

# INNOVATION AND TECHNOLOGY IN THE AUTOMOBILE SECTOR OF PAKISTAN

2022



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# RESULTS AT A GLANCE

## Who was surveyed?

**44%**

Of surveyed firms were small sized firms. A significant proportion of firms were large sized (31%) and a smaller portion was of medium sized firms (28%).



**61%**

of firms innovated 1-5 years ago, while 21% of firms innovated 5-10 years ago and only 18% of firms innovated most recently during the last year. This shows that innovation is not very common in Automobile sector firms



## Location and Type of Industry

**44%**

of surveyed firms were based in Gujranwala, 37% were based in Lahore, 11 % in Karachi while the remaining 8% were based in other cities.in Pakistan.



**60%**

Of firms in the sample were dealing in Auto Parts, while 16% in Automobiles Auto manufacturing. It shows that very few firms are into Auto manufacturing in Pakistan.



## Nature of Innovation

**92%**

Of firms reported that they innovated i.e. purchased new machinery and/or software in the past 10 years.



### CNC Machines

Were the most bought machineries in the automobile sector along with Kherad Machines. The other most bought machines reported by firms in this sector were Dye casting /Dye related machines, and software. Whereas, some firms said that they upgraded their managerial systems and some said they invested in the automation of processes.



## Characteristics of Innovating firms

**63%**

Of the innovating firms claimed to have purchased the technology/equipment from abroad. Whereas, the remaining 37% of respondent firms purchased locally made machinery.



**66%**

Of firm reported that they adopted already established machinery / software. Whereas, only 34% adopted state of the art machinery.





**60%**

Of firms reported that they preferred buying innovation. Whereas, 27% of firms preferred developing their own innovation.



**41%**

Of firms reported that they initiated innovations themselves along with other organizations and institutions



**53%**

Of firms claimed that they were planning to introduce new technology in the next 12 months. Whereas, 30% of firms were uncertain.



## Barriers Faced by Innovating Firms

**86%**

Of surveyed firms faced financial barriers while trying to perform technological innovations. 86% of firms faced some barriers due to lack of innovation opportunities, 79% faced resistance to change within their firm and 79% of firms needed to retrain employees.



## Sources of Funding Innovations Expenditures

**79%**

Of firms reported that their innovation related expenditures were financed using their internal resources (equity funds). While only 13% of firms used both internal resources (equity) and funds borrowed from banks and other financial institutions.



## Types of Innovations

**78%**

Of automobile firms innovated in the areas of Products, 72% in Process, 69% in Technology, 52% in Marketing and only 39% innovated in Business Model.



## Innovations in Combinations of Areas

**20**

Out of a total of 77 firms innovated in the areas of both Product and Technology, followed by the 6 firms that innovated in both product and process. While 18 firms did not innovate in multiple areas of the same time.



Technological Innovation

## Results of Innovation

**84%**

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



**80%**

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



**66%**

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



**38%**

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



**37%**

Of firms faced resistance from employees while trying to introduce innovation.



**26%**

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



## Drivers of Innovation

**36%**

Of firms reported pressure to increase quality was one of the most significant drivers of initiating innovation followed by 20% of firms reported that they innovated because of their desire to increase market share.



## Impact of Innovation on Profitability

**35%**

Of firms reported that innovation product and 29% reported that innovation in technology 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 third survey on Automobile firms in Pakistan in the year 2020/2021 to observe the growing trends in the field of innovation and technology upgradation 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.

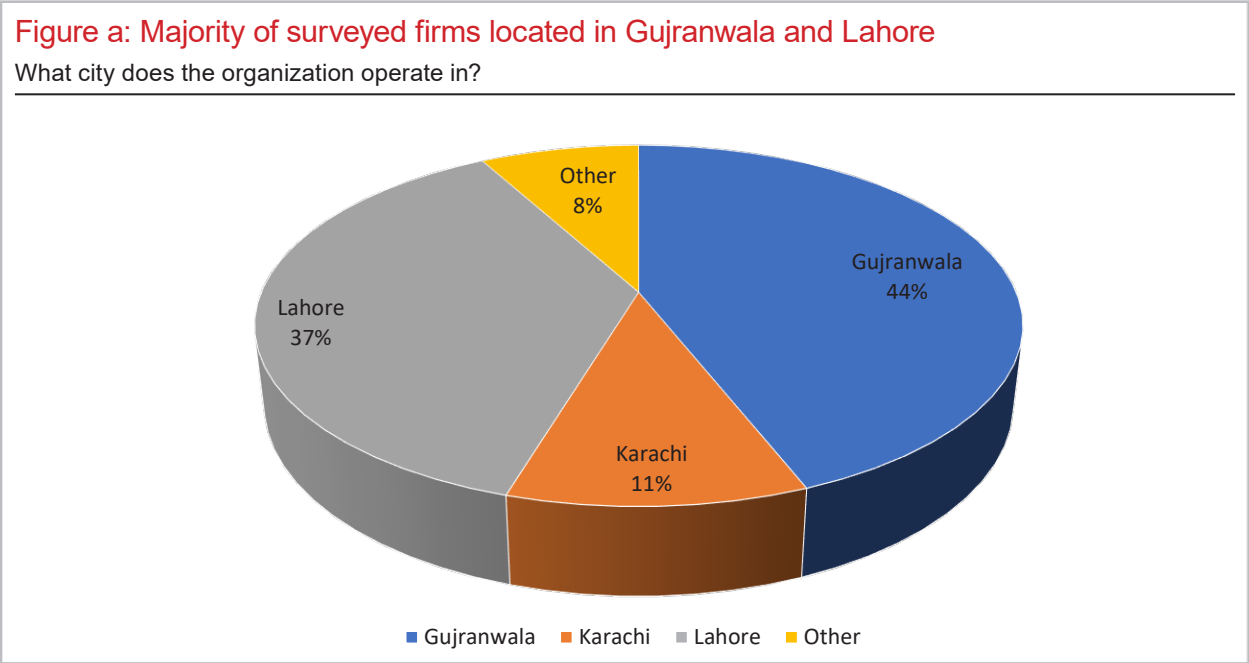
The data was collected from 77 firms involved in automobile during the period from 6<sup>th</sup> July 2020 to 12<sup>th</sup> of September, 2021. 92% of the surveyed firms were found to be innovators i.e. bought new machinery/software in the past 10 years and only 8% of firms reported that they have not innovated. Moreover, a majority of firms in the survey were small sized firms (44%), followed by large sized (31%) and medium sized firms(28%).

Some basic information on the surveyed firms is given below:

### Sample Statistics:

Category	Total Firms	Innovators	Non-Innovators	Exporters	Non-Exporters	Small	Medium	Large
Number of firms	77 (100%)	71 (92%)	6 (8%)	20 (26%)	57 (74%)	31 (44%)	22 (28%)	24 (31%)

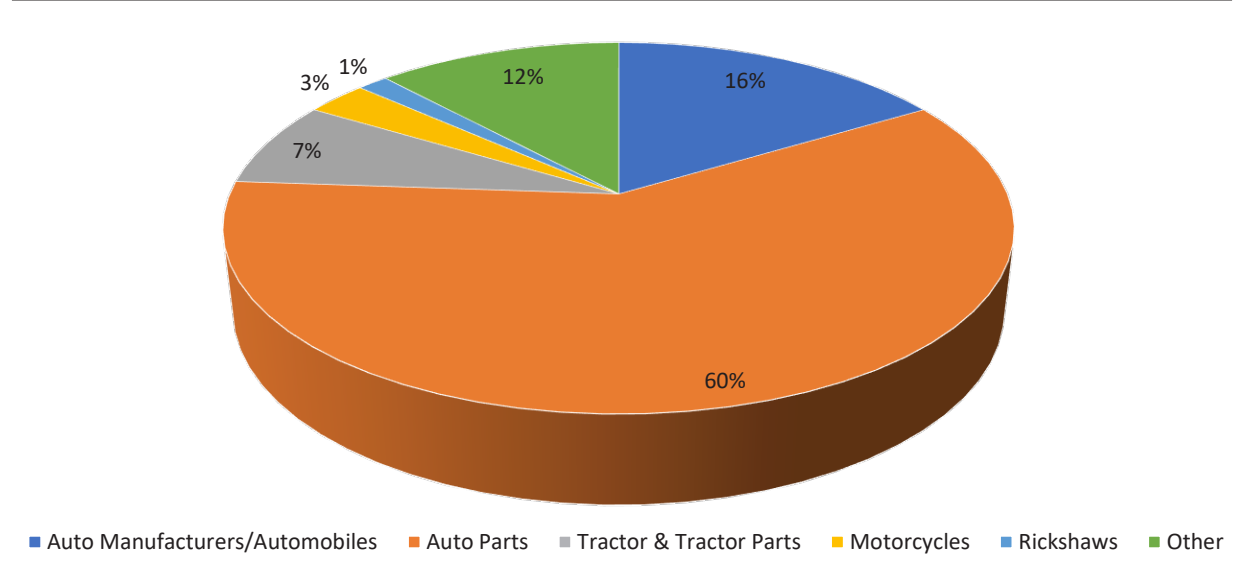
### Location of Surveyed firms:



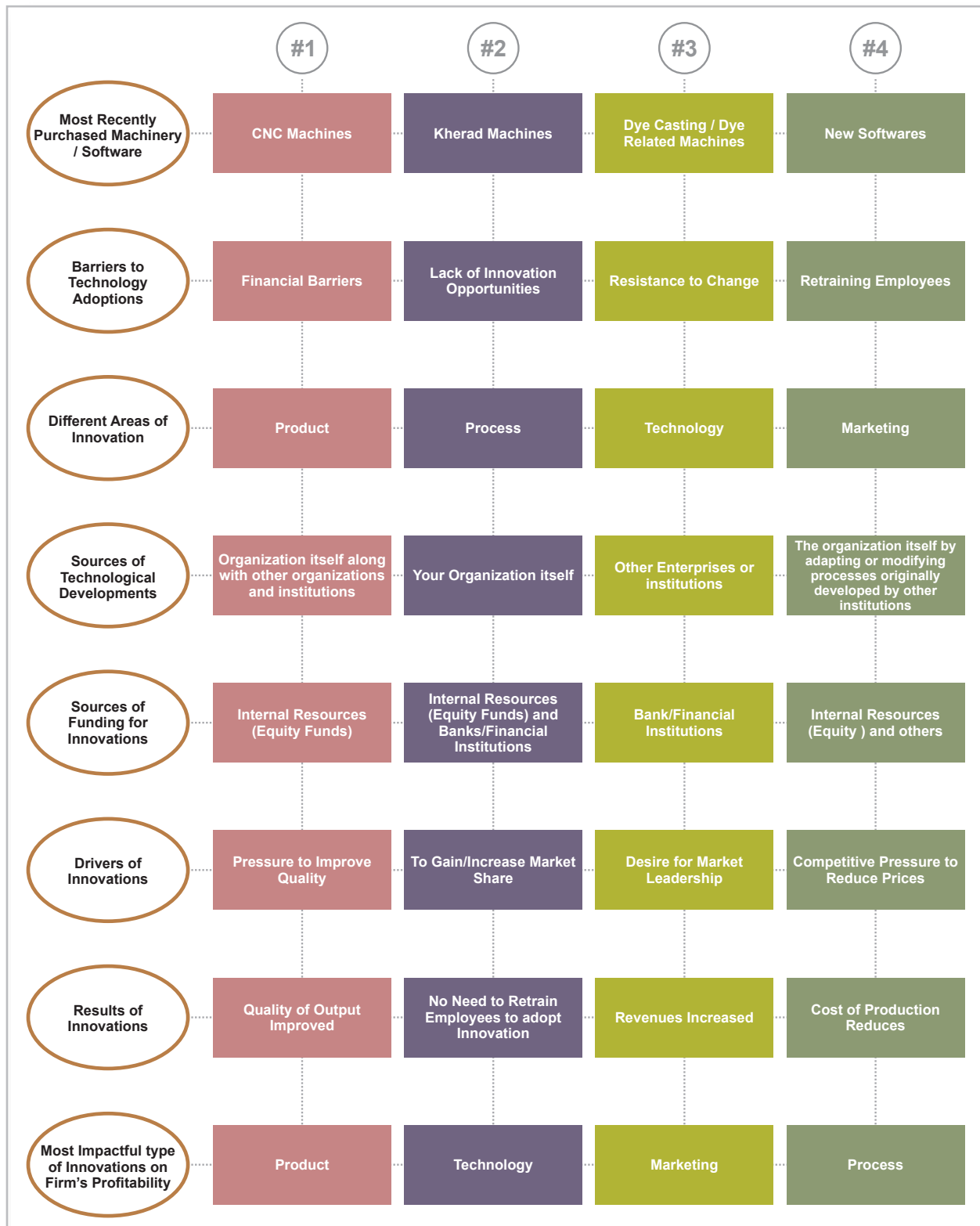
## Type of Industry:

Type of Industry: Most of the firms were dealing in Auto parts followed by auto manufacturing

What type of industry do you operate in?



## ANALYSIS OF INNOVATION BEHVAIOR IN AUTOMOBILE FIRMS



# 1. REVIEW OF TECHNOLOGICAL INNOVATIONS

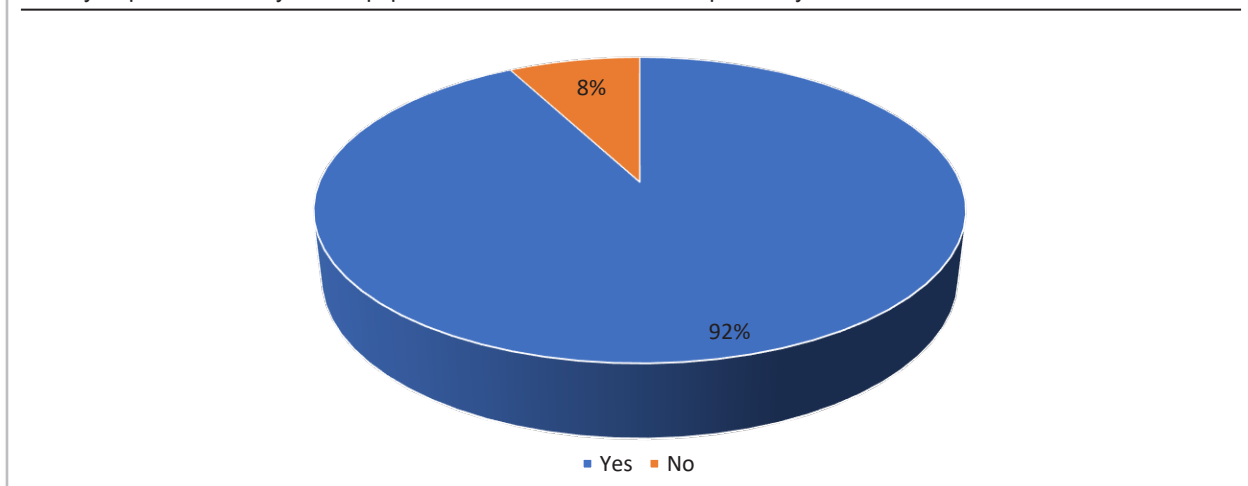
## 1.1. Purchase of New Machinery

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

A total of 71 firms (92%) reported that they innovated i.e. purchased new machinery and/or software in the last 10 years.

**Figure 1.1: 92% of surveyed firms said that they purchased new machinery or software.**

Have you purchased any new equipment and/or Software in the past 10 years?



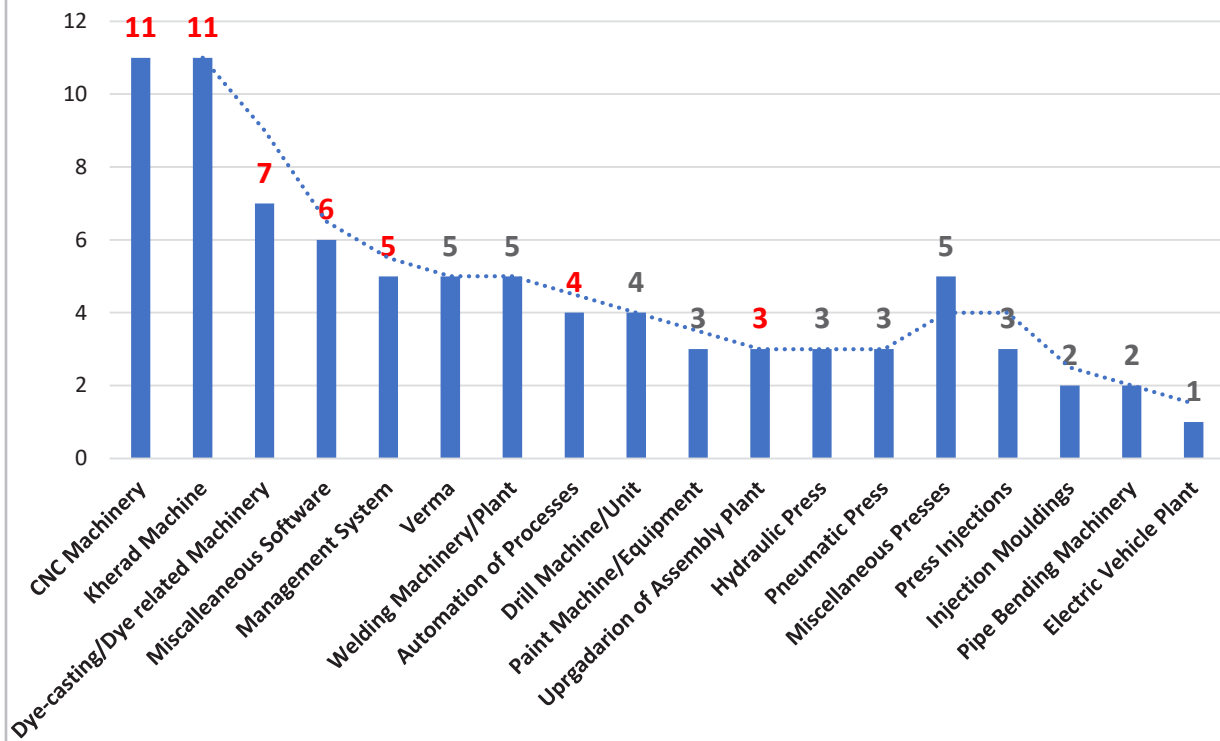
## 1.2. Most Recently Acquired Machinery/Equipment/ Software

When asked about the names of four most recently acquired equipment/software, 11 firms purchased CNC machines, 11 reported to have bought Kherad machines, 7 bought Dye-casting machines, 6 bought different Software, 5 upgraded their Management System, 4 bought Verma machines, 5 bought Welding machinery, 5 went for Automation of Machinery. Whereas, a small number of others firms in sample invested on Paint Machine, Upgrading of assembly, Hydraulic Press, Pneumatic Press, Press injections and Electrical Vehicle Plant etc.



Figure 1.2: CNC Machinery and Kherad Machinery were the most commonly purchased among innovating firms

List down up to 4 of your most recently acquired Equipment/Software?

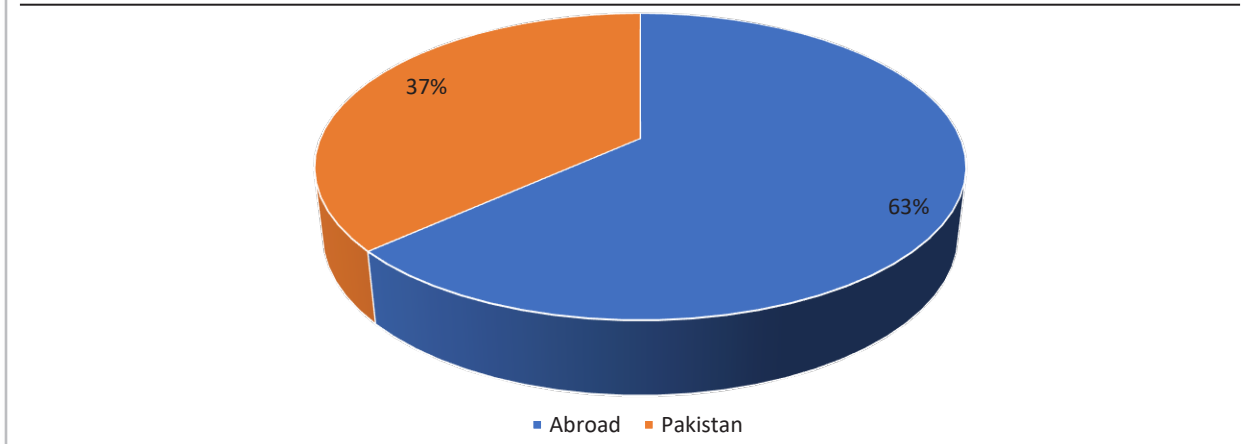


### 1.3. Purchased Locally or from Abroad

More than half of the respondent firms claimed to have purchased the technology/equipment from abroad (63%). Whereas, the remaining 37% of respondent purchased locally made machinery.

Figure 1.3: More than half of the last four technologies/equipments had been purchased from abroad.

Where did you purchase this Technology/Equipment from?

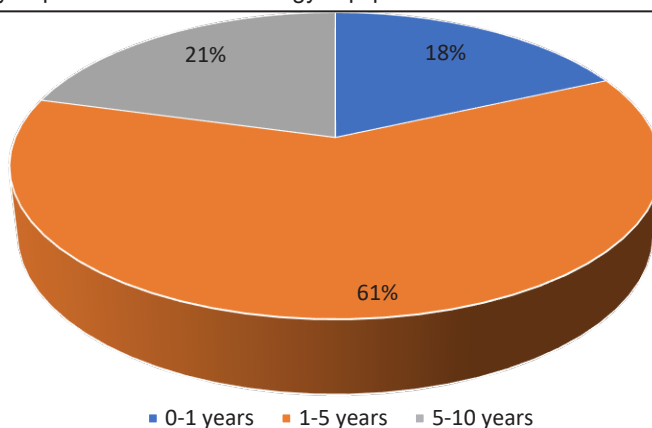


## 1.4. Age of Technology

The timing of innovation is also important. In our sample, 79% of firms innovated recently, with 18% of firms said that they innovated 0-1 years ago and 69% of the firms said that this innovation took place in the last 1-5 years. Whereas, 21% of the firms said that they innovated almost 5-10 years ago.

**Figure 1.4: More than half of the last four technologies/equipments had been purchased within 1-5 years**

How many years ago did you purchase this Technology/Equipment?

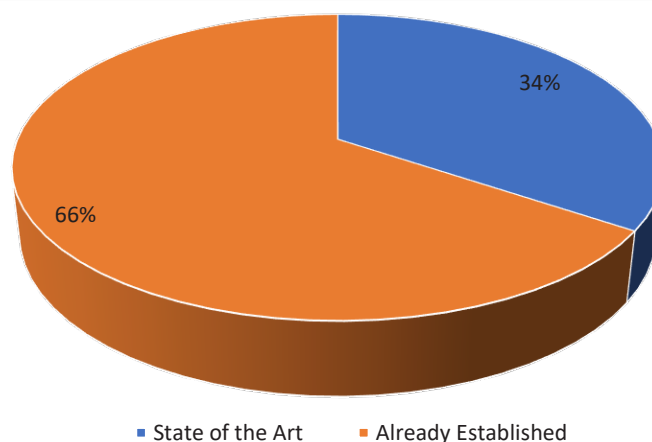


## 1.5. State of the Art or Already Established Technology

In our sample, a significant percentage of firms (66%) reported that adopted already established machinery/software.

**Figure 1.5: More than half of the last four technologies/equipments that had been purchased by surveyed firms were State of the Art**

Was your technology state of the art or already established?

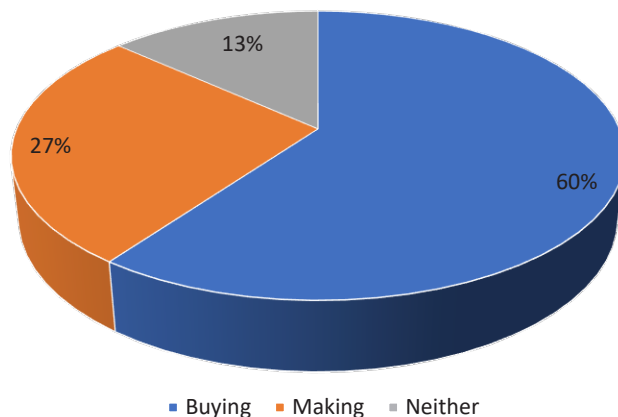


## 1.6. Created vs Bought technology

When firms were asked if they preferred making or buying new innovations, a majority of firms (60%) reported that they preferred buying innovation. Whereas, only 27% firms preferred developing their own innovations.

**Figure 1.6: More than half of the surveyed firms reported that they prefer buying technology**

Do you prefer making or buying innovation?

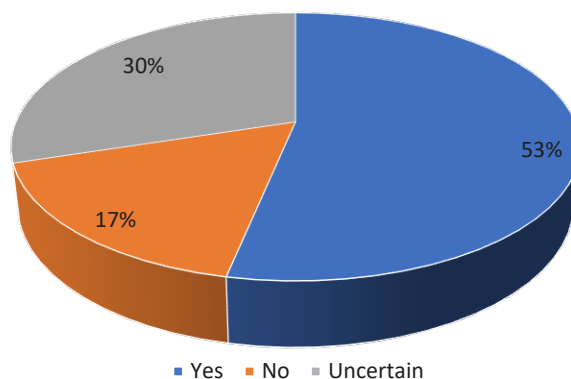


## 1.7. Planning to Introduce New Technology

The survey also analyzed the future innovation plans of firms. Almost half of innovating firms (53%) claimed that they were planning to introduce new technology again in the next 12 months. 17% of firms responded that they were not planning to innovate in the next 12 months, whereas 30% of firms were uncertain.

**Figure 1.7: More than half of the surveyed firms reported that they do plan on introducing new technology in the next 12 months**

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

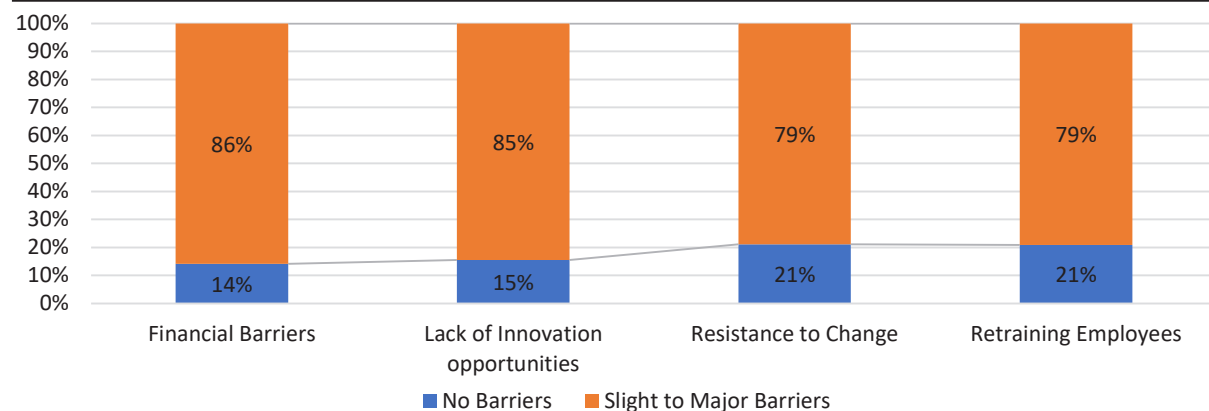


## 2. BARRIERS TO TECHNOLOGY ADOPTIONS

The firms were asked to rate the barrier faced in the attempt to adopt new technologies, equipment and or software upgradation. These firms were particularly asked how lack of financing, lack of innovation opportunities, resistance to change and retraining employees affect their technology adoption. The overall analysis of all these barriers revealed that lack of financing (86%) was the greatest barrier faced by firms followed by lack of innovation opportunities (85%), resistance to change (79%) and retraining employees (79%) respectively.

**Figure 2: Lack of Financing followed by Lack of Innovation Opportunities were the greatest barriers faced by the innovating firms**

How would you rate the barriers (1 to 5) you faced while trying to perform Technological Innovations?

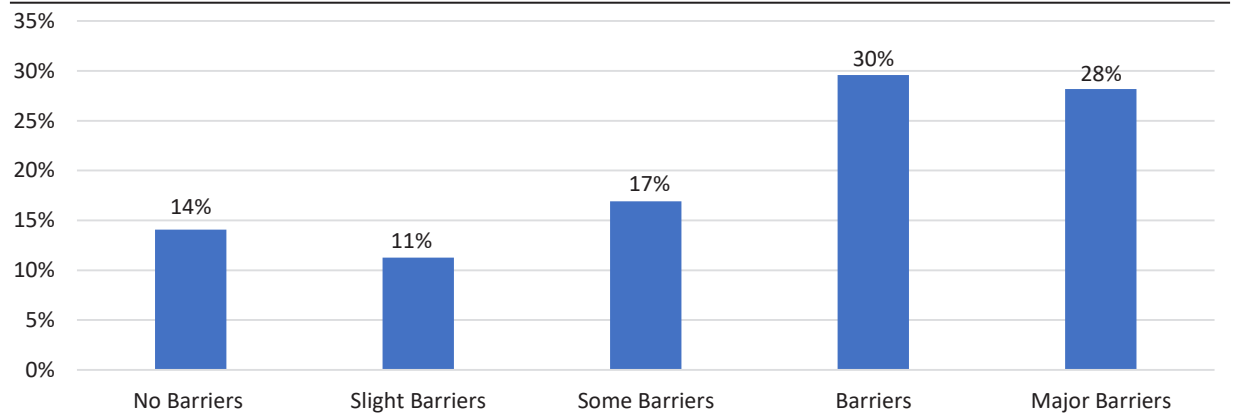


### 2.1. Financial Barriers

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

**Figure 2.1: Only 14% of surveyed firms stated that they faced no financial barriers when innovating**

How would you rate the Financial Barriers faced while trying to perform Technological Innovations? (1 being “No Barriers” and 5 being major Barriers”)

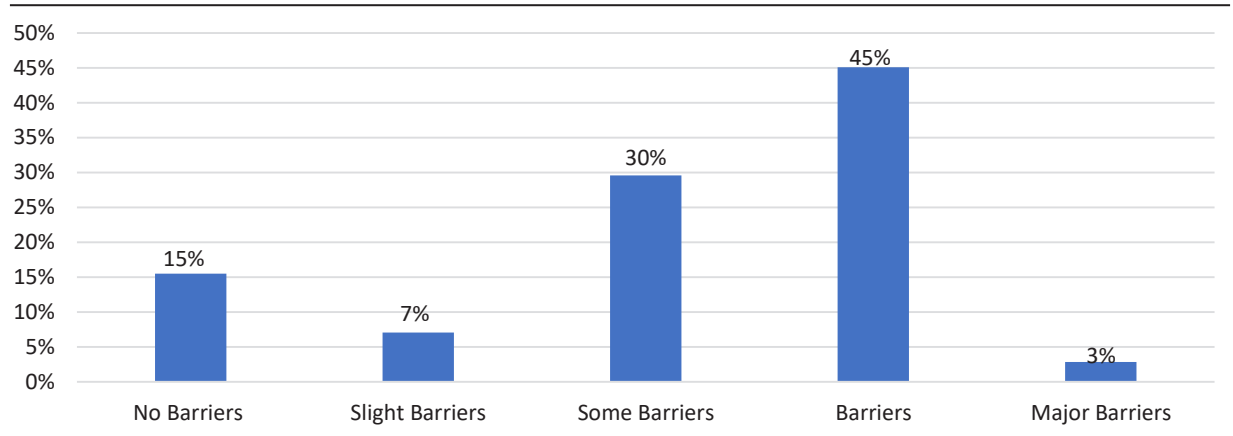


## 2.2. Lack of Innovation Opportunities

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

**Figure 2.2: only 15% of surveyed firms stated that lack of innovation opportunities was not a barrier they faced while innovating**

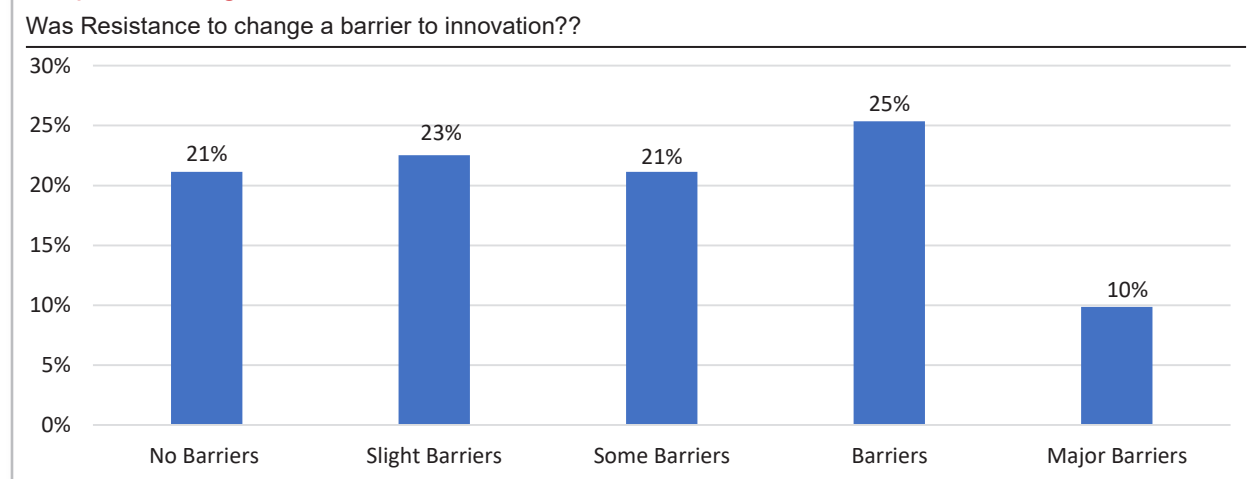
Was lack of Innovation opportunities a barrier to perform Technological Innovations?



### 2.3. Resistance to Change in Workplace

Almost 44% of surveyed firms claimed to have faced little or no resistance from employees when trying to introduce innovation.

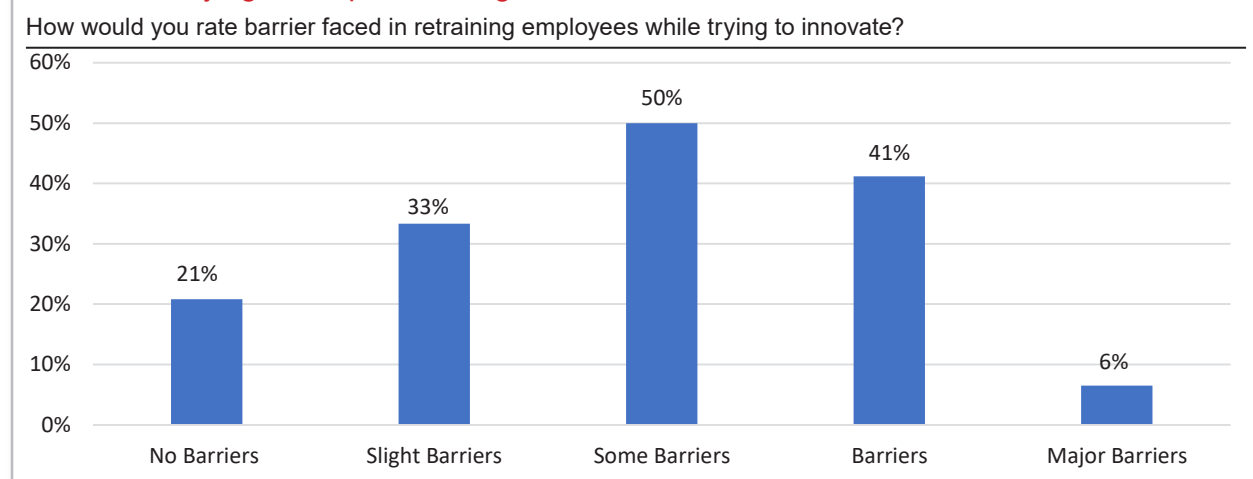
**Figure 2.3: Only 21% of firms said that they faced resistance to change when trying to adopt technological innovations.**



### 2.4. Retraining of Employees

Almost 54% of firms said that they have faced no or very slight barriers to retrain their employees in order to adopt new technologies/software.

**Figure 2.4: Only 21% of surveyed firms stated that retraining employees was a barrier they faced while trying to adopt technological innovations**



# 3. COMPETITIVE INNOVATIONS

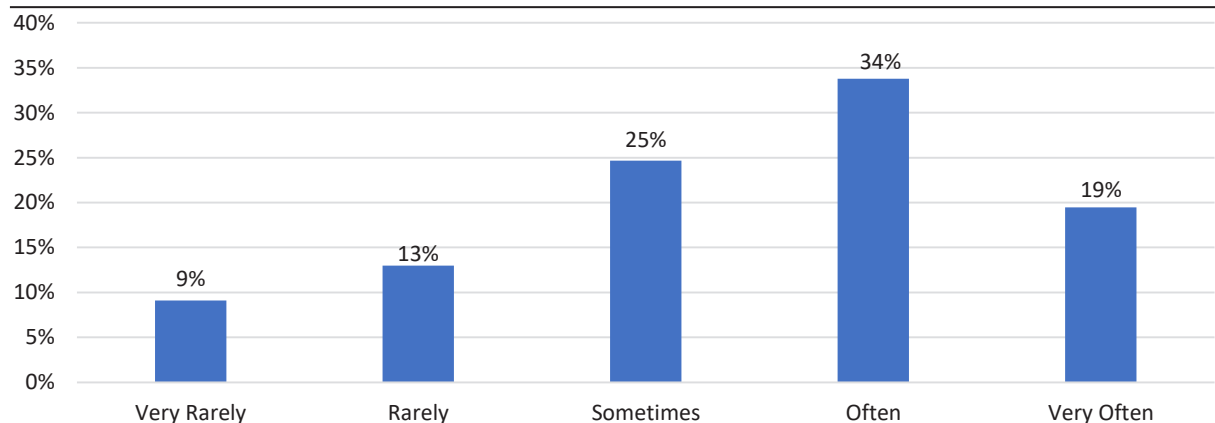
In this part, the innovating firms were asked about their major areas of innovations, who were responsible for these technological developments, their sources of funding to finance their innovation activities and drivers of innovations

## 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 Product (78%), Process (72%), Technology/ Equipment (69%), Marketing (52%) and Business Model (39%).

**Figure 3.1a: 78% of overall firms said that they introduced new products at least some of the time**

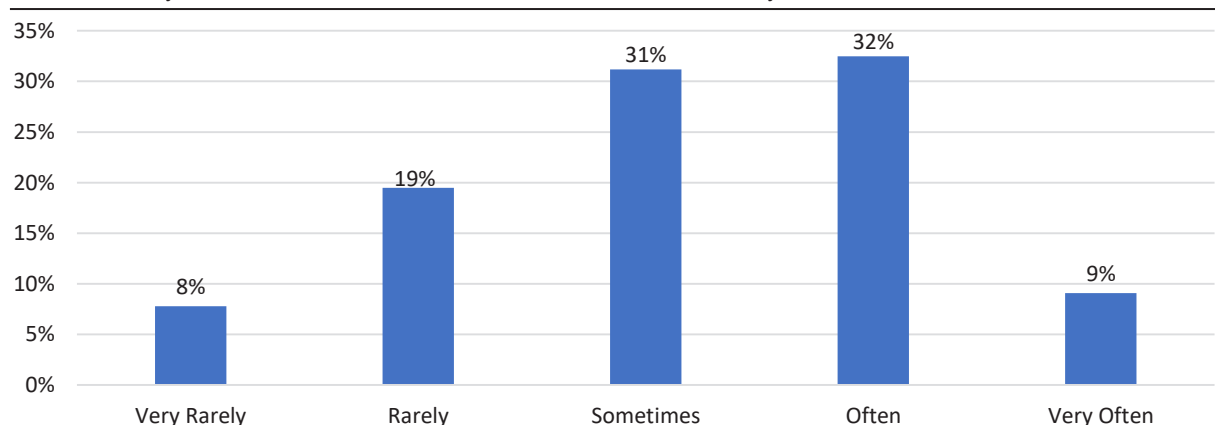
How often did your firm innovate in each of these areas over the last 3 years?



When asked about how often they innovated by introducing a new product, 78% of firms reported that they innovated (sometimes, often & very often) in this way.

**Figure 3.1b: 72% of firms reported that they introduced innovative processes at least some of the time**

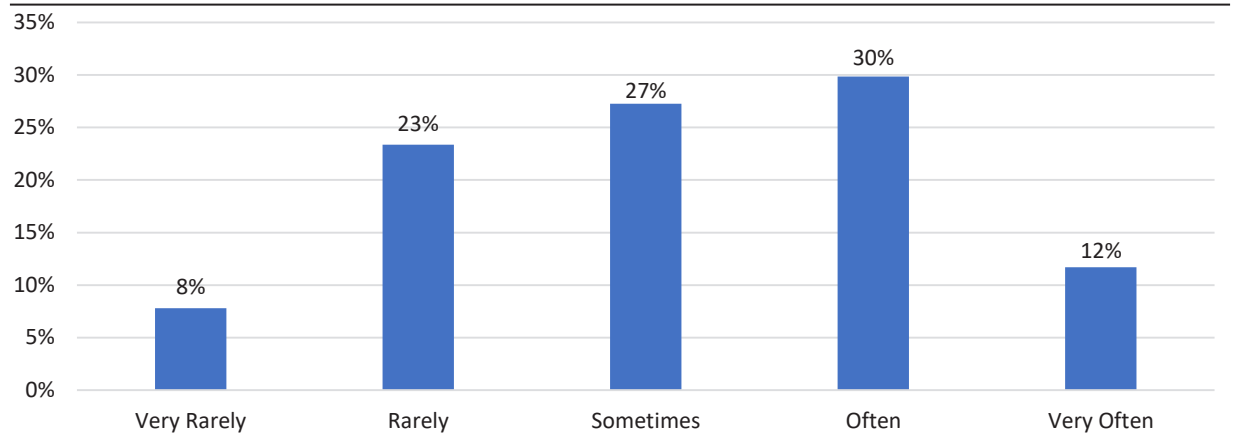
How often did your firm innovate in each of these areas over the last 3 years?



When asked about how often they innovated in the area of process, 72% of firms said they introduced new process I (sometimes, often & very often) in this way.

**Figure 3.1c: 69% of firms said that they introduced innovations in the area of technology/equipment at least some of the time**

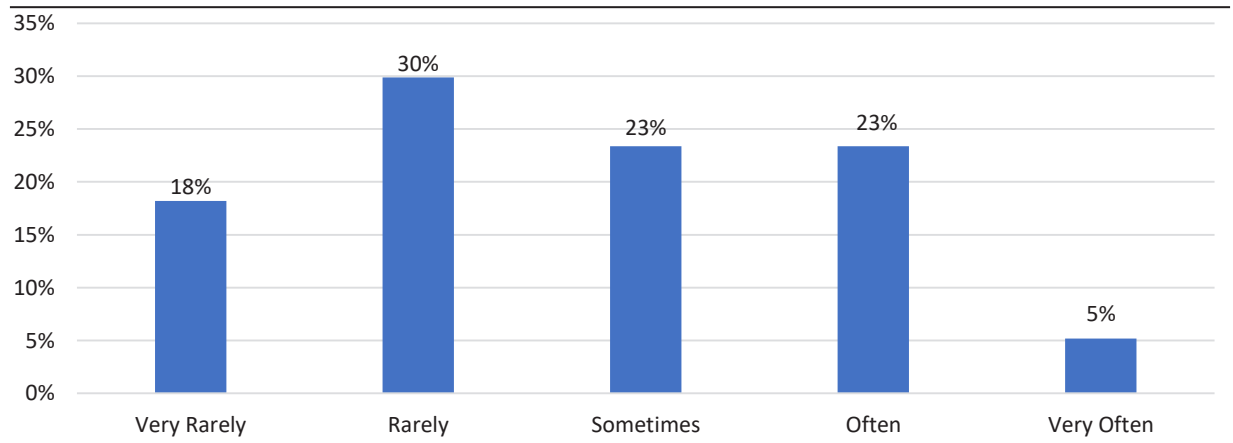
How often did your firm innovate in each of these areas over the last 3 years?



When asked about how often they innovated in the area of technology, 69% of firms said they introduced innovations in the areas of innovation at least some of the time while only 31% of firms reported that they rarely introduce in this area of innovation.

**Figure 3.1d: Half of the firms reported that they introduced innovations in the area of marketing at least some of the time**

How often did your firm innovate in each of these areas over the last 3 years?

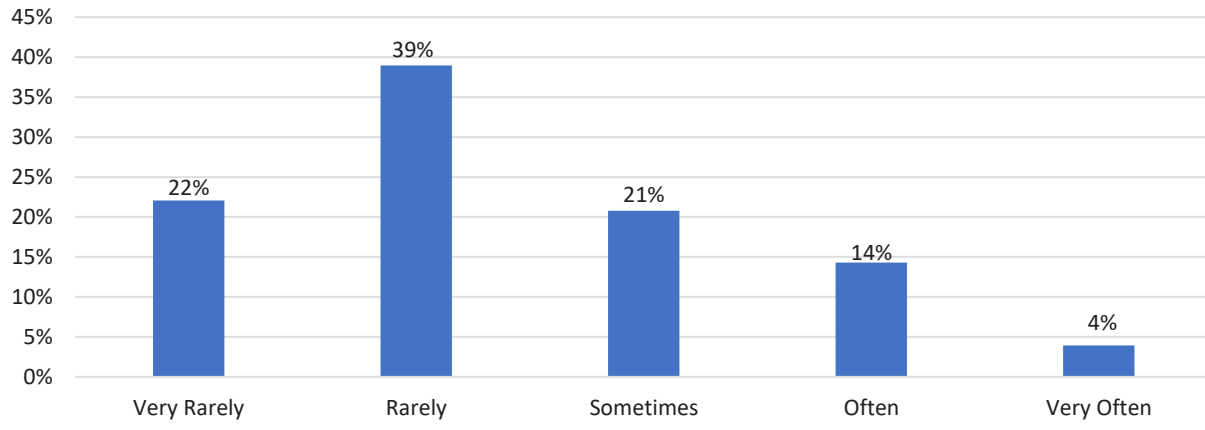


When asked about how often they innovated in the area of marketing, almost half of the firms reported that this innovated (sometimes, often & very often) in this way.



**Figure 3.1e: Only 39% of overall firms said that they introduced innovations in the area of business model at least some of the time**

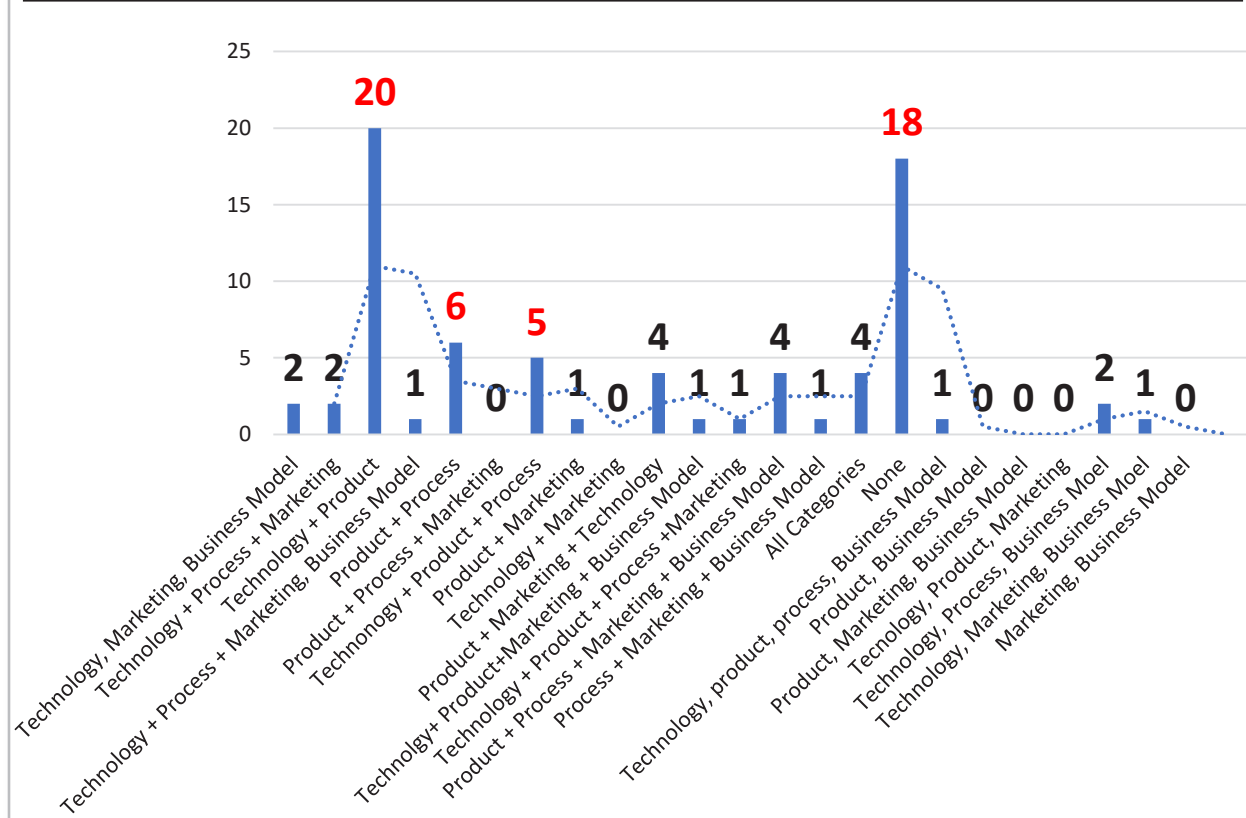
How often did your firm innovate in each of these areas over the last 3 years?



When asked about how often they innovated in the area of business model, only 39% of the firms reported they innovated (sometimes, often & very often) in this way, while a majority of 61% of firms reported that they rarely introduced innovation in this area.

**Figure 3.1f: A majority of firms innovated in Technology & Product, followed by Product & Process**

Of the firms that innovated, how often they innovate in the following areas?



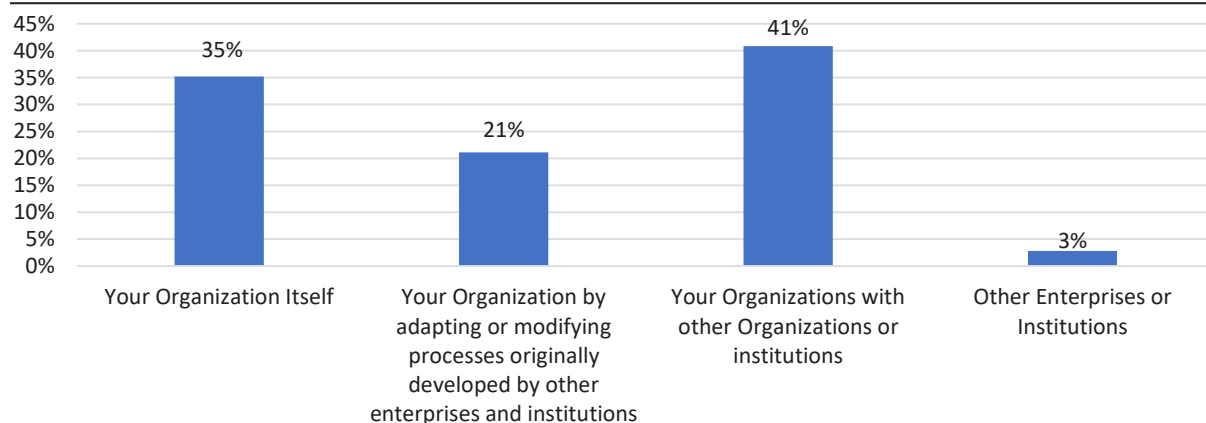
When asked about how often the innovating firms innovated in the areas of product, process, technology, marketing and business model, a majority of firms innovated in a combination of 2, 3 or 4 areas. Looking at the combinations of areas in which the majority of firms innovated, the greatest number of firms (20 firms) innovated in a combination of product & technology. The second highest number of firms (6) innovated in a combination of product and process. The third highest combination firms (5) innovated in was a combination of product, process & technology.

### 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 along with other organizations.

**Figure 3.2: 41% of the firms stated that their own organization along with other organizations or institutions were responsible for introducing new developments**

In the majority of these innovations, who was responsible for introducing these developments?

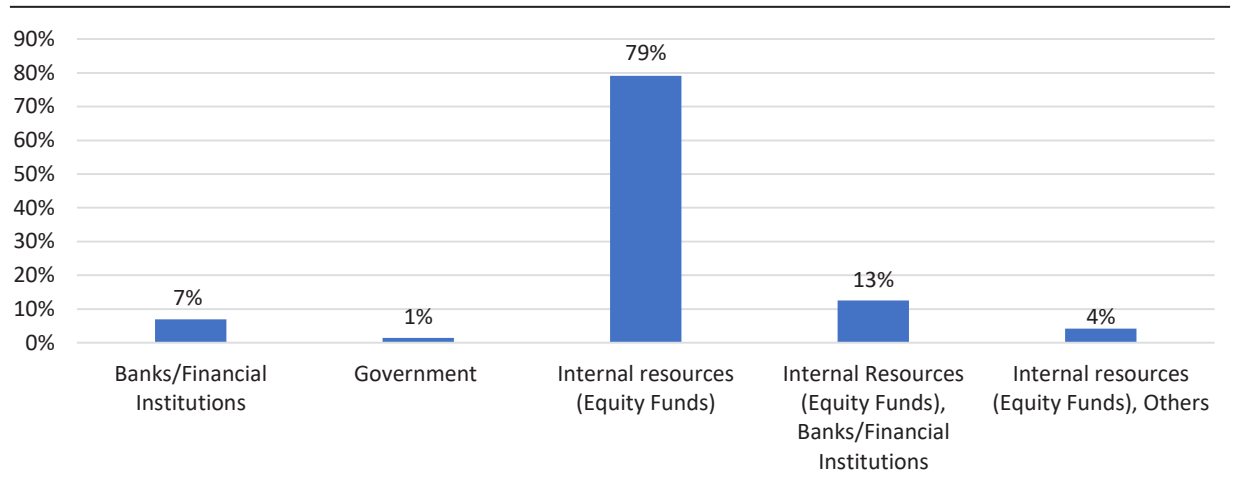


### 3.3. Sources of Innovation Funding

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 (79%) reported that those innovations were financed by their internal resources (equity funds) only. Whereas, 13% of firms said that their innovations were financed by using their internal sources as well as taking loans from the banks.

**Figure 3.3: Majority of the firms relied on their internal resources for funding innovation**

Which source of funding do you rely upon for your innovation expenditure?

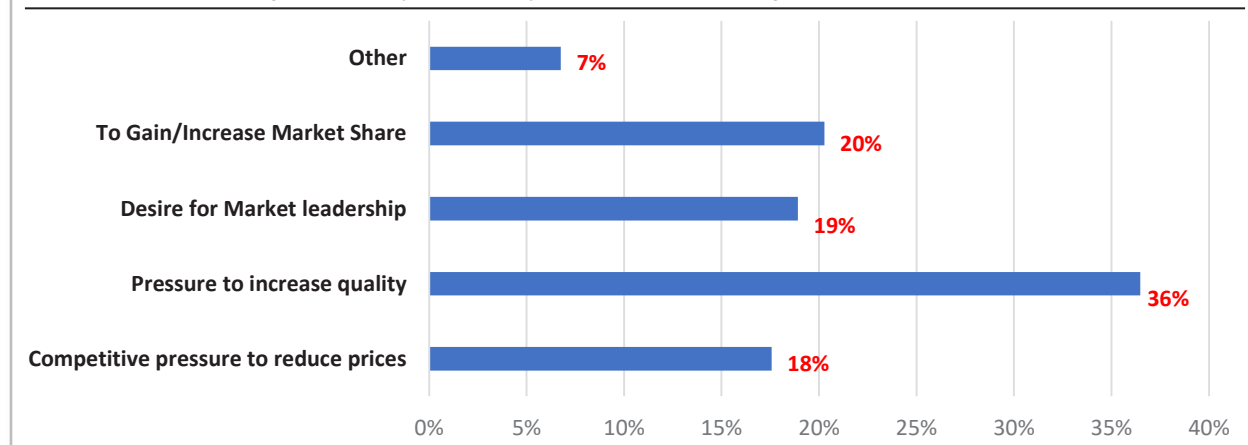


### 3.4. Reasons for Innovating/Drivers of Innovations

The incentives to innovate are important for firms. In our survey, when asked about the most significant driving innovation in their industry, a majority of firms (36%) reported pressure to increase quality was one of the most significant drivers of initiating innovation followed by the desire to increase market share (20%).

**Figure 3.4: Pressure to increase quality was chosen as the driver of innovation by the most number of firms**

Which factor is most significant for your industry as a driver of initiating innovation?



# 4. RESULTS OF INNOVATION

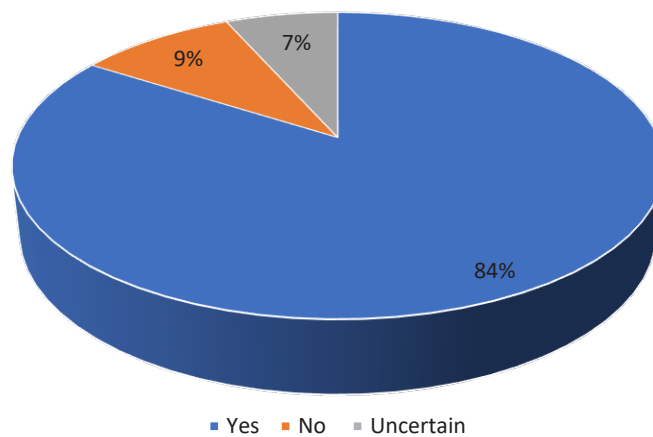
In this section of the survey, the innovating firms were asked about the impact of their innovation related activities on their revenues, costs of production, quality of product and prices.

## 4.1. Impact on the Quality of Output

In this survey, 84% of automobile firms reported that their quality of output increased as the result of innovation.

**Figure 4.1: Majority of firms (84%) said that their product quality increased due to innovation**

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

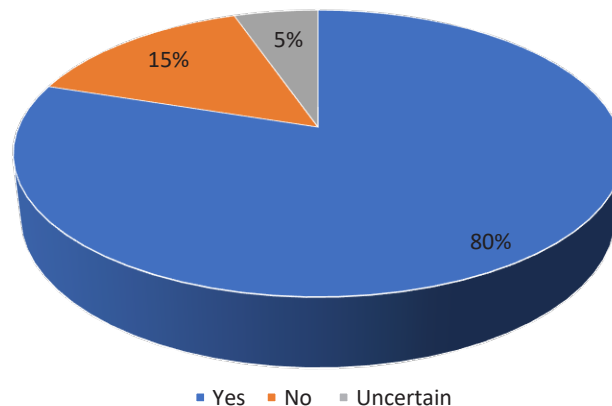


## 4.2. Impact on Retraining Employees

About 80% of firms reported that they had to retain as a result of innovation.

**Figure 4.2: Majority of surveyed firms said that they had to retrain their employees after innovation**

Did your employees have to be retrained in order to adopt the innovations you invested in?

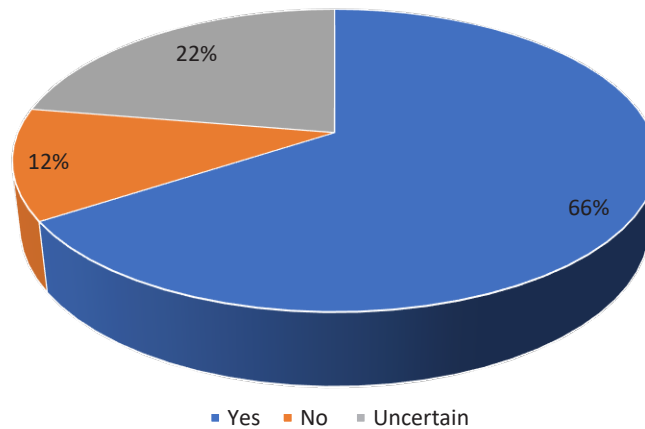


### 4.3. Impact on Revenues

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, 66% of the respondent firms reported that innovation led to an increase in revenues.

**Figure 4.3: A majority of firms (66%) said that their revenues increased because of innovation**

Did your revenues increase as a result of innovation?

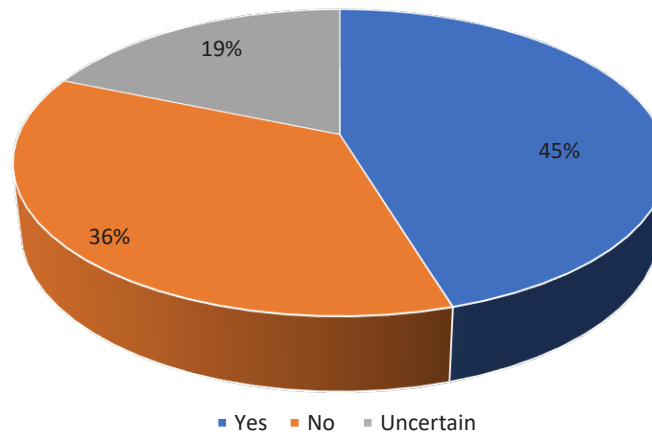


### 4.4. Impact on Cost of Production

45% of firms reported that their cost of production decreased as the result of innovation.

**Figure 4.4: 45% of firms said that their cost of production decreased because of innovation**

Did Innovating reduce your firm's Cost of Production?

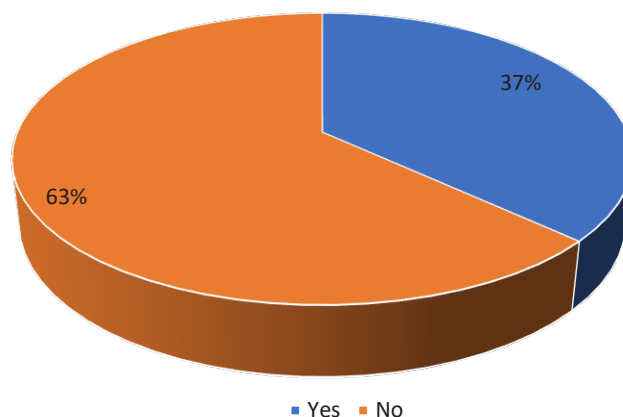


#### 4.5. Impact on Resistance from Employees While Introducing Innovation

Only 37% of firms reported resistance from employees as a result of innovation.

**Figure 4.5: Majority of surveyed firms said that they did not face resistance from employees after innovation**

Did you face resistance from employees while trying to innovate?

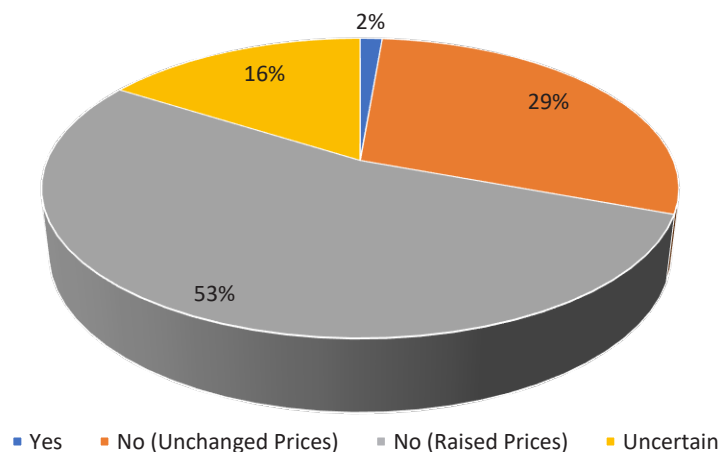


#### 4.6. Impact on Prices

29% of firms reported that their prices remained unchanged as the result of innovation.

**Figure 4.6: 53% of firms said that they reset prices as a result of innovation**

Did you lower prices as a result of innovation?



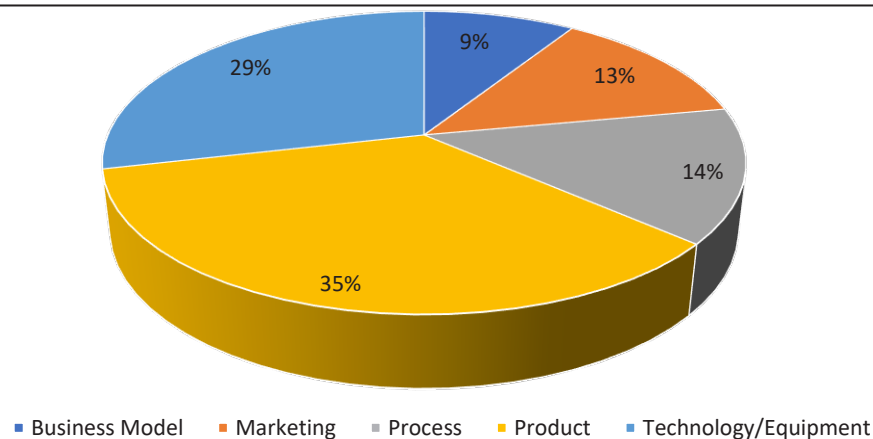
# 5. IMPACT OF DIFFERENT TYPES OF INNOVATIONS ON FIRM PROFITS

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

When asked about the impact of various types of innovations on firm profits, a majority of them reported that product innovation (35%) and innovation in technology/equipment (29%) resulted in higher profits.

**Figure 5: Product innovation was thought to have impact on profitability by the largest number of surveyed firms**

Which of the following innovations has had the most impact on your firm's profits over the last 3 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 2020/2021 to observe the growing trends in innovation and technology upgradation in the automobile sector firms in Pakistan. The majority of surveyed firms were located in Lahore, Gujranwala, Karachi and few other cities in Pakistan. 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 77 firms during the July 2020 to September 2021. The majority of surveyed firms were dealing in auto parts while only 16% were dealing in automobiles and auto manufacturers.

Data analysis of surveyed firms revealed that most of the firms were small sized firms, with majority of them innovated i.e. purchased new machinery/equipment from abroad during the last 1-5 years and the majority of this technology was already established. A majority of these firms said that the major source of funding for their innovations related activities were utilizing their own internal resources (Equity) along with other organizations and institutions. Also, a majority of these firms innovated in the areas of product, followed by process and technology. Looking at the combinations of the innovations adopted by firms, a majority of firms innovated in product plus technology, followed the combination of product plus process and lastly a combination of product, process and technology.

When asked about the impact of various types of innovations on firm profits, a majority of firms reported that innovation in products resulted in higher profits followed by innovation in technology/equipment. Whereas, the least popular innovation among reported by automobile sector was in their business model.

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 to gain/increase their market share.

Looking at the results of innovation, most of automobile firms revealed that their quality of output, they didn't have to retrain their employees to adopt new technology, their revenues increased, their cost of production decreased, they didn't have face resistance from their employees while introducing innovations and lastly the prices of their product remained mostly unchanged as a 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.





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