Lahore School of Economics

Innovation & Technology Centre

INNOVATION AND TECHNOLOGY IN LIGHT ENGINEERING FIRMS IN LAHORE, SIALKOT, GUJRAT AND GUJRANWALA

2020

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Lahore School of Economics
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RESULTS AT A GLANCE

Who was surveyed?

56%

Of surveyed firms were small-sized firms. A significant proportion of firms were medium-sized **(36%)** and a smaller portion was of large-sized firms **(11%)**.

56%

of firms innovated recently, with 17% of firms innovating less than 1 year ago and 39% of firms innovating during the last 1-5 years. Whereas, 44% of firms innovated 5-10 years ago.

Nature of Innovation

98%

of firms reported that they had innovated by purchasing new machinery and/or software.

The most commonly bought machines by the light engineering firms were leth machines, verma machines/drill machines, kherald machines, CNC machines and Injection molding machines.

Characteristics of Innovating firms

52%

of the innovating firms claimed to have purchased the technology/equipment from abroad. Whereas, the remaining 42% of respondents purchased locally made machinery.

70%

Of firm reported that adopted already established machinery / software. Whereas, 30% adopted state of the art machinery.

64%

Of firms reported that they preferred buying innovation. Whereas, only 19% firms preferred making their own innovations.

33%

of firms reported that they initiated innovations themselves.

44%

Of firms claimed that they were planning to introduce new technology in the next 12 months.

Barriers Faced by Innovating Firms

91%

Of surveyed firms faced financial barriers while trying to adopt technological innovations. 89% of firms faced some barriers due to lack of innovation opportunities, 91% faced resistance to change within their firm and 89% of firms faced needed retraining employees.

Sources of Funding Innovations Expenditures

87%

Of firms reported that their innovation-related expenditures were financed using their internal resources (equity funds).

Types of Innovations

81%

Of firms innovated in the areas of Business Model followed by Technology (74%), Marketing (73%), Process (67%) and Product (45%).

Results of Innovation

68%

Of firms said that their revenues increased as a result of innovation.

58%

Of firms reported that the quality of their products improved as the result of innovation.

57%

of firms said that they had to retrain their employees to adopt to new technologies.

51%

of firms faced resistance from employees while trying to introduce innovations.

38%

of firms reported that their cost of production decreased as a result of innovation.

26%

Of firms said that their prices remained unchanged/ as a result of innovation.

Drivers of Innovation

43%

of firms reported pressure to increase quality as one of the most significant drivers of initiating innovation followed by the desire for market leadership (23%).

Impact of Innovation on Profitability

48%

Of firms reported that innovation in product led to higher profits and 34% reported that innovation in technology/equipment (34%) resulted in higher profits.

INTRODUCTION

Productivity growth is critical for long term economic growth. A critical component of productivity growth is innovation and this usually entails significant hurdles in developing countries. The Innovation and Technology Centre (ITC) of the Lahore School of Economics conducted its second innovation survey with a focus on light engineering firms across 4 cities in Punjab including Lahore, Sialkot, Gujrat and Gujranwala in the year 2019/2020 to observe innovation and technology in this sector. The purpose of this survey was to observe the extent, quality and impact of innovation activities on the performance and profitability of the innovating firms. The survey also looked at the barriers faced by the innovating firms in this sector across 4 different cities.

The data was collected from 138 firms involved in light engineering during the period from October 2019 to May 2020. The firms were also characterized in terms of exporters and non-exporters in order to see the innovative behavior of each.

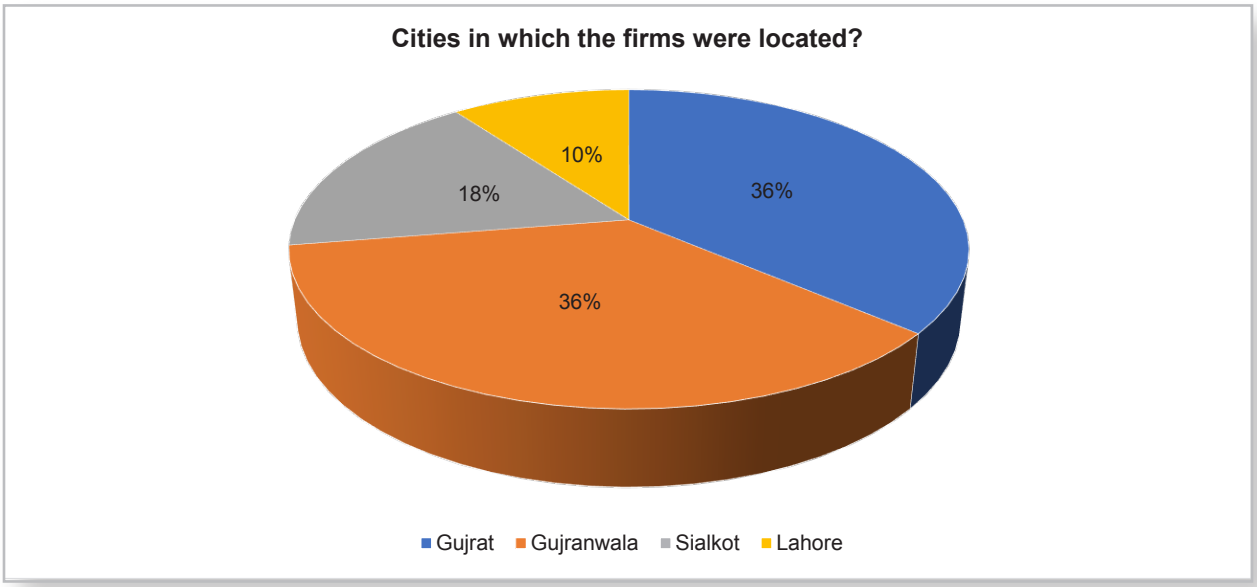
Some basic information on the surveyed firms is given below:

Sample Statistics:

Category	Total Firms	Small	Medium	Large
Number of firms	138 (100%)	77 (56%)	50 (36%)	11 (8%)
Exporters	30 (22%)	11 (37%)	14 (47%)	5 (17%)
Non-exporters	108 (78%)	66 (61%)	36 (33%)	6 (6%)
Innovating firms	135 (98%)	76 (56%)	48 (36%)	11 (8%)
Non-innovating firms	3 (2%)	1 (33%)	2 (67%)	0 (0%)

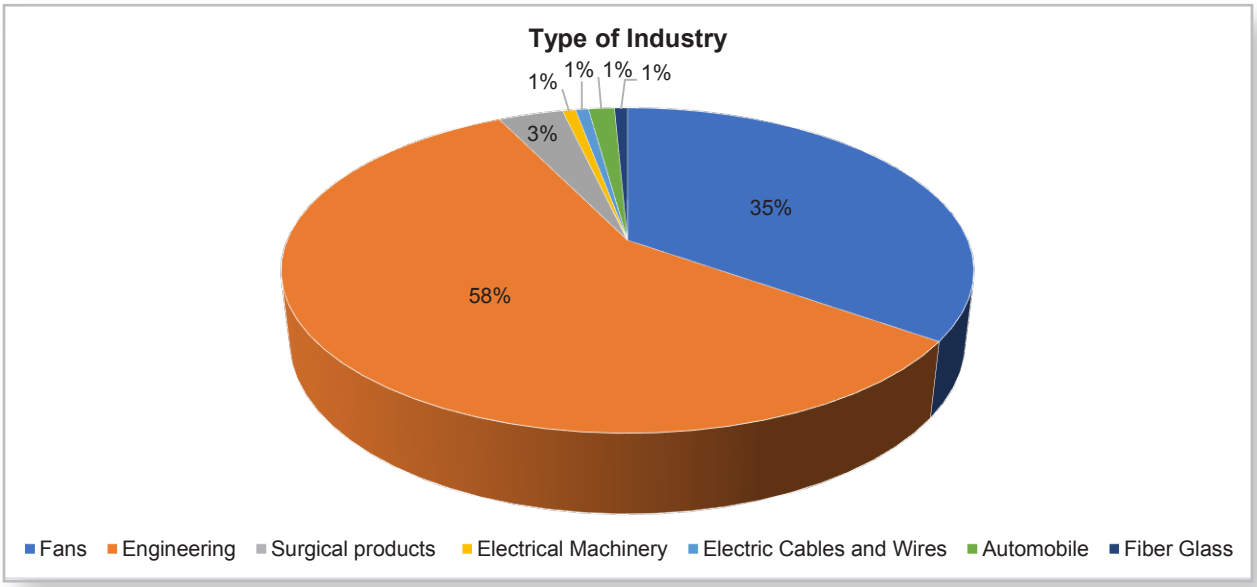
Location of Firms:

The respondent firms were located in Lahore, Gujrat, Gujranwala and Sialkot.



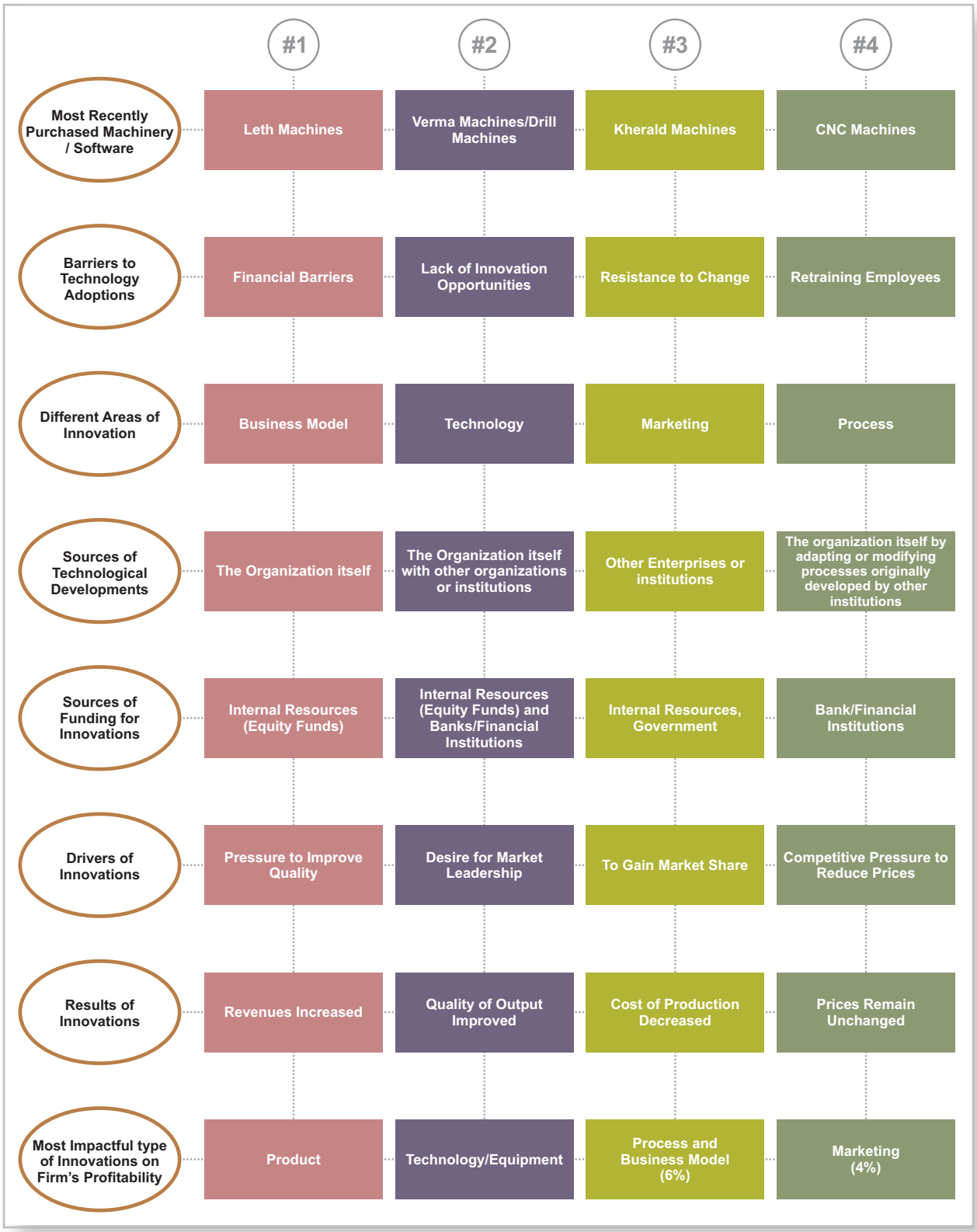
Type of Industry:

The firms surveyed were light engineering firms categorized engineering, fans, surgical, automobiles, electrical machinery, electrical cables and fiber glass firms.



Analysis of Innovation Behavior in Firms

Table 1: Top 4 most important factors: with 1 being the most important, 2 being the second most important and so on



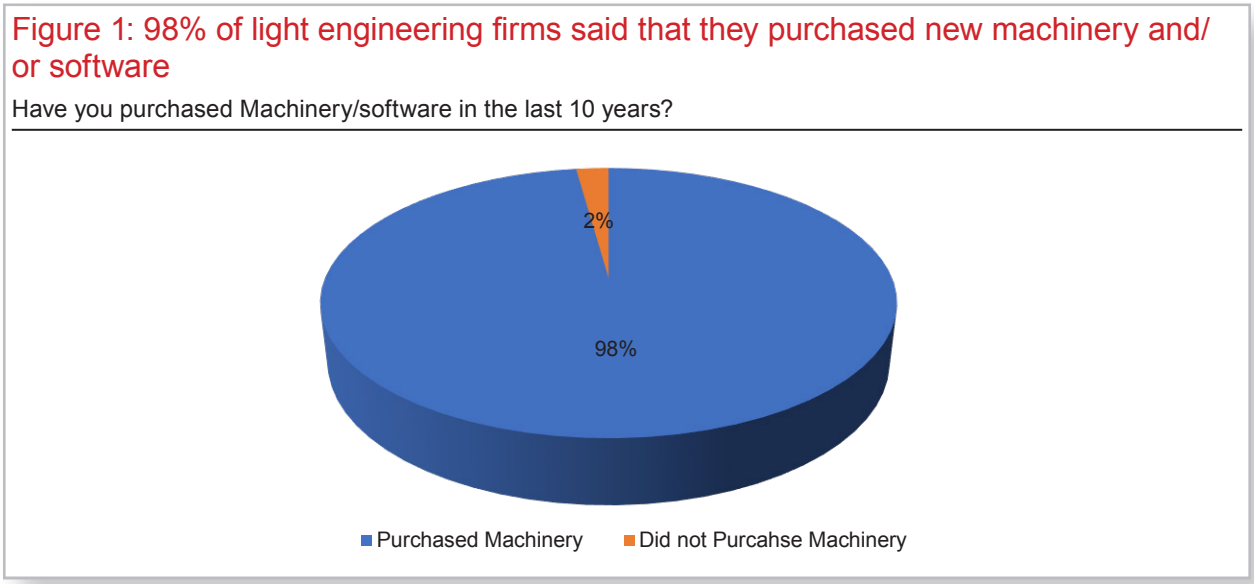
1. REVIEW OF TECHNOLOGICAL INNOVATIONS

1.1. Purchase of New Machinery

A simple measure of innovation is the purchase of machinery. Turning to the purchases of machinery by firms, it is useful to see what percentage of firms purchased new machinery:

A total of 135 firms (98%) reported that they innovated i.e. purchased new machinery and/or software in the last 10 years.

Figure 1: 98% of light engineering firms said that they purchased new machinery and/or software

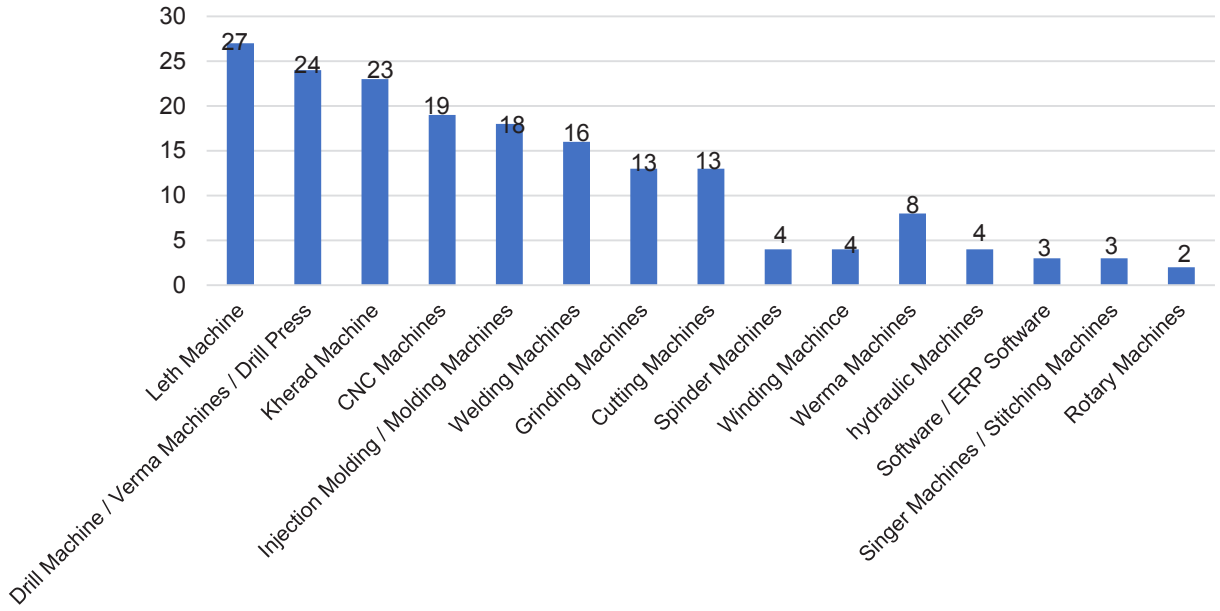


1.2. Most Recently Acquired Machinery/Equipment/ Software

When asked about the four most recently acquired equipment/software, 27 firms reported having purchased leth machines, 24 reported to have bought verma machines/drill machines, 23 bought kherald machines, 19 bought CNC machines and 19 bought Injection molding machines. Whereas only 4 firms in the sample reported that they bought ERP software and other software as part of tehri innovation activities.

Figure 1.2: Majority of light engineering firms bought Leth Machines, Drill Machines/ Verma Machines, Kherald Machines, CNC Machines, Injection Molding Machines

4 recently acquired Machines?

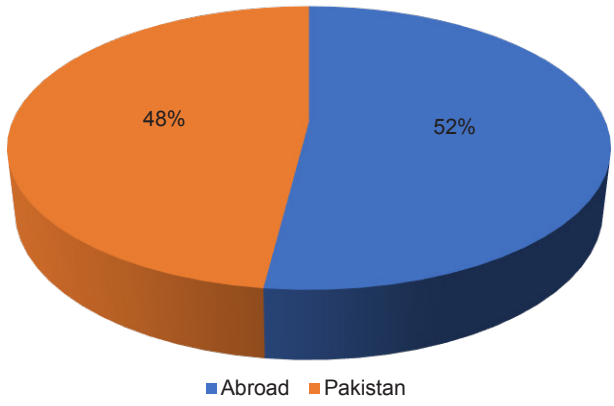


1.3. Purchased Locally or from Abroad

More than half of the respondent firms claimed to have purchased the technology/equipment from abroad (52%). Whereas, the remaining 48% of respondent purchased locally made machinery.

Figure 1.3: Almost half of the firms (52%) bought their last four technologies/equipments from abroad and the remaining 48% bought them from Pakistan

Where did you purchase the last 4 technologies from?

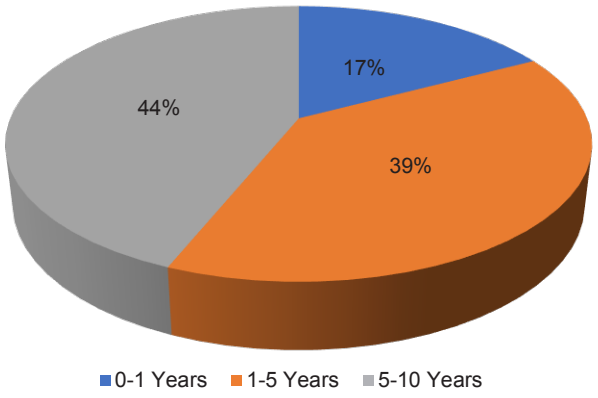


1.4. Age of Technology

The timing of innovation is also important. In our sample, 56% of firms innovated recently, with 17% of firms said that they innovated less than 1 year ago and 39% of the firms said that this innovation took place in the last 1-5 years. Whereas, 44% of the firms said that they innovated almost 5-10 years ago.

Figure 1.4: 56% of the firms said that their innovation took place recently between 0-1 years and 1-5 years ago

How many years ago did you purchase the last 4 Equipments/technologies?

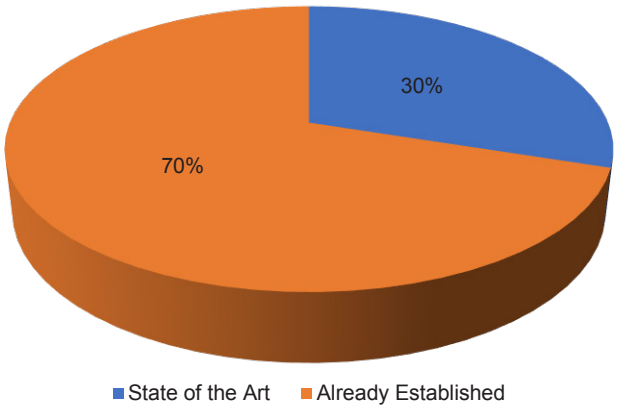


1.5. State of the Art or Already Established Technology

In our sample, a significant percentage of firms (70%) reported that adopted already established machinery/ software.

Figure 1.5: 70% of firms in the sample had adopted already developed technologies

Was the technology state of the art or already established? (top 4 technologies)

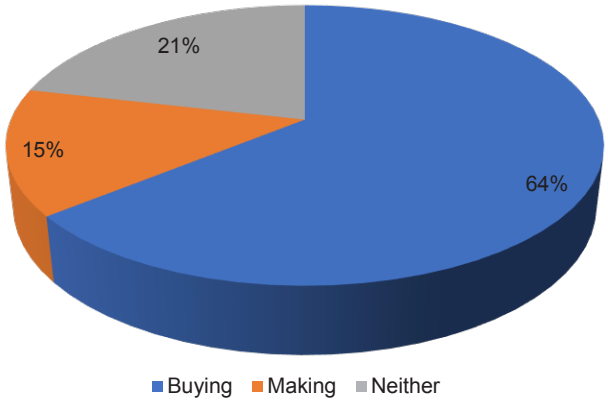


1.6. Created vs Bought technology

When firms were asked if they preferred making or buying new innovations, a majority of firms (64%) reported that they preferred buying innovations. Whereas, only 15% firms preferred developing their own innovations.

Figure 1.6: A majority of firms (64%) reported that they preferred buying already established technologies/softwares

Do you prefer buying or making innovations?

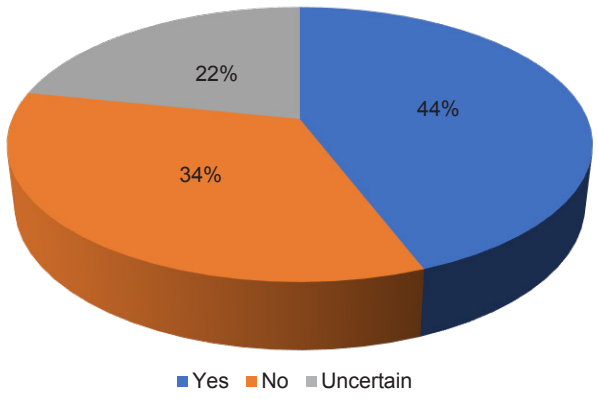


1.7. Planning to Introduce New Technology

The survey also analyzed the future innovation plans of firms. A majority of innovating firms (44%) claimed that they were planning to introduce new technology again in the next 12 months. 34% of firms responded that they were not planning to innovate in the next 12 months, whereas 22% of firms were uncertain.

Figure 1.7: A majority of firms (44%) were planning to introduce new technology again in the next 12 months

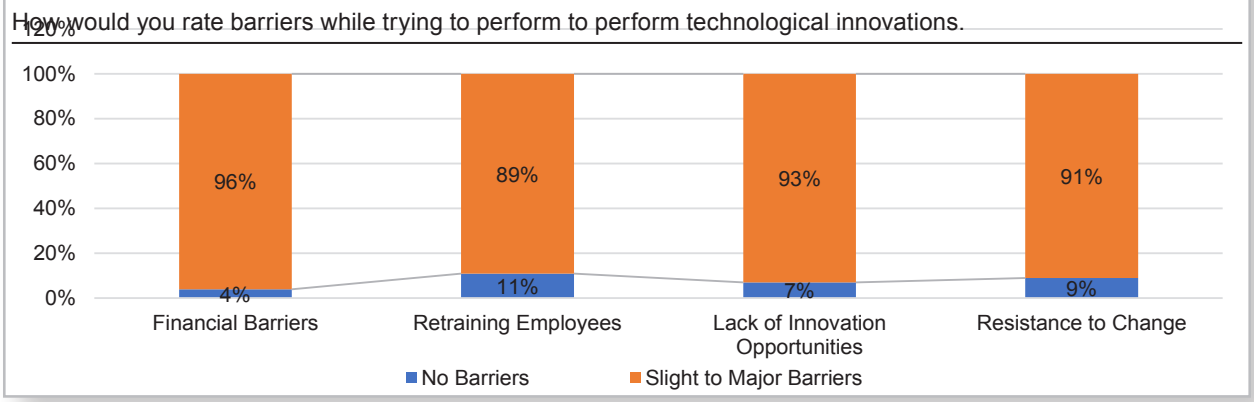
Are you planning to introduce new technology in your firm in the next 12 months?



2. BARRIERS TO TECHNOLOGY ADOPTIONS

The firms were asked to rate the barrier faced while attempting to adopt new technologies, equipment and or software. These firms were particularly asked how lack of financing, lack of innovation opportunities, retraining employees and resistance to change affect their technology adoption. The overall analysis of all these barriers revealed that lack of financing was the greatest barrier faced by firms followed by employees resisting new technology.

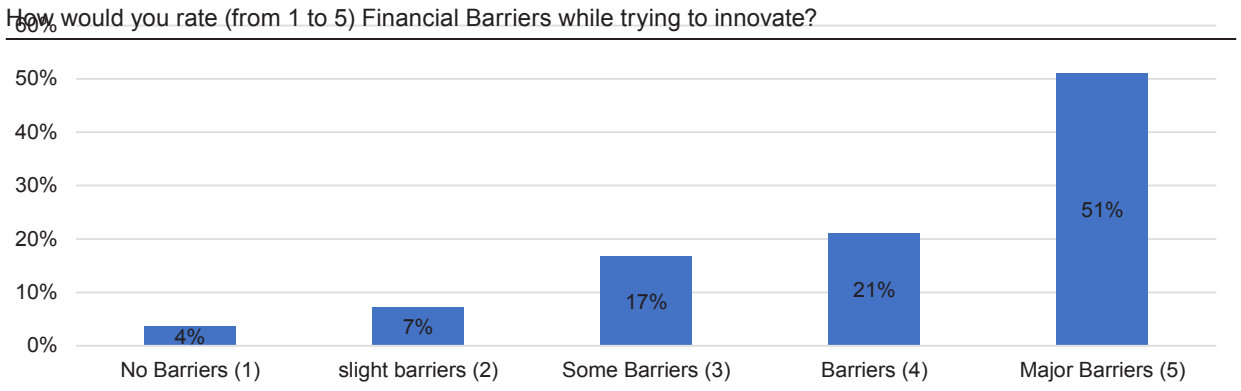
Figure 8: Lack of financing, followed by lack of innovation opportunities were the greatest barriers faced



2.1. Financial Barriers

Firms facing obstacles to technology adoption tend to be less innovative. In our sample, when asked about the barriers faced while trying to perform technological innovations, the most important barrier faced by the firms was lack of financing.

Figure 2.1: 89% of surveyed firms said that they faced some level of financial barriers while trying to innovate

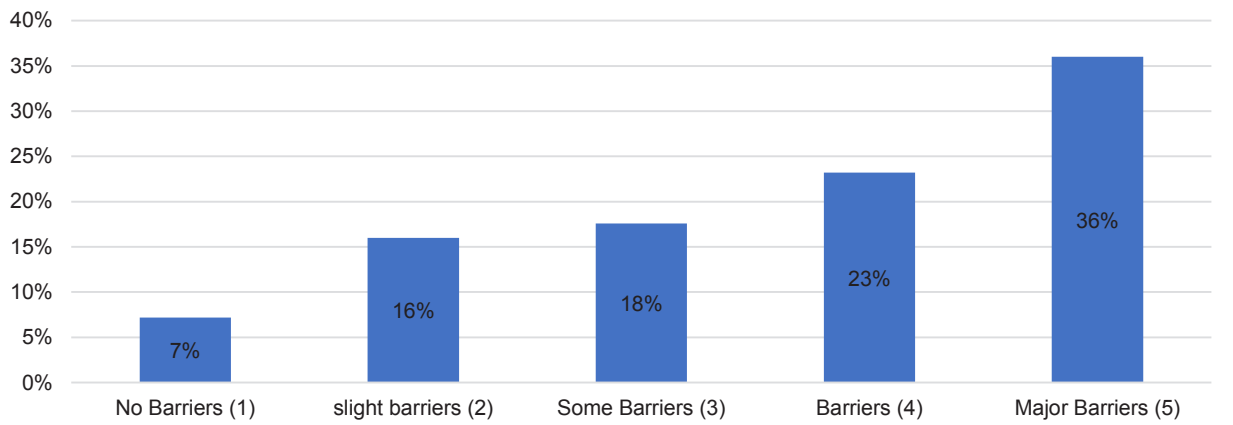


2.2. Lack of Innovation Opportunities

The second greatest barrier faced by the firms while trying to perform technological innovations was lack of opportunities.

Figure 2.2: 77% of firms said they faced a lack of innovation opportunities

How would you rate (from 1 to 5) Lack of Innovation Opportunities, while trying to perform technological innovations?

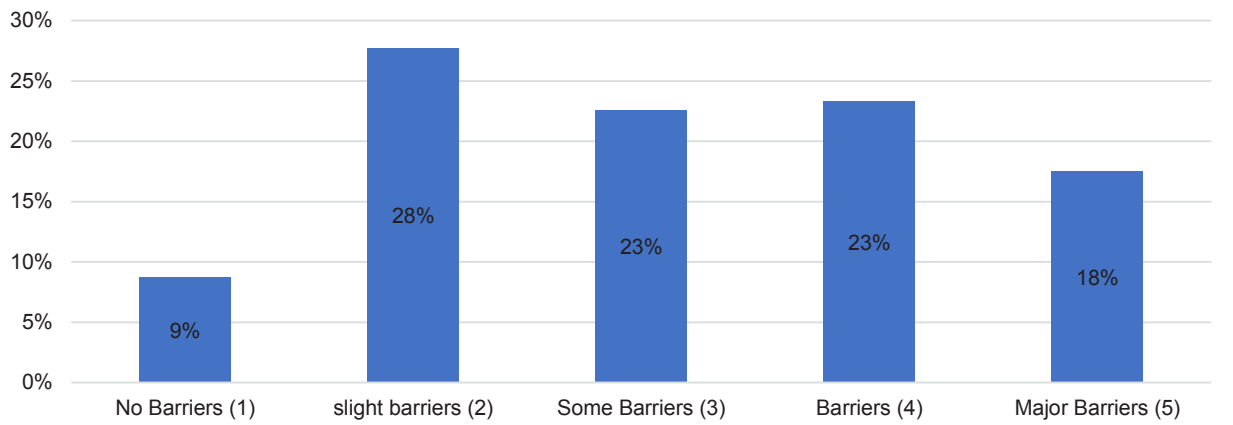


2.3. Resistance to Change in Workplace

Almost 37% of surveyed firms claimed to have faced little or no resistance from employees when trying to introduce innovation.

Figure 2.3: 64% of firms faced at least some barriers due to resistance to change while trying to introduce technological innovations

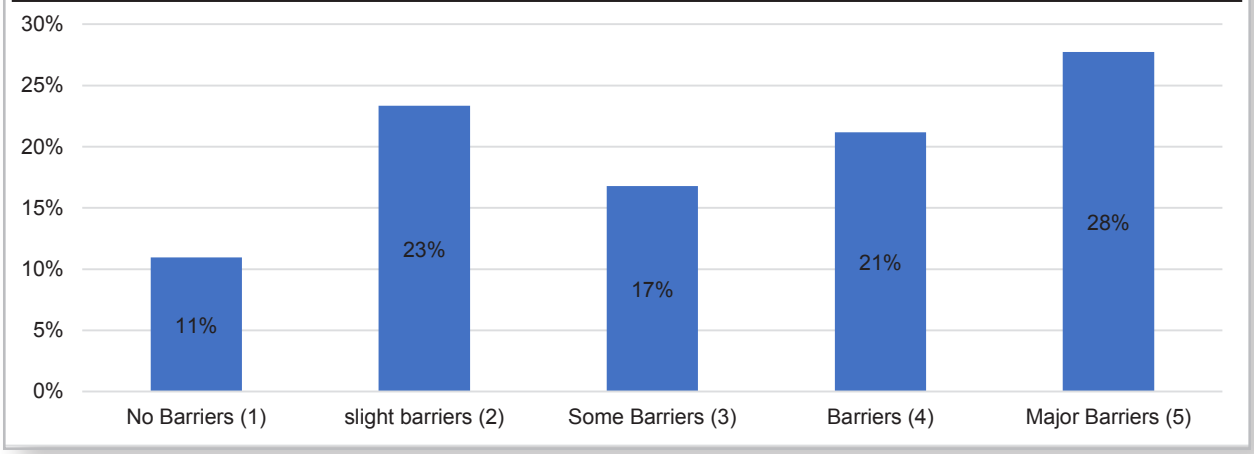
How would you rate Resistance to Change, while trying to innovate?



2.4. Retraining of Employees

Almost 34% of firms said that they did not have to retrain their employees in order to adopt new technologies/ software.

Figure 2.4: 66% of surveyed firms faced at least some of barriers to innovation as a result of having to retrain employees



3. COMPETITIVE INNOVATIONS

In this part, the innovating firms were asked about their major areas of innovations, who were responsible for these technological developments, their sources of funding to finance their innovation activities and drivers of innovations

3.1. Frequency of Different Innovations

When asked about how often the firms innovated in different types of innovation in the last 3 years, firms reported that they introduced innovations in the areas of Business Model (81%), Technology (74%), Marketing (73%), Process (67%) and Product (45%).

Figure 3.1 a: 81% of overall firms said that they introduced innovations in the areas of business model at least some of the time

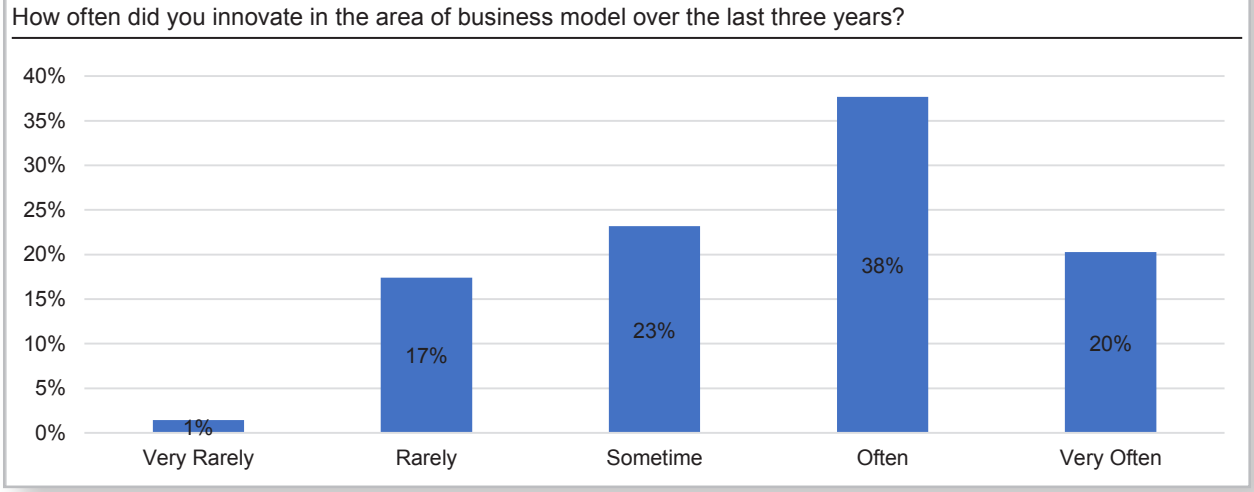
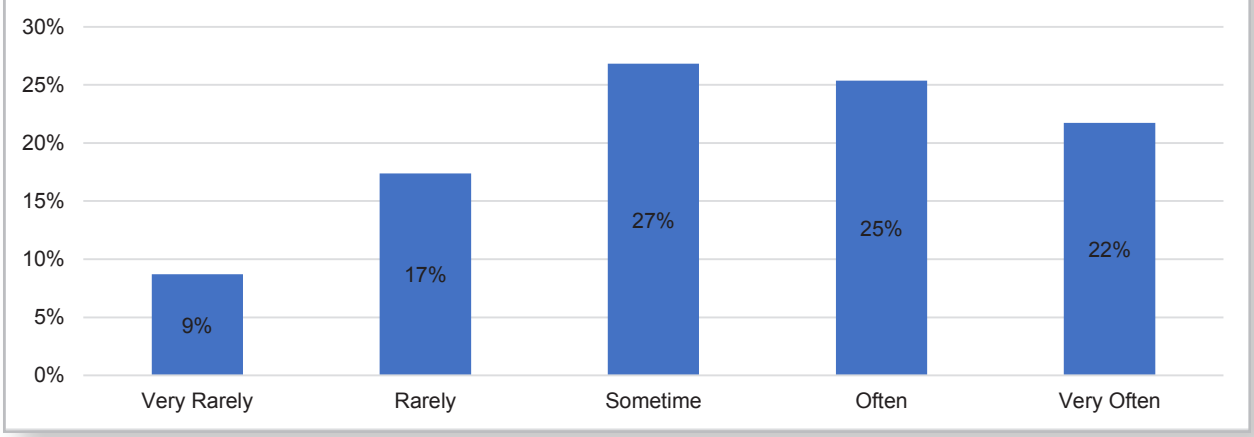


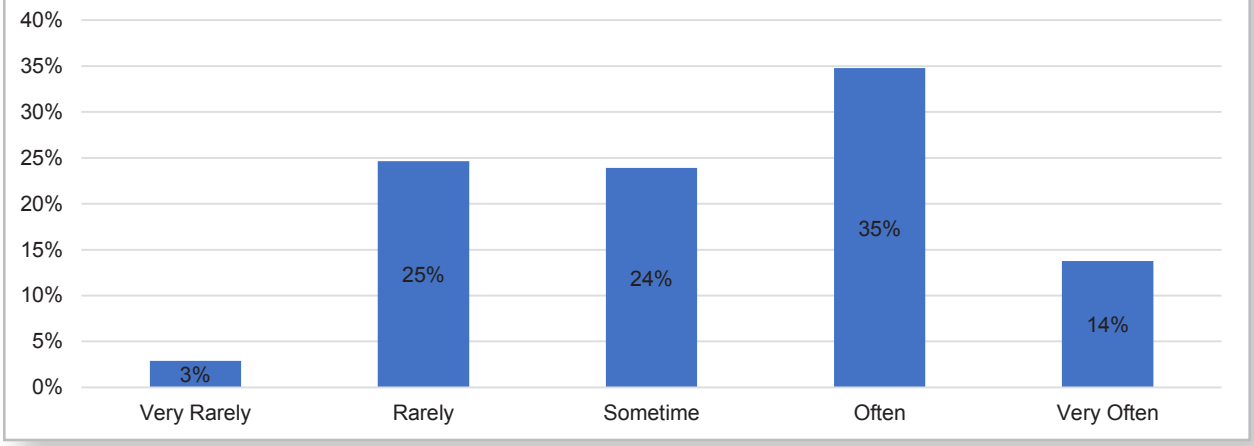
Figure 3.1 b: 74% of firms said that they introduced innovations in the area of technology/equipment at least some of the time



When asked about how often they innovated in the area of technology, 74% firms reported that they innovated (sometimes, often and very often) in this way.

Figure 3.1 c: 73% of firms reported that they introduced innovations in the area of marketing at least some of the time

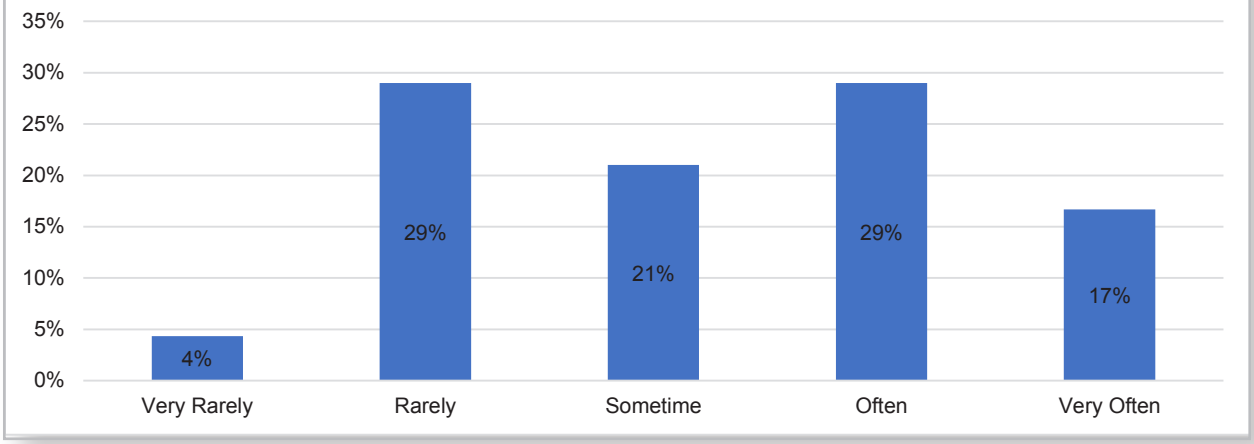
How often did you innovate in the area of marketing over the last three years?



When asked about how often they innovated in the area of marketing, 73% of firms reported that they innovated (sometimes, often and very often) in this way.

Figure 1.3 d: 67% of respondent firms reported that they introduced innovative processes at least some of the time

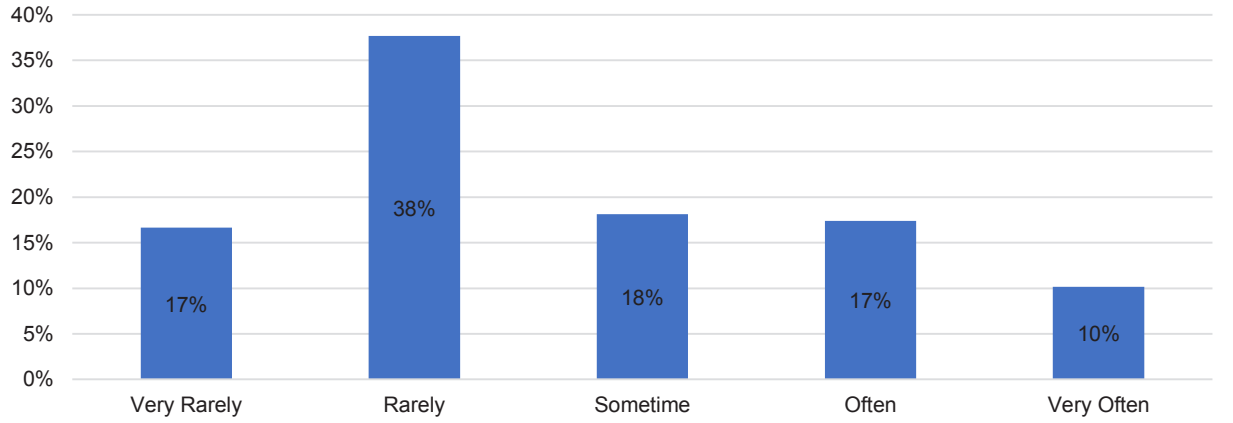
How often did you innovate in the area of process over the last three years?



When asked about how often they innovated in the area of process, 67% firms reported that they innovated (sometimes, often and very often) in this way.

Figure 1.3 e: Only 45% of firms said that they introduced new products at least some of the time

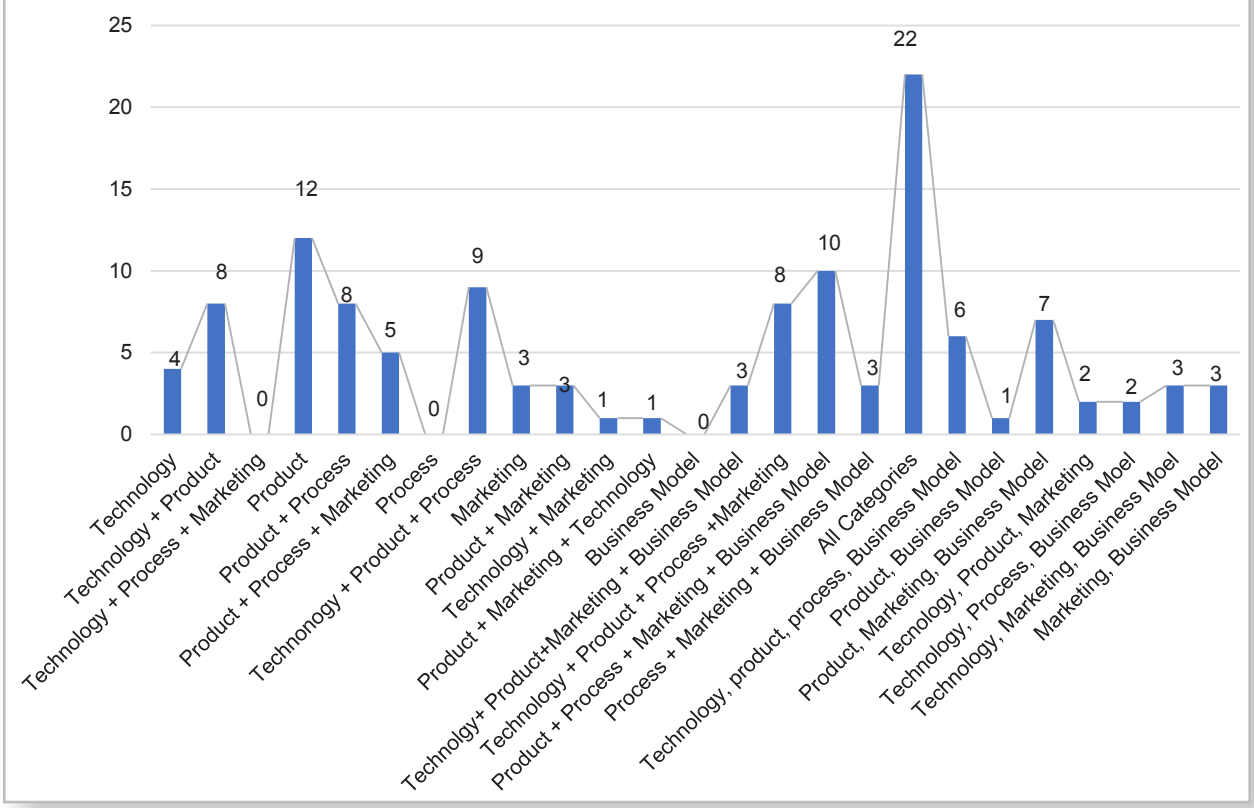
How often did you innovate in the area of product over the last three years?



When asked about how often they innovated by introducing a new product, only 45% firms reported that they innovated (sometimes, often and very often) in this way.

Figure 1.3 f: A majority of firms reported combined innovations in the areas of product, process, technology, marketing & business model

Of the firms that innovated how often they innovate in the following are

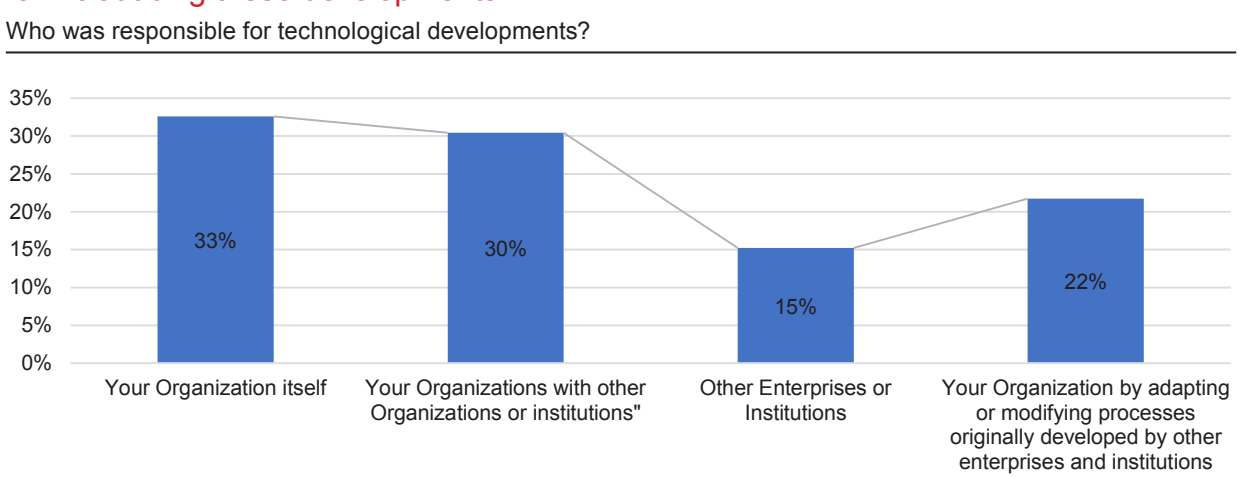


When asked about how often the innovating firms innovated in the areas of product, process, technology, marketing and business model, a majority of firms innovated in the combination of 3 or 4 areas. Looking at the combinations of areas in which the majority of firms innovated, the greatest number of firms (22 firms) innovated in a combinations of all categories i.e. product, process, technology, marketing and business model. The second highest number of firms (10) innovated in the area of product alone. The third highest number of firms (20) innovated in a combination of product, process, marketing and business model. Whereas, the fourth highest number of firms (9) innovated in a combination of technology, product and process.

3.2. Collaborations for New Technology

In response to the question about who was responsible for introducing new technologies, a majority of firms reported that they initiated innovations themselves.

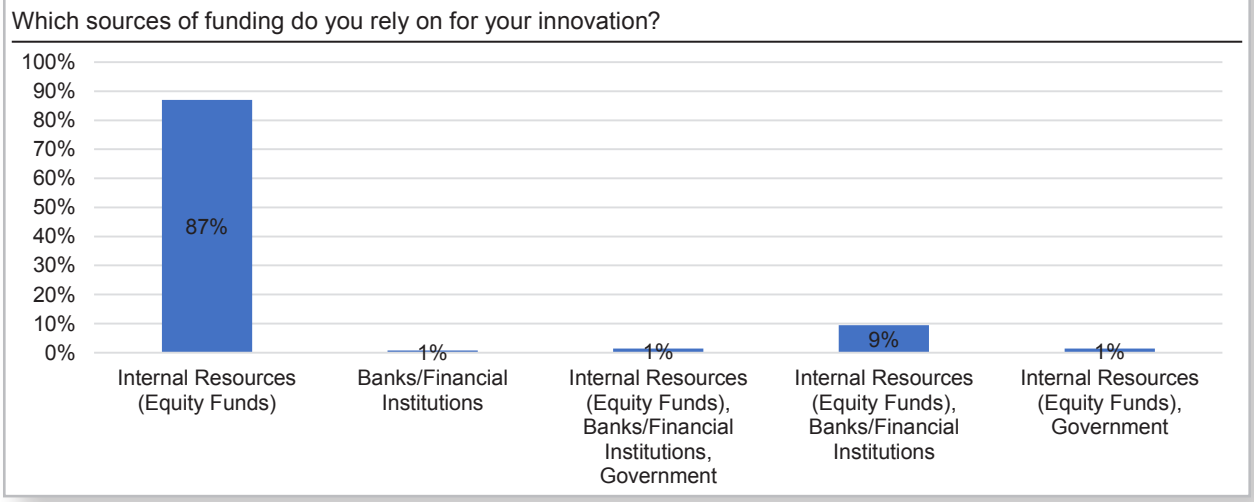
Figure 3.2: A majority of firms (33%) responded that they themselves were responsible for introducing these developments



3.3. Sources of Innovation Funding

Funding of innovation can be a major issue for firms. In our sample, when asked about the sources of funding for innovations, a large proportion of firms (87%) reported that those innovations were financed by their internal resources(equity funds) only. Whereas, 9% of firms said that their innovations were financed by using their internal sources as well as taking loans from the banks.

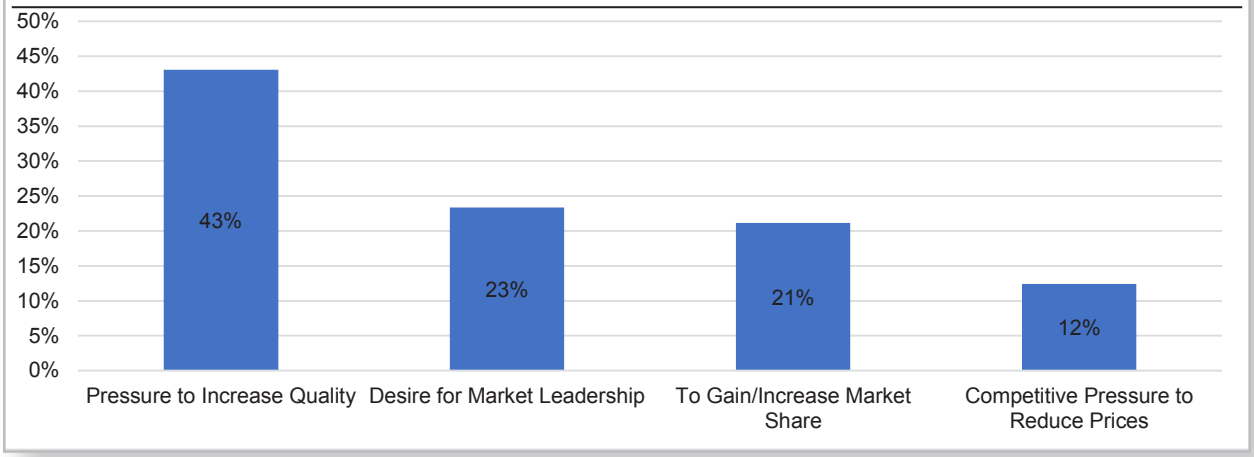
Figure 3.3: A majority of firms (87%) reported that they relied on their internal resources for funding their innovation activities



3.4. Reasons for Innovating

The incentives to innovate are important for firms. In our survey, when asked about the most significant factor driving innovation in their industry, a majority of firms (43%) reported pressure to increase quality was one of the most significant drivers of initiating innovation followed by the desire for market leadership (23%).

Figure 3.4: Most of the firms reported that the reason for innovation was the pressure to improve quality



4. RESULTS OF INNOVATION

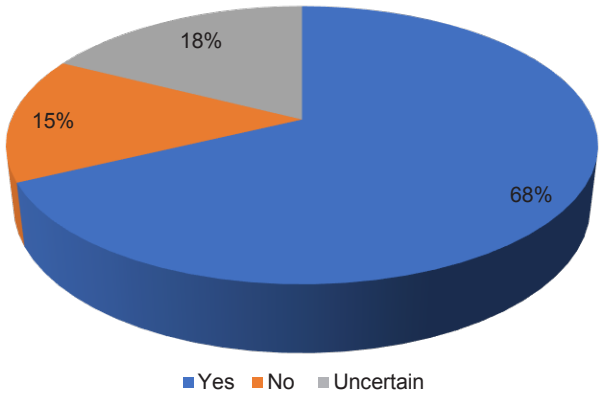
In this section of the survey, the innovating firms were asked about the impact of their innovation related activities on their revenues, costs of production, quality of product and prices.

4.1. Impact on Revenues

It is also important to understand the impact of firm level innovation. In our survey, in response to the question asked about the impact of firm level innovations on firm's performance, 68% of the respondent firms reported that innovation led to an increase in revenues.

Figure 4.1: A majority of firms (68%) said that their revenues increased as a result of innovation

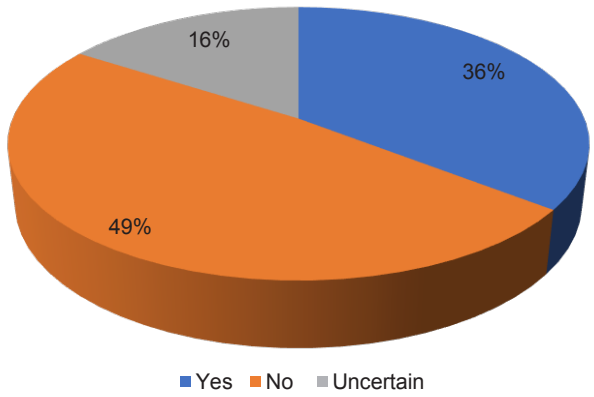
Did your revenues increase as a result of innovation?



4.2. Impact on Cost of Production

Figure 4.2: Around 38% of firms reported that their cost of production decreased as a result of innovation

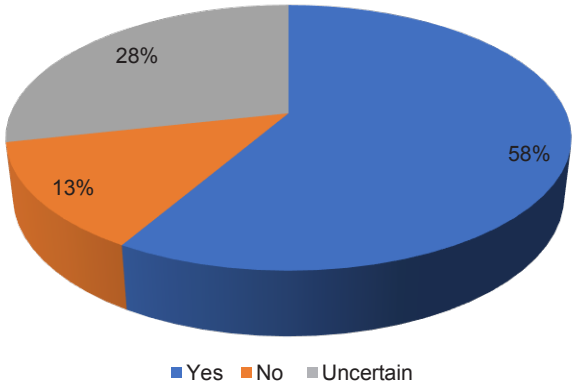
Did cost of production reduce as a result of innovation?



4.3. Impact on the Quality of Output

Figure 4.3: More than half of the firms (58%) said that their quality of output improved as a result of innovation

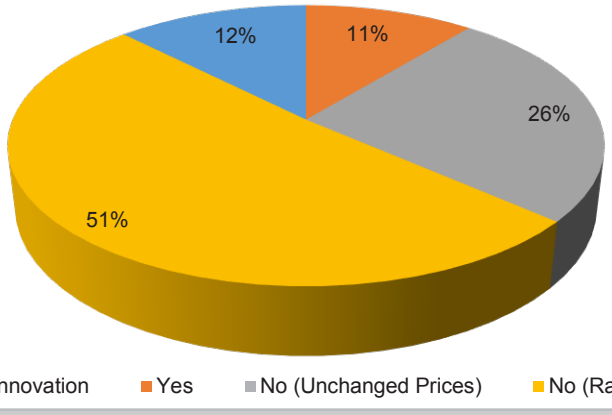
Did your quality of output increase as a result of innovation?



4.4. Impact on Prices

Figure 4.4: Almost 26% of firms said that their prices remained unchanged / were not increased as a result of innovation

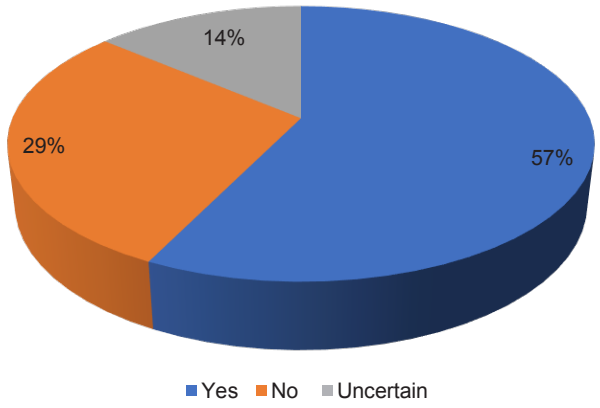
Did you lower prices as a result of innovation?



4.5. Impact on Retraining Employees

Figure 4.5: A majority of firms (57%) said that they had to retrain their employees to adopt new technologes as a result of innovation

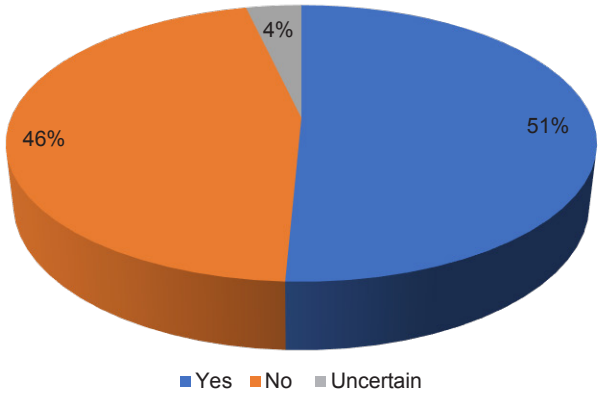
Did you employees have to be retrained as a result of innovation?



4.6. Impact on Resistance from Employees While Introducing Innovation

Figure 4.6: More than half of firms (51%) said that they faced resistance from employees while trying to introduce innovation

Did you face any resistance from employees while trying to introduce innovation?



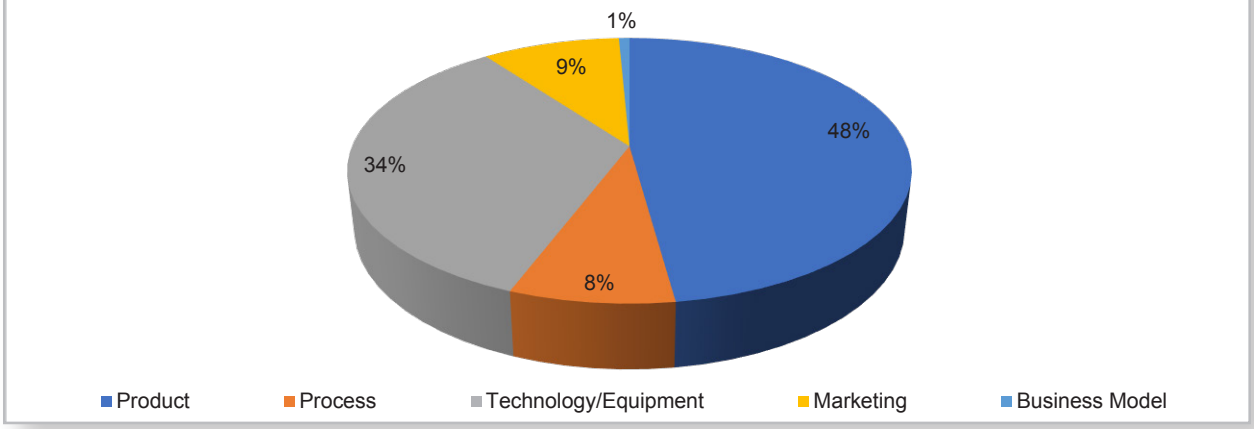
5. IMPACT OF DIFFERENT TYPES OF INNOVATIONS ON FIRM PROFITS

In this section of the survey, the innovating firms were asked how different types of innovations in product, process, technology, marketing and business model impacted their profitability.

When asked about the impact of various types of innovations on firm profits, a majority of them reported that innovation in product (48%) and innovation in technology/equipment (34%) resulted in higher profits.

Figure 5: Product innovation lead to the highest increase in profitability for almost half of the respondent firms

Which innovations had the most impact on firm's profitability over the three years?



6. CONCLUSION

Productivity growth is critical for long term economic growth. A critical component of productivity growth is innovation and lack of innovation is usually a major problem in developing countries. The Innovation and Technology Centre (ITC) of the Lahore School of Economics conducted a survey in 2019/2020 to observe the growing trends in innovation and technology upgradation in the light engineering firms situated across 4 different cities in Punjab (Lahore, Gujrat, Gujranwala and Sialkot). The purpose of this survey was to observe the extent, quality and impact of innovation activities on the performance and profitability of the innovating firms. The survey also looked at the barriers faced by the innovating firms in this sector. The data was collected from 138 firms during the period October 2019 to May 2020.

The data analysis of surveyed firms revealed that most of the firms were small sized firms, and a majority of them innovated i.e. purchased new machinery/equipment from abroad during the last 1-5 years and most of this technology was already established. A majority of these firms said that the major source of funding for their innovations related activities was their own internal resources (Equity). Also, a majority of these firms innovated by developing new business models and technologies.

When asked about the impact of various types of innovations on firm profits, almost half of firms reported that product innovation resulted in higher profits followed by newer technology/equipment.

The incentives to innovate are particularly important for firms. In our survey, when asked about the most significant factor driving innovation in their industry, a majority of firms reported pressure to increase the quality was one of the most significant drivers of innovation followed by the desire for market leadership and increase market share.

Looking at the results of innovation, most of surveyed firms revealed that their revenues increased, cost of production decreased, quality of products improves as the result of innovation. Whereas, the prices of their product remained unchanged and a majority of these firms had to retrain their employees and faced resistance from their employees as the result of innovation.

The two greatest barriers faced while trying to perform innovation were lack of financing and lack of innovation opportunities. It can be concluded that more incentives for innovations could be given by providing more sources of funding for the innovating firms in the form of aid from the government and with the assistance of financial institutions.

Lahore School of Economics

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2020

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