Is an Academic Degree Required for a Successful Product Manager?

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Abstract

Recent years have shown some pioneering and advanced academic study areas required for the diversified business environment. These modern academic programs are prepared and offered to meet the market demands and needs. Product management is one of the innovative fields which is getting importance and growing rapidly in the recent years. The study focused that which academic program will help and guide the SMEs and business enterprises for the better prospect for their business? Unfortunately, a lack of qualified and certified product managers or product developers has also been observed in the recent past. Nevertheless, Product managers have become vital to business success because of their choices, decisions, and actions inherent to the attainment or failure of business growth. However, undergraduate programs are not equipped with proper certificate courses for product management, product design, or product development. This complicates the students in opting and joining any academic major to become a professional product manager. Thus, the basic issue is about which academic discipline is better suited for the development of successful product managers. Hence, the basic purpose of the study is to investigate the academic study disciplines that best serve the product manager career. In addition, the study explores whether an academic program such as Bachelor's, Master or Ph.D. degree is essential and helpful for product managers. A thorough literature review, analysis of workforce databases, and questions asked by key product executives are used for the current study. The study's approach is descriptive and exploratory to assess and evaluate the collected data. It uses a cross-sectional survey method for data analysis purposes. The findings indicate that a bachelor's degree in business, marketing, computer science or engineering, and information technology are the most popular specializations for product managers. The study also discussed the market needs and demands to distinguish between different job professions to better understand the academic requirements for product managers. Additionally, it was found that competent product managers after gaining substantial expertise in their field quite often pursue a master's in business management, business administration (MBA), or leadership.

Keywords
Product Manager, Product Management, SMEs, Business Enterprise.

1. Introduction
Academic programs are a fundamental source of providing the most updated knowledge at the higher education level. Product manager a pioneering academic degree can be useful for Small & Medium Businesses Enterprises (SMEs) and big business enterprises. It is worthy to mention here that Project Managers are somehow contributing to the business and sometimes get tangled with each other. Furthermore, the marketing department and product managers work together to create an effective marketing strategy in a competitive business environment because it is very important for the customer to know about the product details (Porter 1987 ; Man Lau et al. 2002). Similarly, organizations must demonstrate that they are truly flexible to respond to environmental fluctuations, as well as potentially create future changes, in order to succeed (Hedberg Nystrom et al. 1976; Rainey 2010). Achievement and destiny will be determined by product innovation (Sadeh and Dvir 2020). Specialists think that a human asset is a critical component of capital resources in the formation of the competitive edge because a person's unique characteristics enable them to be one of the most flexible and adaptive factors (Singh Agrawal et al. 2021). Product management proponents believe that the product manager role was created in response to the vital enterprise need to create actual revenue centers within their organizations (Luck 1969). It is critical to debate how much a product

manager plays a significant role in increasing the organization's profit. The role of a product manager should be clear and concise so it could be expanded as the job responsibilities increases (Kelly 2019).

Furthermore, Product managers with cross-functional communication abilities can work as part of multi-dimensional teams and have a significant impact on the team (Clark 1991). The position of the product manager is interpreted in a variety of different ways in the business environment. The designation of the product manager is frequently used to reflect a wide range of functions and obligations. The job specification for a product manager varies greatly depending on the company. A product manager delivers product vision to planning and execution teams from the top levels of executive leadership (Mohammad et al. 2017). Additionally, a product manager is most likely a participant or leader of a multidisciplinary team within an innovative business environment. Their role is an embodiment of a company that is focused on the start of a company's value and is supported by strategic business decisions (Gorchels 2000).

This is true that university graduates pursue their careers in a diversified business environment and want to be product managers. They want to improve product development skills to grasp product management responsibilities. Furthermore, a question arises what level of knowledge and discipline should be required at the entry-level for the post of a product manager? This is being still debated by academic and business decision-makers. As a result, this study offers a pioneer and versatile perspective on how to become a product manager and how to improve a product manager's skills and capabilities while being on the job. The descriptive and exploratory research strategy was used to achieve the research objective, and the cross-sectional survey method was used to get the answers to research questions.

2. Literature Review
2.1 Product Manager Responsibilities:
A product manager can have a diverse range of primary roles depending on the organization. In some organizations, the product manager's primary role is to ensure gains and losses. The major responsibility in some organizations is to organize communications efforts and traditional marketing. Generally speaking, the responsibility of product managers is in the areas of analytical, marketing, budgeting, planning, and operational tasks. Essentially, these administrators are supposed to perform a strategic and tactical component of the product portfolio, as well as participate in the development of innovative products (Lehmann and Winer 2005, Kotler and Keller 2013). Product managers possess unique job requirements that outline their responsibilities and functions within a business. While this describes the work, it does not explain how personality traits affect performance (Gorchels 2003).

Both management and product managers must collaborate to analyze the entire product portfolio in terms of demand and market criteria, which encompasses the company's business plan. This evaluation serves as the foundation for the company's core objectives for many of its goods, as well as its resource allocation (Baker and Hart 2007). Product management conducts consistent and periodic business environment research to establish relevant standards for proactive concept development (Gaubinger, Rabl et al. 2015).

Furthermore, the product management along with other key management develops a market presentation concept while working on specialized item development normally handled by the R&D division or the designing plan office. Product managers use project management utilizing control systems to monitor and direct product advancement and market presentation procedures. The product manager also forecasts life cycle needs and adapts existing products to shifting market situations (Kotler and Kemmer 2012). In general, the allocation of tasks within organizational structures is centered on the concern for a particular product or service group. The product manager's hierarchical position is largely determined by whether or not its responsibility includes operational and/or strategic tasks. All of these factors are taken into account when establishing the product management role within the organization (Gaubinger, Rabl et al. 2015).
Following are the key responsibilities of a Product Manager:

Table 1. Product Manager's Activities

Inbound Activates	Outbound Activities
Setting the Vision	Completive Market Variation

Product Planning	Market Research
Product Strategy	Positioning, Branding and Pricing
Product Testing	Customer Communication
Product Development	Promotion and Advertising
Product Launch	Distribution and Sales Support
After Sale Analysis	Analytics

2.2 Product Manager Competencies

Competencies include both personal potentials and work activity domains (Bozkurt 2011). As a result, there is no single definition of competency because each scientific field has its interpretation (Duarte, Goodson et al. 2014). Competency is defined as the capacity to apply knowledge and expertise to new situations and to characterize predictable results for executing professional functions (Lane 1998). Furthermore, Enis (2008) describes competency as the ability to successfully understand and apply, skills, talents, attitudes, and personal traits to do key job tasks, specialized duties, or a specific job role (Enis 2008). Basic competencies are actions that only address a portion of the job's responsibilities, such as conducting market research in the case of a product manager (Leifer and Delbecq 1978). Key competencies correspond to major work responsibilities that must be met to complete the job in developing a product strategy.

Competencies in peer networks have been regarded as critical to a product manager's performance (Gorchels 2003). Because product managers are the primary transmitters of products from the market to the consumer and their actions are critical (Lysonski 1985, Harkonen, Haapasalo et al. 2015). Because product managers play a pivotal position in the company, communication, and technical skills become increasingly important since they are required regularly and are essential for the smooth and clear information flow (Gorchels 2003; Wroblowská 2016).

Product managers devote a significant amount of effort to developing plans, project tracking, and ensuring that projected schedules and budgets are not exceeded (Gorchels 2003). Project managers play a key role in the success of a product's launch, determined by a number of factors, including product-market fit which is achieved through market intelligence and opportunity recognition (Golden 2017). Product management is renowned for legitimizing market needs to improve products through user feedback, product managers have recognition by assuring business orientation (Gorchels 2003). According to Product Marketing Management, Product managers must be able to see the product from start to finish while also ensuring that the organization's vision and strategies are achieved (Chisa 2014). Generally, product managers can be profiled using a variety of competencies required in the modern and competitive business environment.

2.2 Education and Training for Product Managers

Product management involves both technical expertise and customer understanding. Because product manager's responsibilities are more diversified than many other middle management positions, they require more cross-training opportunities (Luck 1969). One way to accomplish this goal is through various training but practical experience while working with other organizational departments adds value. Another way is to improve your academic education including a professional degree like MBA. The organization's needs will determine which training program, education, and experience level are more close to your working environment.

For example, several health services are working to improve and strengthen the skills and abilities of health care managers. It is critical to choose a proper training program, course material, and criteria for evaluating their impact to improve their applicability and efficacy (Ravaghi et al. 2021). In the research, undergraduate degrees, graduate degrees, and certificates were used to examine the educational training profiles of news product managers (Kosterich 2021).

Another research says that pharmaceutical product managers are trained not just to monitor and control the execution of the sales promotion proposal but also have expertise spanning from statistical and quantitative analysis to market analysis. It is also mentioned that a solid grasp of basic management and financial principles, including strong knowledge of profits and losses in business administration dynamics (Katsanis 2006). It is discussed by Kelly in the

research, as it was found that product managers have received very little formal training in the past (Kelly 2019). So, during their careers as part of their training, they try to integrate what they learn into a long-term strategy for their product and improvements by attending various training programs and conferences. This will be the pioneer research to concentrate solely on the level of education and the most appropriate discipline for product managers.

3 Research Methodology

This section explains the research procedure and includes information on the research strategy and also data collection technique and its implementation. It also provides a summary of the methodologies and procedures employed to meet the study objectives. This study aims to find out what academic degree is required for a successful product manager. This study hypothesizes that the position, competencies, and required education level for the position of the product manager are based on previous studies on management positions and objectives defining a theory for organizations. This study used a cross-sectional research method and is descriptive and exploratory. The empirical study is grouped in a twofold manner. To begin, a thorough literature study was conducted to develop the research objectives and questions. The literature contains the product manager's roles, competencies, and educational training, allowing the building of a list of questions to achieve the study goal. The questionnaire includes six basic questions that show the product manager's education level, key courses, relevant training, and market needs. Research objectives are listed below for a better understanding of the research scope:

3.1 Research Objectives:

As per the research scope following research objectives have been identified from the available literature:
1.   To identify the present level of product management education at higher education institutions.
2.   To explore which academic degree is an essential requirement to become a successful Product Manager.
3.   To analyze current product managers' academic degrees.
4.   To identify the market needs and demands for a successful product manager.

3.2 Research Questions

Following is a list of questions identified through the literature review, along with expert opinion. The key questions used to complete the research are included hereunder:

Q.1   Are you satisfied with the present level of product management education at the higher education level?
Q.2   Do product manager training programs play a significant role in identifying and resolving the organization's problems?
Q.3   Does any specific academic degree required to become a Product Manager?
Q.4   Do you support that students should be taught product management subjects at their schools?
Q.5   Do the product managers hold an academic degree i.e. Bachelor's, Master or Ph.D.?
Q.6   What are the market needs and demands for a successful product manager?

Once the questionnaire was completed, it was circulated to academic associates for data collection and further assessment. Initially, the sample was composed of 87 valid product manager responses out of a total of 150. The response rate of roughly 58%, which is greater than the individual level response rate of 52.7% on average as recommended by the experts (Baruch and Holtom 2008). The product managers are chosen from various business organization/company profiles, and their qualifications are shown in Table 2.

Table 2. Product Manager's Portfolio

Qualification Level	Academic Discipline	Score
Bachelor Degree	Business	40%
	Marketing	31%
	Accounting	10%
	Engineering	5%
	Management	7%
Master Degree	Master of Business Administration	5%

	Management and Leadership	2%

In the second phase, a set of 200 distinct recruitment postings for product manager jobs was collected over the course of eight weeks in March, April, and May 2022. The survey's link was published on various social media platforms, including BAYT, Linkedin, and ZIPPIA, to analyze 200 product manager job postings. The findings were accompanied by suggestions for implementing the process of identifying the most qualified individuals for product manager jobs.

4 Results and Discussions:

This study gives a sample product manager portfolio that may be valuable for both organizations trying to get the best applicant for the product manager job and individuals interested in pursuing a career as a product manager and developing the necessary competencies to boost their work performance. Furthermore, the study also considers whether a formal education, such as a Bachelor's or Master's degree, is required to be a successful product manager. The sample consisted of 87 legitimate product manager answers out of 150 total. The response rate of around 58% is higher than the individual level response rate of an average of 52.7% (Baruch and Holtom 2008). Figure 1 depicts the response which was in the form of a questionnaire.

In response to Q.1, 83% of people think that the current level of education is adequate for the position of product manager. Only 17 percent think that product manager training programs need to be updated and it is necessary to improve the skills of the product manager by providing training through various training programs, as well as having the product manager attend conferences to update their knowledge. In response to Q.2, 76% of respondents think that product manager training programs including MBAs, play a role in identifying and resolving organizational problems. According to 91% of respondents answering Q.3, a product manager does not require a specialized academic degree. There is no formal education needed for being a product manager, however, the proper skill and experience level needs to match the qualifications for the particular position of product manager. Also, because product manager is a fairly new concept with no previously described credentials or degrees, it's difficult to determine what the proper aptitude is needed, as lack wise with other positions. Nine percent of the respondents believe that a bachelor's degree in management or business is helpful for a product manager position. Another strategy to get stronger candidates for product managers, according to Q.4 respondents, is to just educate more individuals in school and ensure that technical students are given the opportunity to undertake product management. Before joining the industry, Students need to realize their abilities and provided chances to practice. The Q.5 is about the product manager's entry-level education. Seventy-eight percent of respondents think that a bachelor's degree is sufficient for becoming a product manager but that certification will provide them with management, marketing, and business skills. Twenty-one percent of the respondents say that a product manager should have at least a master's degree. Only a few people believe that a Ph.D. can help someone become a successful product manager. However, the evidence does not support this from the literature. Q.6 is separately assessed and evaluated as it was for obtaining the role of a product manager in business organizations. Detail is given below in figure 8 section 4.1.
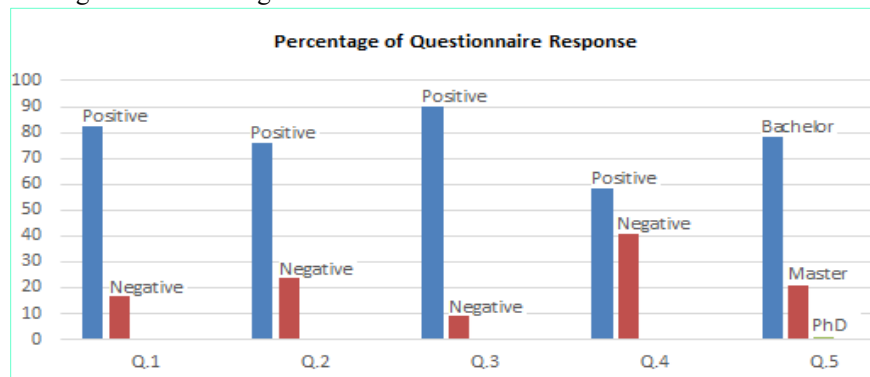

Figure 1. Product Managers' responses to the questionnaire

An empirical investigation on the primary tasks as well as the requisite education and experience for the product manager position was conducted. The survey's link was posted on multiple social media platforms, including BAYT, Linkedin, and ZIPPIA, to examine 200 product manager job postings.

First question of the study is to comprehend the legitimacy of the institutional entrepreneur environment. The ongoing education history of product managers was evaluated across four characteristics, four educational levels: high school diploma, bachelor's degree, bachelor's degree preferred with master's degree, and master's or Ph.D. degree. Figure 2 shows the demand for product managers at various levels of education as advertised in Saudi Arabia.

 In Saudi Arabia, no product manager with a high school diploma was advertised. Only one employment post for an assistant product manager with a high school diploma was advertised. The majority of companies in Saudi Arabia were looking for product managers with a minimum holding a bachelor's degree. According to the current survey, 67% of advertisements state that a bachelor's degree is required for the product manager job. While many organizations list product management education as a bachelor's degree preferred with a relevant master's degree, it ranks second with a relative frequency of 35%. The outcomes are also consistent at the master's degree and doctoral levels of schooling. With a relative frequency of 22.5%, about one-third of the product managers in the country have a master's or Ph.D. degree. Interestingly, the most frequent educational level for product managers in Saudi Arabia is an MBA degree.
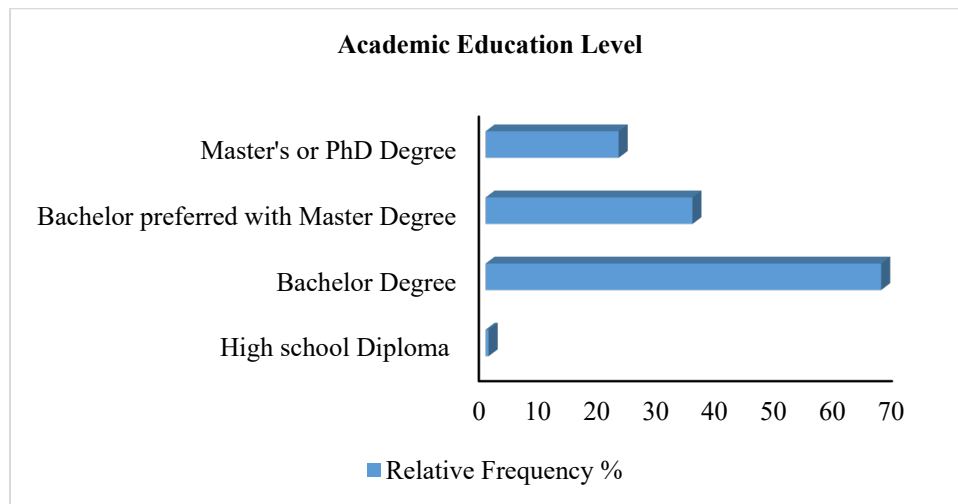

Figure 2. Product Manager's Academic education level

According to the present data, product managers are often required to hold a bachelor's degree. That degree, on the other hand, could be in business administration, accounting, computer science, management sciences, information technology, or any other similar academic discipline. As a result, a specific degree program is not required to pursue the role of product manager. Figure 3 depicts the various degrees available for product managers, as seen by job postings for the product manager position. The majority of product managers are 28%, graduate in business administration. Marketing with 12%, Computer Science and Engineering with 10%, Information Technology with 7%, Management with 5%, Accounting with 3%, and Industrial Management with 2.6% are some of the other typical academic majors for the job of product manager.
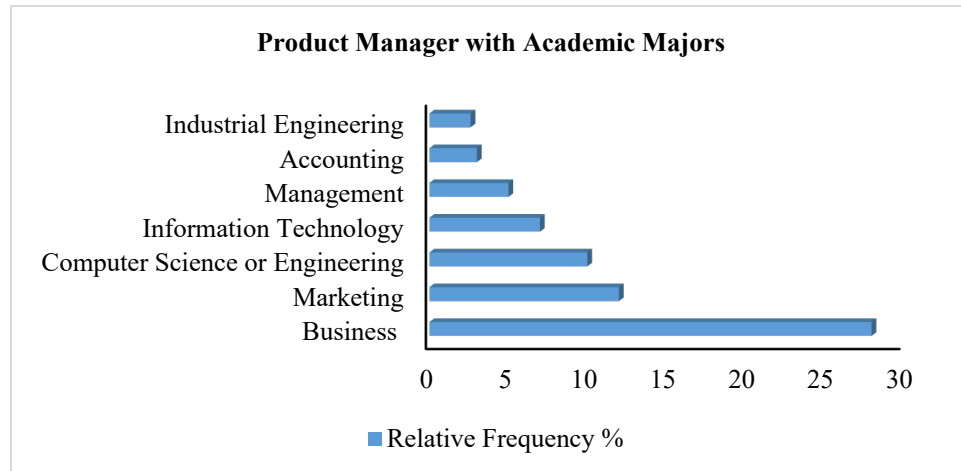
Figure 3. Product Manager's with Academic majors

To the extent that education beyond the traditional limits of graduate and undergraduate education (for example, job-specific certifications), several of the outcomes were very similar throughout countries shown in Figure 4. For example, 25% of product managers in Saudi Arabia have a product management certification, while 2% of product managers have a proper project management academic qualification. According to the survey, most organizations in Saudi Arabia are looking for product managers who have Product Management Certifications. With a percentage of 12%, the Product Manager Certification ranks third in the country's advertisements for product managers. The average number of certifications for product managers was comparable in agile and scrum, which is a framework for project management that emphasizes teamwork, accountability, and iterative progress towards a well-defined objective or goal. The details is illustrated hereunder in figure 4:
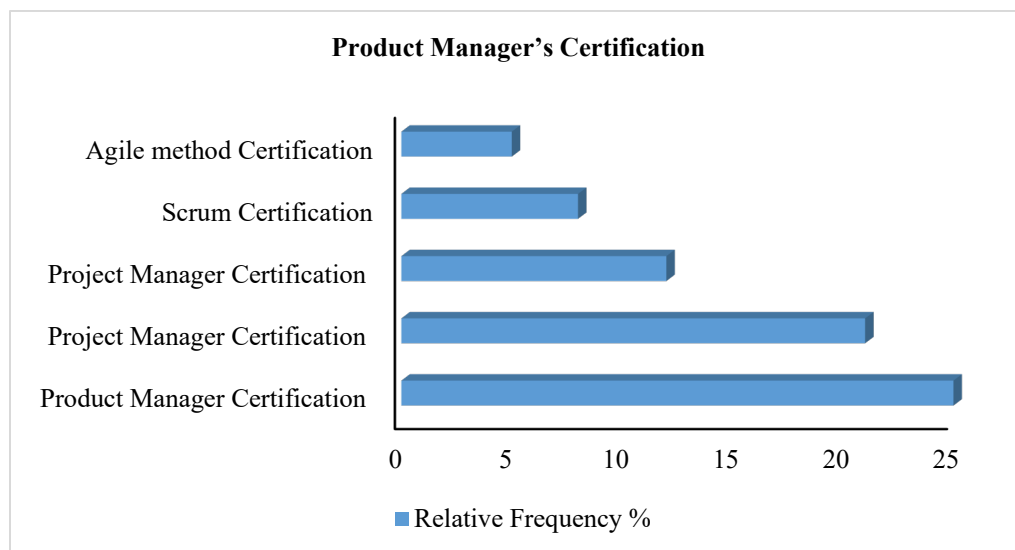

Figure 4. Product Manager's Certification

Product managers are in charge of intellectual, strategic, financial, and operational planning. Essentially, these professionals are supposed to perform at the core of businesses on the strategic and operational level, as well as be engaged in the development of new products (Kotler and Keller 2013). The product manager is most commonly a participant or head of a versatile team. This position is focused on the start of a company's value stream and is defined

by management planning (Gorchels 2011). As a result, a product manager needs extensive knowledge and technical skills. A product manager's knowledge and expertise vary depending upon the company's needs. Figure 5 depicts a list of product management knowledge and skills based on a survey of 200 product manager position advertisements from various companies.

According to the current survey, technical product management skills, with a relative frequency of 55%, are the most in-demand for the product manager positions by the majority of companies. These abilities include data analysis, Microsoft Excel knowledge, and product plan formulation. Another decisive element for the product manager is information technology, which is mentioned in 45% of the advertisements. This is a critical organizational job, particularly in technology firms. These abilities assist the product manager in ensuring the success of a new product and leading the cross-functional team that is in charge of improving it. A product manager also ensures that a brand's aesthetic and intuitive aspects are in sync. The ability to comprehend brand identity is mentioned by 35% of the companies for the position of product manager. This includes packing, product quality, service quality, and the emotional reaction of the customer when interacting with the brand.

Furthermore, a product manager must also have product innovation skills for a company to remain relevant in its market and start to expand and improve over time. Product innovation not only boosts productivity but also competitiveness and profitability. As stated in the advertisements, 25% of companies expect these skills in the employee for the position of product manager. Product managers require marketing skills, mentioned in 23% of advertisements, because they frequently must devise strategies to make the product as appealing to customers as possible. One of the most important marketing skills is the ability to advertise and meet customer needs in the product's most effective way. A product manager should also be familiar with online media and have other technical skills such as backlog prioritization, feasibility analysis, design demonstration, and product and design features.
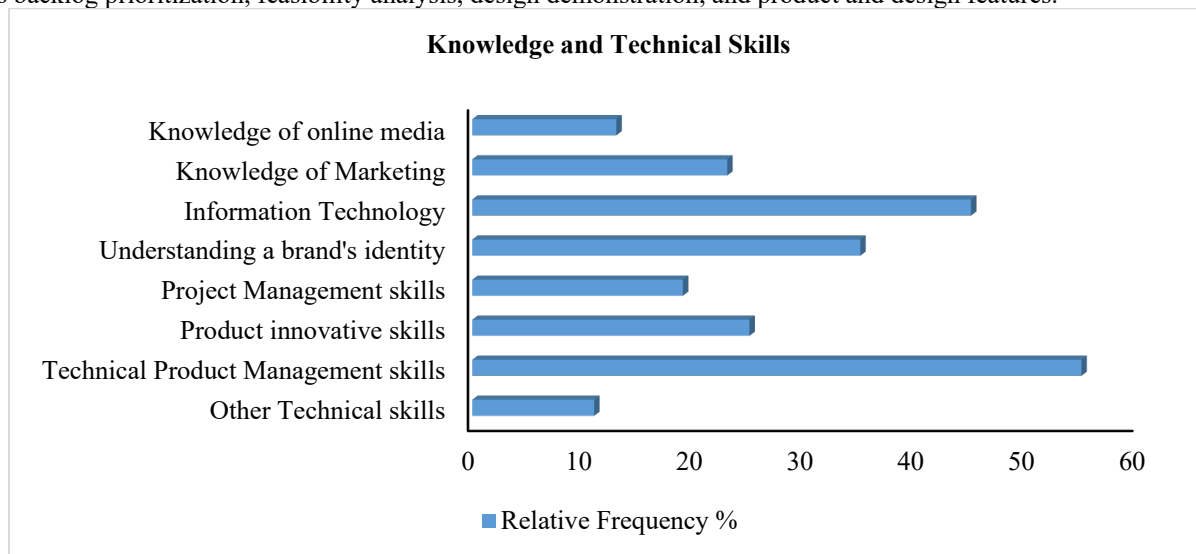

Figure 5. Product Manager's knowledge and skills

As can be seen, it is vital to emphasize how much the product manager's job experience and practices are required. Figure 6 shows the required work experience and the practices for the product manager position. It all comes down to the indicator for assessing intellectual capital. The mark 2 years of experience and practice represented the shortest period of professional experience and practice. During the testing stage of the study project's methodology, which took place in the BAYT, Linkedin, and ZIPPIA, the demands of 6 to 10 years of work experience and practice and above 10 years of work experience and practice were included in advertisements. As a result, the work experience for the product manager position as shown in Figure 4 indicate that certain organizations are undoubtedly interested in hiring product managers with a work experience of 10 years or above. In the current study, 7% of the outcomes for job experience up to 10 years were identified. The majority of the advertisements include work experience of at least 3 years and at least 5 years, with relative frequencies of 29% and 30%, respectively. At the entry-level, product managers must have at least two years of experience as indicated in 13% of advertisements.

At least one criteria of the category that includes the demands for professional competence and skills for the product management jobs was also added to the results in Figure 6. Many organizations advertise the need for a product manager with professional experience in the product lifecycle with the highest relative frequency of 78%. While the product manager with professional experience in production management comes in second with a relative frequency of 34%. Product managers' average work experience was comparable in marketing and sales, with relative frequencies of 21% and 18% respectively.

Required Work Experience and Practices

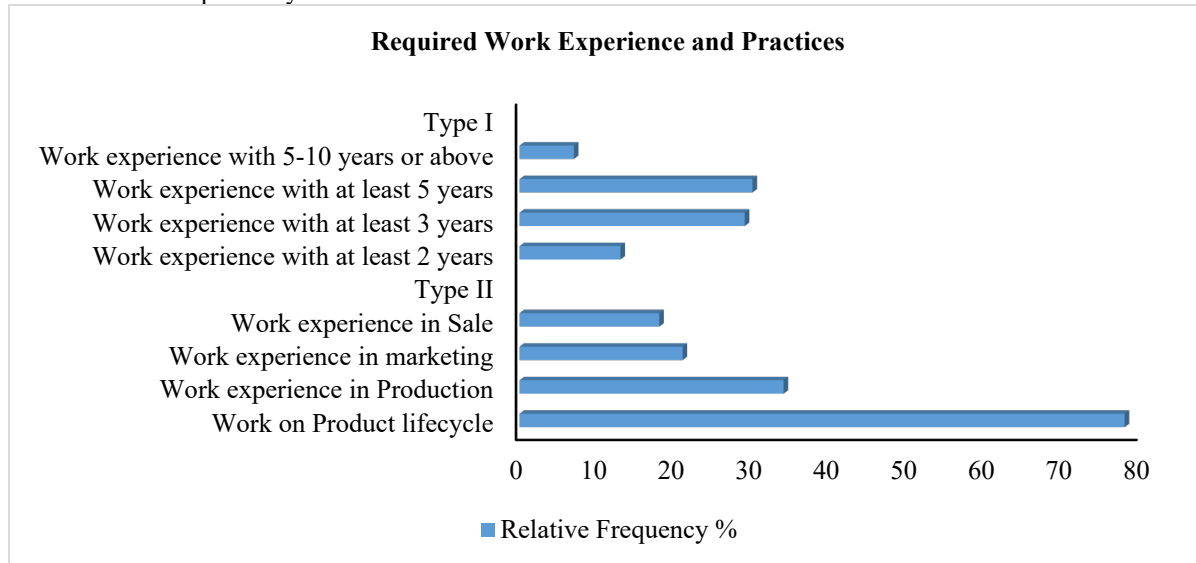|	Relative Frequency %
Type I	
Work experience with 5-10 years or above	
Work experience with at least 5 years	
Work experience with at least 3 years	
Work experience with at least 2 years	
Type II	
Work experience in Sale	
Work experience in marketing	
Work experience in Production	
Work on Product lifecycle	

Figure 6. Product Manager's required work experience and practices

The notion of visualizing business, strategic, and entrepreneurial mindsets has played an important role in product manager recruitment. With the highest relative frequency of 64%, strategic thinking is at the top of the advertisements for the product manager job. Strategic mindset skill is most important as it allows you to apply analytical thinking skills to solve complicated problems and use creative ideas for solutions. These abilities are critical for achieving corporate goals, overcoming hurdles, and dealing with challenges, no matter the time frame for completion, be it in a week or years. Recognizing strategic solutions and using them in corporate activities is part of owning a business mindset. The advertisements also include competencies with a business mindset, which placed second in the current survey with a 24% relative frequency. Importantly, the entrepreneurial attitude ranks third with a relative frequency of 12%, and it can help someone adjust to the fast-changing employment market of today. Figure 7 depicts the product manager's need for business-oriented thinking.
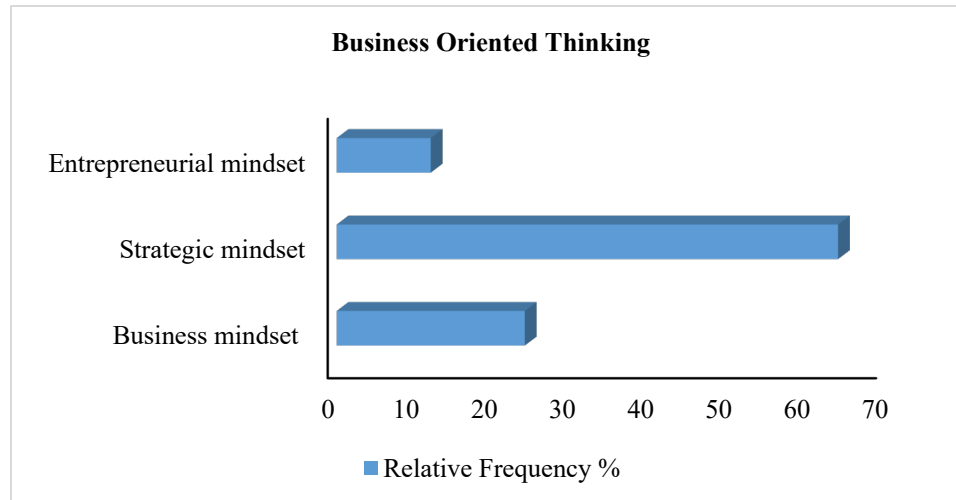
Figure 7. Business-Oriented thinking for the Product Manager

Product managers originate from all academic areas, like media, marketing, management, accounting, business, economics, computer science and engineering. Instead of obtaining the proper degree straight away, product managers must develop their knowledge and training over time by implementing a tactical strategy for continuous education. In a study of 150 product managers, 76% stated they had at minimum one professional certification in product management with a bachelor's degree, and 24% said continuing education was very significant to their development. To put it another way, no school can produce a fully developed product manager. Rather, the job is more like a self-directed journey guided by continual learning mostly in multiple directions. Many times in some situations, product managers know more about the business than anyone else in the organization because of their cross-training and teamwork. They must also be capable of communicating with marketers, developers, designers, engineers, etc.

Before being considered for employment, product managers need to complete the necessary education. They usually have a bachelor's degree in business or a closely relevant subject. Competent product managers frequently pursue a master's in business management and leadership or a master's degree in business administration (MBA) after getting extensive experience in the product management field. The master's course work has been proven to be a nice supplement to enhance the knowledge level of product managers. The courses often fill in the knowledge gap in the financial, tactical, and administrative aspects of a business organization.

5 Market Analysis

As discussed above, this was important for the study to get the viewpoint of the Saudi market professionals. For this purpose, a question was asked to the business decision-makers what are the main roles of the product manager in their daily working of businesses. For this purpose, a question was extended to compare it with two other roles i.e. Product marketing and Project management. This was used to assess and evaluate the market needs and demands from the product manager's perspective. The responses showed that these three jobs look closely coupled with each other but as per the questionnaire responses, there are some areas that very clearly need a properly qualified product manager, who can better deal with the following viewpoints as given in the figure 8 below:
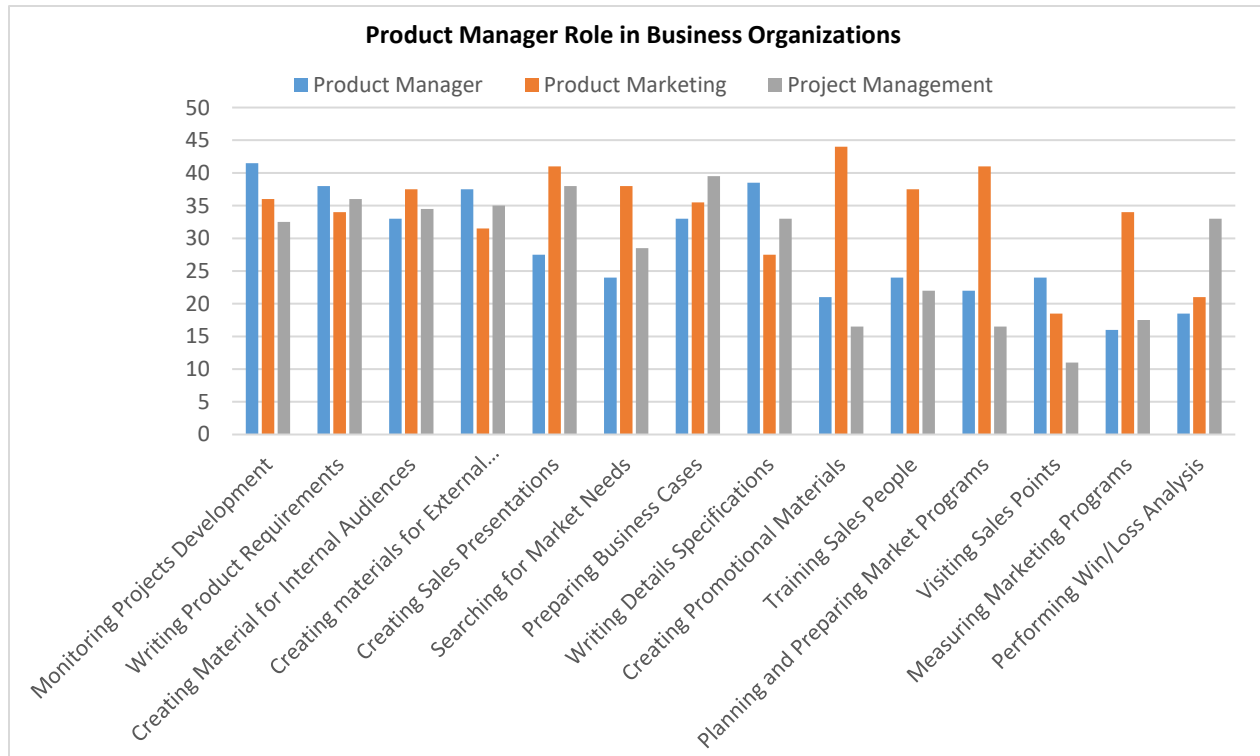
Figure 8. Product Manager's Role in Business Organizations

The figure above states that monitoring project development, writing product requirements, creating sales presentations, creating materials for external audiences, and writing details specifications are highly suited job descriptions for the product manager. Whereas rest of the options are closely relevant to all three job portfolios and must be considered as per the business needs and demands.

6 Conclusions

Over the years the area of a product manager has developed the need for highly structured, technically skilled employees who also possess critical-thinking skills and can use creative strategies to solve business problems. This study shows that what education a product manager should have and what avenues of academic studies are best suited for product managers. The study also provides answers to common questions regarding job opportunities and relevant professions. The study focuses on the education needs and experience required by Saudi business advertisers and employers. In the recruitment of product managers, the concept of envisioning business, strategic, and entrepreneurial mindsets have played an integral role. According to the survey, strategic thinking is the most important notion for the product management profession. The majority of firms are looking for technical product management expertise when hiring a product manager. Data analysis tools, Microsoft Excel ability, and product strategy formulation are among these highly preferred skills. Information technology, which is highlighted in the advertisements, is another important factor for the product manager. Well-trained, educated, experienced product managers are vital in the innovative product development process, productivity, profitability, and competitiveness of a business organization. A product manager must have advanced product development capabilities for a company to remain relevant in its marketplace and grow rapidly while improving over a certain period of time. Market need is also observed by addressing some of the common job roles in the business organizations as it was compared with two other job portfolios. It showed from good to a high number of involvement of product managers in the business organizations concerning different job requirements.

According to the study results, product managers are often expected to have a bachelor's degree. That degree may be in Business Administration, Accounting, Computer Science, Management Sciences, Information Technology, or any other related field. The study showed that a product manager must have at least one professional certification in product management and a Bachelor's degree. No specific degree program is required to rise to the position of product manager. Education is not only important in this process but the number of years of experience is also very significant

for the growth in this field. It is also worthy to mention here that the continuous training programs with the possibility of obtaining a Master's degree in Business Management and Leadership or a Master's in Business Administration (MBA) will be beneficial for the further progression. The role of the product manager can lead to many diverse and challenging positions that give rise to continued training and education so that the product manager can remain on the leading edge of the industry. Lastly, the study has contributed to the body of knowledge of this pioneer research domain of product managers in modern businesses.

Acknowledgment

Biography

Murad Andejany, Ph.D., is an Associate Professor in the Industrial and System Engineering Department at the Faculty of Engineering, University of Jeddah. Currently, he is the Vice President of Assistant for Investment Affairs, and the CEO of the Investment and Sustainable Development Fund at the University of Jeddah. In addition, he is the Vice-Chairman of the Board of Directors of the Saudi Society for Industrial and Systems Engineering. Dr. Andejany earned his Ph.D. in Industrial Engineering from the University of Central Florida, USA. His research interests include quality design and quality management, project engineering, engineering education, renewable energy, IoT, and system dynamics. Dr. Andejany can be contacted at mbazzar@uj.edu.sa.

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