Retaining Talents among Manufacturing Engineers: Job Embeddedness, Intellectual Capital, and Self-Efficacy

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DOI: https://dx.doi.org/10.47772/IJRISS.2024.8120251

Received: 05 December 2024; Accepted: 13 December 2024; Published: 16 January 2025

ABSTRACT

A disconnection between highly skilled workforces and the talent market has become a critical issue for manufacturing firms. Engineers play a pivotal role in driving innovation and maintaining competitiveness in global markets, directly influencing retention strategies. This study aims to examine the impact of job embeddedness (JE) and intellectual capital (IC) on talent retention among engineers in manufacturing firms. Additionally, it investigates the moderating effect of self-efficacy on the relationship between JE and IC. High levels of JE are hypothesized to enhance employee engagement in work activities and foster innovative thinking. Meanwhile, the presence of strong IC supports stable work behaviors and facilitates the transfer of intangible human assets such as skills and knowledge within organizations. Drawing upon social cognitive theory, job embeddedness theory, and human capital theory, this study develops a theoretical framework to explain the influence of JE, IC, and self-efficacy on engineers' turnover intentions. The framework and associated propositions aim to clarify the relationships between these variables. The findings emphasize the need for more in-depth research into the antecedents of turnover intentions, particularly to align the supply and demand of Malaysian engineers in the manufacturing sector now and in the future.

Keywords: Talent retention, job embeddedness, intellectual capital, self-efficacy, engineers, manufacturing

INTRODUCTION

Manufacturing firms are under increasing pressure to produce high-quality, competitive products and seek efficiency gains through human resources, workflows, and innovative management (Baldwin, Reyes, Kumar, & Lona, 2014; Fortes, Tenera & Cunha, 2023). Industry players heavily rely on internal capabilities to achieve strategic advantages, especially as competition escalates to attract and retain high-skilled engineers, which is critical for business growth (Liu, Gan, & Chen, 2024). The demand for engineers in global firms continues to rise due to their indispensable roles in all phases of the innovation process, to improve competitive advantage, and skill shortages (Fathima & Umarani, 2023; Liu, Gan, & Chen, 2024; Williamson, Lounsbury, & Han, 2013). However, as Bigliardi, Petroni, and Dormio (2005) noted, despite engineers' strong need for professional growth compared to other professions, economic and technological changes have exacerbated the challenges of retaining top talent. According to the 2013 Manpower Talent Shortage Survey, employers anticipate losing 60% of their engineering workforce within the next decade.

In Malaysia, a disconnection persists between productivity, skills, and the labour market (Talent Corp, 2024). Retaining top talent remains a critical priority for key industries such as oil and gas, electronics, communications, financial services, and business services, which are vital in enhancing Malaysia's talent competitiveness and establishing the nation as a talent hub. The 1997 Asian financial crisis exacerbated this issue, significantly reducing the number of expatriates in vital sectors, including manufacturing, which previously served as a platform for knowledge exchange between expatriates and local talent. Consequently, Malaysia must now rely on domestic expertise to compete with global players in producing high-quality products and services. According to the Department of Statistics Malaysia (DOSM) and the Malaysia Productivity Corporation (MPC), labour productivity grew by 5.4% in 2023, but mismatches in skills and industry demands remain evident. A Talent Corp report revealed that 20% of Malaysian graduates are

underemployed in low-skilled jobs, while key sectors report challenges in recruiting adequately skilled professionals. To address this, initiatives such as Upskilling Malaysia, the National Workforce Policy, and collaboration with industries under the Malaysia Digital Economy Blueprint aim to bridge these gaps. However, the effectiveness of these initiatives requires continuous monitoring and industry involvement to ensure that talent competitiveness aligns with market needs. Talent retention remains a critical global challenge, consistently drawing attention from researchers and practitioners alike (Karatepe, 2013; Sahi & Mahajan, 2014; Talukder & Wang, 2023). While many organizations adopt workforce reduction strategies to improve efficiency (Kang, Huh, Cho, & Auh, 2014; Varkkey & Kumar, 2013), the ability to attract and retain top talent has become increasingly vital for sustaining competitive advantage (Islam, Khan, Ungku Ahmad, & Ahmed, 2013; Sahi et al., 2014; Kumar & Arora, 2012).

The financial implications of employee turnover are substantial, with talent retention directly affecting organizational costs (Anvari, Fu, & Chermahini, 2014; Gachter, Savage, & Torgler, 2013; Nouri & Parker, 2013; Sean & Ozer, 2024). However, despite its significance, the determinants of talent retention remain insufficiently understood, particularly within different organizational and industry contexts (Biron & Boon, 2013; Flint, Haley, & McNally, 2013; Johnco, Salloum, Olson, & Edwards, 2014; Kossyva, Theriou, Aggelidis, & Sarigiannidis, 2023). This underscores the need for further research to develop targeted strategies that address the nuanced factors influencing talent retention in diverse professional settings. Since the 1980s, talent retention has emerged as a prominent area of research, gaining significant traction among scholars (Di Prima, Hussain, & Ferraris, 2024; Suaber, Snyir, & Sharifi, 1991). The persistent challenge of losing professional workforces continues to concern businesses, emphasizing the importance of comprehensive strategies to retain talent and mitigate the high costs associated with recruitment and training (Haar & Kelly, 2024; Tymon Jr., Stumpf, & Smith, 2011). Extensive studies have explored the implications of talent retention across various professional domains, including specialized contractors (Kroon & Charissa, 2013), military officers (Gachter et al., 2013), IT professionals (Ghapanchi & Aurum, 2011; Mak & HySockel, 2001), executives (Bergh, 2001), small and medium enterprises (Alzbaidi & Abu Madi, 2023), academic leaders (Davis, 2014), recent graduates (Donald, 2023), and engineers (Abdull Rahman, 2012; Anvari et al., 2014; Kennedy & Daim, 2010; Singh et al., 2013).

Despite this broad scope, there remains a critical gap in research focusing specifically on talent retention among manufacturing engineers, a sector pivotal to industrial innovation and competitiveness. Addressing this gap is essential to developing targeted strategies that can support workforce stability and organizational success in manufacturing. Addressing employee expectations has become a pivotal strategy for enhancing talent retention (Di Prima, Hussain, & Ferraris, 2024; Kossyva et al., 2023; Sean & Ozer, 2024; Yang, Wan, & Fu, 2012). Recent studies have highlighted intention to stay (ITS) as one of the most reliable indicators of talent retention, reflecting employees' commitment to remaining within an organization (Chen & Yu, 2014; Yang, Chen, & Chen, 2021; Aman-Ullah, Aziz, Ibrahim, Mehmood, & Abbas, 2021).

From both organizational and individual perspectives, job embeddedness (JE) has been identified as a strong predictor of talent retention, emphasizing the importance of workplace connections and alignment with employee goals (Aman-Ullah et al., 2021; Reitz & Anderson, 2011; Yang et al., 2021). Moreover, intellectual capital (IC) has emerged as a crucial factor in leveraging intangible organizational assets, such as knowledge, skills, and innovative capabilities (Cortés, Sáez, Manchón, & García, 2015; Kapur & Tyagi, 2023).In parallel, self-efficacy has been recognized as a key mechanism in understanding individual performance behaviors and their influence on talent retention (Opolot, Lagat, Kipsang, & Muganzi, 2024; Podder & Saha, 2024). Despite the critical importance of these factors, there is a noticeable gap in research examining their combined impact on talent retention, particularly within engineering roles, which are essential for driving industrial innovation and operational success. This study aims to fill this gap by investigating the effects of JE, IC, and self-efficacy on talent retention among engineers in manufacturing firms. A theoretical framework and associated propositions are developed to explore the relationships between these variables and provide insights into effective strategies for retaining engineering talent.

Manufacturing Sector in Malaysia and Engineers' Talent Retention

The manufacturing industry in Malaysia has experienced rapid growth, becoming one of the nation's most

significant contributors to economic earnings. In 2024, Malaysia's economy was projected to grow by 2.7%, with the manufacturing sector achieving a higher growth rate of 3.3%. In the 2024 budget, the government forecasted even stronger economic growth of 5% to 6%, with substantial investments allocated to the manufacturing sector, including the development of industries such as automation and electric vehicles. However, the Ninth Malaysian Plan highlighted a critical challenge: the failure to attract high-skilled workers essential for producing high-quality outputs. As part of addressing this issue, the plan emphasized enhancing human capital to create more job opportunities and support workforce mobility. In 2024, the manufacturing sector demonstrated a 5.4% increase in productivity growth, employing 2.2 million people, or 16.8% of the nation's total workforce. The National Key Economic Areas (NKEAs) have identified three primary manufacturing sub-sectors—palm oil, electrical and electronics, and refined petroleum products—as key drivers for employment and progress toward Malaysia's high-income nation goals. According to the Department of Statistics Malaysia (2013), the electrical and electronics sector contributed 25.38% to the sectors value-added, followed by refined petroleum at 15.9% and chemicals and chemical products at 10.6%.

Despite these advancements, the manufacturing sector faces significant challenges, particularly labor shortages, a lack of skilled workers, and high turnover rates. Inconsistencies in labor competitiveness were evident in 2013, with declines in unit labor costs and labor costs per employee. Talent shortages stem from various sources, but limited research has been conducted on the specific factors influencing engineers' decisions to stay with or leave their current employers. Management of engineering talent has long been recognized as a crucial factor. As early as 1990, Kharbanda and Stallworthy emphasized the importance of engineering managers in fostering environments where engineers can express their creative talents.

Teamwork, heavily reliant on engineers' knowledge and skills, has been identified as a vital attribute for ensuring organizational attachment. Newman (1998) highlighted the industry's challenges in attracting future engineering graduates, noting the pressing need for high-quality talent to fill skill gaps. Engineers generally exhibit strong growth orientations and a desire for personal development, support and autonomy (Bigliardi et al., 2005; Fathima & Umarani, 2023). However, changes in economic, social, and technological contexts have compounded the difficulties in retaining engineers. Factors such as external career opportunities and inadequate organizational socialization negatively influence turnover intentions. Supervisor support for career development, including promotion of career opportunities, has been identified as a critical factor in improving engineers' satisfaction and reducing turnover intentions.

Research on engineers' motivation and retention remains scarce (Hazeen Fathima & Umarani, 2023). Kennedy et al. (2010) and Abdul Rahman (2012) classified engineers as knowledge workers critical to Malaysia's labor market. Abdul Rahman further argued that the turnover of engineers negatively impacts the nation by depleting investments in skills, knowledge, and experience. Further, Fathima and Umarani (2023) argue that employers should design and implement a fair, transparent, and effective performance appraisal system that not only evaluates employee contributions but also fosters professional growth through well-defined development opportunities. Engineers possess specialized skills that are both costly and time-consuming to replace, making talent retention a priority for organizations (Hazeen Fathima & Umarani, 2023; Liu, Gan, & Chen, 2024).

High job embeddedness plays a critical role in reducing turnover rates, ensuring that essential expertise is retained (Aman-Ullah et al., 2021; Reitz & Anderson, 2011; Yang et al., 2021). Additionally, when engineers feel deeply connected to their organization, they are more likely to contribute innovative ideas and collaborate effectively, driving enhanced innovation. This sense of connection also boosts productivity, as embedded engineers are motivated to perform at their best, recognizing a clear alignment between their personal growth and the organization's success.

Engineers are essential contributors to an organization's intellectual capital, as they bring specialized knowledge, technical expertise, and creative problem-solving skills that fuel innovation and competitive advantage (Hazeen Fathima & Umarani, 2023; Liu, Gan, & Chen, 2024). Their ability to design, build, and optimize systems, processes, and products transforms ideas into tangible solutions, making them invaluable in creating sustainable growth. Furthermore, engineers' contributions to intellectual capital extend beyond their technical expertise, as they often drive cross-disciplinary collaboration, mentor future talent, and shape industry standards. By investing in engineers, organizations not only enhance their capacity for innovation but also

strengthen their overall intellectual foundation to adapt to evolving challenges and opportunities (Hazeen Fathima & Umarani, 2023). Focusing on gender segmentation, Singh et al. (2013) examined the turnover intentions of women engineers and found positive correlations between self-efficacy, job attitudes, and organizational support. These factors significantly influenced women engineers' job satisfaction, commitment, and turnover intentions. Meanwhile, Williamson et al. (2013) explored the personality traits of engineers contributing to innovation and technological development.

Traits such as openness, teamwork, and entrepreneurial roles were strongly associated with career satisfaction, job performance, mobility, and turnover intentions. Hazeen Fathima and Umarani (2023) investigated how engineers' satisfaction with fairness in human resource practices influences their intention to stay within the Indian construction sector. Their findings revealed a positive correlation between perceived fairness in HR practices such as performance management and employee relations and engineers' intention to remain with their organizations.

Research on engineers' retention remains limited, despite their critical role as knowledge workers and contributors to innovation (Abdul Rahman, 2012; Hazeen Fathima & Umarani, 2023; Kennedy et al. 2010; Liu, Gan, & Chen, 2024). While job embeddedness has been identified as a key factor in reducing turnover, its specific impact on engineers' retention, particularly in manufacturing companies, is not well understood (Aman-Ullah et al., 2021; Reitz & Anderson, 2011; Yang et al., 2021). Similarly, although intellectual capital comprising engineers' technical expertise, problem-solving abilities, and innovation contributions is recognized as a vital asset, there is a lack of empirical studies exploring its influence on talent retention (Cortés, Sáez, Manchón, & García, 2015; Kapur & Tyagi, 2023).

Additionally, factors such as organizational socialization and supervisor support for career development have been shown to reduce turnover intentions, but their interaction with job embeddedness and intellectual capital in retaining engineers has not been thoroughly examined. Self-efficacy, which is known to affect job satisfaction, commitment, and performance, has also received inadequate attention as a potential moderating factor in the relationship between job embeddedness, intellectual capital, and retention outcomes (Opolot, Lagat, Kipsang, & Muganzi, 2024; Podder & Saha, 2024). Moreover, while gender-specific factors influencing women engineers' retention have been studied, broader insights into how these dynamics vary across genders in the manufacturing sector are still lacking. Addressing these gaps, this study seeks to investigate the impact of job embeddedness and intellectual capital on talent retention among engineers in the manufacturing sector, while also examining the moderating role of self-efficacy in these relationships.

LITERATURE REVIEW

Job Embeddedness and Talent Retention

Job embeddedness (JE) is a multi-dimensional framework that explains why employees remain in their roles, encompassing three critical components: fit, links, and sacrifice (Martdianty, Coetzer, & Susomrith, 2020; Fuchs, 2022). Fit refers to the perceived alignment between an employee's values, goals, and work environment. Links represent the connections employees form with colleagues, their organization, and their community. Sacrifice reflects the tangible and intangible costs whether material, psychological, or social associated with leaving a job (Aman-Ullah et al., 2021; Mitchell et al., 2001; Reitz & Anderson, 2011; Thome & Greenwald, 2020; Yang et al., 2021). Collectively, these dimensions reveal the extent to which employees are "embedded" in their professional and personal ecosystems.

Mitchell, Holtom, Lee, Sablynski, and Erez (2001), Thome and Greenwald (2020); Yang et al. (2021) emphasize that the strength of these JE components is inversely related to turnover intentions, with stronger fit, links, and sacrifice reducing the likelihood of employees leaving their roles. For example, Fuchs (2022) and Yang et al. (2021) found that employees with extensive organizational and community ties, high compatibility with their work environment, and significant anticipated sacrifices are more likely to stay. JE incorporates individual, organizational, and contextual factors, offering a holistic approach to understanding employee retention. Human resource practices also play a pivotal role in fostering JE. Bergiel, Nguyen, Clenney, and Taylor (2009) observed that HR strategies that promote opportunities for employees to develop links, achieve

better alignment with organizational culture, and recognize the benefits of staying contribute significantly to reduced turnover intentions and increased retention. Holtom, Mitchell, and Lee (2006) further noted that individuals with diverse roles and strong professional relationships are less likely to leave, as these factors strengthen embeddedness in both work and non-work contexts.JE has demonstrated its utility across diverse fields. For example, in addressing nursing shortages, Reitz et al. (2011) showed that JE strategies such as fostering community ties and offering retention incentives can identify at-risk employees and enhance retention. Fuchs (2022) found that the negative relationship between job embeddedness and turnover intention is stronger among less embedded employees with high self-efficacy. The finding also indicates that turnover intention plays a significant mediating role in the relationship between job embeddedness and actual turnover. With regard to theoretical implications, each dimension of job embeddedness has been examined individually in relation to Generation Y's intention to quit.

JE's effectiveness as a retention strategy has been validated across various contexts. Thome and Greenwald, (2020) demonstrated that the distance an employee relocates for a job influences their voluntary turnover behavior, with one form of embeddedness, educational reimbursement, moderating the relationship between relocation distance and voluntary turnover. Additionally, other types of embeddedness, such as assimilation programs and employee contributions to local non-profits, directly reduce the likelihood of voluntary turnover. Offering educational reimbursement is particularly important, especially for employees who have relocated for their positions. This study also highlights the significance of assimilation programs and company-sponsored financial contributions to non-profits, as these initiatives directly influence voluntary turnover behavior. In conclusion, JE provides a comprehensive framework for understanding and enhancing employee retention. By focusing on strengthening fit, links, and sacrifice, organizations can address turnover effectively and foster long-term commitment. This approach shifts the emphasis from merely preventing turnover to proactively building retention strategies tailored to diverse professional contexts. Thus, the propositions of the JE were developed as below:

Proposition 1a: Links have a positive impact on talent retention among engineers in the manufacturing firms

Proposition 1b: Fits have a positive impact on talent retention among engineers in the manufacturing firms

Proposition 1c: Sacrifices have a positive impact on talent retention among engineers in the manufacturing firms

Intellectual Capital and Talent Retention

The concept of intellectual capital (IC) has emerged as a critical driver of organizational value, attracting significant scholarly and practical interest (Aman-Ullah et al., 2021; Dženopoljac, Ognjanović, Dženopoljac, & Kraus, 2023; Nkambule, Wang, Ting, & Lu, 2022; Pedrini, 2007). IC encompasses an organization's knowledge assets, including investments in information, intellectual property, and employee expertise (Seetharaman, Low, & Saravanan, 2004; Kong, 2007). It is broadly categorized into three core components: human capital, structural capital, and relational capital (Bontis, 1998; Roos et al., 1997). Human capital refers to employees' skills, competencies, attitudes, and talents, while structural capital covers organizational processes, systems, and intellectual property. Relational capital reflects the value derived from relationships with customers, partners, and stakeholders (Dženopoljac et al., 2023; Nkambule et al., 2022). Recent research has extended the IC framework to include additional dimensions such as customer capital, process capital, and innovation capital, highlighting its multifaceted nature (Dženopoljac et al., 2023; Khan, Mubarik, Ahmed, Islam, & Rehman, 2024; Nkambule et al., 2022; Tseng, Lin, & Yen, 2015). Human capital, in particular, goes beyond individual skills and knowledge, encompassing employees' capacity to utilize organizational resources effectively to achieve strategic goals (Cortés et al., 2015; Nkambule et al., 2022). Effective management of IC is fundamental to organizational success, as poorly managed human capital directly undermines productivity and performance. For instance, Peng, Pike, and Roos (2007) noted that in Taiwan's healthcare sector, IC management remains underdeveloped, leading to fragmented performance metrics such as turnover rates and employee satisfaction, which fail to provide a comprehensive understanding of success. Similarly, Ferenhof, Durst, Bialecki, and Selig (2015) emphasized that a multidimensional approach encompassing human, structural, relational, and social capital is critical to achieving superior performance outcomes. In developing

nations, IC valuation and utilization often lag behind global standards. Khalique, Bontis, Shaari, and Md Isa (2015) identified IC as a vital success factor for knowledge-intensive industries, yet it is frequently undervalued in contexts such as Pakistan's SMEs. While human capital significantly enhances organizational performance, it is often overshadowed by other forms of capital, including customer, structural, and social capital. This underappreciation suggests a need for greater managerial focus on human capital investment. The influence of IC extends beyond organizational performance to work behaviors and career development. Longo and Mura (2011) found that structural capital plays a pivotal role in employee retention, while human capital positively affects both structural and relational capital. Furthermore, IC is a critical enabler of innovative work behaviors, as Khan et al (2024) demonstrated, linking human, structural, and relational capital to servant leadership's effectiveness in fostering innovation.

IC also supports individual career growth by facilitating the development of social and relational capital. Lin and Huang (2005) applied social capital theory to show that human and social capital synergies significantly enhance career outcomes. This alignment underscores the importance of integrating IC strategies into talent management frameworks to foster both organizational retention and employee development. This study focuses on four key components of IC, such as human capital, structural capital, relational capital, and social capital to examine their predictive influence on talent retention, highlighting their critical role in aligning organizational strategies with workforce needs. By addressing gaps in IC research and its practical application, organizations can unlock new pathways to enhance employee satisfaction, innovation, and long-term success. By examining these dimensions, the study seeks to provide insights into how IC can be leveraged to enhance organizational effectiveness and talent retention. Hence, the propositions were developed below:

Proposition 2a: Human capital has a positive impact on talent retention among engineers in the manufacturing firms

Proposition 2b: Structural capital has a positive impact on talent retention among engineers in the manufacturing firms

Proposition 2c: Relational capital has a positive impact on talent retention among engineers in the manufacturing firms

Proposition 2d: Social capital has a positive impact on talent retention among engineers in the manufacturing firms

Self-efficacy and Talent Retention

Self-efficacy, a concept rooted in Albert Bandura's social cognitive theory (1986), refers to an individual's belief in their capability to successfully perform specific tasks. Bandura posits that individuals with high self-efficacy are more likely to anticipate success in achieving goals, influencing how they think, feel, and act compared to those with lower self-efficacy. These beliefs are shaped by performance accomplishments, vicarious experiences, verbal persuasion, and emotional arousal. The strength of these beliefs significantly impacts motivation, decision-making, and behavior, enabling individuals to organize and execute actions that achieve desired outcomes. Bandura also emphasizes self-efficacy's critical role in organizational decision-making, career choices, and career development (Opolot et al., 2024; Podder & Saha, 2024). The extensive literature underscores the profound influence of self-efficacy on workplace outcomes. Malaeb (2022) provided new evidence on the relationship between self-efficacy, burnout, and turnover intentions among Lebanese nurses, illustrating self-efficacy's critical role in mitigating burnout and improving work-life quality.

In other other, Chami-Malaeb (2021) provides new evidence on the relationships between perceived supervisor support, self-efficacy, burnout, and turnover intention among Lebanese nurses. It uniquely examines the role of nurses' self-efficacy in relation to burnout and turnover intention, contributing to the improvement of nurses' work-life quality. The findings highlight the critical role of supervisors in supporting the psychological well-being of nurses. Additionally, the study's context of Lebanon offers a novel perspective, as it differs institutionally, culturally, and legally from advanced economies in terms of employee-supervisor relationships. High self-efficacy equips employees to manage workplace challenges effectively, perceiving fewer barriers in

meeting expectations. Supportive interactions, such as effective supervision, further enhance retention, particularly among child welfare workers with varying self-efficacy levels (Chen et al., 2010). Additionally, Restubog, Florentino, and Garcia (2010) found that self-efficacy mediates the relationship between career counseling and decision-making, strengthening students' career resolve. AlMazrouei and Zacca (2021) reveals that job satisfaction fully mediates the relationship between cultural intelligence and turnover intention, and partially mediates the relationship between cultural intelligence and creative self-efficacy. It contributes to international business literature by exploring how, an area rarely studied. Research also highlights the broader implications of self-efficacy in fostering organizational success. Alhajaj and Ahmad (2024) investigated the impact of perceived human resource management practices on talent turnover intention, with work engagement serving as a mediator and self-efficacy as a moderator. The findings reveal that employees' perceptions of pay satisfaction, empowerment, participation, and communication significantly enhance work engagement. Additionally, work engagement negatively influences talent turnover intention and mediates the relationship between individual human resource management practices and talent turnover intention. Self-efficacy also moderates the effects of emotional dissonance and counterproductive work behaviors. Cretu and Burcas (2014) reported that high self-efficacy, combined with self-monitoring, reduces counterproductive behaviors and enhances vitality and dedication, even in challenging emotional environments. This underscores the importance of cultivating self-efficacy to maintain productivity, job satisfaction, and ethical behavior. By fostering self-efficacy through training, supportive leadership, and human-centric organizational practices, organizations can build a motivated, resilient workforce. The multifaceted benefits of self-efficacy ranging from improved performance and engagement to reduced stress and turnover make it an essential asset for organizational success and individual growth. Its capacity to influence behavior, drive motivation, and align individual capabilities with organizational goals highlights its strategic value in the modern workplace. Due to limited findings of moderating role of self-efficacy between JE and IC in predicting talent retention among engineers, these propositions were formulated as follows:

Proposition 3a: Self-efficacy moderates in the relationship between JE and talent retention among engineers in the manufacturing firms

Proposition 3b: Self-efficacy moderates in the relationship between JE and talent retention among engineers in the manufacturing firms

Conceptual Framework

Figure 1 shows a theoretical framework to guide the measurement of the impact of each variable.

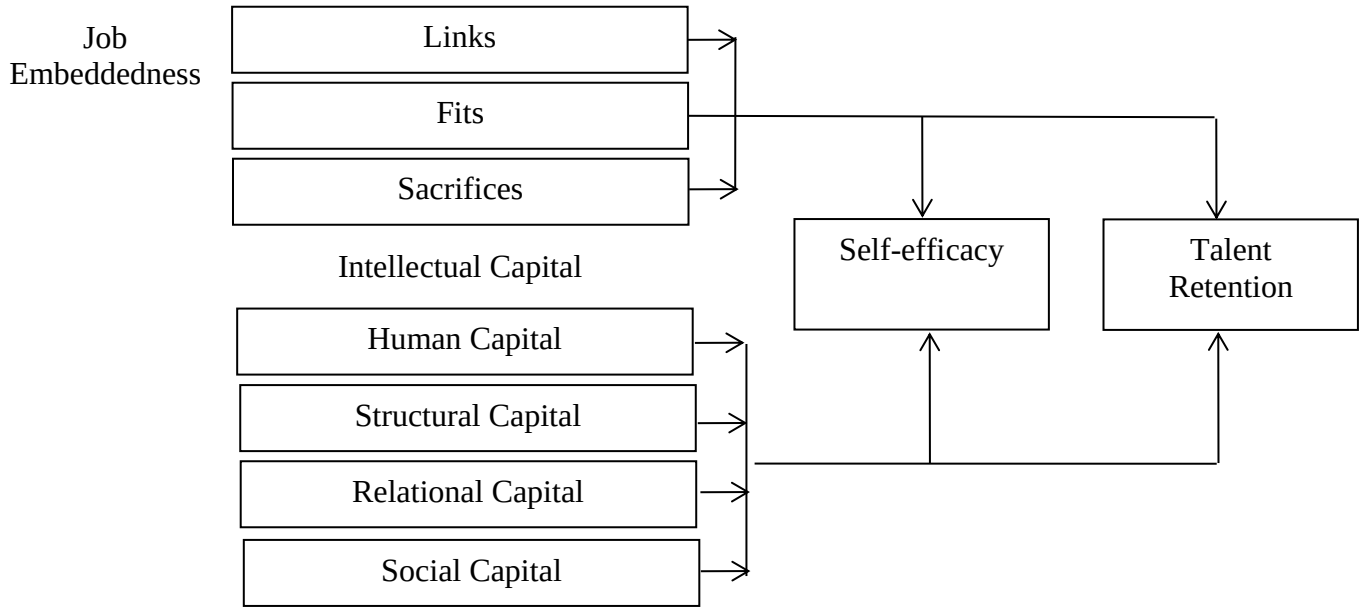

Fig. 1 Conceptual Framework

DISCUSSION

Talent retention remains a pervasive challenge in employment relationships and has garnered significant attention from researchers and practitioners (Di Prima et al., 2024; Haar & Kelly, 2024; Liu et al., 2024). Despite considerable efforts to address this issue, managing employee turnover effectively remains complex, with organizations struggling to identify precise tools and strategies for resolution. Employee turnover is not merely an organizational obligation but a strategic imperative, pushing businesses to develop competitive solutions to this persistent problem. Addressing turnover is crucial to meeting the growing demand for high-skilled workers and sustaining a competitive edge. This requires organizations to analyze internal capabilities and external opportunities to outpace competitors. In Malaysia, the focus on expanding talent pools across various industries is vital to sustaining competitiveness. Talent Corporation Malaysia has highlighted the pressing need to retain top talent in response to increasing demand across industries. However, a concerning forecast suggests Malaysia's performance may drop in the Global Talent Index rankings by 2015 compared to the past three years. To support Malaysia's economic strategies, aligning the availability of high-skilled employees with industry requirements is essential for driving investments. The Economic Transformation Programme (ETP) underlines the need for creating more skilled jobs to achieve Vision 2020. Notably, critical gaps in talent exist across business services (85%), communication, content, and infrastructure (81%), electronics and electricals (57%), healthcare (57%), and oil, gas, and energy (53%). These sectors are pivotal for talent growth within Malaysia's manufacturing and broader industries. Like other sectors, the manufacturing industry also faces significant challenges in managing talent turnover.

Despite extensive research, knowledge on the talent retention of high-skilled workers remains limited (Biron et al., 2013; Flint et al., 2013; Hazeen Fathima & Umarani, 2023; Kennedy et al. 2010; Liu, Gan, & Chen, 2024). Strategic talent management involves retaining talent while aligning external demand with organizational needs. Talented workers, characterized by exceptional knowledge, skills, and capabilities, often exhibit unique personality traits and behaviors. These factors influence their responses to organizational policies and changes. Attracting and retaining such individuals often lies beyond the immediate control of employers, with turnover ultimately driven by employee decisions. A critical step in improving talent retention lies in assessing employee expectations and intentions. Traditionally, talent retention has been defined as the rate at which employees stay an organization. Various factors influencing talent retention have been explored in research, yet no study has comprehensively measured job embeddedness, intellectual capital, and self-efficacy as predictors of talent retention among engineers in Malaysian manufacturing firms. A holistic approach integrating JE and IC is essential for influencing employees' decisions to remain with their current employers. Recent studies suggest that JE and IC are critical determinants of improving talent retention.

Engineers, as knowledge workers, require human, social, and technological capital to support innovation and development in manufacturing. Traits such as openness and critical thinking are essential for adapting to technological demands. Longo et al. (2011) highlighted the positive impact of IC on employee retention, particularly the roles of human, structural, and relational capital. Scholars agree that these components of IC are integral to achieving both individual and organizational outcomes (Cortés, Sáez, Manchón, & García, 2015; Ferenhof et al., 2015; Kapur & Tyagi, 2023; Khalique et al., 2015; Lin et al., 2005; Longo et al., 2011; Seetharaman et al., 2004). Self-efficacy, a concept rooted in Albert Bandura's social cognitive theory, has also gained prominence as a factor influencing employee outcomes. Researchers have found that self-efficacy is linked to various positive outcomes, including motivation, commitment, leadership, job satisfaction, career decidedness, and work engagement (Alhajaj & Ahmad, 2024) AlMazrouei & Zacca, 2021; Chen et al., 2010; Malaeb, 2022). Employees with high self-efficacy exhibit greater resilience, adaptability, and persistence, enabling them to build stronger relationships with their employers (Opolot et al., 2024; Podder & Saha, 2024). Despite these advances, uncertainties remain regarding the relationship between JE and IC in talent retention, particularly when mediated by self-efficacy among engineers in Malaysia's manufacturing sector. A deeper understanding of these dynamics is critical for crafting effective strategies to address talent retention and enhance organizational performance.

CONCLUSIONS

This study examines the evidence on talent retention, focusing on the roles of job embeddedness (JE),

intellectual capital (IC), and self-efficacy. The study suggests that employees' expectations and behaviors significantly influence their decisions to stay an organization. However, due to practical constraints, this paper does not provide a comprehensive review of these elements, as there is limited empirical data to fully capture the interrelationships among these variables in the existing literature. Furthermore, challenges arise in presenting robust evidence specific to engineers' talent retention in the manufacturing sector. A more inclusive study would require examining diverse employee groups, including core and contingent staff, individuals at all hierarchical levels, and workers from various industries and roles. Future research should explore talent retention trends in other critical sectors in Malaysia, such as nursing, hospitality, education, call centers, entertainment, sports, and others, to better understand sector-specific dynamics.The existing literature falls short in offering an accurate and comprehensive model for understanding intention to stay antecedents. Although studies like those by Abdull Rahman (2012), Anvari et al. (2014), Bergh (2001), Chen et al. (2014) Donald, (2023), Gachter et al., (2013), Ghapanchi and Aurum (2011), Kennedy and Daim (2010), Kroon and Charissa (2013), Mak and HySockel (2001), Peachey, Burton, and Wells (2014), and Singh et al. (2013) have made strides, there remains a significant gap in research linking talent retention with actual behavior through complete models. This study's propositions aim to aid practitioners in understanding the roles of JE, IC, and self-efficacy and their impact on talent retention among engineers in manufacturing firms. More robust talent retention models need to be developed to clarify misconceptions and improve the interpretation of employees' intentions to remain with their organizations.

This study relies on secondary data to evaluate the impact of JE, IC, and self-efficacy on talent retention, offering valuable theoretical insights but lacking empirical validation. Future research should prioritize empirical investigations that employ validated instruments from prior studies to measure the actual effects of these variables on talent retention. Such studies would provide critical evidence to support or refute the propositions presented here. Quantitative methods, in particular, hold significant promise for delivering precise measurements and assessing the interplay among these variables.

While this study highlights JE, IC, and self-efficacy, other potential antecedents should be explored to further improving talent retention. It is believed that employees' traits and personalities play a crucial role in complementing turnover antecedents. Strategies to mitigate turnover might involve enhancing career opportunities, fostering emotional intelligence, promoting work-life balance, offering competitive compensation and benefits, and cultivating organizational culture and leadership. Future research could also investigate the role of workplace diversity in influencing talent retention. Diversity might serve as a moderating or mediating factor in shaping turnover intentions, offering fresh insights into organizational dynamics. Additionally, the impact of talent retention could be explored from an Islamic perspective, a dimension that has been largely overlooked in the existing literature. Addressing these areas could significantly expand our understanding of talent retention and inform more effective management practices.

ACKNOWLEDGMENT

I would like to thank to the reviewers for the thoughtful comments and suggestions for the improvement of this paper.

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