Highlights

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Domain Knowledge of Inventory and Supply Chain as a Firm's Competitive Assets

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Abstract

This study aims to investigate and emphasize the importance of reevaluating the role of domain knowledge and its relationship with inventory and supply chain management aiming to explore their interconnectedness and implications for operational performance. This study constructed a conceptual model that draws upon existing models and literature, shedding light on the intricate relationships within this sphere. The study's findings have not only underscored the significant link between inventory knowledge and supply chain information, both sourced from domain knowledge management but have also suggested their profound impact on a firm's operational performance. The future prospects for advancing knowledge in inventory and supply chain techniques are undeniably promising, demanding further empirical exploration. Subsequent research endeavours could delve into the effective utilization of knowledge, the transformative influence of emerging technologies, and the integration of sustainability practices, all within the dynamic domains of inventory and supply chain management, ultimately contributing valuable insights to inform strategic decisions for businesses navigating an increasingly complex and evolving global landscape.

Keywords: Domain Knowledge, Inventory Knowledge, Supply Chain Knowledge, Operational Performance, Information Systems.

1. Introduction

Integrating formal models of design challenges and emphasising the knowledge domain contribute to a more comprehensive

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and practical approach to information system (IS) design (Manthou *et al.,* 1996). By bridging the gap between technical implementation and domain-specific knowledge, researchers and practitioners can create modelling environments that produce IS solutions tailored to the intricacies of inventory management.

Since the early 1990s, knowledge management has been a prominent topic in the business world (Civi, 2000). The advancements and modernization in information technology have played a significant role in the recent emergence of various practices and techniques related to domain knowledge in inventory management (Kumar *et al.*, 2018). These advancements have introduced new tools and capabilities that enhance the tactical understanding of inventory management, leading to improved operational performance. Operations management (OM) focuses on the design, planning, execution, and control of business operations to achieve efficiency, effectiveness, and competitiveness. It involves managing resources, processes, and systems to deliver customer products or services. OM encompasses various aspects such as supply chain management, production planning, inventory management, quality control, and process improvement (Ho *et al.*, 2002). Information systems, on the other hand, deal with the design, development, implementation, and management of computer-based information systems that

support organizational processes and decision-making. IS uses technology, data, and information to facilitate efficient and effective operations, enhance communication and collaboration, and enable strategic decision-making.

Integrating OM and IS is crucial for organizations to achieve operational excellence and gain a competitive advantage. Domain knowledge from operations management provides insights into the intricacies of operational processes, resource utilization, and supply chain dynamics. It helps identify bottlenecks, streamline workflows, optimise inventory levels, and improve overall operational efficiency (Sokiyna & Aqel, 2020).

Information systems, in turn, leverage domain knowledge to develop and implement technological solutions that support and enhance operations (Panigrahi *et al.*, 2022a ; Panigrahi *et al.*, 2023 ; Panigrahi *et al.*, 2022c). IS provides data collection, analysis, and reporting tools, enabling organizations to make data-driven decisions. It facilitates the automation of routine tasks, improves communication and coordination across departments, and supports real-time monitoring and control of operations (Visvizi *et al.*, 2022).

By combining domain knowledge from operations management with information systems and management science methods, organizations can optimize their operational

processes, leverage technology effectively, and make informed decisions (Panigrahi *et al.*, 2022b). The development of industrial systems and technological advancements have indeed transformed the nature of work and control mechanisms. As these systems have become more complex, the role of humans has shifted from manual tasks to supervisory and planning functions. Human factors engineering, or ergonomics, has emerged as a discipline that focuses on designing systems and environments considering human capabilities, limitations, and cognitive processes (Cui *et al.*, 2022). In today's dynamic business environments, the reliance on data professionals has grown significantly. These experts play a crucial role in driving innovative business initiatives and leading the way in adopting process innovation (PI). This demand spans various specialized functions, including machine learning (ML) engineers who harness data insights, hybrid ML engineers with deep domain expertise, system engineers proficient in both robotic process automation (RPA) and domain knowledge, and visionary new business creators who understand the importance of transformative leadership in automation-driven strategies. RPA has emerged as a powerful catalyst in the evolution of organizations, facilitating their digital transformation journey (Bu *et al.*, 2022). This development indicates the importance of the Industry 4.0 era in operation. Industry 4.0, also known as intelligent manufacturing, represents a transformative shift in the future of factories, marked by significant enhancements in operational conditions. It emphasizes decentralized, simplified structures, favoring smaller, easily integrated modules with reduced complexity (Luz Tortorella *et al.*, 2022). Business-wise, Industry 4.0 promises substantial performance improvements through automation and digitalization, facilitated by enhanced interconnectivity across people, products, processes, services, and equipment. This transformation leverages big data analytics and integrates value chains horizontally and vertically (Schroeder *et al.*, 2019). Moreover, Industry 4.0 catalyzes organizations to excel in today's dynamic business landscape by synergizing domain knowledge (Uden & He, 2017), operations management, and information systems to deliver outstanding results.

A significant research gap exists in exploring the interplay between domain knowledge, operations management, and information systems to attain operational excellence. Although the acquisition and utilization of domain-specific knowledge have received substantial attention, the intricate synergy among domain expertise, operations management strategies, and information systems in achieving operational excellence remains largely uncharted territory. Recognizing these components' complex connections and mutual benefits is pivotal in the contemporary business landscape, where streamlined operations, well-informed

decision-making, and seamless technological integration are indispensable for competitiveness. Bridging this research gap promises valuable insights for refining operational processes and nurturing excellence across diverse industries. The study seeks to answer the following research questions:

RQ1: *How does domain knowledge linked to advanced information systems contribute to the operational strategies for improved performance?*

RQ2: *Is there any integration of knowledge of Inventory Management in the warehouse and enhancing supply chain efficiency?*

RQ3: *What is the relationship between knowledge of Inventory Management in the supply chain and adopting Industry 4.0 technologies for optimizing inventory control strategies and achieving operational excellence?*

This study aimed to answer the question, "How can domain knowledge be used to improve inventory and supply chain performance in the context of Industry 4.0?" by developing and presenting a comprehensive conceptual model that clarifies the function of domain knowledge in these areas. By acknowledging and leveraging domain knowledge alongside technical aspects, manufacturing firms can achieve optimal operational performance, adapt to changing market dynamics, and gain a competitive edge in the digital era.

2. Conceptualizing Knowledge & Domain

Knowledge

Knowledge creation results from the dynamic interaction between tacit and explicit knowledge rather than treating them as separate entities. The process through which implicit and explicit knowledge interact and transform into each other is called "knowledge conversion."

2.1 Knowledge Conversion Model

The interaction between tacit and explicit knowledge is vital because each form contributes unique aspects to the knowledge-creation process. Tacit knowledge, rooted in personal experiences, intuition, and skills, provides a rich context for understanding and problem-solving. Explicit knowledge, on the other hand, encompasses codified, formalized information that can be easily communicated and shared among individuals.

Through various modes of knowledge conversion (socialization, externalization, combination, and internalization), tacit and explicit knowledge merge, blend and transform into new insights, ideas, and innovations. This continuous interaction and interchange of knowledge are seen as fundamental drivers of organizational learning, innovation, and the creation of new knowledge.

By acknowledging the interplay between tacit and explicit knowledge, Nonaka and Takeuchi's (1995) model emphasizes the importance of social interaction,

communication, and shared experiences in the knowledge-creation process. It recognizes that knowledge is not solely an individual's possession but emerges and evolves through collaborative efforts and the dynamic exchange of different forms of knowledge. These modes are essential for knowledge creation within organizations. Here's a brief explanation of each method:

Socialization (Tacit-to-Tacit): This mode involves sharing tacit knowledge among individuals through social interactions. Tacit knowledge refers to personal experiences, insights, and skills that are difficult to articulate or codify. Socialization occurs when individuals share their tacit knowledge, creating a collective understanding and developing shared mental models (Figure 1).

Externalization (Tacit-to-Explicit): Externalization is converting tacit knowledge into explicit knowledge. In this mode, individuals express their tacit knowledge in detailed forms such as metaphors, analogies, concepts, hypotheses, or models. Externalizing tacit knowledge makes it more easily contagious and can be shared with others.

Combination (Explicit-to-Explicit): Combination involves integrating and combining different bodies of explicit knowledge. Explicit knowledge refers to formal, codified, and documented knowledge that can be easily communicated and shared. This mode focuses on connecting and synthesizing existing clear knowledge from various sources to create new insights or

Figure 1: Knowledge Conversion Model

	Tacit Knowledge	Explicit Knowledge
	To	
Tacit Knowledge (From)	Socialization	**Externalization**
Explicit Knowledge (From)	**Internalization**	Combination

Source: Nonaka & Takeuchi (1995)

perspectives.

Internalization (Explicit-to-Tacit): Internalization is embodying explicit knowledge into tacit knowledge. It occurs when individuals learn from direct knowledge and internalize it through their experiences and practices. Internalization is closely related to "learning by doing," as individuals acquire tacit knowledge by applying explicit knowledge in real-world contexts.

These four modes of knowledge conversion facilitate the continuous creation and accumulation of knowledge within organizations, promoting innovation, learning, and organizational growth.

2.2 Domain Knowledge

This study aimed to investigate the impact of domain knowledge on the acquisition of new domain-related information. Although it is commonly believed that prior knowledge of a topic facilitates learning, this issue has received limited empirical attention in the past and from work experiences (Scribner, 1985). The significance of this research is heightened by the current interest in studying knowledge representation and utilization in artificial intelligence (Charniak, 1977), discourse comprehension (Anderson *et al.*, 1977) and other related areas.

Defining knowledge within a specific domain remains an unresolved question. While attempts have been made to categorize knowledge, such as distinguishing between tacit and explicit knowledge(Nielsen & Cappelen, 2014; Polanyi, 1966) or declarative and procedural knowledge (Bower, 1987), a comprehensive system for classifying knowledge within or across domains has not yet been developed. Therefore, for this study, domain knowledge encompasses a grasp of its fundamental concepts, goals, rules, and principles.

2.2.1 Knowledge's Modular Structure

The concept of modularity of knowledge pertains to the organization and representation of knowledge in a modular fashion. It explores the idea that learning can be divided into discrete modules or components that are relatively independent and functionally specialized (Gobet, 2001).

The field of cognitive science has developed various formalisms to understand how humans represent and implement knowledge, encompassing both modular and non-modular approaches. Modular representations include production systems, semantic networks, and discrimination nets, while non-modular illustrations involve distributed neural networks, holograms, and mathematical expressions based on matrix algebra. However, it's essential to exercise caution when classifying these representations, as strict modularity may not always apply. For instance, production rules are often organized in problem spaces with significant interdependence, challenging the notion of strict modularity (Harmancioglu *et*

al., 2021). Conversely, modules may emerge in non-modular representations as the system develops or learns (Christensen, 2021; Gobet, 2001).

Modular knowledge organization has garnered substantial interest in computer science and artificial intelligence, given the significance of indexing, structuring, organizing, and retrieving knowledge (Sanchez, 2000). In artificial intelligence, modularity is the ability to independently add, modify, or delete individual data structures within a database, with distinct effects on the system's overall knowledge. While it can be argued that modular and decomposable systems are easier to understand than systems lacking these properties, and their value has been demonstrated in software engineering, the empirical question remains: Is human knowledge modular? Valuable insights into this question have been obtained from research on expert behaviour, which we will now delve into. Implementing effective management of modular knowledge architectures brings several benefits, including enhanced clarity in identifying an organization's existing knowledge assets and improved precision in targeting strategically valuable organizational learning. The adoption of modular architectures not only impacts the technological aspects of work within an organization but also influences the types of knowledge assets created, how learning occurs at both individual and organizational levels, and the characteristics of

the human resources within the organization. These changes necessitate complementary adjustments in performance assessment metrics, incentive structures, employment relationships, and overall management practices (Sanchez, 2000). As a modular knowledge architecture, inventory management offers significant applicability in the cases of IOT applications in inventory management and organisations (Zhang *et al.*, 2016). Modular knowledge architectures are essential in IoT applications like inventory management, offering adaptability, scalability, and efficiency. They facilitate data integration and interoperability among diverse IoT devices, ensuring cohesive data processing for accurate inventory tracking. Scalability is crucial for handling the increasing data volume in IoT systems(Bracke *et al.*, 2021), allowing seamless module additions or modifications. Real-time processing modules enable timely decision-making by analyzing data streams and triggering necessary actions. Adaptability ensures that the system can evolve with changing inventory management requirements. Predictive analytics modules optimize stock levels, while security modules protect sensitive data.

Remote monitoring and control modules enhance operational efficiency, and resource allocation modules streamline inventory processes. Custom reporting and visualization modules provide real-time insights, aiding informed decision-making in inventory management how blockchain can address

challenges such as trust, transparency, and traceability in inventory management.(Xu *et al.*, 2018). The trust, transparency, and traceability issues plaguing inventory management might be amenable to blockchain technology. Blockchain's immutable ledger and smart contracts guarantee accurate record-keeping that can't be altered, while also automating and enforcing agreements to build trust between parties. Because of its decentralised and real-time nature, all authorised participants have access to consistent, up-to-date inventory data, which improves openness (Raj *et al.*, 2022). Additionally, blockchain's unique identities and provenance tracking enable extensive traceability, allowing for exact monitoring of an item's travel through the supply chain and supporting efforts to prevent counterfeiting and fraud.

3. Spears of Domain Knowledge in Inventory and Supply Chain in Operations Research

Inventory and supply chain management involves various spheres of domain knowledge. These spheres of domain knowledge collectively contribute to the effective management of inventory and supply chain operations, ensuring efficient operations, cost optimization, customer satisfaction, and overall organizational success.

3.1 Domain Knowledge in Inventory Management

Inventory management involves overseeing the flow and storage of goods within an organization. It includes tracking inventory levels, replenishing stock, optimizing order quantities, and minimizing holding costs. Critical areas of domain knowledge in inventory management include:

Inventory Control: Understanding different inventory control methods like ABC analysis, economic order quantity (EOQ), just-in-time (JIT) (Panigrahi *et al.*, 2021), and reorder point (ROP) to ensure optimal inventory levels and minimize stockouts or overstocking (Panigrahi *et al.*, 2019).

Demand Forecasting: Knowledge of forecasting techniques to estimate future demand, such as time series analysis, regression analysis, and market research (Hwang *et al.*, 2020). Accurate demand forecasting helps determine appropriate inventory levels (Panigrahi *et al.*, 2022d).

Inventory Valuation: Familiarity with different inventory valuation methods like first in, first out (FIFO), last in, first out (LIFO), and weighted average cost. This knowledge is essential for financial reporting and assessing inventory value accurately (Kaufinger & Neuenschwander, 2020).

Stock Keeping Units (SKUs): Understanding the concept of SKUs, which represent unique product identifiers, and their role in inventory management, including classification, tracking, and managing different product variants.

Warehouse Management: Knowledge of efficient warehouse layout design, storage methods (e.g., bin systems, pallet racks), inventory labelling, picking strategies (e.g., FIFO, wave picking), and implementing technologies like barcode scanning or radio-frequency identification (RFID).

3.2 Domain Knowledge in Supply Chain

Supply chain management involves coordinating and integrating various activities and entities involved in delivering products or services to customers (Alzoubi *et al.*, 2021). Critical areas of domain knowledge in supply chain management include:

Supply Chain Optimization: Expertise in optimizing supply chain networks, considering factors like demand variability, transportation costs, inventory levels, and production capacities. This knowledge helps design efficient supply chain networks and improve performance (Bhosekar & Ierapetritou, 2021).

Demand and Supply Planning: Understanding the processes and methodologies used to forecast demand, plan production, manage inventory, and synchronize supply with demand. This includes sales and operations planning (S&OP), demand-driven planning, and production scheduling. The synchronization of information, material, and financial flows is critical in achieving a better balance between demand and supply. It reduces inefficiencies, costs, excessive inventory, and stock-outs

while improving customer satisfaction and overall operational performance (Pereira & Frazzon, 2021).

Logistics and Transportation: Familiarity with logistics management, including transportation modes (e.g., trucking, rail, air, sea), routing, carrier selection, freight consolidation, and warehouse operations (Zhou *et al.*, 2021) brings success to the industry. Knowledge of international trade regulations, customs, and documentation is also essential for operational flexibility (Kalinic & Brouthers, 2022).

Supplier Management: Understanding SSCM (sustainable supply chain management) includes (supplier selection, evaluation, and development) for achieving sustainable performances (León Bravo et al., 2022; Modgil & Singh, 2019). This includes assessing supplier capabilities, negotiating contracts, monitoring performance, and implementing strategies for supplier development and risk mitigation.

Supply Chain Analytics: Expertise in using data analytics and technologies like big data, predictive analytics, and supply chain visibility tools. This knowledge helps analyze supply chain performance, identify improvement opportunities, and make data-driven decisions (Asmussen & Møller, 2020). Supply chain analytics empowers global companies to navigate the complexities of the modern business environment. By providing real-time visibility, predictive modelling, and data-

driven insights, supply chain analytics enables organizations to make informed decisions, enhance responsiveness, mitigate risks, and optimize their supply chain operations (Ogbuke *et al.*, 2022).

4. Domain Knowledge of Inventory & Supply Chain for Firm Operations Performance

By leveraging domain knowledge in inventory and operations research, firms can enhance their decision-making processes, streamline operations, minimize costs, improve customer satisfaction, and achieve higher performance levels. This knowledge empowers firms to make data-driven decisions, optimize resource allocation, and effectively manage their inventory and operational processes (Chang & Ahn, 2005). Assessing the contribution of knowledge to business performance is a valuable approach to understand the impact of knowledge assets on organizational success. It aids in evaluating and compensating knowledge workers and allocating and developing human capital to align with business needs. While this is not the only approach to assess knowledge contribution, it serves as a foundational step in leveraging knowledge for improved operational flexibility and contributing towards business performance (Ahn & Chang, 2004 ; Panigrahi *et al.*, 2022b ; Panigrahi *et al.*, 2022e). In the context of Industry 4.0, (Xie *et al.*, 2020) study suggests the following indicator framework can be used to measure performance in terms of visibility, legality, personalization, information governance, supply chain warning, green practices, innovation, learning:

Visibility: This indicator assesses visibility and transparency across the supply chain. It measures the ability to monitor and track inventory, assets, and processes in real time using technologies such as IoT (Internet of Things), RFID (Radio Frequency Identification), and advanced analytics. Key metrics include real-time inventory visibility, asset tracking accuracy, and supply chain event visibility. With domain knowledge, organizations can better interpret and visualize data, improving visibility into operations and performance. (Mohanty & Shankar, 2019; Yang & Yu, 2019).

Leagility: Leagility combines the concepts of agility and lean principles. This indicator measures the ability to respond quickly to changes in demand or market conditions while maintaining operational efficiency. Key metrics may include lead time reduction, responsiveness to demand changes, flexibility in production and logistics, and agility in adapting to market trends. Understanding the domain's specific requirements, constraints, and dependencies enables organizations to streamline processes, reduce waste, and respond quickly to changes and disruptions while maintaining high productivity levels (Sengupta, 2020; Xie *et al.*, 2020).

Personalization: This indicator focuses on the ability to customize products or services to

individual customer requirements. It measures how organizations can offer personalized solutions, configure products on demand, or provide tailored services. Metrics may include the percentage of customized products, customer satisfaction with bespoke offerings, and personalization lead time. Understanding the domain also facilitates the collection and analysis of customer data, enabling organizations to personalize offerings based on insights derived from the data (Xie *et al.*, 2020).

Information Governance: Information governance assesses data management, integrity, and security across the supply chain. This indicator measures the effectiveness of data governance practices, data quality management, and cybersecurity measures. Metrics may include data accuracy, data integrity, compliance with data regulations, and cybersecurity incidents. Understanding the domain-specific regulations, compliance requirements, and security concerns ensures data is managed and protected appropriately (Xie *et al.*, 2020).

Supply Chain Warning: This indicator evaluates the ability to anticipate and proactively manage risks and disruptions in the supply chain. It measures the effectiveness of early warning systems and risk management processes. Key metrics may include the time to detect and respond to supply chain disruptions, the number of incidents mitigated, and the effectiveness of

risk mitigation strategies. Knowledge enables organizations to understand the intricacies of their supply chain networks, including dependencies, vulnerabilities, and potential bottlenecks. This knowledge allows for implementing early warning systems, risk assessment strategies, and proactive measures to mitigate supply chain disruptions (de Vries *et al.*, 2022).

Green Practices: Green practices focus on sustainability and environmental impact reduction. This indicator assesses the organization's efforts to minimize its carbon footprint, conserve resources, and adopt eco-friendly practices in manufacturing, logistics, and packaging. Metrics may include energy consumption reduction, waste reduction, use of renewable energy sources, and carbon emissions intensity. Knowledge of Green Practices in organizations helps implement different practices, i.e. energy-efficient processes, waste reduction strategies, and the adoption of renewable resources (Xie *et al.*, 2020).

Innovation and Learning: This indicator measures the organization's ability to foster a culture of innovation, continuous learning, and knowledge sharing. It assesses the implementation of new technologies, employee engagement in innovation, and investment in research and development. Metrics may include the number of new products or services introduced, employee participation in innovation initiatives, and

acquisitions in innovation projects (Mead *et al.*, 2022).

By tracking and evaluating these indicators, organizations can gain insights into their performance and progress in leveraging domain knowledge within the context of Industry 4.0. These indicators provide a comprehensive framework to assess different performance dimensions and identify areas for improvement or investment.

The above backdrop study presented the proposed conceptual model (see Figure 2).

Our proposed conceptual model could benefit from recent examples from the corporate world and its business practices. It can supplement your conceptual model regarding the impact of domain knowledge in inventory management and supply chain management

(SCM) on firm performance:

Apple's Supply Chain Expertise: It's commonly agreed that Apple has some of the best supply chain management in the world. Apple uses its extensive expertise in electronics production and the complexities of the supply chain. Apple can better manage its global supply chain, reduce its inventory holding costs, and increase the speed with which it brings new products to market by incorporating this domain knowledge into its operations management techniques and information systems. Because of this, Apple can maintain a high level of consumer happiness and a healthy bottom line year after year.

Zara's Fast Fashion Model: Zara, an Inditex brand, dominates the fast fashion market.

Figure 2: Proposed Conceptual Model

Source: Author's Compilation
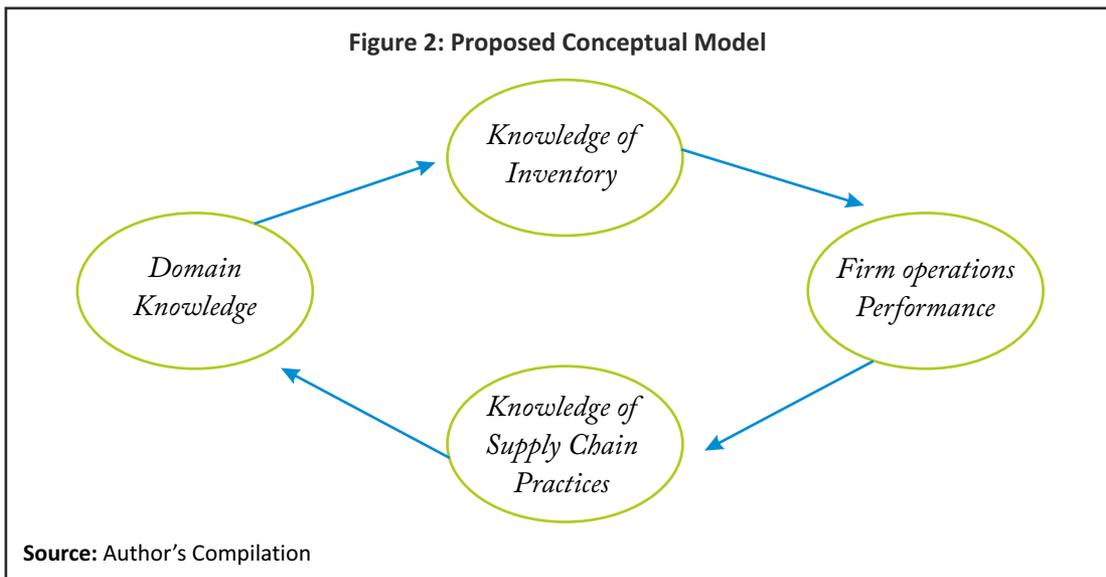
Zara's operational success is mainly due to the company's mastery of fashion trends and inventory management. The company can reduce waste and surplus inventory by using information from its stores in real time to guide manufacturing decisions and keep up with the ever-evolving world of fashion. Zara has been successful in the fashion retail industry due to the integration of domain expertise with operational and informational systems.

Amazon's Inventory Optimization: Amazon's inventory management expertise is critical to the company's success in e-commerce and supply chain management. The firm uses machine learning and complex algorithms to forecast consumer demand and optimise stock levels. Amazon has accomplished phenomenal financial performance and consumer happiness by integrating expertise in e-commerce with cutting-edge operations management approaches and data technologies.

Procter & Gamble's Supply Network Operations: Procter & Gamble (P&G) illustrates a firm that values supply chain knowledge and experience. P&G's extensive expertise in the consumer goods industry and strong operations management and information systems have successfully enabled it to organise a global supply chain. This integration benefits P&G's market leadership and bottom line since it guarantees on-time product delivery across global markets and reduces the likelihood of supply disruptions.

Walmart's Inventory Optimization with RFID: Keeping accurate stock levels is a breeze for Walmart because of the company's years of retail experience and strategic use of information systems like Radio-Frequency Identification (RFID) technology. Walmart uses RFID to track product movement in real time to maximise restocking and minimise stockouts. As a result of combining expertise in retail, operational management, and cutting-edge automation, Walmart has become a retailing powerhouse.

These real-world examples underscore the critical role of domain knowledge, particularly in inventory and supply chain management, in shaping firm performance. When integrated with effective operations management practices and advanced information systems, domain expertise can lead to enhanced operational efficiency, reduced costs, improved customer satisfaction, and superior performance.

5. Findings of the Study

5.1 Knowledge of Inventory Management in the Warehouse

Warehouse inventory management entails the systematic control and optimization of inventory levels within the context of the warehouse environment. The following is an outline of fundamental information concerning inventory management that is specifically pertinent to warehouse operations:

Warehouse Layout and Organization: Knowledge of inventory management in a warehouse starts with understanding the layout and organization of the warehouse space. This includes determining the optimal location for different types of inventory based on factors such as item characteristics, demand frequency, and storage requirements. Warehouse managers must consider efficient storage methods such as pallet racking, shelving systems, or automated storage and retrieval systems (AS/RS) to maximize space utilization and facilitate smooth inventory handling.

Inventory Classification and Labeling: The effective classification and labelling of inventory goods are necessary to ensure smooth warehouse operations. A person, knowledgeable in inventory management will understand how to classify items based on their size, weight, degree of fragility, and the space they need to be stored in. It is much easier to accurately identify, track, and retrieve inventory goods from within the warehouse if a uniform labelling system has been implemented.

Inventory Receiving and Inspection: Warehouse managers are expected to be familiar with receiving and inspecting inventory. This involves knowing what is necessary to verify inbound shipments against purchase orders, checking for faults or discrepancies, and ensuring proper documentation of inventory quantities.

Maintaining accurate inventory counts and avoiding problems further down the line is made more accessible by implementing quality control procedures during the receiving process.

Storage and Stocking Strategies: Effective inventory management in a warehouse requires knowledge of various storage and stocking strategies. This includes determining the appropriate storage methods based on inventory characteristics and picking requirements, such as bulk storage, bin locations, or pick-and-pack areas. Knowledge of optimal stock rotation methods, such as first in, first out (FIFO) or last in, first out (LIFO), is also essential for minimizing product obsolescence or spoilage.

Inventory Tracking and Control: Warehouse managers need knowledge of inventory tracking and control techniques to maintain accurate inventory levels. This involves implementing inventory control systems, such as barcode scanning or radio frequency identification (RFID) to track real-time inventory movements. Using inventory management software or warehouse management systems (WMS) helps monitor stock levels, initiate replenishment orders, and conduct regular cycle counts to identify and resolve discrepancies.

Order Fulfilment and Pick/Pack Operations: Knowledge of inventory management in a warehouse extends to efficient order fulfilment processes. This includes optimising

pick/pack operations, such as batch or zone picking, to minimize travel time and improve order accuracy. Knowledge of order prioritization, picking strategies, and packaging requirements contributes faster and error-free order processing.

Inventory Reporting and Analysis: Warehouse managers need knowledge of inventory reporting and analysis techniques to monitor and evaluate inventory performance. This involves generating regular reports on key metrics such as stock levels, turnover rates, fill rates, and order accuracy. Analyzing these metrics helps identify trends, forecast demand, and make data-driven decisions to improve inventory management practices.

5.2 Knowledge of Inventory Management in the Supply Chain

Inventory management is a critical aspect of supply chain management, and knowing inventory management within the supply chain context is crucial for ensuring efficient and effective operations. Here are key areas of knowledge related to inventory management in the supply chain:

Demand Forecasting and Planning: Knowledge of demand forecasting techniques is essential for inventory management in the supply chain. This involves analyzing historical data, market trends, and customer insights to forecast demand accurately. Supply chain managers can optimize inventory levels, minimize stockouts, and reduce excess inventory by understanding demand patterns.

Supply Chain Network Design: Knowledge of inventory management includes understanding the design and configuration of the supply chain network. This involves determining the optimal number and location of distribution centres, warehouses, and inventory holding points to ensure timely product availability while minimizing transportation costs and lead times.

Inventory Optimization: Effective inventory management in the supply chain requires knowledge of inventory optimization techniques. This includes setting appropriate reorder points, safety stock levels, and order quantities to balance customer service levels with inventory carrying costs. Knowledge of inventory optimization models, such as economic order quantity (EOQ) and just-in-time (JIT) principles, helps minimize inventory investment while meeting customer demand.

Inventory Visibility and Tracking: Supply chain managers need to know inventory visibility and tracking systems to monitor inventory levels at various points in the supply chain. This includes using technology such as barcodes, RFID, or sensors enabled by the Internet of Things (IoT) to track inventory in real time. Managers can make educated decisions on order fulfilment, restocking, and production planning with accurate and timely inventory visibility across the supply chain.

Collaborative Planning and Forecasting: A working knowledge of strategies for

collaborative planning and forecasting is necessary for efficient inventory management along the supply chain. When suppliers, manufacturers, and distributors work together on a project, they can better coordinate their efforts and share information. This, in turn, results in more accurate demand projections and better decisions regarding inventory management.

Vendor Managed Inventory (VMI): The VMI method of inventory management is a form of collaborative inventory management in which customers and suppliers share responsibility for managing inventory levels at client sites. Working knowledge of VMI procedures helps developing fruitful partnerships with suppliers, maximising the effectiveness of inventory management and streamlining the supply chain.

Inventory Performance Metrics: Supply chain managers can track and evaluate the success of inventory management techniques, thanks to their knowledge of inventory performance measures. The number of days of inventory on hand, the fill rate, the stockout rate, the inventory turnover, and the order cycle time are all important indicators. The managers may discover areas for improvement, optimise inventory levels, and improve supply chain performance by studying these KPIs and drawing the appropriate conclusions.

Risk Management: Understanding the supply chain risks that can affect inventory availability and taking steps to mitigate those risks are essential to have inventory management knowledge. This requires analyzing potential risks, including fluctuations in demand, supply chain interruptions, varying lead times, and natural calamities. Supply chain managers can ensure continuity of supply and mitigate inventory-related risks by implementing risk mitigation methods, such as having safety stocks or alternate sourcing options in place, among other risk mitigation strategies.

5.3 Knowledge of Inventory Management in Industry 4.0

For effective Inventory Management in the age of Industry 4.0, familiarity with relevant Inventory Systems and Technologies is essential. Information essential to understanding Inventory Management in Industry 4.0's Inventory Systems and Technologies includes the following:

Automation and Robotics: In the age of Industry 4.0, proficiency with robots and automated stock systems is a must. Knowledge of the potential of AGVs, robotic arms, and autonomous robots in stock handling, picking, sorting, and replenishment is essential. Inventory optimization necessitates familiarity with robotic process automation (RPA) and machine learning technologies.

Internet of Things (IoT) and Sensors: Adequate knowledge of the Internet of Things (IoT) and sensor technology provides

real-time inventory monitoring and tracking. This includes awareness of how sensors can be utilised to collect data on the levels, conditions, locations, and inventory movements. A thorough understanding of IoT platforms and connectivity protocols enables inventory management systems and other aspects of the supply chain to exchange data and be integrated and streamlined.

Cloud Computing and Big Data Analytics: Knowing cloud computing and big data analytics makes it possible to store, analyse, and analyse massive volumes of data relating to inventory. This includes having a solid understanding of the scalability, accessibility, and real-time data insights that cloud-based inventory management solutions may provide. Forecasting demand, optimising inventory levels, and recognising patterns or anomalies requires knowledge of data analytics approaches such as predictive analytics and machine learning algorithms.

Blockchain Technology: A greater level of trust, transparency, and traceability can be achieved in inventory management by using blockchain technology. In the context of Industry 4.0, it is essential to have a solid understanding of how blockchain technology may be implemented to facilitate safe and decentralised inventory transactions, visibility throughout the supply chain, and validation of product provenance. The use of smart contracts and decentralised inventory databases can help simplify the processes

involved in inventory management while also lowering the risk of fraud or other problems.

Cybersecurity and Data Privacy: Regarding safeguarding inventory data and systems, cybersecurity and data privacy expertise is crucial. Complying with data protection standards requires familiarity with encryption methods, access controls, and best cybersecurity practices. Safeguarding inventory records calls for an understanding of risk assessment and mitigation techniques.

By developing knowledge across these areas, organizations can leverage Inventory Systems and Technologies in Industry 4.0 to achieve improved inventory accuracy, real-time visibility, predictive analytics-driven decision-making, streamlined processes, reduced costs, and enhanced customer satisfaction.

5.4 Acquisition, Storage, and Utilization of Domain Knowledge within Supply Chain and Operational Performances

In the context of this study, domain knowledge refers to the specialized expertise related to Inventory Management and Supply Chain Operations. Understanding the processes of acquiring, storing, and utilizing this domain knowledge is pivotal for appreciating its impact on gaining new domain-related information and, subsequently, on operational excellence.

Acquisition of Domain Knowledge:

The acquisition of domain knowledge within the supply chain and operational context is a

dynamic process involving various avenues:

A. Education and Training: Individuals acquire foundational domain knowledge through formal education, workshops, seminars, and specialized training programs focused on supply chain management, inventory optimization, and Industry 4.0 technologies.

B. On-the-Job Learning: Practical experience gained through roles in inventory management, logistics, and supply chain operations is a primary domain knowledge source. Learning from real-world scenarios, problem-solving, and adapting to evolving challenges contribute significantly to domain expertise.

C. Interactions and Collaborations: Collaboration with colleagues, experts, and cross-functional teams fosters the exchange of domain knowledge. Informal discussions, brainstorming sessions, and knowledge-sharing platforms are crucial in knowledge acquisition.

Storage and Management of Domain Knowledge:

Efficiently storing and managing domain knowledge within the supply chain and operational contexts is essential for its accessibility and utility:

A. Knowledge Management Systems (KMS): Knowledge management systems facilitate the organization, categorization, and retrieval of domain-specific information. These systems are equipped with search functionalities to access valuable insights quickly.

B. Tacit Knowledge Preservation: Tacit knowledge, rooted in personal experiences and practical insights, is often shared through mentoring, coaching, and informal interactions. Cultivating a culture that encourages tacit knowledge-sharing helps retain valuable expertise.

Utilization of Domain Knowledge in Supply Chain and Operational Performances:

Domain knowledge plays a pivotal role in shaping decision-making, innovation, and performance improvement within supply chain and operational contexts:

A. Informed Decision-Making: Supply chain and operational experts leverage their domain knowledge to make data-driven decisions related to inventory optimization, demand forecasting, procurement, and distribution. This expertise enhances the accuracy and effectiveness of decision-making processes.

B. Problem-Solving: When confronted with operational challenges, domain experts apply their knowledge to diagnose issues, identify root causes, and implement effective solutions. This proactive approach is crucial for maintaining operational efficiency.

C. Innovation and Adaptation: Industry 4.0

encourages innovation by integrating advanced technologies. Domain knowledge is a foundation for identifying opportunities to apply emerging technologies like IoT, AI, and blockchain to enhance inventory management and supply chain operations, thus improving overall operational performance.

This research sheds light on knowledge transfer, retention, and application dynamics by investigating how domain knowledge is acquired, stored, and used in the unique context of supply chain and operational performance. Developing fresh information relating to the domain and driving continual improvement in operational excellence is greatly aided by domain expertise; therefore, this comprehension is crucial.

6. Limitations and Future Scope of the Study

The current study has been restricted to a review of related literature within the information systems domain, mainly focusing on the knowledge related to inventory and supply chain management. However, this study lays the groundwork for promising avenues of research that could significantly contribute to the field.

On one hand, the impact of emerging technologies on inventory management is an area ripe for exploration. Rapid technological advancements such as artificial intelligence, the Internet of Things (IoT), blockchain, and data analytics can revolutionize how businesses handle inventory and supply chains. Investigating how these technologies can be effectively integrated and leveraged to optimize inventory practices and enhance supply chain efficiency is crucial for future research.

On the other, dynamic and agile inventory management is a facet that holds immense promise. With market dynamics becoming increasingly volatile and consumer demands constantly evolving, businesses need agile inventory management strategies to adapt swiftly. Research in this domain can delve into techniques and frameworks that enable organizations to adjust their inventory levels, procurement processes, and distribution networks in response to changing market conditions.

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Economics of Happiness

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Abstract

Happiness is the hidden resource that can enhance the capacities, capabilities and adaptabilities of an individual to the next level associated with monetary dimensions. For sustainable development happiness plays an important role, economic progress backed with public satisfaction or happiness can result in the steady growth of an economy. Apart from quantitative growth, qualitative growth is being supported by the happiness indexes which are accepted globally. Happiness is not just an individual affair, rather motivation and nudges also play an important role in happiness, when a work is done after being motivated the level of happiness achieved is much higher.

Keywords: Happiness, Income, Benefit, Behavior, Choice.

1. Introduction

Most of us probably don't believe we need a formal definition of happiness, we know it, when we feel it, and we normally use the term to refer to the range of positive emotions, including joy, pride, contentment, and gratitude.

Surprisingly happiness has a direct and indirect effect on our minds and in our pockets too. For example, if it's a weekend and all of Tom's peer groups are planning to arrange a house party, even if Tom has a budget constraint, out of enthusiasm, he will surpass his purchasing power and try to cope with the monetary demand irrespective of the source of the money. This may sound very normal for an individual but it has got vibrant implications in national economies when these things are grossed up in total.

2. Work, Happiness & Income

As scarcity is the heart of economics on the same lines satisfaction is the heart of each penny spent. Likewise, it can be said that with a certain budget, an optimum level of satisfaction can be achieved. But strangely happiness has taken things to the next level where, in order to achieve satisfaction, people, surpass their budget constraints but as money is limited, consumers curtail the money kept aside for other expenditures and try to grab the happiness-achieving opportunity or borrow funds from external sources, in the form of personal loans or occasion-based loans for example marriage loan, etc. apart from the fact that institutions charge high rate of interest from these loans. This thing happens every

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now and then when money is not available but we are not willing to leave the opportunity of being happy.

Through this, it can be inferred that happiness may not have any quantitative value but it has a monetary value which is basically the cost incurred to enjoy the range of positive emotions in a condition with his/her degree of income. If we assume all other factors are constant, when income increases it makes an individual happy associated with the condition that he has happiness grabbing opportunity or else an increase in income will have no value.

For example, if there are two boys A and B and both of them have a box of fireworks. A lighted them all alone, whereas B lighted them with his brother C.

i.   Happiness Level of A ≠ Happiness Level of B.

ii. Happiness Level of A < Happiness Level of B.

iii. Happiness Level of A – Happiness Level of B = Social Cost Variable.

3. Happiness and Choice

" Freedom, Choice, Consistency and Rationality is the formal representation of the capability set of a person is that of a set of functioning n-tuples (or vectors when the functioning can be numerically measured) from which a person can choose. If freedom is only instrumentally valued, then the valuation of the person's capability to function would be no different from evaluating the chosen functioning bundle in the respective capability set, i.e., the person's actual functioning. But if freedom is of some intrinsic value in a person's life, then the valuation of a capability set need not coincide with the evaluation of the chosen element of it. The substantive problem, once again, is whether we value freedom over and above its instrumental role, i.e., what freedom permits us to achieve" (Sen, 1987).

For example, if, Mr Robber is a coffee maker in a café but likes cooking then there is a high probability that, if Mr Robber is promoted to the culinary section of the café initially, he may take time to get accustomed to the job but the time will surely be lesser than learning to make coffees because as per human tendency we do what makes us happy even if it's difficult or painful. Once Mr Robber gets established as a cook in the café, he can add more value to the café in terms of his innovations and creativity which he was unable to do in the coffee-making section which will have a parallel effect on his income. "The view that money makes you happier finds ringing endorsement in economic theory. The implication is that one can improve one's happiness by getting more money" (Easterlin, 2004).

If we analyse the example it can be inferred that when a person is provided freedom of work then his productivity increases due to the job satisfaction or the level of happiness he receives from the job, which motivates the person to work more in the same wage and is referred as Organisational Citizenship

Behaviour as per organizational behaviour which is an internal boost for the organization and to the economy as a whole and is more widely described in Nudge theory or behavioural economics.

4. Happiness, Public Policy & Nudge

Layard (2005) expressed his bold view on happiness research and has stated that the change in public policy will have a direct impact on the happiness level. Apart from that the status difference between rich and poor, and the rat race for betterment actually affects welfare and reduces well-being. Layard also observed the effective and positive performance of safety in the workplace and in-house and also of the quality degree of the social relationships and trusts. In line with the same thought, Layard also recognised the implication for fiscal and labour market policy in the form of taxation on higher income gain and via re-evaluation of the merit-oriented performance payment.

5. The Nudge Theory

Richard Thaler bagged his Economics Nobel in the year 2008 by putting forward this work on the Nudge Theory (Business Lines, 2018) which sheds light on Improving Decisions about Health, Wealth and Happiness and has had a wide impact with some governments even setting up 'nudge units' in their countries.

Nudges are basically not mandates but motivation for doing some time and in such a way that once they do perform the task, they feel a certain level of happiness. So, there is some encouragement, there is no compulsion to comply and people have the freedom to choose other options. This again brings us back to the concept of Dr. Amartya Sen's Freedom of Choice which says "Doing X is not equal to doing X by choice" which results in an increase in their income in the longer run because people will be happy with what they are doing and get paid accordingly which will keep them happier improving their economic viability.

6. Happiness in Social Level

As we know happiness has a vibrant implication in an individual's behaviour likewise it has a direct effect on his/her income, from a very common notion it can be said that when a person is doing something happily then he is sure to do it in a better way than people who are just performing the task for the sake of doing, therefore the person doing the work happily will surely generate extra income in the long run. Apart from the income aspect, the expenditure aspect is also taken by happiness i.e., when a person is willing to achieve a level of happiness with his/her reference group (friends, family & colleagues) his tendency will be to surpass his budget constraints either by taking up loan or reducing the budget set aside for some other expenditure. Then from both income and expenditure sides, it can be concluded that happiness levels up things either be it income or expenditure.

7. Global Happiness and Gross National Well-Being Index

If we minutely assess the global trends it can be seen that many developed countries and developing countries are topping the list in terms of Gross Domestic Product (GDP) but they are not doing well in terms of gross domestic happiness within the country. This is conflicting indeed which is not good for the sustainability of the development. Parallelly, if we look into the Nordic countries, they are pretty good in terms of the happiness index and Gross National Well-being/Wellness (GNW), because of a happiness framework policymakers develop around their people which includes well-functioning democracy, free education, healthcare, and a high priority of life balance and income procurement through better employment opportunities which have created a model of sustainable development.

8. Happiness Research and Implications

At the micro level (in an organisation) if proper assessment of happiness can be done then it will not only be beneficial for the organisations but also for the employees because work done with happiness is always better than an imposed work. If the choice work analysis can be done in the human resource department, then in all the departments operations will be smoother and there will be a notable betterment in the work culture of the organisation. Apart from the betterment of the organisation, there will be a relatively lower risk of efficient and effective employees leaving an organisation. This will not only place the firm with a better reputation but also save much cost of employee retention. Sometimes employees leaving organisations become a severe problem for an organization as a talent crisis.

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Gender Pay Gap –Current Realities and a Wake-up Call for HRM

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Abstract

Ever since 2015, when the move towards implementation of 'mandatory reporting' of the gender pay gap was announced by the then Prime Minister of the United Kingdom- David Cameron, there has been a mixed response on the likely impact a state intervention would have on bridging the pay gap between men and women. While critics have suggested that regulation is a mere tokenism on the part of the government, supporters have argued that potential reputational losses through 'naming and shaming' of employers have turbo-charged the drive towards gender pay equity. Many inter-related and complex factors- societal, institutional, and individual, account for the pay gap, and therefore reporting only helps to scratch the surface. This article starts by setting the context of the reporting legislation and puts forth an argument that organizations must look inward at their human resource practices. This is because while the practices may not be overtly discriminatory, there is an overwhelming evidence that they can play a role in institutionalizing the pay gap through 'unconscious' bias against women. The article concludes with suggestions to pre-empt the problems of gender inequity and help organizations become inclusive in their intent as well as actions.

Keywords: Gender pay gap; Mandatory Reporting; Unconscious Bias; Diversity; Human Resource Practices.

1. Gender Pay Gap- A Dismal Reality

Gender Pay Gap has been around ever since women first participated in the labour force. It is ubiquitous and signals to individuals that gender and not merit determines what a person is paid. It has been a part of the public as well as academic discourse for several years (Blau & Kahn, 2017). In order to counter the pay inequity on account of gender, many countries have implemented anti-discrimination laws including equal pay laws in different forms in the last few decades. A few years ago, the United Kingdom (UK) took the lead in bringing in more transparency on the issue by introducing 'Gender Pay Gap Reporting legislation' which made it mandatory for employers with over 250 employees to publish their gender pay gap

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figures. A key feature of the reporting was an 'optional narrative statement' that many big companies chose to include alongside their gender pay gap figures. The textual narrative helped in putting the story behind the numbers and was used to highlight actions being taken and planned by individual organizations. A focal point in these narratives was employers' plans to rejig their key Human Resource Systems, namely: Staffing, Training, Retaining, and Compensation practices, by reducing 'unconscious bias' in order to gradually bring down this gap (gender pay gap data from Gov. UK, 2018). This demonstrated an implicit acknowledgment by employers, that besides the societal and institutional reasons for the gender pay gap, organizational practices had a substantial role to play in perpetuating wage inequity between men and women.

In an age where society at large seemingly upholds values of egalitarianism, it might be difficult to fathom the lack of gender pay parity in the 21st century. Indeed, skeptics dismiss its existence, as was also found by research conducted by Lean in and Survey Monkey and reported by Fortune (2018) which showed that a substantial percentage of men and women thought that this issue was a passé. Yet overwhelming evidence suggests that an increase in female participation in the workforce has not necessarily translated into wage equity. (Goldin, 2014; Mastracci & Arreola, 2016).

Having said that, gender pay inequity may not be a straightforward issue of 'direct discrimination' where managers do not pay men and women equally solely on account of their gender. Rather, in the backdrop of equal pay laws implemented in several countries, this is a complex issue that needs an in-depth assessment of causes as well as outcomes.

This article describes key elements of the reporting regulation and evaluates the main causes of the gender pay gap. Further, it asserts that gender pay is a multi-dimensional phenomenon and beyond the institutionalized factors, organizational practices particularly formal human resource systems, have played a part in exacerbating the gap (Goldin, 2014; Davies *et al.*, 2015). Finally, it concludes by offering practitioners some specific ways in which gender pay inequity can be tackled by individual organizations.

2. The Global Narrative on Pay Transparency

Driven by the need for greater accountability of employers and creating a fairer society, public policy on pay has been evolving in many countries across the globe. Several European nations like the UK, Austria, Belgium, Denmark, and others have introduced legislation to support greater pay transparency. Others have gone a step further. For example, Germany has passed an act that gives men and women the right to request for salaries of their colleagues doing similar jobs. An exemplar of pay transparency is Norway, where the government in 2011 put every person's salary

and tax details online and publicly accessible. The United States (US) almost introduced a mandatory pay gap reporting during the Obama era but the order was repealed by President Trump in 2017. The idea of pay transparency as a mechanism of dealing with the wage differential based on gender is therefore not new.

However, pay transparency remains a contentious topic and the evidence on the extent to which it can bring in more equity (and the perception of it) is mixed. Collela *et al.* (2007) and more recently, Trotter *et al.* (2017) highlighted this tension suggesting that while keeping pay under wraps negatively affects the perception of justice and motivation from an employee point of view, communication of it could create more difficulties by causing labour mobility and loss of organizational control. Marasi & Benette (2016) suggest that the *all-or-none* approach towards pay transparency is neither practical nor desirable and that it should be looked at as a spectrum with two extremes- total pay transparency and total pay secrecy. The jury is still out on pay transparency particularly its potential success in mitigating wage inequities. What is clear though is that the rising demand from the public is driving the state and the employers for more transparency and greater wage equity.

3. United Kingdom- A Front Runner in Introducing Gender Pay Gap Reporting

The gender pay gap is calculated as the difference in average pay (and in some countries as median pay) between men and women at work (ONS, 2018). Typically, this is a headline measure and is expressed as a percentage value. For instance, the overall gap for the UK in 2017 was 18.4 per cent (9.1per cent, if we consider only full-time employees), while for the United States, this was about 19.5 per cent (U.S. Census Bureau, 2017). Globally the gender pay gap has shown a downward trend, however, the decline has slowed down in the last few years (Goldin, 2014).

In 2017 United Kingdom (UK) became one of the first countries in Europe to make it a legal requirement for employers, both private and public sector, with 250 or more staff, to publish their gender pay gap data. The data is supposed to be published annually along six metrics- mean gender pay gap, median gender pay gap, the difference in the mean bonus pay of men and women, the difference in median bonus pay of men and women, the proportion of men and women who received bonus pay, and the proportion of men and women in each of four pay quartile bands. The results from these reports have shown (once again) that the under-representation of women in top jobs, along with a larger proportion of women in the so-called 'female jobs' compared to the 'male jobs' largely contributed to the gender pay gap. This was consistent in both the public sector as well as the private sector as with the FTSE 100 companies, where almost 29 per cent of the senior-level board positions were

held by women (Gov. UK, 2018). In that sense, there were no big surprises. However, data showed that even in the cases where employers hire women in senior positions, they tended to hand out higher bonuses to men. National Health Service (NHS) is a case in point, where women make up about 30 per cent of the consultant doctors but only 20 per cent of the consultants who received the excellence awards-based pay (bonuses) were women. Similarly, the education sector predominantly comprising female workers, has a whooping gap of 25 per cent. (Gov. UK, 2018)

An 'optional' narrative – a written statement on why a gap exists- is also a part of the reporting regulation. The narrative helps in contextualizing the gap. For instance, easyJet, a low-frill airline company that has a gap of more than 50 per cent, explained that this is because of the sector's inability to hire enough women as pilots (high-paying jobs in the sector*). The airline states in its report "easyJet is seeking to encourage more women to become pilots through its Amy Johnson Initiative. It has set a target that 20 per cent of new entrant pilots should be female by 2020."* (easyJet, 2017). Similar narrative statements have been used by employers to indicate their intent of 'fixing' the problem and most have focussed on doing this through their human resource management practices.

4. What Leads to the Gender Pay Gap?

The gender pay gap as well as its causes have been documented extensively. Office of National Statistics United Kingdom, (ONS), in its latest report in January 2018, found that 36.1 per cent of the gender pay gap can be attributed to seven characteristics namely age, job tenure, work pattern, occupation, region of work, business size and sector, 63.9 per cent of the gap is not explained. Further, it suggests that some of this could arise out of factors such as family structures, education, and career breaks, number of children, the age of children, whether parents have any caring responsibilities, the number of years spent in school, and the highest level of qualification achieved. However, the report also indicates that discriminatory behaviour "possibly could play a part". This concurs well with the Women and Work Commission Report (2006) that listed several interrelated factors, including occupational segregation, lack of vocational qualifications, discrimination, and fewer quality job opportunities enabling women to combine their work and care roles as contributing to the gap. In the following sections, some of these are explored in more detail.

4.1 Economic Argument for The Under-Representation of Women

The economic argument uses the Human Capital (HC) Theory to explain the difference in pay by attributing it to the differences in capabilities between men and women (Becker, 1964). It is believed that as women have family priorities and discontinuous careers, they are a little less inclined to develop their skills and

they work a lesser number of hours in comparison to men. Very few women choose high-paying work-intensive careers and over time the wage gap widens between the genders (Blau & Kahn, 2017). This theory fails to capture the changing reality as more women are joining the workforce and are also opting for better-paying careers, especially in the STEM areas. In spite of the changes in workforce participation, the wage gap still persists and the theory does not provide any explanation for the same.

4.2 Personality Attributes and Gender Roles

Research shows that certain personality factors also deter women from being ambitious and demanding higher salaries (Nyhus & Pons, 2012; Semykina & Linz, 2010). Women tend to choose less competitive and ambitious careers and also choose to focus on their socially gendered role of being the caregiver in the family. It is also seen that women find it difficult to negotiate their salaries and use firm bargaining at the time of salary discussions thereby settling for lesser pay (Kugler *et al.*, 2018). The idea of women negotiating for pay does not seem very agreeable so women may be paid less than men (Bowles, 2014).

4.3 The Motherhood Penalty

According to a research report in 2018 by the Government Equalities Office, UK, there was no significant gap between male and female salaries until the age of 22. As men accumulate more skills, experience, and progress up the career ladder, women take a career break or part-time jobs due to caring commitments and thereby causing the gap to widen.

4.4 Undervaluation of Women's Work

Crowding of women in low-paying sectors, also called *'occupational segregation'* because of stereotypical assumptions associated with these jobs further propagates the gender pay gap. Similar undervaluation happens because of the dearth in the number of women in top jobs, also called *'vertical segregation'*. Women tend to be relegated to lower and middle levels in the organizational hierarchies. This was highlighted in the gender pay reporting figures of most organizations in the UK (Gov. UK, 2018). Such 'institutional undervaluation' is embedded in the formal mechanisms of wage determination and HR practices (Koskinen Sandberg, 2017), as will be discussed in the subsequent sections.

4.5 Systematic Discrimination Through HR Practices or Unconscious Bias at Play?

Most modern organizations incorporate diversity and inclusion in their value statements and many have taken progressive steps to recruit and retain women. Indeed, female participation across roles has been progressively improving. However, better gender ratios don't necessarily mean better careers and top jobs for women. As discussed in the previous sections, even when family-

friendly policies are introduced, as is the case in countries like the UK, Denmark, and Norway, gender pay inequity remains a significant issue.

An explanation for the gap between intent shown in value statements and real action is suggested to be an 'unconscious' but systematic gender bias that is propagated through deeply gendered organizational practices and processes (Davies *et al.,* 2015; Acker, 1990). Much of these practices are inspired by the concept of the "Administrative Man" (Mastracci & Arreola, 2016), which is based on stereotypical assumptions about what positive employee performance outcomes comprise. For instance, the 'proactive' human resource management approaches such as the 'High Commitment and Involvement approach', High-Performance Work Systems, and Talent Management, all hinge on the desired human resource outcomes of commitment, quality, and flexibility (Guest, 1987). Consequently, these 'gendered' practices implicitly extol competencies such as 'hard work', 24/7 availability', and 'commitment' which are often in conflict with the demands on women to balance their work and family (given that domestic and caring responsibility often falls in the ambit of women's work). Further, the assumptions associated with the 'administrative man' often undervalue traits such as caregiving, sensitivity, and handling of emotions and conflicts (associated with women) while rewarding assertiveness, and

rational decision-making (associated with men). Thus, bias propagated by these HR systems has contributed to the marginalization of women in the workplace (Acker, 1990; Ely & Meyerson, 2000; Festing *et al.,* 2015). The following sub-sections will attempt to highlight how three key HR systems- namely Hiring; Rewarding and Promoting have contributed to the gender pay gap.

4.5.1 Marginalisation During Hiring

Hiring processes can contribute to gender pay inequality in several ways and at different stages—right from the time the organization puts out an advertisement (Davison & Burke, 2000) to ultimately giving an offer to the potential employee. For instance, job descriptions for senior positions that include attributes such as toughmindedness, rationality, and analytical skills are seen to favor men and get better visibility and valuation (Ely & Meyerson, 2000). Subtle discrimination could happen when the organization depicts women employees in secretarial and administrative roles and men as managers and in senior roles. Likewise, even when criteria for candidate selection are clearly defined one might find stereotypical assumptions playing out. Legislative changes in the Equality Act across the Western world have managed to mitigate these overt sources of bias to some extent. However, a recent study of 76,929 job adverts by Totaljobs, a recruitment company in the UK, and their

partners found that on an average, there were six male-coded or female-coded words per job advert (Totaljobs, 2017).

Unconscious Bias is rife during the screening and selection stage. For example, hiring managers can unintentionally make biased decisions based on the demographic details of candidates because of their deep-seated beliefs about gender roles. Many modern organizations prefer to hire for attitudes and behavioral competencies rather than technical skills and thereby look for a person who can be a right fit with the organization's culture. A closer look at some of the most sought-after competencies, include Communication; Achievement/Results orientation; Customer Focus; Teamwork; Leadership; Planning and Organizing; Flexibility/adaptability; Problem-solving; Analytical thinking; Building relationships, etc. Taylor (2014), shows that most of these have gendered connotations (Armstrong, 2018) and therefore an unconscious bias is can impede the drive towards inclusiveness. Similar qualities demonstrated by both men and women are judged differently. For example, Assertiveness is seen as desirable in men and unbecoming in women. Ibarra *et al.* (2013) conclude that women leaders are in a double bind as they are "damned if they do and damned if they don't". If they emulate male behaviour, they are considered to flout the stereotypical behavioural expectations from women and if they behave more ladylike- they are criticized for not being leaders like

demonstrating more masculine traits. The hiring methods whether they are formal such as rigorous assessment centres and interviews, or more informal such as 'word of mouth' recruitment are prone to potential biases because they ultimately depend on 'interpretations' of competencies and skills by individuals rather than a logical algorithm (Bohnet, 2016; Kirton & Healy, 2009)

4.5.2 Performance-Based Pay and Bonus

Pay progression systems based on performance such as performance based pay as well as bonuses have long been associated with the gender pay gap and it is suggested that employers who have a performance-based reward culture are not likely to favor their women employees (Metcalf & Rolfe, 2009). This happens because of a systematic bias in the performance review process- right from setting objectives to the assessment of success (Cecchi-Dimeglio, 2017). The Heidi Howard story, made popular by Sheryl Sandberg in her book 'Lean In' (2013) is an example of how individuals tend to read the success of men and women differently. Sandberg narrates an incident where a group of students at a prominent university in the States were given a case study about a venture capitalist and were asked to list down attributes that they thought made the person successful. As a part of the experiment, students were split in two groups- one where the protagonist in the case study was a woman named 'Heidi' while for the other group it was 'Howard'. Interestingly, the

students reviewing the case study with the woman's name on it identified 'arrogance' and 'self-promotion' as key traits while those who had the male version of the story listed down 'entrepreneurship', 'self-confidence', and 'vision'. Clearly, the connotations of achievement were quite different in both cases.

Gender pay gap reporting has shone the light on another contentious issue – that of the bonus culture, also called the 'fat cat culture'. Findings show that for a majority of companies, the proportion of men being given a bonus far outweighed women, partly because men make up a large share of the senior jobs, which tend to receive more bonuses. However, even in cases where women were represented in the upper levels of the hierarchy, a higher proportion of men received bonuses compared to women (Gender Pay data, 2018).

4.5.3 Career Advancement and Development

Of all of the human resource management practices, perhaps advancement along the career ladder is most prone to gender stereotyping. Reflecting a patriarchal society, men are unconsciously seen as a natural fit as the head of an establishment or the leader of a group. It is still widely believed that while women are high on nurturing qualities, men are better at strategic leadership, which is a pre-requisite for higher positions, portraying the 'think manager think male' phenomenon (Braun, 2017). Women do not typically meet the image/ schema of leadership as the

implicit leadership theories tend to suggest that leaders should have traits typically associated with men, while followership theories advocate so-called feminine traits. Interestingly women seem to match the images of followers better in the follower implicit theories. Both men and women tend to project gender stereotypes and seem to take notice when these are reinforced and ignore them when they go unchallenged.

Further, there is evidence that while male leaders tend to show a preference for male contenders for promotions, women leaders enact a "queen bee" role (Derks *et al.*, 2016) and remain isolated without sufficiently leveraging their power in assisting other women. This also manifests itself in the form of opportunities for talent development. For example, Festing *et al.* (2015) in their study of German organizations found that the group responsible for selecting individuals for talent development was exclusively composed of men and selected substantially more men than women for these programs. A performance-based reward culture, discussed in the previous section, also limits career opportunities available to women. Therefore, if women are not seen as achieving high performance as defined in terms of the so-called masculine traits, they are unlikely to climb up the career ladder.

Most blame the 'Glass Ceiling' for women reaching the top. But the concept of the 'Glass Cliff'- the preference of women to be chosen for top positions in poorly performing

companies or in precarious circumstances, shows further complexities involved in women taking up senior roles (Ryan & Haslam, 2005; Bruckmuller *et al.*, 2014). There are several examples of this phenomenon across politics and business.

5. So, What Can Managers Do?

Organizations need several strategies to encourage women. Carlson & McEnrue (1985) in their study based in the US suggested behavioral strategies that question societal values and beliefs and help women integrate their roles and feel motivated to have a career and succeed. Another set of strategies is structural (processes) that would modify the behaviours of individuals and thereby help gender equality (Bohnet, 2016). Below are listed some specific steps that can be taken by practitioners in order to manage the gender pay gap in their organizations. None of these are likely to work in isolation. Rather multi-dimensional, long-term interventions rolled out to cover all employees will be required.

5.1. Consciously Tackle the Unconscious Bias through Rejigging HR Processes

Unconscious bias of people, perpetuated through processes, remains a significant obstacle in an organisation's drive towards gender equity and often it is this hidden form of sexism rather than an overt one that holds women back. Simple measures include introducing the term "unconscious bias" in the vocabulary of the organization, not just in the form of mandatory training, as many organizations seem to do, but to include it in day-to-day practices and conversations (Bohnet, 2016; Knight & Brinton, 2017). Obvious steps such as using gender-neutral language in job descriptions and omitting demographic details in resumes while screening them (much like musical instrument auditions behind a curtain) seem to have worked to a certain extent. For example, vodafone piloted a screening process in India, where it blanked out names of individuals from their resumes and found that they were hiring more women than before. This shows that "Heidis" and "Howards" can have an equal probability of making it through the screening process. However, this only helps at a very superficial level and requires a deeper commitment by organizations to weed out gender inequities. While selecting candidates, the use of work sample tests (where applicants are given a sample of tasks that they would be expected to perform in the job), role-specific interview questions, the use of neutral checklists, less reliance on informal networks that tend to propagate 'monocultures' as well as focussing on diversity of ideas rather a constant endeavor of finding the perfect fit between the organization and the person will reduce the scope for bias (Bohnet, 2016). Further, an in-depth analysis of the language used in formal policies and practices such as Manuals, HR handbooks, and Employment contracts can be helpful in avoiding gender stereotypes.

Often the wage determination and career advancement practices based on performance assessment, as suggested in the earlier sections, tend to favour men. While gender-neutral job evaluation is seen as a remedy for creating gender equality, they can also help in further 'institutionalising the bias' (Armstrong, 2018) Hence having more women on the job evaluation committees will be useful in getting multiple perspectives about 'jobs' as well as 'factors and weightings' used in the jobs. Performance review processes are highly susceptible to biases as they are based on the 'judgment' of managers about potential and current performance (Bohnet, 2016). This could be partly avoided by more 'data-based' evaluations as the ones done by Google and Amazon. Further, the use of regular reviews and feedback on performance can help not only in assessment but also improvement of performance (Cecchi-Dimeglio, 2017)

Many companies are implementing unconscious bias training for their staff, particularly managers, in order to make them more aware of their biases. However, biases are developed over several years and hence difficult to fully eliminate. A cookie-cutter approach can be counterproductive. Perhaps a more individualized approach can be taken to tailor the training to the needs of employees. The role of line managers, coaches, and HR managers can be crucial here in ensuring that steady progress is made toward mitigating the biases of employees. Like with any other training, it is the implementation that matters. There is research that shows that mandatory unconscious bias training can have an adverse impact on trainees potentially making them even more biased (Dobbin & Kalev, 2016). However, there are ways in which such training can be made successful. For instance, "perspective-taking" technique (Emerson, 2017) gives participants the opportunity to see what it feels like to be in place of a person who is a victim of bias. Similarly implementing a long-term intervention rather than a one-off training can help.

5.2 Advertising Returner Programmes and Family Friendly Policies

A break to bring up their family can be a major disruptor for women wanting to pursue their careers. Family-friendly policies, now implemented in several countries have not been very effective in reducing pay disparity. Hence returner policies for women can be critical. HR needs to brand and market these schemes well so that they give more confidence to women to come back after their break and get a buy-in from both men and women. Similarly, offering fast-track development programs specially designed to help women hit the ground running on their return to work can be a win-win situation (Government Equalities Office report, March 2018). However, in order to have a vibrant and diverse talent pipeline, such policies must be rolled out across all levels of the organization,

rather than limiting them to middle or top levels of management, as some organizations have done.

5.3 Supporting Women through Mentoring, Sponsorship and Networking

Mentoring, Sponsorship, and Networking all are invaluable in helping women negotiate the complexities of their career paths (Ibarra *et al.*,2010). Although the scope of the three differs, all these initiatives enable women to connect with others as well as introspect and experiment with successful career-enhancing behaviours (Brescoll, 2011; Stead, 2013). The '30 per cent club', a cross-company organization that provides mentoring to women, is an excellent example of this, which has seen women thrive in an inspiring environment. Having female mentors and role models can inspire women to dream big and provide support as well as confidence through different stages of their careers particularly at major inflection points such as at an entry-level job or when they come back from their career break. Recognizing both mentees as well as mentors through the process can be mutually beneficial and critical to the success of such initiatives.

In a study of female CEOs by Asthanapolou *et al.* (2018), the respondents acknowledged the importance of mentoring, scholarship, and role modeling by female leaders in organizations. Having women at the top as role models can also help female managers learn from them about communicating their accomplishments more confidently (Grant & Taylor, 2014).

5.4. Having more Women on the Remuneration Committees

There is evidence that having more women on remuneration committees reduces the chances of CEO pay increases through an increase in the variable component and thereby contributes to reducing the pay gap. Having women on the executive/ non-executive board also helps in propping up the numbers to a 'critical mass' (Usman *et al.*, 2018). Similar committees can also be made responsible for monitoring pay and promotions and analysing pay across the organization.

5.5 Create a Culture that Supports Diversity

Last but not least, it is imperative that managers create and nurture a culture of inclusiveness not just for women but also for all employees in the organization. The effects of diversity only emerge under an organizational culture that values breadth of experience, skills, and attributes irrespective of gender (Fitzsimmons, 2012; Joshi *et al.*, 2015). Diversity must be made a norm in organizations by raising awareness about it. Further, creating an understanding of current practices by encouraging reflection and developing a vision through creating a trust-based environment can support diversity (Pless & Maak, 2004).

6. Concluding Thoughts

The writing is on the wall. Employers must demonstrate substantive action on gender pay inequity. They simply cannot afford to ignore it. There is an ethical, moral, social as well and increasingly legal case for it (as was recently seen in Iceland, which became the first country to make it illegal to pay men more than women). If organizations have the right intent, great strides can be taken in mitigating the gender pay gap. There is a real momentum around equality, diversity, and inclusion as well as corporate governance, social responsibility, and corporate sustainability. The reporting regulation fits well with this current narrative of enhanced pay transparency and equity. However, merely recruiting a higher number of women across the organization and the board will not be sufficient. The action has to be a multi-pronged one and integrated into the social fabric of the organization. Even in the most diverse organizations, positive outcomes are unlikely to come unless diversity is embedded in a culture of inclusiveness. Employers therefore must constantly up the ante. Any slackness will only result in tokenistic measures that will provide a superficial veneer of diversity to hide the gender divide. HR professionals must champion the cause and reengineer their processes in order to ensure equity and fairness rather than implementing practices that are skewed in favor of only one part of the population.

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