TEXT MINING OF JOB PROFILES: FINDING RELEVANT JOB SKILLS IN DIFFERENT INDUSTRIES

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Abstract

Pandemic and rapid technological changes in the era of Industry 4.0 have unleashed new job opportunities making some obsolete. Young professionals are not skilled enough to take up these jobs resulting in increasing unemployment. A lot is being written about the skills requirements in various industries. However, none of the study talks about the recent skills mentioned in the new job profiles created for entry-level positions by companies of various industries. This study examines (through text mining) job profiles of several companies operating in different industries to identify the skills that are most sought after in these sectors. This will help young professionals to know and acquire necessary skills required to work in industry of their choice. Educational Institutions can revamp their curriculum or design new courses/programs keeping in view the industry requirements, thus, filling in the skill gap.

Keywords: Job profiles, skill, gap, text mining, content analysis, Technology, management.

INTRODUCTION

Organizations always strive to be successful. However, in these turbulent times it has become hard for organizations to sustain in the environment. Business environment has become very volatile, uncertain, complex and ambiguous (VUCA). Organizations struggle to survive and maintain continuous growth in this environment. Technology and skilled workforce have become critical for growth and sustenance of an organization in today's VUCA world. Technology allows organizations to reduce costs by bringing efficiency in operations. Therefore, organizations leverage technology to gain competitive advantage. This is apparent by the fact that in India itself on an average 1000 tech based startups are launched each year. In the year 2019, 1300 tech startups have started. Technology has become a driving force in all the industries in this digital age be it education, retail, marketing, finance or manufacturing. New Technologies are transforming the way work is done in organizations. Therefore, increasingly the need for tech leaders is felt, leaders who can understand and spearhead technological changes in organizations and who have good business understanding so that they can anticipate changes, make sense of the environmental changes and prepare their organizations to lead the change. Leaders who have technical expertise as well as holistic view of business are the need of the day. However, it has been observed that those who have expertise in technology lack in business skills. They have bird-eye view of things and lack broader perspective. In order to lead an organization in ever-changing turbulent environment, technical as well as systemic perspective is required. Therefore, leaders should not just have technical expertise but should also be well-versed with all aspects of business. Long before, Henri Fayol has concluded that in order to be successful, managers should have technical, human & conceptual skills. This still seems to be relevant as organization's performance and success depends on how well managers are able to apply their technical, human and conceptual skills.

Technical skills are the specialized knowledge and analytical abilities leveraged in engineering, manufacturing etc.

Human skills also known as interpersonal skills are the skills required to work along other people in a team and as a leader. These include

Conceptual skills are the skills that help a person understand complex and abstract ideas. These allow a person to see bigger picture and have holistic view of things and include critical thinking, creative thinking, strategic thinking etc.

The need of specialists with broader business perspective has led to emergence of courses like Technology management. A course in MBA in technology management makes students aware about the emerging technologies and orient them on these technologies but also impart knowledge in business administration. Students are trained in various business domains of their choice such as finance, marketing, BIA etc. Interpersonal skills such as communication skills, presentation skills, time- management skills, social skills, empathy, negotiation skills, problem solving, professional ethics etc. are also honed which are required for navigating in corporate world. This helps students in gaining a systemic view of business in addition to technical expertise they have in their fields. This knowledge make them effective managers and equip them with all the requisite skills needed to drive any organization to success.

REVIEW OF LITERATURE

MBA in Technology Management aims at developing leaders who can manage new technologies. Leaders, who focus on innovation and create an environment conducive for acclimatization of new technologies, can only lead organizations to success in this VUCA world.(Hasgall, Alon, 2015)

Knowledge of business strategy, new product development, understanding issues in implementation of technology, oral & written communication are considered as important skills for managing technology. (Mallick, D. N., & Chaudhury, A,2000).

Technological disruptions are happening at a faster pace. New technological innovations make older ones obsolete. This has led to tremendous gap in demand and supply of required skills. Skills that are in demand across industries are social skills, resource

management skills (financial, material, time management skills), complex problem solving skills and technical skills etc. The level of requirement of these skills in different industries is different. It may change according to time, rate of automation and other technological changes happening in that industry. (Leopold, T. A., Ratcheva, V. & Zahidi, S.,2016).

It is an era of Industrial Revolution 4.0. Industry 4.0 is led by technologies like robotics, big data analytics, internet of things, augmented reality, simulation, 3D printing etc. Therefore, workforce needs to be equipped with these technical skills. In order to lead and work with people generic skills like negotiation, communication, critical thinking etc. are also needed. Therefore, curriculum should include these industry enablers as well as generic skills. (Amiron Evarina, Latib Abdul Azlan, Subar Kamalularifin (2019).

Industry 4.0 has also led to emergence of new areas/sectors which fulfill the strategic and technical needs of other industries like financial consultancies, financial IT solutions, marketing consultancies, Operations IT solutions etc.

Review of literature on skill requirements reveals that there is demand for technical and generic skills across industries in the era of Industry 4.0. However, no study has examined the job profiles of the companies that are rolled out to the candidates during recruitment drives. Therefore, it seemed interesting to know the skills mentioned by the companies in the job profiles. Skills that are given prominence across the industries and the skills that are industry specific. So, this research has been conducted with the following objectives in mind:

OBJECTIVES

1) To examine the job profiles of different companies from various sectors to know the relevant skills & traits for that industry.

2) To know the generic and technical skills required in different sectors as mentioned in the job profiles.

3) To know the average package offered in different sectors

RESEARCH METHODOLOGY

Job profiles of companies belonging to different sectors were collected and analyzed to check the skills relevant in that industry. Job profiles of 133 companies were analyzed for this study. List of skills- generic as well as technical was prepared. Expert faculty from different areas like finance, operations, marketing, analytics etc. were involved in preparation of the list of keywords related to that area which ensured the validity of the key words. Text mining of the selected key words was performed using python version 3.8.2 and the IDE used to write the script was pycharm 2020.3
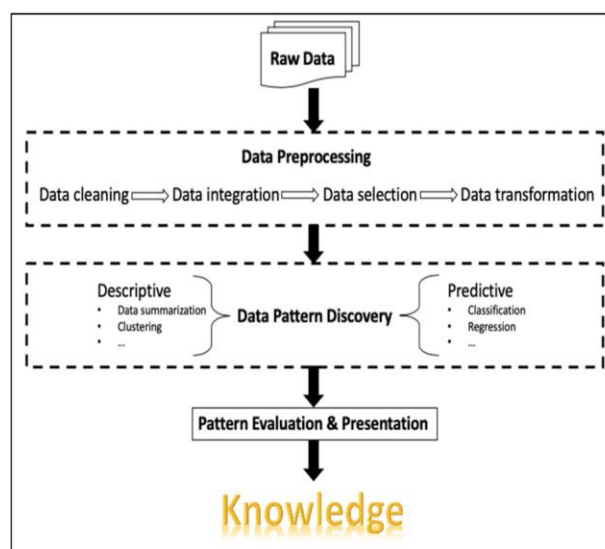

Figure1: *Data mining procedure in the process of knowledge discovery*

Source:Tao Dandan, Yang Pengkun, Feng Hao (2020)

Text mining is applied to infer information from the job profiles collected from various companies of different sectors (Zhai & Massung, 2016). Normalization of the data was done by converting all letters to lower or upper case, removing punctuation, numbers etc. Stop-words like on , an , the ,is were also removed (Zhai & Massung, 2016) followed by stemming (removal of suffixes) and lemmatization (vocabulary and morphological analyses to return a word's foundation). Noise removal is done by removing HTML, XML, metadata, and headers from text file. Tokenization was conducted by converting text file into vector of terms or tokens consisting of validated terms for each area (Manning et al., 2010; Zhai & Massung, 2016). Word level analysis was done

by counting the frequency of each term/token. Consequently, data summarization was performed in excel to gain insights from the data.

DATA SUMMARIZATION

Data was summarized using Excel and Tableau 2021.1.

FINANCIAL SERVICES

Technological advances have taken place in financial services at a faster pace giving rise to fintech related jobs. Besides, BFSI, financial consulting and finance IT solutions industry have seen huge growth in last decade. In a research paper which analysed of 500 job profiles of fintech jobs listed on job portals revealed that" manager, developer and engineer" are most frequently used words in financial sector (Sung.A et.al.,2019). In the present study, researche found that technical skills necessary to work in financial services are -data analytics, selling, operations, fund/wealth management. Important generic skills for this sector are found to be punctuality, customer orientation, business solutions, communication and reporting skills. It's important to understand customer's needs and requirements before giving any financial advice, therefore, it's considered and important skill in this industry.

ADVERTISING & MEDIA

It is evident from the chart that data analytics is one of the most essential technical skill in Advertising & media industry. These days ML & NLP is utilized to understand audience's intentions to create efficient marketing strategies.

A well-researched creative content is required for effective advertisement. Therefore, it is considered a key skill in advertising (see chart). Besides these, effective communication & presentation skills are of paramount importance in advertising world.

CHEMICAL

Chemical industry has gap of 45-50% at supervisor level jobs. Supervisor job involves highly technical & commercial operations (NSDC,2013). This study also suggests that the skills required in this industry are analytics, marketing & research. Customer orientation is

also considered an important generic skill for this industry.

LOGISTICS

According to a research study, data analysis, customer and strategic management, international trade and regulation skill, computer science, finance and communication besides logistics knowledge like transportation, operations, information management and supply chain are essential for working in this sector. Communication is considered as a very important generic skill in logistics industry (Lin, C. C., & Chang, C. H., 2018). Another study posits customer and strategic management skill, international trade and regulation skill, computer skill, finance skill and communication skill as important skills in logistics industry (Thai, V. V., Cahoon, S., & Tran, H. T. 2011). However, the job profile analysis done by us suggests key technical skills for this sector to be selling skills, computer skills and quantitative skills. Key generic skills include communication, strategic thinking and teamwork.

INFORMATION TECHNOLOGY

Besides technical skills , generic skills like Leadership, Team working, Project management, Oral communication skills are considered essential for working in IT industry (Misra Rajnish Kuma, Khurana Khushbu, 2017). Analytics, OS, mobile applications, coding, DBMS, optimization, cloud computing etc. are some of the technical skills required in IT industry along with problem solving, team-work, communication and time management skills (Doyle Alison,2020). As depicted in the chart technical skills needed for IT jobs include knowledge of emerging technologies, sales & marketing , analytics, research, optimization etc. Notably, sales & marketing are important skills in IT sector as per data analyzed .Reason for this could be that professionals have to collaborate with clients to sell their ideas to the company. Therefore, marketing and selling is an important skill for IT professionals as well. Adhering to deadlines, time-management, customer orientation, business solution skills are considered important generic skills for IT industry.

MANUFACTURING

White color jobs in manufacturing involve use of Industry 4.0 focused technical skills like AI, coding, machine learning, cybersecurity, data analytics etc. with stress on innovation. Design thinking, creativity, problem-solving, environment consciousness, sustainability, etc. are major generic skill required in manufacturing sector (Chenoy Dilip et.al.2019). Successful manufacturing involves research & development, and gaining efficiencies. Innovation is a key in achieving these. Science, Technology, Engineering & Management (STEM) play pivotal role in generating innovative ideas and therefore, skill enhancement in these areas is necessary (UKES,2012).

As per results of our study job profiles mainly has skill requirement of data analysis, research and sales. Interestingly, marketing and selling skills are considered important for manufacturing sector as well, possibly because whatever is manufactured needs to be marketed well. Most common generic skill for this industry is customer orientation probably because goods should be manufactured keeping the need and requirement of customer. Customer orientation comes through empathetic attitude. Therefore, there is a need for evidence-based social and emotional learning.

REAL ESTATE

Robotics has emerged as a good alternative to labor intensive jobs in real estate e.g. façade cleaning, painting by drones, inspection of hard to reach exteriors. AR/VR make visualization of technical components possible. AR is utilized to create 3-D reality of hard to reach components. Sensors bring in efficiency in maintenance and repairs. IoT picks data from sensors and pass it on to other objects. Digitization of real estate is not implausible. These technological changes in real estate sector have created a need for data specialists with analytics and IT expertise (Delloite,2018). Job Profile mining leads to the same results. Selling & marketing and data analytics have emerged as most required technical skills in real estate industry. Team-work, communication, presentation skills & knowledge of business solutions are key generic skills for this industry.

RETAIL

During covid pandemic retail has majorly shifted to online platforms leading retail companies to adopt new technologies to enhance the shopping experience of customers. Industry 4.0 has led to emergence of technologies, which are now employed in this sector. This has created a need for people having expertise in technology (Khairawati Salihah,2020). However, our job profile analysis does not reflect the same. Selling skills, operations, stock management , reporting and knowledge of supply chain are skills that the companies sought for in retail sector as per our analysis. Team-work, customer orientation, punctuality, communication and negotiation are important generic skills for this sector.

Marketing IT Solutions & Marketing Consulting

Recently, marketing consultancies and companies offering marketing IT solutions to other companies have proliferated. Therefore, technical skills have become very important in the area of marketing (Pefanis Schlee, R., & Harich, K. R ,2010) these days . As depicted in the chart besides marketing, data analysis, research and reporting are important skills required to work in marketing solutions companies. Business solutions can be provided only when a person has business knowledge and is able to understand the customer needs well, so, these are essential generic skills for working in this area.

EDUCATION

Education sector has become more technology focused especially during pandemic. This trend is expected to stay with a shift towards blended learning. Increasing use of AI and robotics and integrated learning platforms can observed in this sector. Skill enhancement and professional education required for career advancement is also facilitated by edtech (Dham,Kiran, 2019). Skills like data analytics and mobile application development have gained importance in education sector which is due to increasing use of technology in this area. Selling the platforms and apps is another major activity and therefore, it is another important skill in this area. General skills like good communication & presentation skills, knowledge of business solutions, team-work and enthusiasm are most sought for in this industry.

1)   Technical Skills Across Sectors

Chart depicts technical skills which are in demand in across sectors. It is evident from the chart that data analytics, marketing & selling & reporting are the skills which are required in most of the companies across sectors.

2)   Generic Skills & Traits Across Sectors

Chart clearly shows that communication skills, customer orientation, team work, punctuality are required by most of the companies across the sectors.

3)   Salary Package Sector-wise

Average package offered by companies in each sector for entry level positions are given in table

Table1 *Sector wise Salary Package (per annum)*

Sector	Package
Banking & Finance	7.74
Real Estate	7
Insurance	7.38
Chemical	6.3
Logistics	6.89
Consulting Finance	6.74
Consulting Marketing	8
IT Solutions Marketing	7.73
IT Solutions Finance	7.13
Telecom	6.5
Advertising & PR	4.56
Retail	5.17
IT	9.17
Manufacturing	7.17
Education	8.5

RESULTS & DISCUSSION

The study reveals that some generic and technical skills differ sector wise whereas there are some skills that are common across sectors. Big data, IoT, Data analytics, AI and machine learning are in big demand across the sectors. These technologies are changing the way business was done earlier. Therefore, there is big gap in demand and supply of these skills across all the industries.

Surprisingly, it was found that selling and marketing skills are required not just in marketing sector but also in other sectors be it finance, education or logistics. The reason can be attributed to the fact that ultimately all organizations either sell services or products or

ideas and therefore, selling and marketing skills have become essential to all the businesses.

Companies of all sectors are focused towards customers' requirement. So, customer orientation or empathy towards customers is considered as one of the most important skill across sectors.

Be it any industry team-work is the most sought after skill. Effective team is crucial for any company's success. Therefore, many companies provide training to their employees for effectively performing in team.

Reporting and documentation is essential for all the businesses and therefore, it is another important skill which is required in most of the sectors. Preparation of business reports is a legal requirement, so the workforce should be trained in this skill.

Data reveals that these days knowledge of business operations, conceptual, planning & strategic skills are not just required for higher-level managerial positions but for entry-level positions as well given the proliferation of consultancies in all the sectors. Therefore, it has become important to provide knowledge of complete business operations to the existing and future workforce so that they can develop holistic perspective of business and help organizations in taking right decisions.

Examination of average salary package reveals that IT and IT related sectors like IT finance solutions, IT marketing solutions etc. offer highest salary packages for entry-level positions.

It is interesting to know that companies put lot of stress on honesty and integrity and being ethical, however, this is not reflected in the job profiles rolled out by the companies. Most of the job profiles analyzed do not lay any stress on these skills. It can be that it is so implicit that companies do not mention it in the profiles, as no organization would like to have dishonest employees. However, it is advisable that companies explicitly mention this in the job profiles to underline zero tolerance for dishonesty in organizations.

CONCLUSION

A report by Global Business Coalition for Education (GBC-Education), the Education Commission, and UNICEF mentions that only 47% of the students in India have right skills required for the available jobs. Skill gap is one of the major reasons for increasing unemployment in India. Therefore, it is essential that students are equipped with right skills to improve employability and reduce unemployment. This makes it imperative to know the relevant skills in demand in various sectors. Certain key skills are specific for a particular sector whereas some skills are common across the sectors. Business schools and Institutes should work towards training the students in both industry specific skills and common skills required by the companies to reduce the widening skill gap. Students looking for jobs in particular industry can focus on learning skills specific to that industry in order to increase their chances of employment in that particular sector. Courses like MBA in Technology Management can help students' by providing them orientation on current technologies prevalent in various industries and by imparting knowledge of business operations to develop an overall business perspective. Since, Industry 4.0 is led by information technologies like big data, cloud computing, Internet of Things etc. therefore, higher salary packages are being offered to students having knowledge of analytics, AI, computer science & business. However, salary packages should not be a reason for pursuing studies in any area. Interest in the area should be the basis to choose a field of study because interest leads to excellence and excellence gives satisfaction. Multi-disciplinary studies can also be an option to gain knowledge and insights into different areas. This will not only help in widening the perspective of the students' but will also help in increasing employability.

LIMITATIONS & FURTHER RESEARCH

This study limits itself to white-collar entry-level jobs in various industries. However, there is lot of skill-gap in shop floor jobs as well. This gap also needs to be examined and therefore, accounts for further research.
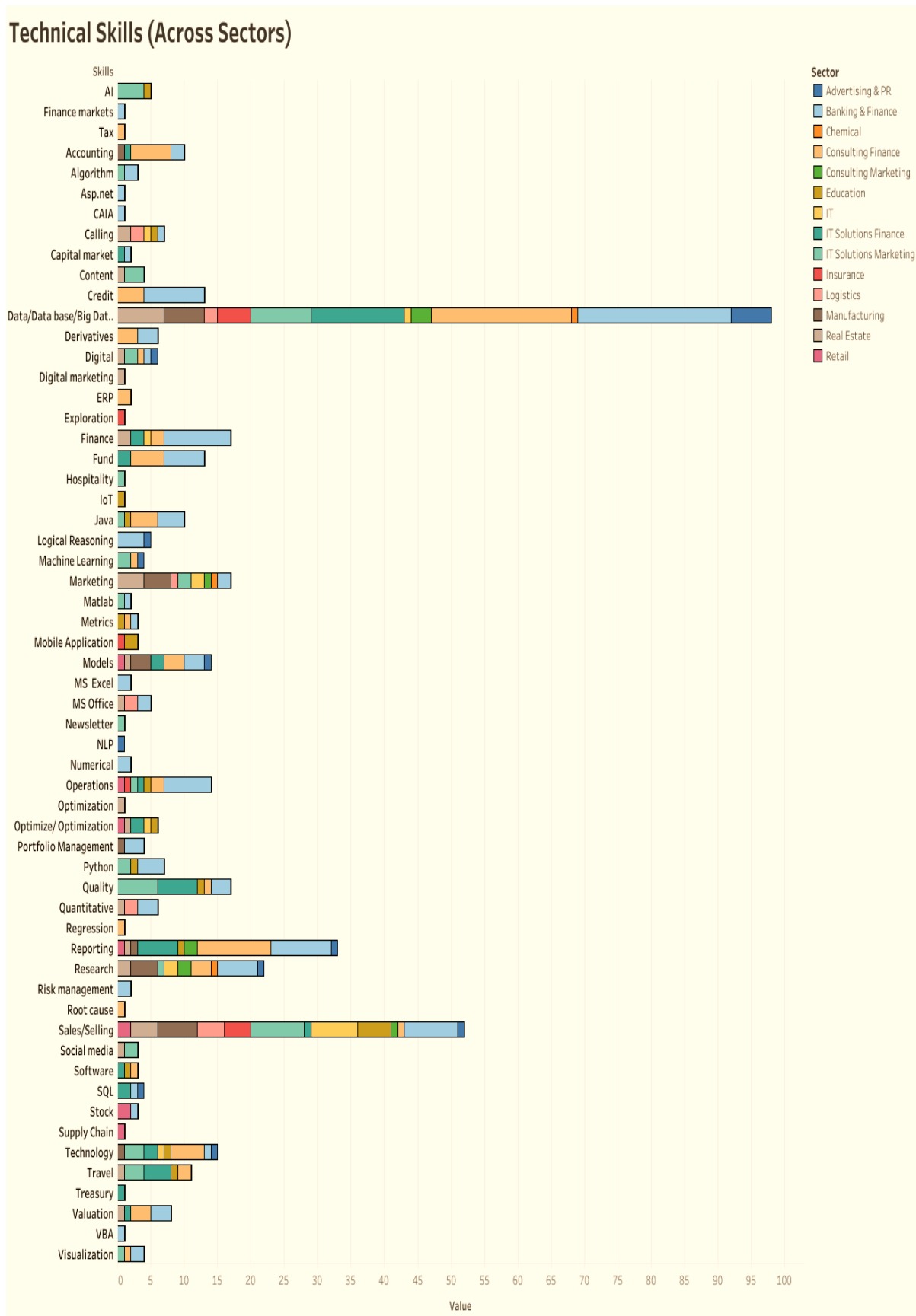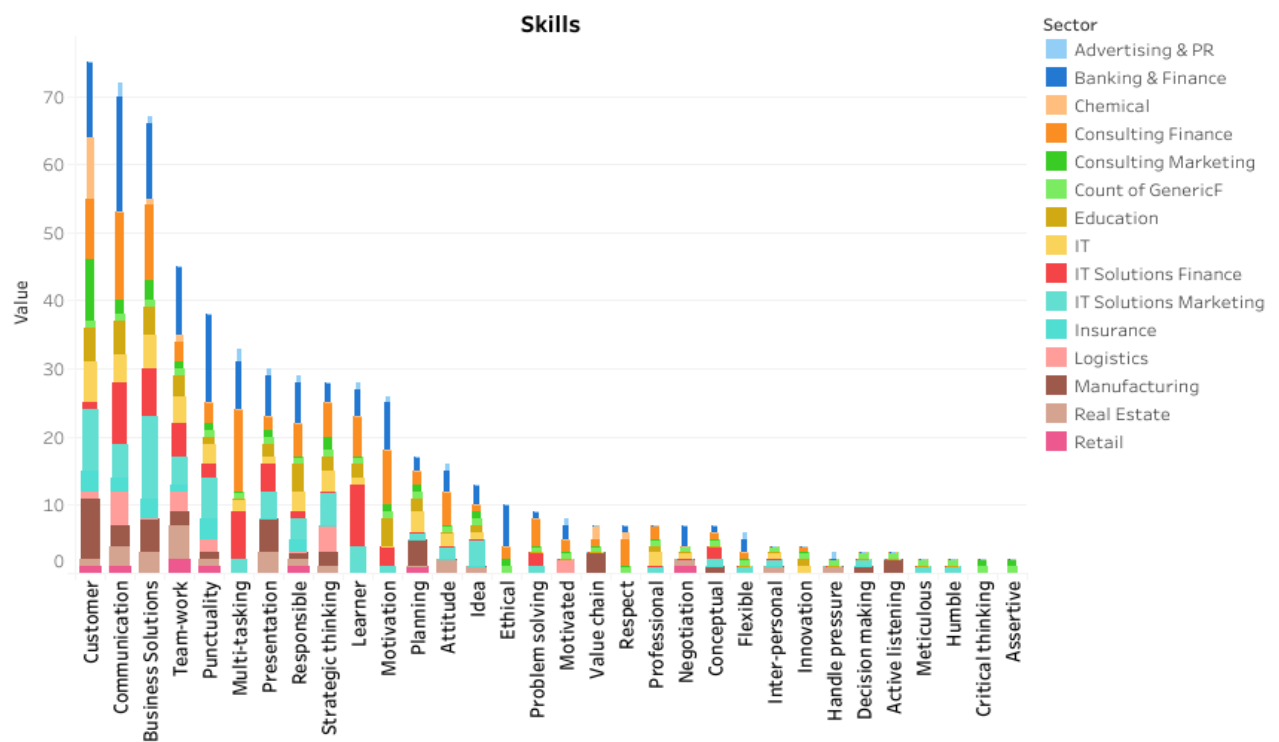
Figure 2

Generic Skills (Across Sectors)

Figure 3

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