

Emerging Trends in Green Chemical Technologies

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*Navigating Challenges and
Exploring Opportunities*

Edited by

S.V.A.R. Sastry, Shravan Kumar
and Zeenat Arif

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CHAPTER 1

INNOVATION VS SUSTAINABILITY: DEVELOPING HIGH-PERFORMANCE WORK SYSTEM (HPWS) IN MSMEs IN INDIA

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Abstract

Innovation is crucial, on the one hand, for the refinement of the customer experience, on the other hand, adds risk to the business. This may affect the sustainability of the business. Hence a balancing approach is needed while developing HPWS. This becomes more sensitive in the case of a new venture/startup. The objective of this study is to analyse the relationship between High-Performance Work Systems (HPWS), innovation, and sustainable development in MSMEs. To achieve this a thorough study and review of the literature, past studies, and new business models are analysed and a conclusion is arrived. It can be interpreted that innovation directly influences sustainability.

Keywords: Innovation; Sustainability; High-Performance Work Systems (HPWS); Micro, Small, and Medium Enterprises (MSMEs); Human Resource

1. Introduction

Micro-, Small-, and Medium-sized Enterprises (MSMEs) play a pivotal role in India's economic growth and development. Indian MSMEs are one of the main drivers of the country's economy. It is producing and exporting goods,

increasing employment, and making a significant contribution to the expansion of the Indian GDP (Srinivasan et al. 2017). However, these businesses often face significant challenges in balancing innovation and sustainability, which are crucial for long-term success and competitiveness (Bos-Brouwers 2010). High-Performance Work Systems (HPWS) have emerged as a promising approach to foster both innovation and sustainable development within organizations (Tamayo-Torres et al. 2016). Due to globalisation, smaller businesses have to focus on Sustainable Oriented Innovation (SOI) activities as a crucial component of gaining a competitive edge (Khurana et al. 2021).

The Indian MSME sector, recognized as a significant job creator and contributor to India's GDP, incorporates sustainability into its core activities.

A collection of HR procedures known as HPWS are designed to raise employee engagement, motivation, and performance, which will eventually improve organisational results (Huselid 1995). High-Performance Work Systems, which are generally associated with major organisations, include a variety of human resource management methods aimed at improving employee performance and organisational outcomes.

Innovation and sustainability have emerged as key aspects for economic success in the twenty-first century, particularly for Micro, Small, and Medium Enterprises (MSMEs) in developing countries.

HPWS may establish a work environment that fosters innovation and promotes sustainable practices by advancing employee empowerment, skill development, and employee participation (Donate and Guadamillas 2015).

2. Innovation and Sustainability

Innovation and sustainability have become essential requirements for companies, including Micro, Small, and Medium-Sized Enterprises (MSMEs), to survive in the business landscape of today. Innovation and sustainability are two essential ideas that have grown more linked in current business operations, especially among MSMEs seeking long-term success and competitiveness. In business, sustainability refers to strategies that fulfil current requirements while preserving future generations' ability to meet their own needs.

Innovation fosters competitiveness by empowering businesses to create new goods, services, and procedures that cater to changing consumer demands and market trends (Donate and Guadamillas 2015). MSMEs can create environment friendly products, use clean technology, and apply circular economy models by balancing innovation and sustainability. This will improve their long-term viability while also promoting environmental conservation (Rizos et al. 2016).

Innovation and sustainability have a complicated and multifaceted relationship. Innovation may lead to technical advancement and economic expansion, but it can also have unforeseen repercussions like resource depletion and environmental deterioration (Hojnik and Ruzzier 2016). On the other hand, sustainability projects have the potential to stimulate creative thought processes and generate novel approaches to tackle environmental and social issues (Schaltegger and Wagner 2011). For MSMEs to succeed in the long run and advance larger societal objectives, it is necessary to find the ideal balance between these two forces. Adopting sustainable practices may help MSMEs save money, enhance their reputation, get access to new markets, and build long-term resilience.

3. Innovation and HPWS

HPWS, a collection of HR procedures intended to improve employee productivity, engagement, and motivation, can be very helpful in creating an innovative work environment within an organisation.

HPWS has the potential to stimulate the creation and application of new ideas by encouraging employee involvement, exchange of knowledge, and teamwork (Donate and Guadamillas 2015). On the other hand, the HPWS's strict performance control systems and standardised procedures can sometimes clash with the quest of innovation. The goal of HPWS is to develop a highly motivated and productive workforce that can propel corporate success using a variety of HR strategies.

HPWS can help organizations build the capacities necessary to foster innovation. Organizations may build a workforce with the technical and soft skills such as creativity, critical thinking, and adaptability that are required to encourage innovation (O'Malley and Burke 2022).

Introducing adaptability and flexibility into HPWS procedures is crucial for organisations to achieve a suitable balance. Decentralised decision-making, self-governing project teams, and permitting departures from established

protocols when investigating novel ideas are among methods that can help achieve this (Shipton et al. 2005).

4. HPWS and Sustainability

HPWS to foster sustainability may rely on components such as the organisational setting, industry characteristics, and the combination of HR practices used. HPWS can encourage a culture of innovation and continual improvement, which is necessary for establishing long-term solutions and adjusting to changing environmental and societal demands (Ehnert et al. 2016). HPWS's efficacy in fostering sustainability may rely on elements such as organisational environment, industry characteristics, and the precise combination of HR practices used. These systems often incorporate activities such as selective recruiting, intensive training, performance-based remuneration, and employee participation in decision-making, all of which may be linked to sustainability objectives.

5. Strategies for implementing HPWS in MSMEs in India

HPWS supports innovation in the following ways:

- **Employee empowerment and engagement:** HPWS principles, including as open communication, participative decision-making, and employee empowerment, can inspire staff members to share their thoughts, question the status quo, and take charge of innovation projects (Donate and Guadamillas 2015).
- **Sharing of knowledge:** Innovation can result from practices like cross-functional teams, job rotation, and information sharing that promote knowledge interchange and cross-pollination of ideas (Martínez-Sánchez et al. 2009).
- **Training and development:** HPWS develops a workforce with the technical and soft skills (such as creativity and problem-solving) required to promote innovation by investing in employee training and development. It provides opportunities for continuous learning and skill development through on-the-job training, mentoring, and formal training programs.
- **Incentives and Rewards:** Innovative behaviours and contributions can be encouraged and recognised through HPWS performance management systems and reward systems (Ceylan, 2013). It uses incentive schemes to reward and retain high performers, such as profit-sharing, bonuses, or stock options.

- **Selective Recruitment and Selection:** Examine and revise job descriptions to ensure they appropriately reflect the competences, knowledge, and skills needed. Establish a systematic and verified hiring procedure that incorporates a range of evaluation techniques, including work samples, interviews, examinations of cognitive ability, personality, and assessment centres. It helps to educate hiring managers and interviewers on how to minimise biases and conduct structured behavioural interviews as well as other effective recruiting and selection methods.

6. Challenges faced by MSMEs in applying innovation within organizations

- **Limited resources:** MSMEs have limited capital and funding so it is very difficult for them to adopt new technology, invest in equipment, infrastructure and innovation (Doh and Kim, 2014). MSMEs are not having the sufficient fund for research and development also. They do not have talented staff and experts.
- **Lack of innovation culture:** MSMEs are totally based on traditional culture and mindsets so they do not want to adopt the change in their working methods or way of working. They are very rigid about their practices and procedures (Bos-Brouwers 2010). They do not want to take risk and worried about trying new technology and approaches.
- **Skill gaps:** Employees are not able to match the latest trends of technologies and tools that create the skill gap in MSMEs in India. MSMEs has the limited resources so that it fails to attract fresh talent and skilful employees.
- **Cost factor:** MSMEs have limited budget so that they are not able to provide proper training and development, workshop etc. Attracting and hiring qualified workers with experience in sustainability and HPWS practices can be difficult and expensive.
- **Lack of communication and knowledge sharing:** lack of communication and knowledge sharing decreases the sustainability of an organisation. An innovative atmosphere requires open communication and knowledge exchange.
- **Technological Barriers:** Technological obstacles provide substantial hurdles to MSMEs in their quest of innovation. Reliance on certain technology providers Can limit flexibility and raise expenses over time. Once you've invested in a certain technical environment, moving may be expensive and disruptive. Limited technical infrastructure, such as insufficient IT systems and poor internet

access in some locations, impedes the implementation of cutting-edge technologies. Cybersecurity issues, software licensing complications, and restricted R&D skills all provide significant challenges.

- **Market Challenges:** Smaller firms struggle to keep up with quickly changing client tastes and global market trends. MSMEs generally lack the sophisticated tools and skills required for in-depth market analysis, limiting their capacity to make educated product development and innovation decisions. MSMEs generally lack the sophisticated tools and skills required for in-depth market analysis, limiting their capacity to make educated product development and innovation decisions.

7. Findings

The study explores the potential of high performance work systems (HPWS) as a strategy for achieving competitive advantage in context of MSMEs in India. The study proposes a moderated mediation model to explain the relationship between high-performance work systems (HPWS), organisational innovation and sustainability. Balancing between innovation and sustainability is crucial, especially for startups. Our findings show that innovation has a direct impact on sustainability, highlighting the need of taking a balanced approach while designing HPWS. Organisations may face increased risks linked with innovation, which might jeopardise their long-term viability if not managed correctly.

8. Conclusion and Discussion

The objective of this study was to identify peculiarities involved in the relationship between HPWS and organisational sustainability by the mediating effect of innovation. It emphasises the importance of a strategic approach to human resource management, with HPWS playing a critical role in aligning organisational goals with employee talents and motivations.

The research focuses on the particular problems that new enterprises and startups confront when combining innovation and sustainability. These organisations frequently operate in extremely dynamic and resource-constrained contexts, making it critical to prioritise and strategically allocate resources to projects that are aligned with their long-term objectives.

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CHAPTER 2

CAN OCB BE A STRATEGY OF COMPETITIVE ADVANTAGE: A CASE OF MICRO ENTERPRISES?

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Abstract

OCB is known as voluntary actions performed by employees in an organization excluding job responsibilities. This adds over and above to the defined role. In a highly competitive global economy, there is a need to develop an edge over the competition in order to set a benchmark. The micro enterprises are generally people driven organizations where personal touch to the business drives revenue. Organization citizenship behavior in micro enterprises seems to be one of the important strategies for sustainability. This study aims to understand whether OCB can be a strategy to competitive advantage? The study is based on the concluding outcomes of the past studies. The outcome of this study outlines in and around that the micro enterprises use citizenship behavior one of the strategies to grow business and develop competitive advantages.

Keywords: organizational citizenship behavior, strategy, competitive advantage

Introduction

Organizational Citizenship Behavior (OCB) is a concept that was first introduced by Dennis Organ and his colleagues in the late 1980s. It refers to discretionary behaviors that are not formally recognized by the organization's reward system but contribute to the effective functioning of the organization(P. M. Podsakoff et al. 2000).

OCB encompasses various behaviors that go beyond the formal job requirements, such as:

Altruism: Voluntarily helping others with work-related problems or tasks(Organ 1988).

Conscientiousness: Going beyond minimum requirements, such as attendance, punctuality, and efficient use of resources(Organ 1988)(P. M. Podsakoff et al. 2000).

Sportsmanship: Tolerating inconveniences and avoiding complaints about trivial matters(Organ 1988).

Courtesy: Consulting with others before taking actions that may affect them(Organ 1988).

Civic Virtue: Participating in organizational affairs and supporting the organization's best interests(P. M. Podsakoff et al. 2000).

OCB is believed to have a positive impact on organizational effectiveness and performance (N. P. Podsakoff et al. 2009). There is an important impact of organizational citizenship behavior on organizational performance with mediating variable organizational effectiveness (Ramalakshmi and Ravindran 2022). It can enhance coworker and managerial productivity, improve organizational efficiency, and contribute to resource conservation (Organ 2014). Additionally, OCB has been linked to increased customer satisfaction, profitability, and competitive advantage (Koys 2001) (Walz and Niehoff 2000). The strong sense of belongingness and identification with the organization facilitates the tendency to engage in OCB. Employees with high levels of these factors show commitment and survive in difficult situations (Paul, Bamel, and Garg 2016).

While OCB is discretionary and not formally rewarded, researchers have identified several potential antecedents, including job satisfaction,

organizational commitment, perceptions of fairness, and leadership styles (Organ and Ryan 1995) (P. M. Podsakoff et al. 2000).

It is important to note that OCB should not be forced or mandated, as it is a voluntary behavior. Organizations should strive to create an environment that naturally encourages and supports OCB, such as through positive leadership, fair treatment, and a supportive organizational culture (Organ 1988) (P. M. Podsakoff et al. 2000).

The primary purpose of this study is to investigate whether organizational citizenship behavior (OCB) can serve as an effective strategy for achieving competitive advantage, specifically in the context of micro-enterprises. Despite the growing body of research on OCB and its organizational implications, there is a dearth of studies examining the strategic role of OCB in small, people-driven businesses like micro-enterprises.

Micro-enterprises often face unique challenges, such as resource constraints, heavy reliance on personal relationships, and the need for flexibility and adaptability in a highly competitive market. In such an environment, fostering OCB among employees could potentially provide a sustainable competitive edge by enhancing productivity, customer service, and organizational efficiency.

By analyzing the findings and conclusions from previous studies on OCB and its impact on organizational performance, this study aims to explore the following:

1. Evaluate the potential benefits of leveraging OCB as a strategic tool for micro-enterprises to gain a competitive advantage
2. Examine the challenges and limitations that micro-enterprises may face in implementing and sustaining OCB as a strategy
3. Examine factors influencing the effectiveness of OCB in micro-enterprises

Ultimately, the study seeks to contribute to the existing literature by exploring the strategic implications of OCB in the unique context of micro-enterprises. By understanding the role of OCB in driving competitive advantage, micro-enterprises can develop targeted strategies to leverage the potential benefits of employee citizenship behaviors and enhance their overall competitiveness in the market.

Potential benefits of OCB as a strategic tool to gain competitive advantage

Here are some potential benefits of leveraging organizational citizenship behavior (OCB) as a strategic tool for micro-enterprises to gain a competitive advantage

Enhanced Productivity and Efficiency: OCB can lead to increased productivity and efficiency within micro-enterprises. Behaviors such as altruism (helping coworkers) and conscientiousness (going beyond minimum requirements) can improve teamwork, reduce workload, and facilitate better resource utilization (N. P. Podsakoff et al. 2009) (Organ 1988). This is particularly valuable for micro-enterprises with limited resources. When employees voluntarily assist one another, it can help to distribute the workload more evenly and ensure that tasks are completed efficiently, even in the face of resource constraints. Additionally, conscientious behaviors like punctuality and efficient use of resources can help micro-enterprises to maximize their limited resources and minimize waste.

Improved Customer Service: OCB dimensions like courtesy (considering others before acting) and civic virtue (supporting organizational interests) can contribute to better customer service and satisfaction (Walz and Niehoff 2000). In micro-enterprises where personal relationships with customers are crucial, OCB can help build strong customer loyalty and retention. By exhibiting courteous behaviours, employees can demonstrate a genuine concern for the needs and preferences of customers, which can enhance the overall customer experience. Civic virtue behaviours, such as actively promoting the organization's best interests, can foster a customer-centric culture that prioritizes exceptional service and satisfaction.

Increased Adaptability and Innovation: Civic virtue, which involves actively participating in organizational affairs and offering constructive suggestions, can enhance micro-enterprises' ability to adapt to changing market conditions and foster innovation (P. M. Podsakoff et al. 2000). This agility is vital for micro-enterprises to maintain a competitive edge. As micro-enterprises often operate in dynamic and rapidly evolving markets, the ability to quickly respond to changes and embrace innovative solutions is crucial. By encouraging civic virtue behaviors, micro-enterprises can tap into the collective knowledge and creativity of their employees, enabling them to identify opportunities for improvement,

develop innovative products or services, and respond promptly to market shifts.

Positive Work Environment and Employee Retention: OCB can contribute to a positive work environment by promoting behaviors like sportsmanship (tolerating inconveniences) and altruism (helping others). This can lead to higher employee satisfaction, engagement, and retention (Koys 2001), which are critical for micro-enterprises with limited human resources. In a positive work environment fostered by OCB, employees are more likely to feel valued, supported, and motivated, leading to increased job satisfaction and a stronger commitment to the organization. This can help micro-enterprises retain their talented workforce, reducing the costs associated with employee turnover and ensuring a consistent level of expertise and knowledge within the organization.

Cost Savings: By encouraging OCB, micro-enterprises can get benefit from employee's voluntary contributions and willingness to go beyond their formal job descriptions (Organ 2014). This will lead to cost savings, as the organization may not need to allocate additional resources for certain tasks or initiatives. For instance, when employees demonstrate altruistic behaviors and voluntarily assist their colleagues, it can reduce the need for additional staffing or overtime pay. Similarly, conscientious behaviors like efficient resource utilization can help micro-enterprises minimize waste and optimize their limited budgets.

Competitive Differentiation: OCB can differentiate micro-enterprises from their competitors by cultivating a culture of citizenship behaviors, which can be difficult for others to replicate. This unique organizational culture can provide a sustainable competitive advantage (Bolino, Turnley, and Bloodgood 2002) (Walz and Niehoff 2000).

In addition to these benefits, OCB can also foster a sense of community and collaboration within micro-enterprises, which can be particularly beneficial in small, close-knit teams. When employees go beyond their formal roles to support one another and contribute to the overall success of the organization, it can create a sense of shared purpose and camaraderie. This, in turn, can lead to increased employee engagement, motivation, and commitment to the organization's goals.

OCB can help micro-enterprises build a reputation for excellence and customer-centricity. By consistently displaying behaviors that prioritize customer needs and exceed expectations, micro-enterprises can differentiate

themselves from competitors and establish a loyal customer base. This positive reputation can translate into increased word-of-mouth referrals and ultimately, sustained growth and success.

Challenges and limitations that micro-enterprises face in implementing and sustaining OCB as a strategy

Micro-enterprises face several challenges and limitations in implementing and sustaining organizational citizenship behavior (OCB) as a strategy

Limited Resources: Micro-enterprises often operate with scarce resources, including financial constraints and a small workforce (Ghobakhloo and Tang 2013). This can make it challenging to invest in initiatives aimed at fostering OCB, such as employee training, recognition programs, or cultural initiatives (Organ, Podsakoff, and MacKenzie 2005). With limited budgets, micro-enterprises may struggle to allocate funds for activities that directly promote OCB, such as employee development programs or teambuilding events. A small workforce can make it difficult to dedicate time and effort to cultivating OCB, as employees may already be stretched thin with their primary job responsibilities.

Role Ambiguity and Workload: In micro-enterprises, employees may have multiple roles and responsibilities, leading to role ambiguity and heavy workloads (Patel and Conklin 2012). This can make it difficult for employees to engage in discretionary behaviors beyond their formal job duties, potentially hindering OCB (P. M. Podsakoff et al. 2000). When employees are juggling multiple tasks and responsibilities, they may feel overwhelmed and find it challenging to prioritize voluntary behaviors that fall outside their defined roles. This role ambiguity and high workload can create stress and burnout, ultimately diminishing employees' willingness or ability to participate in OCB.

Lack of Formal Systems: Micro-enterprises may lack formal human resource management systems, performance evaluation processes, or reward structures (Patel and Cardon 2010). Without these systems in place, it can be challenging to measure, recognize, and reinforce OCB effectively (Organ, Podsakoff, and MacKenzie 2005). In the absence of formal mechanisms for evaluating and rewarding OCB, employees may feel that their discretionary efforts go unnoticed or underappreciated. This lack of recognition can demotivate employees and undermine the long-term sustainability of OCB within the organization.

Informal Culture and Interpersonal Dynamics: Micro-enterprises often have an informal organizational culture and strong interpersonal dynamics (Patel and Conklin 2012). While this can foster a sense of community, it can also lead to conflicts, favoritism, or hesitancy to engage in OCB due to fear of being perceived as a "show-off" or seeking recognition (Organ, Podsakoff, and MacKenzie 2005). In small, close-knit teams, personal relationships and dynamics can significantly influence employee behavior. If interpersonal conflicts or perceptions of favoritism arise, employees may become hesitant to engage in OCB, fearing that their actions could be misinterpreted or met with resentment from colleagues.

Sustainability and Consistency: Maintaining a consistent culture of OCB over time can be challenging, especially as micro-enterprises grow or experience changes in leadership or workforce (Bolino, Turnley, and Bloodgood 2002). Sustaining OCB requires ongoing efforts and a commitment to reinforcing the desired behaviors (Organ, Podsakoff, and MacKenzie 2005). As micro-enterprises expand, the close-knit culture that initially fostered OCB may become more difficult to maintain. Changes in leadership or the introduction of new employees with different values and attitudes can also disrupt the existing culture of citizenship behavior.

Potential for Exploitation: If not managed carefully, micro-enterprises may risk exploiting employees' OCB by taking advantage of their willingness to go above and beyond their formal duties (Vigoda 2006). This can lead to burnout, resentment, and a decline in OCB over time. In their pursuit of productivity and efficiency, micro-enterprise owners or managers may inadvertently rely too heavily on employees' discretionary efforts, gradually increasing expectations without adequate recognition or compensation. This can create an environment where OCB is no longer truly voluntary, but rather an unspoken expectation, leading to employee dissatisfaction and a potential backlash against citizenship behaviors.

Factors influencing the effectiveness of OCB in micro-enterprises

Leadership Style: The leadership style of the manager plays a crucial role in shaping the organizational culture and influencing OCB. Transformational and ethical leadership styles have been found to be positively associated with OCB (Khuong and Hoang 2015) (P. M. Podsakoff et al. 2000). In micro-enterprises, where the leader's influence is more direct, their behavior and actions can significantly impact employees' willingness to

engage in OCB. There should be coherent and co-existing workforce in the organization (Singh and Prasad 2014). A transformational leader who inspires, motivates, and empowers employees is more likely to cultivate a culture of citizenship behavior. Conversely, an authoritarian or unethical leadership style can discourage OCB and foster an environment of mistrust and disengagement (Khuong and Hoang 2015).

Organizational Culture: A supportive and positive organizational culture is essential for fostering OCB in micro-enterprises. Factors such as trust, fairness, and a sense of community can encourage employees to go beyond their formal duties (Patel and Conklin 2012) (Organ, Podsakoff, and MacKenzie 2005). In contrast, a negative or toxic culture can discourage OCB and lead to counterproductive behaviors. Micro-enterprises should strive to create a culture that values and recognizes citizenship behaviors, where employees feel respected, valued, and motivated to contribute to the organization's success.

Employee Motivation and Job Satisfaction: Motivated and satisfied employees are more likely to exhibit OCB. In micro-enterprises, where employee-employer relationships are closer, factors such as job autonomy, recognition, and opportunities for growth can contribute to employee motivation and job satisfaction (Organ and Ryan 1995).

Role Clarity and Job Design: Clear role expectations and well-designed jobs can facilitate OCB in micro-enterprises. When employees understand their responsibilities and have adequate resources, they may be more inclined to engage in discretionary behaviors (P. M. Podsakoff et al. 2000) (Patel and Conklin 2012). If roles are ambiguous or jobs are poorly designed, leading to excessive workload or stress, employees may be less likely to engage in OCB as they focus primarily on managing their core job duties.

Managers should prefer OCB demonstrating employees in hiring process, can encourage competitive advantage (Sharma and Agrawal 2015).

Perceived Organizational Support: Employees, who perceive that their organization values their contributions and cares about their well-being are more likely to engage in OCB (Organ, Podsakoff, and MacKenzie 2005) (Eisenberger et al. 1986). In micro-enterprises, where relationships are closer, fostering a sense of perceived organizational support can be crucial for enhancing OCB. This can be achieved through actions such as providing

adequate resources, recognizing and rewarding employee contributions, and demonstrating genuine concern for employee welfare.

Interpersonal Relationships and Team Dynamics: Strong interpersonal relationships and positive team dynamics can facilitate OCB in micro-enterprises. When employees have good rapport with their colleagues and feel a sense of belonging, they may be more willing to help and support each other (Organ, Podsakoff, and MacKenzie 2005) (Bolino, Turnley, and Bloodgood 2002). Conversely, strained interpersonal relationships or dysfunctional team dynamics can hinder OCB, as employees may be less inclined to go above and beyond for those they do not get along with or trust.

Managers should encourage all type of organizational citizenship behavior. It may through psychosocial working conditions in the area of job satisfaction and possibilities of development (BORTNOWSKA and SEILER 2023)

Findings

The study explores the potential of organizational citizenship behavior (OCB) as a strategy for achieving competitive advantage in context of micro-enterprises.

First of all, the study highlights that OCB can indeed serve as a valuable strategic tool for micro-enterprises to gain a competitive advantage. OCB dimensions such as altruism, conscientiousness, and civic virtue can contribute to enhanced productivity, improved customer service, increased adaptability, positive work environments, cost savings, and competitive differentiation. These benefits are particularly significant for micro-enterprises, which often operate with limited resources and rely heavily on personal relationships and employee discretionary efforts.

However, the study also acknowledges the challenges and limitations that micro-enterprises may face in implementing and sustaining OCB as a strategy. These include limited resources, role ambiguity, and lack of formal systems, informal organizational culture, sustainability concerns, and the potential for exploitation. Addressing these challenges requires a concerted effort from micro-enterprise owners and managers to create an environment that naturally encourages and supports OCB.

The study identifies several factors that can affect the effectiveness of OCB in micro-enterprises, such as leadership style, organizational culture, employee motivation, role clarity, perceived organizational support, and interpersonal relationships. By fostering a positive organizational culture, providing clear role expectations, and nurturing strong interpersonal relationships, micro-enterprises can enhance the impact of OCB on their competitive position.

While the study provides valuable insights into the strategic role of OCB in micro-enterprises, it is important to note that OCB should not be viewed as a panacea or a substitute for effective management practices. Rather, it should be considered as a complementary strategy that can augment other organizational efforts to improve performance and competitiveness.

Conclusion

In conclusion, the study contributes to the understanding of OCB as a strategic tool for micro-enterprises to achieve competitive advantage. By leveraging the potential benefits of OCB and addressing the associated challenges, micro-enterprises can cultivate a culture of citizenship behavior that supports their growth, adaptability, and long-term success in an increasingly competitive business landscape. Cultivating OCB within micro-enterprises can serve as a powerful differentiator, enabling them to stand out in crowded markets and attract both customers and top talent. The discretionary efforts and voluntary contributions of employees engaged in OCB can drive innovation, enhance operational efficiency, and create a superior customer experience – all of which are critical competitive advantages in today's dynamic business environment. By fostering a culture of OCB, micro-enterprises can build a strong sense of community and shared purpose among their employees. This can lead to increased job satisfaction, employee retention, and a more resilient organizational culture that can weather challenges and adapt to changing market conditions. Ultimately, a thriving culture of OCB can contribute to the long-term sustainability and growth of micro-enterprises, enabling them to achieve lasting success.

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CHAPTER 3

RESPONSE SURFACE METHODOLOGY (RSM) BASED PROCESS PARAMETRIC OPTIMIZATION OF Cr (VI) BIO-SORPTION WITH INDIAN GOOSEBERRY SEED POWDER

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Abstract

This work definitely outlines the importance of Box-Behnken Design (BBD) in RSM in order to optimize the process parameter for the batch bio-sorption of Cr (VI) using Indian Gooseberry seed powder. The optimization process employed the Box-Behnken Design (BBD) to explore the variation in concentration of Cr (VI) (20-100 ppm), pH (1-4), dosage of biomass (6-10 g/L). The resulting optimal process parameters are 8.809 g/L Cr(VI) biomass dosage, 1.82 pH and 27.87 mg/L initial concentration, leading to maximum Cr(VI) removal of 75.46%. The model efficacy is explained by regression coefficient of 0.991 between experimental and model response values, affirming its accuracy in forecasting the Cr (VI) removal using gooseberry seed powder in synthetic wastewater. Thereby, the obtained second order polynomial process model parameters are envisaged to be relevant for the modeling and simulation of bio-sorption process in conjunction with other processes in complex waste water treatment process systems.

Keywords: BBD, Indian gooseberry seed powder, Cr (VI), biosorption.

Abbreviations

ANOVA	Analysis of Variance
BBD	Box Behnken design
BSS	British Standard Screen
Cr (VI)	Chromium (VI)
RSM	Response Surface Methodology

1. Introduction

The Ongoing trends of urbanization and industrialization play a substantial role in the substantial escalation wastewater volumes generated from chemical, petrochemical, and refinery operations. Within these wastewater streams, heavy metals constitute a significant component, frequently being discharged into water bodies without regard for specified limits outlined in strict environmental regulations. Consequently, heavy metals pose a noteworthy risk to human populations, aquatic life and other organisms. This emphasizes the global imperative to address water contamination result in from heavy metals presence [1-2]. Among the group of heavy metals contaminants in wastewater, chromium is particularly perilous when existing in its hexavalent state due to its pronounced toxicity, carcinogenicity and mutagenicity [3]. For instance, the presence of $\text{Cr}_2\text{O}_7^{2-}$ has been linked to the onset lung cancer [4-5]. Notably, sources of in wastewater commonly originate from industries such as metal finishing, leather industries and textiles.

Among the assorted components, both the chromium (VI) and Cr (III) are frequently singled out as pivotal factors influencing toxicity risks. It is widely recognized that Cr (VI) exhibits toxicity levels approximately 100 times greater than Cr (III), because of water solubility at higher rate, permeability and susceptibility to reduction [6]. The toxicity of Cr (VI) primary stems from its intrinsic oxidizing properties and its capacity to generate free radicals as it transitions from Cr (VI) component to Cr (III) in living cells [7]. The established permissible threshold for Cr (VI) content in wastewater typically stands at 0.05 ppm [8].

Traditional methods employed for Cr (VI) extraction from wastewater encompass precipitation technique [9], ion exchange technique [10], reduction technique [11], electrochemical process [12], extraction technique [13], membrane process [14], evaporation technique [15] and foam