ISBN: "978-93-87901-17-9" 10th, 11th, 12th December, 2020

STUDY OF BEHAVIORAL COMPETENCIES REQUIRED FOR INDUSTRY 4.0

Leena Immanuel
Research Scholar, Savitribai Phule Pune University, Pune, India

Dr. Mohsin Shaikh
Professor, ASM Institute of Professional Studies, Pune, India

Abstract
The term 'Industry 4.0' has gained immense popularity in the last two decades. The skill & readiness of the workforce for the same has been a matter of research and discussion for academicians & scholars. Artificial Intelligence, Machine learning, cloud computing among other emerging digital trends is creating a major shift or change in skill set asks. It therefore becomes important to have an unbiased review of literature to understand the terms 'competency' & 'industry 4.0' and the impact it has on the current workforce and skills needed for the future. The current paper explores at understanding the title 'Behavioral competency needed in Industry 4.0' with specific reference to the research/study that has been already done. It also looks at the research done in terms of understanding the impact of industry 4.0 on job market and skills of existing workforce. The present study contributes to body of knowledge by reviewing existing literature on the topic and understanding the gaps and thus providing a starting-point for further research regarding behavioral competencies needed in Industry 4.0.

Keywords: Competency, future skills, Industry 4.0, Behavioral competency

Introduction:

The contours of the existing work environment are changing in many ways than one with the Fourth Industrial Revolution (I4.0). The pace of change has further accelerated with advancements in technologies underlying the integrated environment of I4.0. Every industrial revolution brings along with it a shift in the way the industry operates and thus a direct impact on the quality and quantity of jobs. Such augmentations brought about in jobs in an i4.0 environment are definitely creating a completely new family of jobs, which never existed before. The impact of new technologies with Artificial intelligence using automation and algorithms has great potential in positively influencing the quality and productivity of employees. The opportunities for global progress, economic prosperity, societal advancement and individual development are phenomenal, depending on the ability of individuals &concerned stakeholders to introduce strong and robust approaches to identifying &developing skills/competencies of the future. Competency models/frameworks can help in this transitioning of the workforce to a new skillset by defining characteristics and performance thresholds, standards & requirements. There cannot be a single or unique set of standards as far as competency model is concerned. This is because the ask and requirement of every job, industry and business is different. However, a large repository of themes and dimensions can be articulated based on a generic understanding and then based on the need the same can be refined or tweaked.

Understanding Competency:

Competency includes knowledge, skills/ability, attitude behaviors and underlying this therefore is a whole gamut of soft skills that is difficult to highlight. In 1982, there was a research study undertaken by an individual named Zemek with an objective of defining the term 'competency'. He did this by interviewing several individuals who were specialists in the field of training. At the end of all the study, he concluded, "There is no clear and unique agreement about what makes competency." It therefore has merit in at least reviewing and understanding what the founding fathers of this terminology meant by the term 'Competency'

R. W. White (Motivation reconsidered, 1959) brought up the term competence for the very first time. He introduced it as a concept for performance motivation. Craig C Lundberg picked it up and defined the concept in 'Planning the Executive Development Program in 1970. David McClelland's seminal paper entitled, 'Testing for competence rather than for intelligence' further gained a lot of traction. Since then the term competence has been popularized by many others including Richard Boyatzis & T.F Gilbert. In 1982, there was a research embarked upon by and individual named Zemek with an objective of defining the terms 'competency'. He did this by interviewing several individuals who were specialists in the field of training. At the end of all the study he concluded "There is no clear and unique agreement about what makes competency." It therefore has merit in at least reviewing and understanding what the founding fathers of this terminology meant by the term 'Competency'

Hayes in 1979 articulated competences generally include knowledge, motivation, social characteristic and roles, or skills of one person in accordance with the demands of organizations of their clerks. In 1982 Boyatzis opined Competence lies in the individual's capacity which superposes the person's behavior with needed parameters as the results of this adaptation make the organization to hire him. Albanese (1989) defined Competences are individual's characteristics which are used to effect on the organization's management. Woodruff in 1991 opined competence is a combination of two Competences is a combination of two topics of personal competence and merit at work. Personal merit is a concept which refers to the dimensions of artificial behavior in order to show the competence performance and merit at work depends on the competences of the person in his field. Mansfield (1997) defined it as the personal specifications which effect on a better performance are called competence. Rankin (2002) termed it as a collection of behaviors and skills which people are expected to show in their organization.

Unido (United Nations Industrial Development Organization) (2002) defined it as knowledge, skill and specifications which can cause one person to act better, not considering his special proficiency in that job. According to Industrial Development Organization of United State, competences are a collection of personal skills related to knowledge and personal specifications which can make competence in people without having practices and related specialized knowledge. Hay Group (2012) defines competencies as measurable characteristics of a person which are related to efficient actions at work, organization and special culture.

Javier Perez Capdevila (2017) defines competences as fusions obtained from the complete mixture of the fuzzy sets of aptitudes and attitudes possessed by employees, both in a general and singular way. In these fusions, the degree of belonging to the resulting group expresses the extent to which these competencies are possessed. Lucia and Lepsinger offer this definition of a competency: as a cluster of related knowledge, skills, and attitudes that affects a major part of one's job (a role or responsibility), that correlates with performance on the job, that can be measured against well-accepted standards, and that can be improved via training and development."

The above study of definitions spans a period of about 50 years. The reason for this compilation & study is to understand the origin & journey of the word 'competency' and have an all-encompassing understanding given there is no standard and/or scientific definitive definition of the word. The literature review on 'behavioral competency' uncovers the lack of a standard definition for the term competency. After having studied all of the above in-depth, it is fair to assume that competency relates to skills that are translated to demonstrable behaviors and evaluated by performance.

Competency Model:

A competency model refers to a well-articulated and defined model that diligently and meticulously lists down knowledge and skill required to perform a particular activity. It may have competencies that are technical/functional, domain and behavioral. Organisations have competency models designed specifically for their own consumption.

ISBN: "978-93-87901-17-9" 10th, 11th, 12th December, 2020

Benefits of Competency model:

Defines standards of performance (Posthuma&Campion, 2007) – A competency model which is well articulated helps employees understand the organisation's expectations of them in their jobs.

Hiring reference guide (BArtram, 2002)–An organisation's performance is a function of the performance of every employee across functions and levels. A robust competency framework chalked out for the organisation base lines the standards expected. A strong gating/filtering at the hiring stage, thus ensures the inflow of expected competency levels.

Improved talent planning. A comprehensive competency assessment gives visibility to current and future talent capability. This data can be further used to plan for movements (right skill sets mapped to right roles) across the organisation, future pipeline projects etc

Training and development to meet and exceed thresholds (Schipmann, 2000). The outcome from the competency assessment acts as an injestion into the training and development team. The skill gaps of employees can be ascertained from the results of the assessment and developmental plans can thus be chalked out accordingly.

Improved operational efficiencies – Operational efficiencies can be plugged when skill gaps are flagged of by a comprehensive Competency assessment followed by development plans.

Promotions and movements ((Morgeson, 2009) – Promotions and movements based on a well-defined competency framework ensures that the right person with required skill set is placed at the right job thus ensuring optimized performance.

Employee career development (Groves, 2007): Employees are the only assets of any organisation that appreciate over a period of time due to experience gained and proficiency mastered. If the employees are therefore regularly trained and their skills honed, the appreciation will be far higher and will show visible in the outcomes.

Challenges of Competency model:

Implementation fallacy: Organisations where Competency management exists as an HR process, and not a business imperative, may not be able to fully reap the benefits of performance excellence due to lack of standards against which performance can be measured and actions taken

Difficulty in identification of critical competencies: Identification of critical competencies is not an easy task. Therefore, it is noticed that there is a considerable amount of inappropriate identification or inadequate identification of competencies and the fall out of the same.

Inappropriate alignment of competencies with business goals: It has been observed that mapping of competencies and articulating of business goals are directly linked. The inappropriate alignment directly impacts the accomplishment of goals adversely.

Insufficient or deprioritized Investments being made in competency management – While there is enough evidence that robust competency management helps in accomplishing overall goals of an organization, it is discouraging to note re-prioritization of investments for the same. Of the total talent management budgets only 9% were allocated to competency management in 2014which further fell down by 5 points in 2016.

Unavailability of digital tools for managing competency management – While investment is the critical reason for this challenge, the compromise made is on accuracy, confidentiality and objectivity of the info/data collected and processed. .

Types of Competency Models:

Core Competency Model

Core competency model is a unique model as the competency framework is based on defined/articulated values and beliefs of the organisation. The competency framework thus forms the

ISBN: "978-93-87901-17-9" 10th, 11th, 12th December, 2020

baseline required to function within the organisation. Any opposing views will thus create a conflict because it will not be aligned to the values of the organisation.

Job-Specific Model

This model refers to defining the threshold for performance of job specific activities with a high level of skill. Each skill held by an individual is a considered as a competency. This model is used by organizations as a threshold for hiring or even promotions or movements (vertical or horizontal)

Management Models

Management models generally refer to leadership abilities needed to deliver in an environment where there are multiple functions or large employee base.

Prominent Competency model:

Lominger Competency model – This model was created over a research work of 15 years by two individuals Michael Lombardo and Robert Eichinger and published through their organisation created in 1991, it has a comprehensive list of 67 competencies.

McClelland/McGee Competency Models (studies done in 1970s and 1980s and published in 1993 and 1996) .This list of competencies was way too long and was finally distilled to about 18 competencies

Industry 4.0

Industry 4.0 is the nomenclature used to describe the tectonic shift in the industry. The manufacturing sector has been christened as industrial revolution and has been suffixed with 1.0 (introduction of steam-powered mfg), 2.0 (introduction of electric mfg & mass production) and 3.0 (introduction of electronics &IT). The advent of the Cyber physical systems and the giant leap in information technology has given way to a mighty revolution not only in the manufacturing sector but also across human lives itself. Thus Industry 4.0. is considered the subset of what is called as the 4th industrial revolution though both the terms are used interchangeably. The term Industry 4.0 was coined by the BMBF in Germany (Federal Ministry of Education and Research) and introduced at the Hannover Messe Industrie (HMI Fair) in 2011to make public the technology strategy of the German government with an intention to regain its competitiveness and position as the industry leader in the manufacturing sector. Klaus Schwab (executive chairman of the World Economic Forum), a German engineer has been a pioneer and contributed immensely to the ever growing body of knowledge on the topic of I4.0.

I4.0 is comparatively a new concept (introduced in 2011) and therefore from a research standpoint lacks the necessary depth in a research world. Nevertheless, in an attempt to add value to the knowledge repository it is essential to review available literature on the definition of Industry 4.0.Hermann, Pentek, & Otto (2015) referred to Industry 4.0 (or named in the report as Industry 4.0 in a more collective term for various technologies/ concepts of value chain organisation.

From the above it is clear that there is no definitive or agreed upon definition for the terminology 'Industry 4.0'. There are points of view (Pfeiffer, Jan 2017) on the founding fathers deliberately avoiding details to keep the term vague or expecting the same to evolve. Considering the underlying elements of I4.0 to be harnessing emerging technologies, it can be safely assumed that there can be no standard definition of I4.0.

A. Changing landscape of workforce

Industry 4.0 has resulted in a considerable shift in the overall job market due to the introduction of artificial intelligence, cloud computing etc.

Cobots: Cobots (robots that work alongside humans) will make up for a large portion of the workforce. International federation of robotics, have highlighted that 2.25 million robots have been deployed in the past 2 decades and by the end of this year the number will reach to about 3 million. The manufacturing industry in the US alone uses about 189 robots per 10,000 workers.

New jobs families: A Price water coopers report highlights that by 2030, of 2.66bn global workforce; 8-9% will be engaged in occupations that do not exist today. According to a WEF report, 65% of primary children will pick up job types that are not yet on our radar. With mundane and routine jobs being automated, there is a significant rise in jobs that are highly engaging and requiring higher order skills of decision-making, creative thinking or problem solving. (David Sproul, Angus knowles-Cutler, Harvey Lewis, 2019) highlighted in their paper that in UK alone 800,000 low rung jobs were replaced with 3.5 million higher order that influenced the economy to the tune of £140bn.

Boundrylessness of work – A survey by Global Workplace Analytics and FlexJobs reported that work from home has grown 91% over the last 10 years. A law firm Seyfarth collected responses from 550 clients to check for their willingness to allow employees to work from home during the current pandemic. 67% of the employers were taking steps to encourage employees (who normally do not work from home) to work from home. Employees are no longer bonded to their jobs in terms of location, hierarchy, timing of work etc. In their paper The new boundaries of the "boundaryless" company Larry Hirschhorn and Thomas Gilmore explore these concepts where flexi working is the new norm.

Half-life of skills – Half-life of a learned skill today is at 5years which is significantly coming down. In a career that spans to about 40-50 years this would simply mean de-skilling and re-skilling is absolutely needed to keep oneself competitive and relevant in the job market.

B. Changing landscape of business

Evolution of Multichannel Businesses – It refers to the practice of using multiple sales channels to sell a products/mechandise. Eg banks, retailers

Introduction of Modular Producers – plug and play services and products with the ability to adapt to any ecosystem. Eg paypal

Ecosystem Drivers – Provides branded platform for rent where customer and providers needs are matched eg Amazon

C. Changing lifestyle of people

Connectivity–Devices with own social networks will make connectivity pervasive.

Perception - Society will view one another through multiple data layers.

Improved quality of life - Augmented reality and wearable devices will monitor and give quick feedback on daily life, especially tied to personal health.

Digital divide – Divide in society due to accessibility of data will be an added dimension to the existing socio-economic factors.

From the above it is certain that lower end, routine and mundane jobs are seeing a declining trend due to automation; while, there is a gradual increase in jobs that need human intervention in terms of decision-making & problem solving. The change in workforce composition from human only to human-machine mix is another key feature of I4.0. Chances of having to work alongside machines call for a completely different competency (behavioral and technical) which not many have learnt or adapted to/adopted. Thus, there is a greater emphasis on skills of employees today than it ever was. Employees have lesser duration to de-skill / re-skill due to shrinking lifecycle of skills. While it will be critical to nurture new skills in an effort to harness the potential offered in the digital economy, honing existing skills is equally important.

Need for behavioral competency in I4.0

Competence as a concept emerged for the first time about in mid 50s; however, it gained popularity in the 70s. It refers to performance behaviours, which are observable & measurable and critical to successful individual and company performance. It includes knowledge; skills & attributes that help

individuals scale up on their performance. Thus, most organisations today have a competency framework that forms the basis of hiring & on-boarding, development and movement of employees.

Industry 4.0 refers to the new phase of the industrial revolution with the advent of the digital era – Artificial intelligence, machine learning, internet of things etc. The fourth wave of technological change (Industry 4.0) may be particularly impactful, largely due to combinational (different technologies coming together, spanning digital and physical in new ways) and rate of diffusion. The speed at which change is being introduced through the digital medium is overwhelming and quicker than human comprehension in most cases. Michael E Porter of the Harvard Business Review said: "What is underway is perhaps the most substantial change in the manufacturing firm since the second industrial revolution, more than a century ago." This new environment is transforming our lives rapidly. Every sector in the industrial world is gearing up to face the new revolution. In an effort to embrace the change and adapt to the digital world, there is an urgent call to analyse, evaluate and incorporate the new skills/competencies that will help in assimilate better into the digital world. With the advent of robots & technological advances, the quality of life has been on an upward trend. While there is a school of thought that is highlighting the loss of jobs, it is imperative to understand the kind of jobs that are becoming obsolete – lower end jobs that are repetitive & mundane, physical & manual jobs, unsafe & hazardous jobs. Interestingly, even some of the jobs that are considered high end like medical surgeons, financial analysts are seeing a lower trend with automation removing the margin of errors due to human involvement thus improving the accuracy.

Almost every organization is moving into the space of Digital operations (Machine learning, AI, automation, robotics) to be competitive in the market. Organizations are spending huge amount on re-skilling their employees to ensure they are future ready.

Conclusion:

Based on the detailed review of literature, it can be concluded that with technology paving its way across all industry segments and core functional and domain skills being automated largely, the skills that stand out and risk being left out of automation (for now) are the behavioral skills. A robust behavioral competency framework therefore, can be great tool to equip the existing/ future workforce and retain skilled employees to meet the demands of future. With the awareness, knowledge and use of the information contained within the framework, individuals and organizations can benefit in articulating guidelines of successful hiring, training & development , coaching/mentoring, career exploration and other employee career related areas. A robust behavioral framework can be fungible across industries, functions and levels/roles as it will now focus on mid/higher complexity human skills (considering low skill work will be automated)

References

1) BArtram. (2002). Organizational Effectiveness: The Role of Psychology. wiley.
2) Basl, J. (2018). Companies on the Way to Industry 4.0 and their Readiness. si journal.
3) Boyatzis, R. E. (2008). Competencies in the 21st century. Journal of mgt dev.
4) FONSECA, L. M. (2020). Industry 4.0 and the digital society: concepts, dimensions and envisioned benefits. 12th international conference on Business excellence. De Gruyter - Open.
5) Groves, K. S. (2007). Integrating leadership development and succession planning best practices. Journal of Management development.
6) international federation of robotics. (n.d.). Robots double worldwide by 2020.
7) Jian Qina, Y. L. (2016). A Categorical Framework of Manufacturing for Industry 4.0 and Beyond. Sciencedirect.
8) Johannes Cornelis de Man, J. O. (2017). An Industry 4.0 research agenda for sustainable business models. the 50th CIRP conference on mfg systems. Elsevier.

9) Loina Prifti, M. K. (Feb 17). A competency model for 'Industrie 4.0' Employees. Wirtschaftsinformatik und Angewandte Informatik.
10) Mario Hermann, B. O. (2015). Design Principles for Industrie 4.0 Scenarios: A Literature Review. Dortmund: Researchgate.
11) Mehetre, S. N., & Apte, S. K. (2019). A study of competency mapping. Research review journals.
12) Morgeson, C. &. (2009). Why Don't You Just Show Me? Performance Interviews for Skill-Based Promotions. International Journal of Selection and Assessment.
13) Pfeiffer, S. (Jan 2017). The Vision of "Industrie 4.0" in the Making—a Case of Future Told, Tamed, and Traded. NAnoEthics - Springer links, 107-121.
14) Posthuma&Campion. (2007). Age stereotypes in the workplace. journal of mgt.
15) Sanches, W. (2019). Beyond Industry 4.0. RFID.
16) Schipmann. (2000, September). THE PRACTICE OF COMPETENCY MODELING. Personnel Psychology, pp. 703-740.
17) Shuk Ying Ho, K. F. (2010). A Competency Model for the Information Technology Workforce: Implications for Training. AISEL.
18) Sore, L. B. (2017). Consequences of Industry 4.0 on Human Labour and Work Organisation. IARJSET.
19) Strukturwander. (2011, april first). Industrie 4.0: Mit dem Internet der Dinge auf dem Weg zur 4. industriellen Revolution. Strukturwander. Dusseldorf, Germany: Struktwander.
20) White, R. W. (1959). Motivation reconsidered. American psychological association.