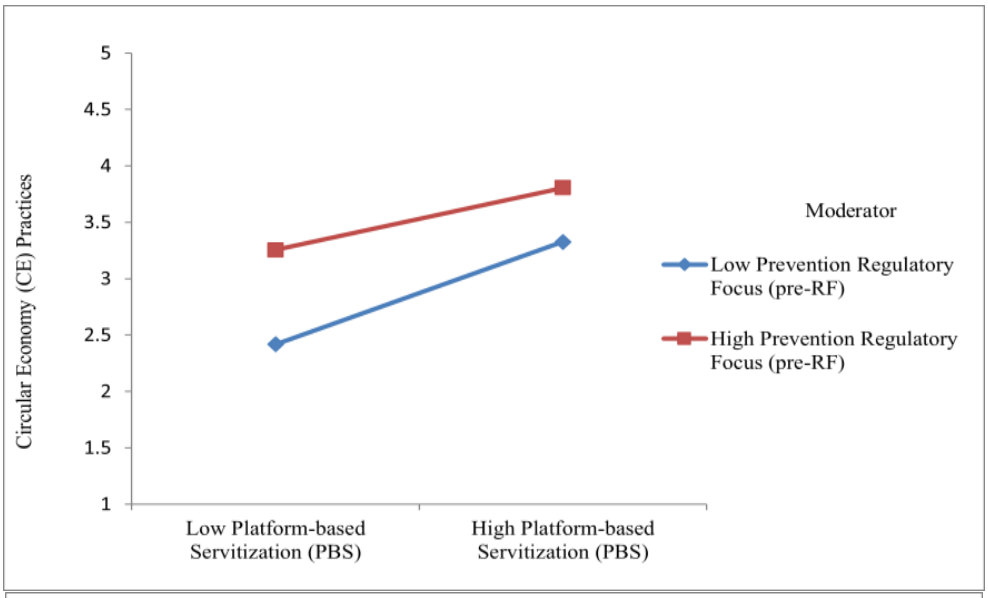


Figure 3: Plot showing Moderating Effects of pre-RF and pro-RF through PLS Algorithm


Circular Economy (CE) Practices
5
4.5
4
3.5
3
2.5
2
1.5
1
Low Platform-based Servitization (PBS)
High Platform-based Servitization (PBS)
Moderator
Low Prevention Regulatory Focus (pre-RF)
High Prevention Regulatory Focus (pre-RF)

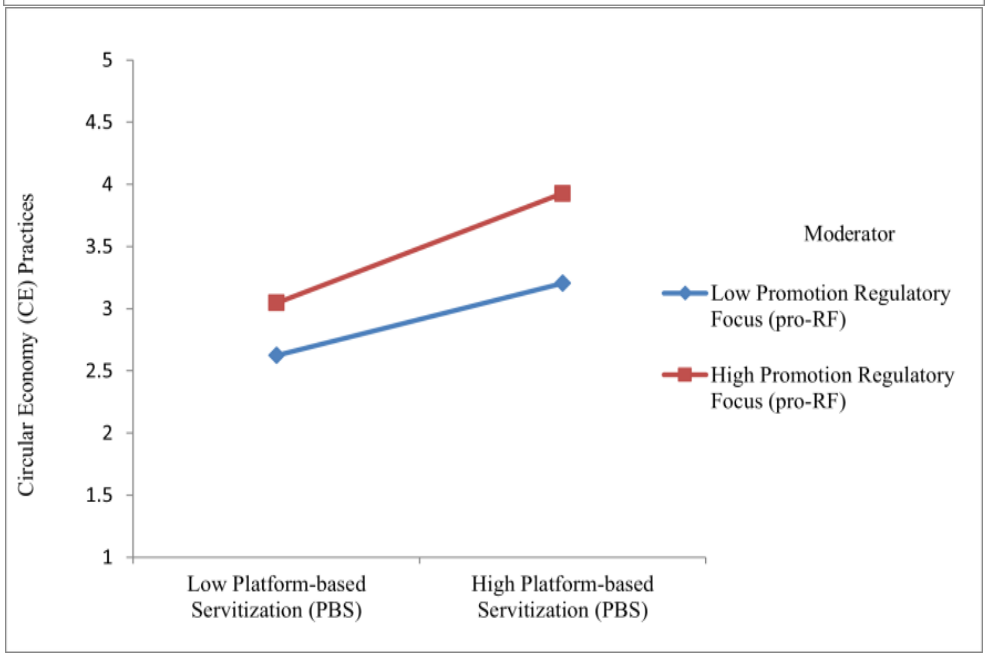

Circular Economy (CE) Practices
5
4.5
4
3.5
3
2.5
2
1.5
1
Low Platform-based Servitization (PBS)
High Platform-based Servitization (PBS)
Moderator
Low Promotion Regulatory Focus (pro-RF)
High Promotion Regulatory Focus (pro-RF)

Table 1: Sample Demographics

Measures	Categories	Percentage	Frequency
Organization Type	Telecommunication	35.39	138
	Retail	31.29	122
	Banking	20.00	78
	Other	13.22	52
Organization Size	1-50	25.12	98
	51-100	33.09	129
	101-250	24.36	95
	250+	17.43	68
Employees Gender	Male	58.71	229
	Female	41.29	161
Employees Education	Polytechnic	32.57	127
	Bachelors	34.35	134
	Masters+	33.08	129
Employees Age	25-35 Years	50.25	196
	36-55 Years	28.46	111
	56-75 Years	21.29	83
Employees Position	Managing Director	13.58	53
	Service Manager	37.69	147
	Marketing Manager	29.49	115
	Head/ Supervisor	19.24	75
Employee Experience	1-5 years	49.48	193
	6-10	32.82	128
	11+	17.70	69

Table 2. Items, Descriptive Statistics, and Factor Loadings

Items	Source	M	SD	Kurtosis	Skewness	FL
	[1, 77]	3.928	0.815			
CE1: Our organization has adopted more CE processes.				14.535	-2.360	0.884
		3.661	0.861			
CE2: Our organization prioritizes initiatives to address resource scarcity.				9.227	-1.628	0.898
CE3: Our organization seeks ecologically friendly opportunities.		3.701	0.735			
				-0.364	-0.031	0.681
NC1: Our organization works in tandem to strategize its policy toward PBS.	[75]	3.589	0.887			
				7.577	-1.379	0.857
		4.008	0.785			
NC2: Our organization collaborates on new PBS design and development of services.				16.929	-2.440	0.814
NC3: Collaboration is always necessary to enhance service provision.		4.075	0.755			
				11.520	-1.877	0.718
ED1: Our organization discloses present environmental expenses to stakeholders.	[40]	3.768	0.859			
				9.973	-1.738	0.848
ED2: Our organization discloses projected fossil control expenses to stakeholders.		3.821	0.872			
				9.548	-1.778	0.939
ED3: Our organization shares statements and discusses its internal environmental policies and issues with stakeholders.		3.821	0.872			
				9.548	-1.778	0.939
MV1: Metaverse can aid the PBS approach to our organization.	[74]	3.859	0.755			
				0.334	-0.358	0.660
MV2: Our organization can reduce harmful material usage through Metaverse.		4.029	0.818			
				15.168	-2.435	0.842
MV3: The Metaverse can discourage harmful actions in our organization.		3.987	0.805			
				15.836	-2.502	0.892

PBS1: Our organization rarely prioritizes PBS transition.	[76]	3.528	0.920	6.395	-1.341	0.926
PBS2: Our organization promotes a future of PBS offers.		3.741	0.906	8.316	-1.776	0.935
PBS3: Our organization reviews the progress of PBS transformation with the leadership team.		3.632	0.899	7.618	-1.527	0.924
Pro-RF1: Our organization emphasizes success and attains it in the future.	[78]	3.669	0.948	6.333	-1.503	0.838
Pro-RF2: Our organization often imagines and experiences good things.		3.651	0.899	7.231	-1.529	0.864
Pro-RF3: Our organization frequently imagines and achieves its targets.		3.715	0.910	7.344	-1.473	0.861
Pre-RF1: Our organization often experiences bad things and fears what might occur to them.		3.811	0.816	13.193	-2.183	0.905
Pre-RF2: Our organization often thinks afraid of change that might occur in the future.		3.795	0.768	16.704	-2.538	0.757
Pre-RF3: Our organization is more oriented toward preventing losses than achieving gains.		4.067	0.828	14.547	-2.358	0.897
Pro-RF x PBS		3.928	0.815			1.000
Pre-RF x PBS		3.661	0.861			1.000

Table 3: Reliability and Validity Assessments

Factors	VIF	C-α	CR	AVE	CE	NC	ED	LM	PBS	Pro-RF	Pre-RF
CE	1.654	0.767	0.865	0.684	**0.827**						
NC	2.980	0.720	0.840	0.638	0.790	**0.798**					
ED	2.737	0.896	0.935	0.828	0.820	0.771	**0.810**				
LM	2.534	0.723	0.844	0.647	0.784	0.750	0.710	**0.804**			
PBS	2.903	0.920	0.949	0.862	0.805	0.780	0.745	0.715	**0.828**		
Pro-RF	2.904	0.815	0.890	0.730	0.739	0.760	0.762	0.795	0.725	**0.854**	
Pre-RF	2.450	0.816	0.891	0.732	0.779	0.713	0.681	0.749	0.746	0.665	**0.846**

Table 4: Path Analysis through PLS Bootstrapping

Relationships	Sample	Mean	SD	T-statistics	p-values	Remarks
Direct Effect						
H1: VM → PBS	0.211	0.212	0.058	3.663	0.000	Supported
H2: ED → PBS	0.284	0.279	0.052	5.487	0.000	Supported
H3: NC → PBS	0.403	0.406	0.060	6.661	0.000	Supported
H4: PBS→CE	0.365	0.358	0.055	6.692	0.000	Supported
Pro-RF → CE	0.286	0.284	0.052	5.529	0.000	Supported
Pre-RF → CE	0.329	0.333	0.048	6.796	0.000	Supported
Mediating Effects (H4)						
ED → PBS → CE	0.104	0.100	0.026	3.940	0.000	Supported
MV → PBS → CE	0.077	0.076	0.024	3.220	0.001	Supported
NC → PBS → CE	0.147	0.145	0.032	4.596	0.000	Supported
Moderating Effects						
H5A: Pre-RF x PBS →CE	-0.089	-0.101	0.040	2.202	0.028	Supported
H5B: Pro-RF x PBS →CE	0.075	0.086	0.034	2.206	0.027	Supported