Guest editorial

Sustainable career and innovation during manufacturing transformation

Introduction

> Careers as we know them have died. The career as a series of upward moves, with steadily increasing income, power, status, and security is now a thing of the past. By Hall (1996)

Global manufacturing workers are facing unprecedented career challenges due to digitization and automation of manufacturing processes. Demand of uneducated, manual labor has fallen precipitously whereas demand for educated, knowledgeable and highly skilled technical workers is on the rise. This changing landscape means that lifetime employment and career security are no longer the norm in contemporary manufacturing environment (Schreurs *et al.*, 2015; Rafiq and Chin, 2019).

Our research team visited several unmanned food and pharmacy factories in Malaysia, Singapore and China in the late 2018. Looking through the glass partitions we could see thousands of square meters of clean, tidy and modern workshops with a variety of machines and robotic arms working 24 h a day, but could not see a human employee. This shocking scene is very different from that of 10 years ago when most of the factories were heavily reliant on a large number of cheap labor engaging in simple and repetitive tasks as their primary competitive advantage. Notwithstanding the popularity of this unmanned operation has mitigated previous concerns about exploiting labor, especially those low-skilled, blue-collar ones (Chin and Liu, 2015; Rafiq *et al.*, 2019), the increasingly prevalent use of smart machines and robots with artificial intelligence (AI) to replace human jobs has caused new concerns for not only individuals and firms but also for societies and governments about career sustainability and innovation ability among such workers (Dahl, 2011; Jiao *et al.*, 2013, 2015; Koekemoer *et al.*, 2018; Chin, Li, Jiao, Addo and Jawahar, 2019).

How does career sustainability relate to innovation: positive, negative or both?

From a positive angle, along with the advent of the Industrial Revolution 4.0 that has and will continue to transform the nature of manufacturing jobs and careers, some proactive workers are observed to actively engage in a form of crafting behavior (Akkermans and Tims, 2017) – taking the initiative to re-organize and shape their prescribed jobs by changing the scope, tasks or working relationships to better fit their motives, strengths and passions, and thereby creating sustainable careers. This job crafting can be very conductive for employees to highlight their own unique value under such a tough situation of diminishing job opportunities and limited career mobility. Viewed from this angle, we further argue that albeit the threat of involuntary technological unemployment facing manufacturing employees (Frey and Osborne, 2017), the desire to pursue sustainable careers may still kindle the interest of more proactive ones in performing innovative work behaviors.

From a negative stance, although the continuously heightened job demands coupled with increasing job insecurity may to a certain extent propel factory employees to learn expertise in new, previously unfamiliar domains for sustaining careers, the constant strain, in turn, may also exhaust their energetic resources and dis-encourage their work engagement. In light of the conservation of resource (COR) theory (Hobfoll, 2011), intense stress at work that often raises individual fear of losing resources, may lead to critical fatigue and health problems – which is very likely to inhibit employee motivation to

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engage in innovation activities with relatively high risks and uncertainties. As such, seeking the sustainability of manufacturing careers today may sometimes become a heavy burden that results in negative impact on workers' sense of well-being and thereby stifling their passion to innovate.

In consideration of the foregoing, we contend that the fast-paced technological advancement has caused an unheard-of career pandemonium for all levels of manufacturing employees, given the influence of their pursuit for sustainable careers on firm innovation can be positive, negative or both. However, in spite of its significance, the dynamic interplay between career sustainability and innovation among manufacturing workers remains a largely under-researched domain, as digitalization is a relatively recent, continuously evolving phenomenon.

Objectives of the special issue

Given the scarcity of research on these topics, with the support from Editor-in-chief Professor I.M. Jawahar, we organized a special issue (SI) in an attempt to bring to fore ideas, issues and concerns related to this topic. The primary purpose of this SI is to gain a greater understanding of the career-related challenges facing global manufacturing employees in this new digital era from more comprehensive, systematic and cross-disciplinary perspectives. Particular attention is thus paid to linking external innovation dynamics with internal career construction and management of manufacturing organizations based on more pragmatic and multidisciplinary approaches. In short, we aim to contribute to the conceptual clarity of the evolving notion of sustainable careers and thereby expound how managers and workers seek their career sustainability under such a transition context.

A SI workshop was hosted by two guest editors in Beijing Normal University on June 26, 2018, where 9 of 42 submitted abstracts and full papers were presented, and about 35 scholars plus several PhD students participated in the discussion. After a rigorous peer-review process, 11 papers were selected to be included in our SI that covers both the fifth and sixth issues of *Career Development International* in 2019. We would like to show our sincere gratitude to Professor I.M. Jawahar again for his marvelous guidance in leading us to complete this SI, and to the outstanding efforts of quite a few dedicated reviewers; without their valuable contributions, this SI would not have been possible.

Overview of studies

Built upon a systematic, comprehensive review of literature, the paper written by Chin, Li, Jiao, Addo and Jawahar (2019) integrates the job demands-resources (Bakker and Demerouti, 2017) and COR theory to propose a novel, context-specific framework constituted by four dimensions (i.e. resourceful, flexible, renewable and integrative and RFRI) – which introduces a new measure of "career sustainability" among manufacturing employees during a highly dynamic period of technological revolution. This new RFRI scale clearly illustrates the positive effects of continuous learning, organizational support and governmental involvement on workers' career sustainability, but also acknowledges pessimism regarding the link between sustaining careers and undertaking innovation by ordinary employees who are aged, less-educated or both. It indicates that such workers, particularly those in emerging and low-income countries, often lack critical resources to bear the potential risks and overcome the predicaments in taking bold and innovative actions.

In contrast, the paper written by Cillo *et al.* (2019) incorporates knowledge management into the career domain, taking an optimistic perspective on the building of a learning culture and its association with career sustainability of blue-collar workers in Italian smart manufacturing companies. Their research draws our attention to a previously under-investigated work group, namely the blue-collar labors (Koekemoer *et al.*, 2018), and offers fresh insights into why soft skills are considered as a newly required competency for

such workers to sustain their careers in high-tech innovative firms. Their results also highlight the positive mediating effect of workers' commitment to develop soft skills on the relationships between organizational learning (i.e. knowledge exploration, exploitation and transformation among blue-collar employees within organizations) and workers' career success in the context of ongoing manufacturing innovation. In comparison, Zhang *et al.* (2019) who deem career adaptability as a vital psychological resource seem to show a more neutral stance on how employees construct their careers in response to the changes brought by automation technology. They suggest that when perceiving more threat or less opportunities employees may either perform passive vocational behaviors such as shifting to another industry or engage in innovative vocational behaviors like job crafting.

China as the world's biggest manufacturing hub and the second largest economy is undergoing a new round of industrial transformation toward "Made in China 2025" that reflects the arrival of the new information age. For the past three decades, a vast number of peasant workers had rushed into the industrialized coastline cities for seeking more economically rewarding jobs in China's fast-growing manufacturing sector. Despite the great contributions of these rural laborers to China's stunning economic growth, they in general were merely able to earn a bare living and suffered severe inequality in wage and education in urban cities in the past. Fortunately, since the Chinese government has largely overhauled the household registration (*hukko*) system, those migrant workers could finally gain far better pay and avoid being discriminated against as second-class citizens in the early twenty-first century.

Nevertheless, in the recent years, the wide application of AI and information technologies has ruined the traditionally stable bureaucratic career systems of Chinese manufacturing, inducing a career crisis among manufacturing employees. This unfavorable situation where workers are suffering from the intensifying anxieties of not being able to innovate and thereby being laid off has raised quite a few perplexing social and environmental concerns in this context.

The following three papers focus on linking corporate social responsibility (CSR) to employees' concerns of occupational development. Hu *et al.* (2019) and Li *et al.* (2019) shed light on the positive impact of CSR performance in affecting career development of top management and innovative behaviors of non-managerial employees in Chinese manufacturing, respectively. Yang *et al.* (2019) argue that the magnitude of a safety accident does matter, as it significantly affects the occupational decisions of manufacturing employees. Their study also reports that the company's CSR initiative may moderate the negative impact of accident magnitude on employee turnover.

Yu *et al.* (2019) use a sample of 468 employees in 20 manufacturing firms in Taiwan, China, demonstrating how the various roles of the four dimensions of psychological capital play in affecting creativity among employees, whereby their career can be sustained. Beyond the micro-level concerns, the following paper addresses how environmental factors such as policy environment, workplace health and safety influence workers' career development and choice. Bao *et al.* (2019) bring to our notice the mediating role of middle-level managers' openness toward change and the moderating role of top managers' bottom-line mentality on the relationship between the impact of macro-level environmental policies on middle managers' proactive behavior in Chinese manufacturing. While the Chinese government has constantly reinforced the policies regarding prevention and control of environmental pollution and ecological destruction, their findings that underscore the extraordinary importance for middle managers to deal with the continuously-updated environmental regulations for career growth thus carry unique practical implications.

Moving from the focus on describing various career-related challenges posed by the contemporary digital transformation among manufacturing workers of both supervisory and non-managerial positions, Xiao *et al.* (2019) advance to investigate whether the formulation of

proper human resource strategies help reduce employees' career-related stress. Their research suggests that a well-designed Employee Stock Ownership Plan as a typical, broadly-adopted financial incentive for retaining high-level talents in MNEs also facilitates workers of China's large, listed manufacturing firms to achieve career sustainability and stability. Chen *et al.* (2019) propose a conceptual framework embodying how disruptive technologies lead to three new types of occupational transition strategies (i.e. industry-oriented, technology-oriented and comprehensive transition strategies) that enable middle-skilled workers to sustain their manufacturing careers. Caputo *et al.* (2019) who investigated 1,227 employees of 37 entrepreneurial firms in Europe indicate the urgent need of developing ambidextrous workforces for organizations to cope with labor market turbulence.

Future research agenda

Overall, the final 11 studies shed light on a variety of occupation-related opportunities and threats encountered by manufacturing employees of different job positions who seek sustainable careers under severe pressure to innovate. Their findings are instrumental to enhancing conceptual clarification of sustainable careers and provide novel perspectives to the intriguing mechanisms between employee career sustainability and organizational innovation – which reveals a more holistic picture characterizing the changing career landscape in a new, digitalized manufacturing environment. In addition to remarkable theoretical implications, these studies also offer practical advices for manufacturing firms to formulate career strategies and take possible strategic actions in tackling the innovation challenges with respect to their workers' career sustainability. We believe that this SI partly answers to a renowned puzzle raised by Hall and his associates in the late 1990s about "what the 21st career looks like."

Whereas quite a few scholars have called for new ways of thinking on conceptualizing career sustainability and have suggested some important and meaningful avenues for future research (Chin, Yang, Zhang, Yu and Cao, 2019), below we only outline several emerging trends on relevant issues with a focus on the innovative context of digital manufacturing.

Gig work and career sustainability

The gig economy model (also known as the "shared economy") underpinned by digital platforms and AI has sharply disrupted our traditional understanding of employment relationships and career sustainability in manufacturing. This gig model that may provide individual workers more flexibilities and opportunities to take back control over their work–life balance are sometimes especially welcome by younger working population (Bamber *et al.*, 2017). Optimists even argue that the newly-emerging labor platform has promising potential to create jobs for those workers with less access to traditional career opportunities (Fabo *et al.*, 2017). Nevertheless, this new form of employment may also cause negative concerns about the deprival of career security. Despite some public debates on the positives and negatives of the growing gig workforce (Benach *et al.*, 2014), there is very little empirical research examining opportunities and challenges. As such, the mechanism between gig work and career sustainability might offer fruitful avenues for future research.

Developing workers' meta-competencies for sustaining careers

Whereas the innovation capacity of a firm mainly hinges on the motivation of human capital, instead of automation technology infrastructures (Malhotra *et al.*, 2016), the technological upgrading and industrial revolution currently underway are expected to keep pushing manufacturing firms to accelerate their speeds of innovation by recruiting for multinational and knowledgeable workers instead of those cheap yet less-literate ones. However, while many manufacturing firms still have deficiencies in training less-educated

blue-collar workers the crucial soft or meta skills (e.g. critical thinking and the ability of learning how to learn) to realize innovation (Chin, Li, Jiao, Addo and Jawahar, 2019), identifying and developing key meta-competencies that enable manufacturing employees sustain careers might be another promising direction for future research.

Pursuing protean yet sustainable careers beyond boundaries

The findings of SI imply that it is more appropriate to study career sustainability as a dynamic phenomenon that fluctuates within persons rather than the organizations and occupations in which they worked, as contemporary workers may prefer to self-direct their career development, self-assess career success and to be recruited by multiple employers simultaneously. More specifically, unlike in the past where people often spent a lifetime developing a single career identity and followed a linear upward career path, the younger generations may be more willing to pursue shorter-term agreements with their employers, thereby remaining open to new experiences and opportunities. Integrating this spirit of protean career (Hall, 2004) into our understanding of sustainability of careers promises new avenues of research and insights.

Conclusions

Transcending technological competitions with more humanistic care

Without a doubt, the job and skill requirements in this modern digital era have far greater complexity than those in the past, which necessitates the development of new person–job fit, occupational competences and appraisal indicators. Production workers nowadays usually need to be trained for operating computerized equipment and electronic devices, and for getting professional licenses from a variety of globally-recognized, impartial and authoritative third party such as the ISO auditor certification, so as to execute quality testing as prescribed in international trade regulations. In the past, factory workers were not expected to have such high levels of skills and knowledge (including both breadth and depth) for undertaking critical and creative thinking, or to display some specific contextual performance that helps constitute a proper social context for fulfilling innovative job assignments (Jawahar and Ferris, 2011). It is thus plausible to see rising employee turnover and career indecision in today's manufacturing enterprises.

Taking together the foregoing arguments, we conclude that digitalization and automation indeed signify a crucial turning point for global manufacturing employment, the pursuit for career sustainability in such context may not only refer to seeking a long-term stable employment but also to obtaining a sense of personal achievement and satisfaction (Jawahar and Liu, 2017). However, it is worth noting that the digitalized world may bring the spring of hope for young and knowledgeable workers, but the winter of despair for middle-aged and low-educated ones. As such, apart from the focus on the interrelationship and interaction between career sustainability and innovation, we believe more care and compassion should be given to mature-age, mid-career and gig manufacturing employees. It is imperative for global entrepreneurs and policy makers to take the initiative for promoting a positive humanistic spirit in the course of technological innovation whereby happiness and well-being of manufacturing workers can be enhanced.

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