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A Snapshot of Innovation in the Philippine Services Sector

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A Snapshot of Innovation in the Philippine Services Sector

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Abstract

The PDP 2023–2028 recognizes innovation as one of the drivers of growth in the services sector, creating a strategic framework to reinvigorate the sector and strengthen creativity and innovation. To help formulate the appropriate strategies and policies, this paper examines the evidence on innovation in service industries using the 2021 Survey of Innovation Activities of Establishments, which provided broader sector coverage. The survey was conducted during the pandemic when firms had to pivot to new modes of service delivery to survive. It gives a more nuanced profile and innovation behaviors of services firms and seeks to identify the effects and determinants of innovation across the services subsectors.

Among the four types of innovation, organizational innovation was the most common type of innovation introduced in most service sectors, followed by marketing, process, and product innovation. For most of the services subsectors, the most common innovation activity of the establishments was "Training for innovative activities". Across all services subsectors, cost factors are identified as the most common barrier considered of high significance. Organizations that employ at least one FIRe technology, obtain funding, use platforms, engage in R&D activities (whether outsourced or in-house), or use knowledge management methods are more likely to be innovation active and produce at least one type of innovation. The survey also reveals greater reliance on internal and market sources of information while the utilization of institutional and other sources of information, such as incubators, scientific journals or technical publications, and regulatory bodies was low for most subsectors. Universities or other higher education institutions were also not popular cooperation partners. In terms of knowledge management, regularly updating internal databases or manuals was the most popular practice while a policy to bring in external experts from universities, research institutes, or other establishments to participate in projects teams was the least common practice across the subsectors.

The Philippine Innovation Act (R.A. 11293) provides different interventions to address the various impediments related to cost factors, knowledge factors, market factors, and legal or regulatory factors (Albert et al, 2023). Given the diversity of services, a one-size-fits-all strategy will not be effective. While this study presents a snapshot of the innovation profiles of the different subsectors, in-depth analysis of the innovation ecosystem is required to develop industry-specific innovation roadmaps.

Keywords: innovation, services, product innovation, process innovation, marketing innovation, organizational innovation

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A Snapshot of Innovation in the Philippine Services Sector

Ramonette B. Serafica and Queen Cel A. Oren*

1. Introduction

1.1 Policy context and objectives

The services sector accounts for about 60 percent of the GDP and employment of the Philippines. Because of its importance in the economy, Chapter 7 of the Philippine Development Plan 2023-2028, titled "Reinvigorating Services," seeks to strengthen creativity and innovation to further boost the sector's performance. An innovation is the implementation of a new or significantly improved product, process, marketing, or organizational method in businesses, workplaces, or external relations. Product and process innovations must be either new or significantly improved and introduced to the market, while marketing and organizational innovations must be new and brought into actual use (Gault 2018). Gustafsson et al. (2020) adds that that an invention, whether a new idea, product, service, or process, can be called an innovation when it is introduced and becomes profitable in the market. The term "new", regardless of whether it is incremental or radical, is considered by firms as innovation. Innovation influences companies to imitate, leading to the formation of new markets (Gustafsson et al. 2020).

Crafting suitable strategies requires a good understanding of the service industries and their innovation behavior. According to Peixoto et al. (2023), the majority of studies on service innovation tend to treat diverse service segments as a singular, uniform unit of analysis. Services exhibit distinctive characteristics that influence the behavior and features of innovation within the service industries. This highlights the need to adequately distinguish nuances among various service segments in terms of innovation behaviors.

There is a dearth of research on the innovation of the services sector in the Philippines. To fill this knowledge gap, the study will use the 2021 survey on innovation activities, which provided a broader coverage of the sector than in previous national surveys. Specific objectives include:

- To understand the pattern of innovation behavior among different service industries
- To identify the determinants and effects of innovation among firms in the services sector
- To explore the services firms' use of digital platforms

Although it takes a macro view, by examining the similarities and differences of various industries in the services sector as well as the determinants and effects of these innovations, the study hopes to provide appropriate and more nuanced recommendations to enhance innovation in the services sector.

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The views expressed in this paper are those of the authors and do not necessarily reflect the position or official policy of any company or any agency of the Philippine government. The authors are solely responsible for the analysis and conclusions in this paper, including any errors.

1.2 Methodology

The data used for the study is from the 2021 Philippine Survey of Innovation Activities of Establishments. It utilized a Stratified random sampling method where strata is by 3-digit PSIC industry. Geographic domain and employment size were also considered. Respondents were owners/managers of the sampled establishments who answered self-administered questionnaires. 7,176 samples out of 10,489 valid responses were from the services sector.

The services sector encompasses a diverse range of subsectors including Wholesale and Retail Trade, which involves the sale and repair of motor vehicles and motorcycles; Transportation and Storage; Accommodation and Food Service Activities; Information and Communication; Financial and Insurance Activities; Real Estate Activities; Professional, Scientific, and Technical Services; Administrative and Support Service Activities; Education; Human Health and Social Work Activities; Arts, Entertainment, and Recreation; and Other Service Activities.

The study conducted a descriptive statistical analysis to provide an overview of innovation activities in each subsector, recognize similarities, and differences; identify the effects of innovation among firms; and explore on the use of digital platforms. Probit regression was also used to identify determinants of innovation among firms in the services sector.

1.3 Overview of innovation in the services sector

Characteristics of services

The intangible nature and unique characteristics of services make it more difficult to establish valid indicators for innovation. Defining service innovation based on monetary value may not adequately capture its nature since financial outcomes may not always be a sufficient or relevant measure of success (Gustafsson et al. 2020). The services industry used to be perceived as lacking innovation, except for innovations related to technology adoption. This view was influenced by the way people conceptualized and understood innovation in the services sector. However, scholarly research recognizes distinctions between the operations of manufacturing and services firms. This highlights a shift in understanding the nature of innovation in the services sector and emphasizes the need for a nuanced approach, considering the unique aspects of services (Taques et al. 2021).

According to Taques et al. (2021), service innovation may be more subtle, involving gradual modifications to something that already exists. Convergence occurs between the services and manufacturing sectors to improve products and services to keep up with the rapid economic dynamics. This means that service production processes may also be integrated into manufacturing activities and outsourcing services activities in industries. Compared to the manufacturing sector, R&D expenditure in the services sector tends to be lower. This does not necessarily mean that the services sector has lower R&D investments; rather, R&D investments in services tend to be less formal and more difficult to trace. It is also challenging to separate

process innovations from the services produced, leading to increased complexity in measurement. Services characteristics are shown below (Taques et al. 2021):

- Immateriality/intangibility – items that cannot be perceived through the physical senses.
- Simultaneity - simultaneous production and consumption of the service, meaning there is no distinct separation between the methods of production and consumption.
- Perishability - services are consumed as provided, meaning there is no option for storage, return, resale, or any subsequent use.
- Heterogeneity - possible fluctuations in the quality attributes of services may occur as they are delivered from one person to another.
- Interactivity - interaction between consumers and suppliers, manifesting in various forms, particularly in the exchange of information related to the issue at hand. It also involves the gathering of guidelines and recommendations approved by consumers.
- Co-production - connected to interactivity, exemplified by situations where suppliers and customers engage and collaborate to achieve optimal results.

The services sector comprises significantly diversified activities, even within a subsector. For instance, computer services are commonly perceived as "high technology," "knowledge-intensive," and "innovative" at the two-digit level in the standard industrial classification. However, it includes routine tasks like data entry. There may still be significant differences even in activities that are very similar. For example, traditional carriers and low-cost airlines are innovating in different ways, depending on the focused demand segments and future market development. The differential behaviors of firms lead to the evolution of the sector (Tether 2003).

Perspectives on innovation in services

Tether (2003) presented three perspectives on service innovation. First, not all services conform to a 'supplier-dominated' model, where they merely adopt externally developed technologies passively. In contrast to the conventional belief, some services act as origins of new technologies. Some of these technologies are collaboratively generated through interactions between users and producers. Second, looking from this standpoint, services are more than just providers of routine activities; they are dynamic and adaptable, continuously changing to meet customer needs. They achieve this by creatively combining ‘hard’ elements, such as equipment and computer software, with ‘soft’ elements, like human skills and operating practices. In essence, they blend machinery with human knowledge and skills. Third, competition and innovation are interconnected processes tied to the potential for strategic positioning. Firms are likely to engage in innovation, at least in their outputs, to survive because without innovation their offerings may become outdated and fail to attract demand (Tether 2003).

Toivonen and Touminen (2009) also describe some of the features of services innovation. For one, companies in this sector typically lack specific resources, such as dedicated R&D departments. Innovations are typically not the result of deliberate action, but rather develop as part of the process of meeting the demands of the client. Furthermore, it is usually difficult to classify service innovation as either a product, process, or organizational innovation due to the nature of services as both products and processes. As compared to a new industrial product, it may be difficult to detect a change or improvement in service outputs. Companies may not necessarily use innovation terms but rather refer to quality improvements and customer

satisfaction when talking about enhancements in their services. This can have two opposite results when it comes to measuring innovation: either innovations are underestimated, or every activity is considered an innovation as no two service outputs are exactly alike.

Product development can be more informal for services than for manufacturing, starting initially through search, idea gathering, and commercial evaluation, before full execution (OECD and Eurostat 2005). Service innovation is also typically continuous in nature involving a succession of incremental adjustments to products and processes. This can often make it difficult to identify service innovations as a distinct event, such as the adoption of a significant change in products, procedures, or other approaches. Although R&D is critical to the innovation process, services rely more on skills and talent as well as interactions with external parties. An environment that encourages learning is also a useful to the innovation process in services.

Hipp and Grupp (2005) similarly observed that service firms typically do not engage in traditional R&D activities, and their innovation processes tend to include more departments and project teams than those in the manufacturing sector. They also note that, because internal R&D focused on science and technology plays a less significant role in services than in manufacturing, service companies prioritize alternative methods of generating knowledge. According to Taques et al. (2021), human resources and knowledge are essential elements of innovation in services, relying particularly on knowledge, skills, creativity, and entrepreneurial skills. Environmental factors can influence the development of service innovation. Internally, these factors encompass elements such as strategy, culture, market orientation, resources, and capabilities. Externally, they may involve technological infrastructure, market turbulence, and governmental policies. In addition, there may be external factors, depending on the nature of a specific industry (Singh et al. 2020). Similarly, Drake-Brockman et al. (2022) noted that service innovation typically occurs at the point of interaction between the service provider and the client. Thus, compared to manufacturing, client relations influence innovation in services requiring flexibility, creativity and problem-solving skills. Services innovation requires both technological and non-technological inputs, drawing from different disciplines such as social and natural sciences, as well as the humanities and the creative arts. The softer aspects of innovation are important in services innovation, which are based on the skills of employees as well on cross-professional and inter-organizational collaborative skills (Drake-Brockman et al. 2022).

Castro et al.'s (2011) findings examined Spanish firms' innovation behaviors in the manufacturing and services sectors. They reveal that companies in both sectors engage in innovation, but their preferences differ in terms of innovation types. Manufacturing firms tend to focus on innovations related to products, processes, organizational structures, and product design and packaging. In contrast, service firms are more inclined to innovate in areas such as business relationships and sales and distribution strategies. Manufacturing firms are more likely to engage in technological innovations, such as product and process improvements, whereas service firms tend to focus on organizational and commercial innovations.

Pires, et al. (2008) examined the innovation behavior of manufacturing and services firms in Portugal. Overall, there is no evidence that one sector outperforms the other in terms of innovation. The best performing service sectors such as Knowledge Intensive Business Services and Financial services are as innovative as the best performing manufacturing sector, namely, high-technology manufacturing. There are however differences in terms of behavior. For example, manufacturing leads in intramural R&D and machinery acquisition while the

services lead in extramural R&D, R&D cooperation, and training activities. Their findings confirm that human capital is a critical resource for innovation in general, and particularly for service innovations. However, innovation in services is less sensitive to the size of the firm compared to innovation in manufacturing.

Using micro level data for Chile, Iacovone, et al. (2013) found that services firms tend to be equally innovative as those in manufacturing. However, services firms are more reliant on non-technological kinds of innovation than manufacturing firms. In both sectors, exporters are more innovative and tend to spend significantly more on innovation compared to non-exporters. While services firms have a considerably lower propensity to export than manufacturing firms, their exports are less dominated by large firms and are more skill intensive. Skills appear to be important for both exports and innovation in the services sector.

Differences in innovation among service subsectors

Due to the diversity within the services sector, R&D and innovation activities vary across different industries. For instance, analyzing a 2000 survey of the German economy, Hipp and Grupp (2005) observed minimal R&D efforts in trade and transport sectors. In contrast, technology-focused industries like technical service providers and electronic data processing/telecommunications companies showed significantly higher levels of R&D involvement. Moreover, their R&D activities as well as tradability and exportability are similar to those of manufacturing. The study by Castro et al. (2011) of Spanish companies revealed differences in innovative behavior across subsectors too. Financial services demonstrate strong performance in various types of innovation, except for enhancing product design and packaging, which may not be relevant to them. Additionally, firms in the financial sector are more inclined to focus on process innovations compared to those in the retail and hospitality sectors, such as hotels and restaurants.

Even within a subsector, there are also differences in innovation behavior. For example, some activities under Information and Communication are knowledge intensive while others involve routine tasks like data entry. In addition, even in activities that are very similar, there could still be different approaches to innovation. In passenger air transport services for example, traditional carriers and low-cost airlines are innovating in different ways, based on their target demand segments and future market development (Tether 2003). Vence & Trigo (2009) proposed a typology of innovation patterns according to their innovation process attributes:

i. Low innovation-intensive sectors (LIIS)

   In terms of most innovation indicators, the performance of these industries is weaker compared to others. In these service activities there is strong price competition, low appropriability and innovation opportunities, and relatively poor human capital endowment. They also have little external linkages and have been characterized as supplier-dominated which merely adopts externally developed technologies passively.

   In the past, the sectors assigned to this group were wholesale and retail trade as well as transport service, collectively referred to as distributive services. Also, includes personal services, real estate, hotels and restaurants.

ii. Technology-intensive and moderately innovation-intensive sectors (TIMIIS)

The second type, TIMIIS, contains productive processes based principally on information. Firms in this category are particularly responsive to innovations introduced by suppliers of new technologies and information and communication technology (ICT), although non-technological innovations also play a significant role in their operations.

There is little or no linkage at all with traditional sources of knowledge, such as universities, technology institutes (TIs), and public research institutes for instance. But there is a high level of interaction with clients and strong information flows within these relations. Because of these connections, many authors have classified these service activities as network-based. The sectors assigned are fundamentally banking, insurance, and other financial services.

iii. Knowledge and innovation-intensive sectors (KIBS)

These service activities are known to use knowledge, mainly tacit knowledge, to develop their services. Moreover, knowledge is not only considered an important tool, but also the core of their final product. Because of the significant use of knowledge both for producing services and creating new outputs, they can innovate more frequently than any other sector. The way they accumulate knowledge through learning by doing permits these firms to develop innovation while providing their services.

The intense level of interaction, the ad hoc mode of innovation and the high level of interface with clients contribute positively to the innovation process. Largely represented by business services, innovation could be perceived as the result of co-production with the client; and frequently takes place within the client firm. Moreover, competencies and abilities to solve complex problems in various areas of expertise are the main selling points rather than the service itself. Other activities that belong to this cluster include computer and other service-related practices, R&D, architecture and engineering, technical consultancy as well as technical testing and analysis.

Innovations in the services sector

OECD and Eurostat (2005) defined four types of innovation (see Table 1 with examples in the services sector).[1]

Table 1. Types of innovation and examples

Product innovation The introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses.	Significant improvements in Internet banking services; dynamic toll pricing to ease traffic congestion; Video on demand via broadband Internet
Process innovation	The introduction of global positioning systems (GPS) tracking devices for transport

[1] Note that in the 4th edition of the Manual (OECD and Eurostat 2018) only two types of innovation were defined – product innovation and business process innovation. A **product innovation** is "a new or improved good or service that differs significantly from the firm's previous goods or services and that has been introduced on the market" while a **business process innovation** is defined as "a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and that has been brought into use by the firm" (p. 34). Six different business functions are covered by the business process innovations, which align with the process, marketing and organizational innovations defined in the 3rd edition of the Manual (OECD and Eurostat 2005).

The implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software	services; the implementation of a new reservation system in a travel agency; the application of data mining analysis to large databases
Organizational innovation The implementation of a new organizational method in the firm's business practices, workplace organization or external relations	New training system; new quality management system; Outsourcing or subcontracting of a business activity for the first time
Marketing innovation The implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing	Introduction for the first time of a franchising system; Adopting a new or significantly different media or technique (e.g., product placement in movies or television programs or the use of celebrity endorsements).

Source: OECD and Eurostat (2005; 2018)

Distinguishing between product and process can be challenging in the case of services because of the simultaneity property. According to the OECD and Eurostat (2005), the type of innovation depends on whether it involves new or significantly improved characteristics of the service (a product innovation) or involves new or improved methods, equipment and/or skills used to perform the service (a process innovation). If it includes both kinds of improvements, then it could be considered a product and process innovation. Many innovations tend to be bundled (OECD and Eurostat 2018). For example, a product innovation such as a new digital service can require supporting business process innovation in terms of ICT systems. It can also lead to marketing innovation if a new sales channel is created. When the process is indistinguishable from the product, innovations in product and processes tend to be intertwined. This is typically the case for services activities where the production, delivery, and consumption occur at the same time.

Innovations can be new to the world, the market, or the firm (OECD and Eurostat 2005, 2018). New-to-firm (NTF) refers to a first time use or implementation by a firm and is considered the minimum requirement of an innovation. New-to-market (NTM) is an innovation by a firm that has not been available in the market(s) served by the firm. In terms of novelty, an NTM innovation is considered to represent a higher threshold for innovation than an NTF (OECD and Eurostat 2018, p. 250).

Containerization, outsourcing, and e-commerce are considered among the top 50 innovations that have shaped the global economy and modern business (FT 2013). During the COVID-19 outbreak, digital technologies have enabled industries to innovate. Examples of how the pandemic affected the innovation processes in services sectors include the rapid uptake of telehealth and remote care management (health); shifting of media production to the cloud (media); use of online meeting tools for digital classrooms (education); deployment of autonomous vehicles for contactless delivery of medical supplies and equipment (transport); and the development of contact-tracing apps (government administration) (EIU 2020). Box 1 provides some examples of recent innovations by firms in the Philippine services sector.

Box 1. Examples of innovations by Philippine service firms

Transportation and Storage
Unlike traditional cargo trucking services that require businesses to pay for an entire truck regardless of load size, adhere to fixed schedules, and follow limited routes, Ninjavan's "Ninja Restock" offers a more affordable and efficient pay-per-space solution. Businesses can opt for smaller, more frequent restocking, with deliveries from warehouses to multiple drop-off points, store-to-store, or warehouse-to-warehouse (Ninjavan n.d.).

Financial and insurance activities
In contrast to traditional customer service interactions, GCash developed Gigi, an AI-powered tool that addresses queries and issues using generative AI. The company also released a new app design, Dashboard 3.0, for easier and more intuitive navigation. Additionally, GCash introduced GScore AI, which calculates users' creditworthiness and loan eligibility, removing the requirement for customers to fill out forms. Furthermore, the app now features GCoach, which guides users on spending, saving, and growing their money (Sun Star 2024).

Palawan Pawnshop, a one-stop money shop with over 10,000 outlets nationwide, introduced its own mobile app, "Palawan Pay," in 2022. The app offers bill payment, loading, QRPH scan-to-pay features, international remittance, online pawn renewal, and microinsurance services without the need to visit a physical store. Within two years of its launch, it has already gained 15 million users (Philstar 2024a; BusinessMirror 2024).

Education
From traditional face-to-face classes, the pandemic driven a shift to diverse learning modalities. Carl Balita Review Center, with its 120 branches, responded to the COVID-19 crisis by transitioning to online review classes and digitizing its study materials (Rappler 2020). Mapua University, in collaboration with Cisco Philippines through the Country Digital Acceleration (CDA) program, introduced Tri-X, a flexible learning program offering face-to-face, synchronous, and asynchronous options. These smart classrooms are equipped with cutting-edge technology, including Webex Boards, the Webex suite, AI-generated meeting summaries, and Meraki cloud-managed smart cameras (Philstar 2024).

2. Profile of establishments

Before presenting the results of the 2021 Philippine Services Innovation Activities survey, an overview of the establishments covered are presented in this section.

The bulk of employment are in the Services sector, wherein the majority are women. In contrast, Agriculture and Industry employ more men than women (Albert et al. (2023). Per services subsectors, Human health and social work activities; Education; and Financial and insurance activities have the highest proportion of employed women, while transportation and storage; Information and communication; and Professional, scientific and technical services sectors have the highest proportion of employed men compared to women (Table 2).

Table 2. Total Employment, by Sex and selected services subsectors

Services subsector	Male	Female	Total
Wholesale and retail trade; repair of motor vehicles and motorcycles	1223006	1312115	2535122
Transportation and Storage	160099.7	44013	204112
Accommodation and food service activities	265589.5	222138	487728
Information and Communication	175186.7	96917	272104
Financial and insurance activities	657893.6	1219029	1876923
Real estate activities	48186.18	45897	94083
Professional, scientific and technical services	109307.5	76535	185842
Administrative and support service activities	1163415	1032564	2195979
Education	104113.5	194161	298274
Human health and social work activities	59319.84	123522	182842
Arts, entertainment and recreation	32023.1	31704	63727
Other service activities	43878.24	58053	101932

Source: 2021 PSIA, PIDS

Across all the subsectors, most employees were within the age group 25 to 34 years old. Accommodation and food service activities had the highest proportion of young employees (28% are below 25 years old), while Education had the highest proportion of old employees (11% are 55 years old and above) (see Table 3).

Table 3. Proportion of employment by age and sex

	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Below 18 Years Old												
Male	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%
Female	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
18-24 Years Old												
Male	6%	6%	15%	6%	3%	2%	7%	12%	5%	3%	6%	4%
Female	7%	2%	13%	5%	9%	4%	7%	13%	13%	8%	6%	6%
25-34 Years Old												
Male	22%	27%	24%	24%	18%	20%	26%	22%	13%	14%	19%	20%
Female	24%	10%	21%	16%	37%	20%	16%	20%	24%	30%	22%	25%
35-44 Years Old												
Male	13%	28%	10%	22%	9%	15%	16%	12%	8%	9%	13%	11%

Female	12%	6%	8%	10%	13%	14%	11%	9%	13%	16%	13%	16%
45-54 Years Old												
Male	5%	14%	4%	10%	3%	9%	7%	5%	6%	4%	9%	4%
Female	7%	3%	3%	4%	4%	7%	5%	4%	9%	9%	7%	7%
55-64 Years Old												
Male	1%	3%	1%	2%	1%	4%	2%	2%	4%	2%	3%	2%
Female	2%	1%	1%	1%	2%	4%	1%	1%	5%	3%	2%	2%
65 Years Old and Above												
Male	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	2%
Female	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	2%

Source: 2021 PSIA, PIDS

Across all services sector, a higher proportion of employed men and women have bachelor's degree compared to other educational attainments. A considerable proportion (18%) of the Transportation and Storage sector employ males with lower secondary education, while the Other services sector employ females with lower secondary education (see Table 4). A considerable proportion of the Transportation and Storage sector employs males with lower secondary education (18%), while 17 percent of employed women in the Other services sector have lower secondary education.

Table 4. Proportion of employment by highest educational attainment and sex

	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Early Childhood Education												
Male	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Female	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Primary Education												
Male	2%	2%	1%	0%	0%	1%	0%	1%	0%	1%	1%	2%
Female	1%	0%	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Lower Secondary Education												
Male	11%	18%	12%	2%	1%	9%	7%	13%	2%	3%	12%	12%
Female	8%	2%	10%	0%	0%	2%	2%	8%	1%	3%	9%	17%
Upper Secondary Education												
Male	5%	9%	10%	1%	0%	4%	3%	5%	1%	1%	7%	5%

Female	4%	0%	8%	1%	0%	1%	1%	3%	1%	1%	5%	8%
Post-Secondary Non-Tertiary Education												
Male	3%	16%	6%	2%	1%	3%	2%	4%	1%	2%	4%	5%
Female	2%	2%	4%	1%	0%	1%	1%	2%	1%	2%	3%	7%
Short-Cycle Tertiary Education or Equivalent												
Male	7%	8%	7%	7%	2%	3%	3%	7%	2%	2%	4%	7%
Female	6%	1%	5%	3%	1%	2%	2%	5%	3%	3%	5%	6%
Bachelor Level Education or Equivalent												
Male	21%	24%	17%	53%	30%	29%	42%	24%	22%	21%	20%	11%
Female	29%	16%	17%	30%	62%	42%	33%	28%	47%	54%	22%	17%
Master Level Education or Equivalent												
Male	0%	0%	0%	0%	0%	1%	2%	1%	5%	1%	2%	0%
Female	0%	0%	0%	0%	0%	1%	2%	1%	8%	3%	5%	0%
Doctoral Level Education or Equivalent												
Male	0%	0%	0%	0%	0%	0%	1%	0%	2%	1%	0%	0%
Female	0%	0%	0%	0%	0%	0%	0%	0%	2%	2%	0%	0%

Source: 2021 PSIA, PIDS

Across all services sectors, the most significant proportion of firms are young (established in the past 10 years). Education has the highest proportion of firms that are at least 11 years old. Moreover, 19% are more than 50 years old. See Table 5.

Table 5. Average firm age

Services subsector	0-10 years	11-20 years	21-30 years	31-40 years	41-50 years	More than 50 years
Wholesale and retail trade; repair of motor vehicles and	62.06	22.39	9.56	2.55	1.4	2.05
Transportation and Storage	49.86	24.13	16.4	2.35	3.1	4.17
Accommodation and food service activities	75.2	15.75	5.86	1.95	0.23	1.01
Information and Communication	48.85	24.39	16.35	3.65	2.52	4.24
Financial and insurance activities	45.41	25.55	15.92	4.51	2.86	5.75
Real estate activities	35.52	30.74	16.89	8.47	7.44	0.93
Professional, scientific and technical services	49.44	27.58	16.24	1.94	2.49	2.3

Administrative and support service activities	49.25	27.72	14.03	4.82	1.6	2.58
Education	25	24.64	17.72	9.63	4.29	18.71
Human health and social work activities	51.78	26.98	13.66	2.37	2.31	2.91
Arts, entertainment and recreation	65.32	19.59	11.56	1.89	0.77	0.87
Other service activities	72.72	15.71	6.68	1.06	1.04	2.8

Source: 2021 PSIA, PIDS

Among the services subsectors, Administrative and support service activities have the highest proportion of establishments that sold to foreign markets, followed by Information and Communication (Table 6). Note that these two sub-sectors are associated with the Information Technology and Business Process Management (IT-BPM) industry. Additionally, a number of service activities are non-tradable which may explain the low proportion of establishments engaged in exports at the subsector level.

Table 6. Proportion of establishments with foreign sales (%)

Services subsector	Proportion of firms (%)
Wholesale and retail trade; repair of motor vehicles and motorcycles	1.67
Transportation and Storage	8.21
Accommodation and food service activities	2.7
Information and Communication	14.22
Financial and insurance activities	6.94
Real estate activities	1.89
Professional, scientific and technical services	7.03
Administrative and support service activities	21.47
Education	3.34
Human health and social work activities	0.36
Arts, entertainment and recreation	1.8
Other service activities	0.74

Source: 2021 PSIA, PIDS

Among the services subsectors, the Information and Communication has the highest proportion of firms with majority foreign ownership, followed by the Administrative and support service activities (Table 7).

Table 7. Proportion of establishments with majority foreign ownership (%)

Services subsector	Proportion of firms (%)
Wholesale and retail trade; repair of motor vehicles and motorcycles	2.03
Transportation and Storage	3.33
Accommodation and food service activities	2.46
Information and Communication	11.29
Financial and insurance activities	1.85

Real estate activities	2.5
Professional, scientific and technical services	5.07
Administrative and support service activities	8.44
Education	2.14
Human health and social work activities	1.1
Arts, entertainment and recreation	0.11
Other service activities	1.82

Source: 2021 PSIA, PIDS

3. Types of innovation and perceived effects

3.1 Innovation status

The national survey adopted the four types of innovation discussed previously, namely: product, process, organizational, and marketing. A firm that has implemented at least one innovation is considered **innovative** (OECD and Eurostat 2005). Even if no innovation was implemented, they could still be considered as **innovation active** during the period under review (see Box 2).

Box 2. Who are the innovation active establishments?

The 2021 PSIA surveyed establishments to probe on their innovative activities, the level of effort employed, and the achievement of new or improved products and/or processes. Following the 2015 SIA (Albert *et al*, 2018), in this report establishments are defined as innovation-active if they are:

(a) product innovators that introduced new or significantly improved products, i.e., goods and/or services;
(b) process innovators that introduced (i) new or significantly improved methods of manufacturing or producing goods or services; (ii) new or significantly improved Logistic, delivery or distribution methods for inputs, goods, and services; (iii) new or significantly improved supporting activities for processes, such as maintenance systems or operations for purchasing, accounting, or computing;
(c) engaged in innovation projects either not yet complete or abandoned; and/or
(d) engaged in expenditure of innovation activities for (i) internal or outsourced R&D; (ii) training; (iii) acquisition of external knowledge machinery, equipment or software linked to innovation activities; (iv) market introduction of innovations; and (v) other preparations to implement innovations.

Source: Lifted in full from Albert et al. (2023, pp.10–11)

The three subsectors with the highest proportion of **innovation active** establishments were Information and Communication, Financial and insurance activities, and Professional, scientific and technical services. The three subsectors with the lowest proportion of innovation active establishments were Real estate activities; Arts, entertainment and recreation; and Administrative and support service activities.

At least 50 percent of establishments in most subsectors were **innovative**, implementing one or more of the four types of innovation. Real estate activities and the Arts, entertainment and recreation subsector had the lowest proportion of innovative establishments.

Organizational innovation was the most common type of innovation implemented in most of the services subsectors, except in Wholesale and retail trade; Accommodation and food service activities; Arts, entertainment, and recreation; and Other service activities, where marketing innovation was the most common innovation implemented during the period (see Table 8).

Table 8. Proportion of establishments by innovation status (%)

Services subsector	Innovation active	Innovative establishment	Product innovator	Process innovator	Organizational innovator	Marketing innovator
Wholesale and retail trade; repair of motor vehicles and motorcycles	34.25	57.59	22.23	28.11	33.55	38.92
Transportation and Storage	29.95	48.87	17.8	23.65	32.42	25.21
Accommodation and food service activities	35.19	60.17	24.36	29.98	35.77	40.3
Information and Communication	38.39	61	24.08	29.75	38.87	35.99
Financial and insurance activities	37.8	60.95	24.7	30.88	42.2	39.3
Real estate activities	15.87	32.03	11.39	9.71	23.29	15.55
Professional, scientific and technical services	37.24	57.64	24.54	28.67	39.86	32.87
Administrative and support service activities	26.38	50.67	13.91	20.14	35.63	26.26
Education	35.6	60.74	22.02	26.18	39.74	33.58
Human health and social work activities	31.65	53.72	21.38	22.25	36.77	31.51
Arts, entertainment and recreation	21.3	34.42	14.2	9.75	18.31	21.2
Other service activities	27.13	51.66	16.64	20.69	34.71	35.1
Chi-square test for association using all services subsectors	43.65*	75.34*	58.25*	42.25*	81.94*	100.83*

Note: *Statistically significant at 0.05 level; Innovative establishments refers to those that implemented one or more of the four types of innovation
Source: 2021 PSIA, PIDS

3.2 Product innovation and process innovation

Of the firms that implemented **Product innovation**, there were more firms that introduced new or significantly improved services than those that introduced new or significantly improved goods, except in the case of real estate services (see Figure 1). Note that firms may offer both new and significantly improved goods and services, so these categories are not mutually exclusive.

Figure 1. Establishments that implemented product innovation (%)

	G	H	I	J	K	L	M	N	P	Q	R	S
New or significantly improved goods	17.49	8.93	20.69	14.14	12.39	12.1	14.95	6.75	8.68	12.96	6.53	12.07
New or significantly improved services	19.19	17.21	22.72	21.88	24.1	12.1	24.56	13.3	21.74	20	16.08	16.61

Notes: G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical services; N - Administrative and support service activities; P – Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities
Source: 2021 PSIA, PIDS

For firms that introduced **Process innovation**, the majority of the services subsectors' common type of innovation was New or Improved Supporting Activities, except for Transportation and Storage where Improved Logistics Delivery or Distribution is most common. In Accommodation and food service activities; Real estate activities; Education; Human health and social work activities; and Other service activities the most common process innovation was Improved Methods. See Figure 2.

Figure 2. Establishments that implemented process innovation (%)

Notes: G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical services; N - Administrative and support service activities; P – Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities
Source: 2021 PSIA, PIDS

The top three (3) **effects of product and process innovation** with the highest proportion of establishments that rated the effect as 'high' were (1) Improved Quality of Goods and Services, (2) Increased Range of Goods or Services, and (3) Positive Impact On Company Culture. Specifically for the Administrative and support service activities, "Competitive Advantage Over Other Competitors In The Industry" was also perceived as one of the high effects of product and process innovation. For the Education sector and Arts, entertainment and recreation sectors, "Met Regulatory Requirements" was the highest effect of product and process innovation (see Table 9).

Table 9. Proportion of establishments that regarded the following effects of introducing product and process innovation as "high"

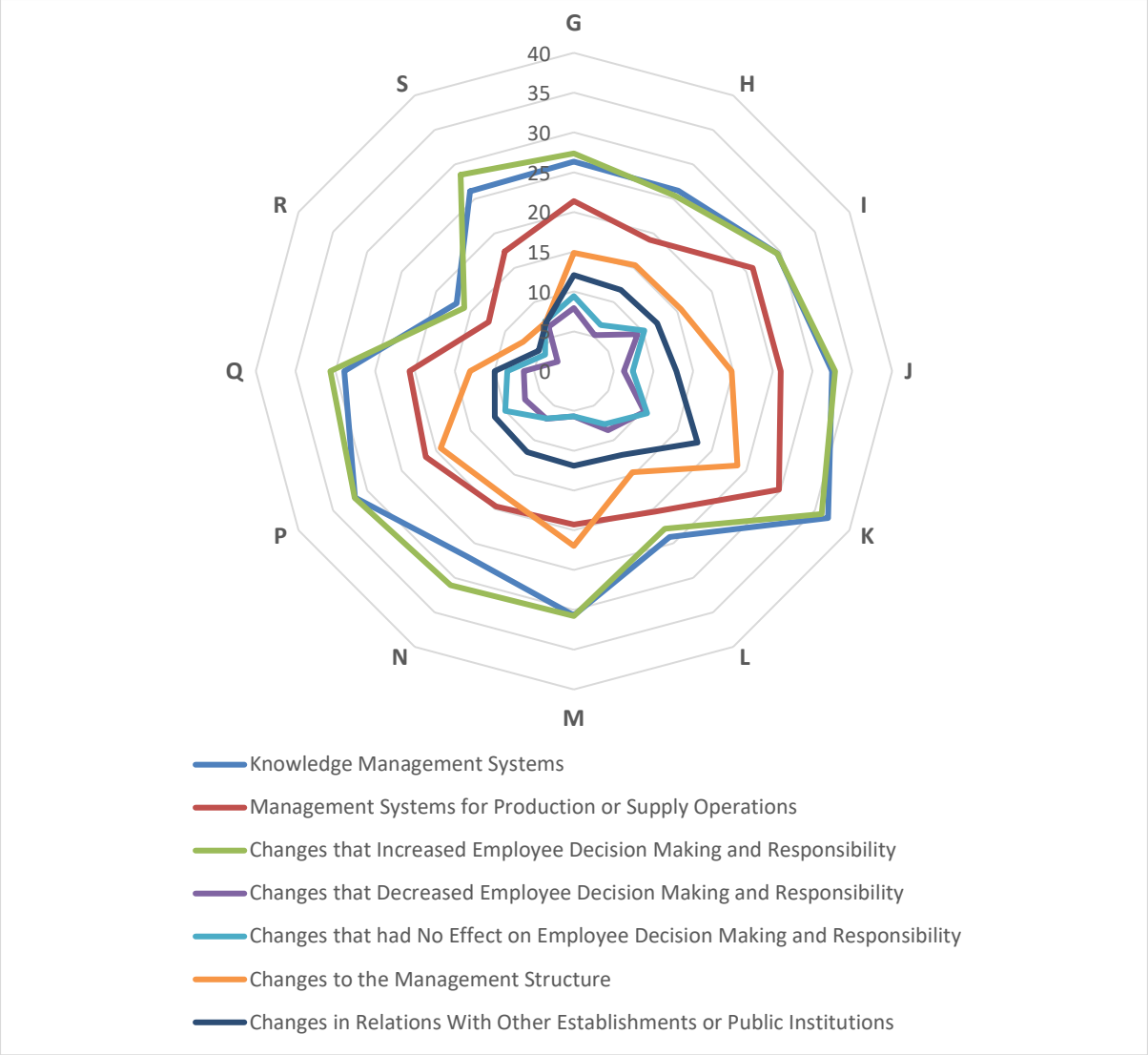
Services subsector	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Product-oriented effects												
Increased Range of Goods or Services	36	16	35	31	45	52	41	33	30	34	25	28
Entered New Markets or Increased Market Share	24	11	29	27	30	32	37	24	15	23	1	22
Improved Quality of Goods and Services	41	25	46	39	43	54	39	37	33	43	26	34
Process-oriented effects												
Improved Flexibility of Production or Service Provision	32	17	39	29	35	39	33	33	36	24	17	28
Increased Capacity of Production or Service Provision	29	13	36	31	33	52	32	28	32	28	17	25
Reduced Labor Costs Per Unit Output	19	6	20	20	15	18	19	15	12	13	10	15
Other effects												
Reduced Materials and Energy Per Unit Output	18	4	22	17	14	5	18	15	11	13	10	15
Reduced Environmental Impacts or Improved Health and Safety	31	11	34	23	28	30	28	22	31	29	26	25
Met Regulatory Requirements	33	11	38	27	33	43	33	33	38	30	36	22
Increasing Collaboration with Other Institutions or Agencies	20	10	24	18	24	16	17	26	23	15	10	10
Competitive Advantage Over Other Competitors in The Industry	27	7	32	32	29	32	31	36	26	24	12	18
Positive Impact on Company Culture	28	16	35	35	34	61	38	31	31	32	21	25
Increased Profitability and Maximized Return On Investment (ROI)	25	10	29	29	33	36	29	23	12	29	10	15

Source: 2021 PSIA, PIDS

3.3 Organizational innovation

Organizational innovation was the most common type of innovation undertaken in 2021. For firms that introduced Organizational innovation, "Significant changes to the organization of work in this establishment that increased employee decision making and responsibility" and "New or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within this establishment" were the most common type of innovation across all services subsectors (see Figure 3).

Figure 3. Establishments that implemented organizational innovation (%)



Notes: G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical services; N - Administrative and support service activities; P – Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities
Source: 2021 PSIA, PIDS

The top three (3) effects of organizational innovation with the highest proportion of establishments that rated the effect as 'high' were (1) Improved Quality of Goods or Services, (2) Improved Communication or Information Sharing, and (3) Increased public awareness of

the company/product/service. For the Real estate activities sector, "Reduced Time to Respond to Customer or Supplier" was also perceived as one of the high effects of organizational innovation. See Table 10.

Table 10. Proportion of establishments that regarded the following effects of introducing organizational innovation as "high"

Services subsector	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Reduced time to respond to customer or supplier needs	25	12	27	24	29	29	31	24	22	20	15	16
Improved quality of goods or services	45	34	50	43	50	42	51	49	47	55	42	43
Reduced costs per unit output	23	17	25	23	25	22	18	24	18	17	16	22
Improved employee satisfaction and/or lower turnover	30	26	33	32	44	23	33	39	33	38	30	34
Improved communication or information sharing	39	32	42	42	48	37	45	47	44	48	33	36
Increased public's awareness of the company/product/ service	39	32	40	36	48	25	38	39	40	40	34	42
Increased ability to develop new products or processes	32	26	39	31	39	15	32	32	27	25	24	27
Others	25	12	27	24	29	29	31	24	22	20	15	16

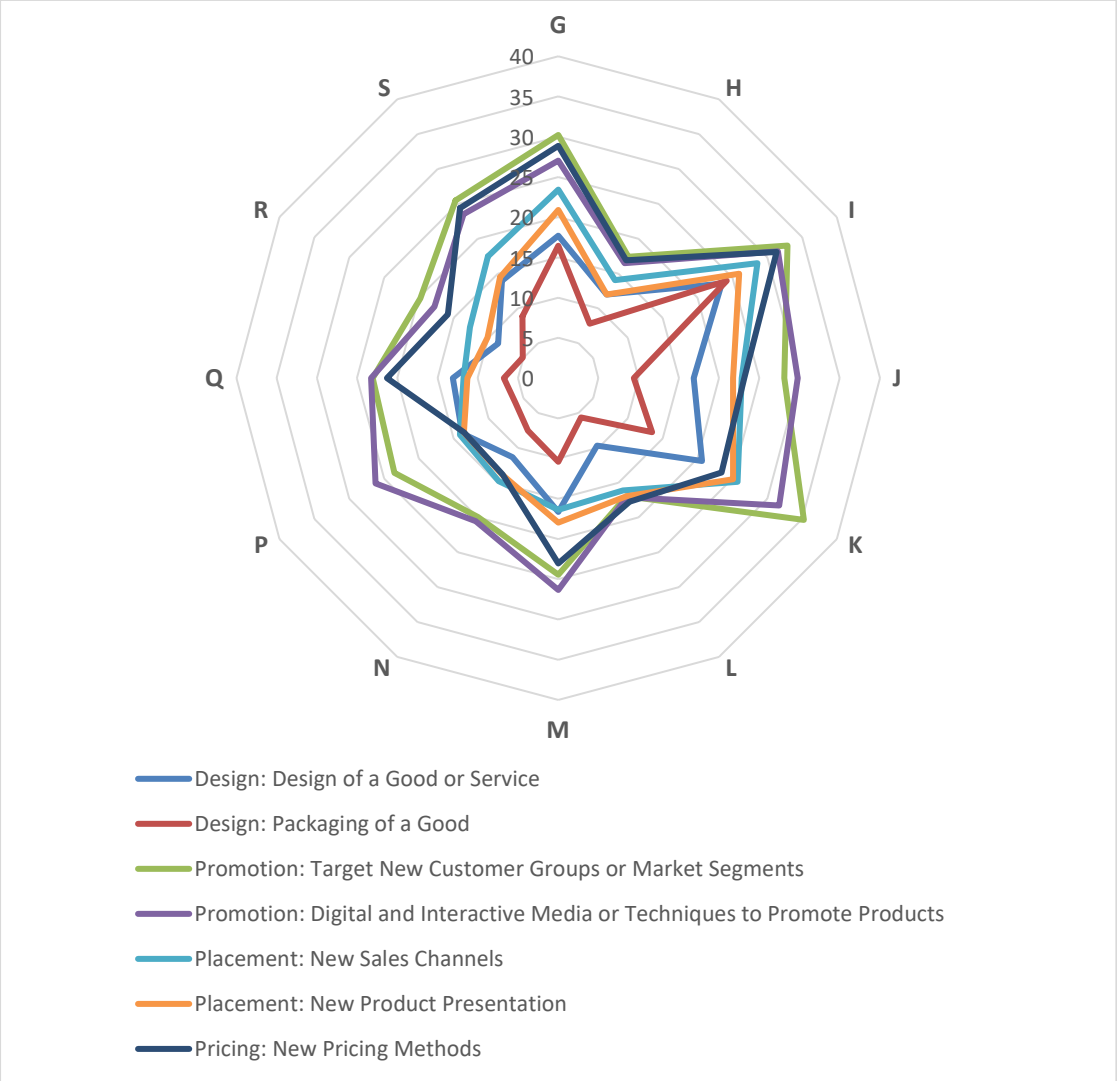
Source: 2021 PSIA, PIDS

3.4 Marketing innovation

For firms that introduced Marketing innovation, "Implement a new marketing strategy to target new customer groups or market segments" was the common type for the majority of the services subsectors, while "Use digital and interactive media or techniques to promote products, such as new advertising concepts, a new brand image or new techniques to customize promotion to individual customers or groups" was the most common type of innovation for the Information and Communication; Professional, scientific and technical services;

Administrative and support service activities; Education; and Human health and social work activities. “Use new pricing methods to market goods or services” was the most common type of marketing innovation for the Real estate activities sector (see Figure 4).

Figure 4. Establishments that implemented marketing innovation (%)



Notes: G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical services; N - Administrative and support service activities; P – Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities
Source: 2021 PSIA, PIDS

The top three (3) effects of marketing innovation with the highest proportion of establishments that rated the effect as ‘high’ were (1) Improved Customer Satisfaction, (2) Strengthened Relationships with Customers, and (3) Sales Growth for Goods and Services. In addition, for the Real estate activities, “Increased Visibility of Products or Business” was also highly perceived effects of organizational innovation, while for the Professional, scientific and technical services, “Identified More Specific Sectors for Target Market” was also highly perceived effect of marketing innovation. See Table 11.

Table 11. Proportion of establishments that regarded the following effects of introducing marketing innovation as "high"

Services subsector	Wholesale and retail trade; repair of	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Sales growth for its goods and services	38	35	44	38	37	46	39	46	27	42	24	35
Increase in product/service exports	24	26	33	25	22	34	40	31	12	28	14	23
Increased visibility of products or business	33	35	42	36	34	53	43	43	22	35	19	33
expanded market reach (whether local or global)	27	27	34	28	30	38	39	38	20	26	23	26
Strengthened relationships with customers	42	47	51	44	51	58	49	54	37	47	44	47
Improved customer satisfaction	46	55	55	48	48	59	46	56	37	51	58	51
Identified more specific sectors for target market	32	40	46	36	37	40	46	43	24	31	30	26
Increased market share	25	30	38	31	29	31	41	33	12	22	16	21
Increased market leadership/market concentration	27	34	37	35	33	31	29	36	17	26	14	23
Others	15		16		1			23		25		

Source: 2021 PSIA, PIDS

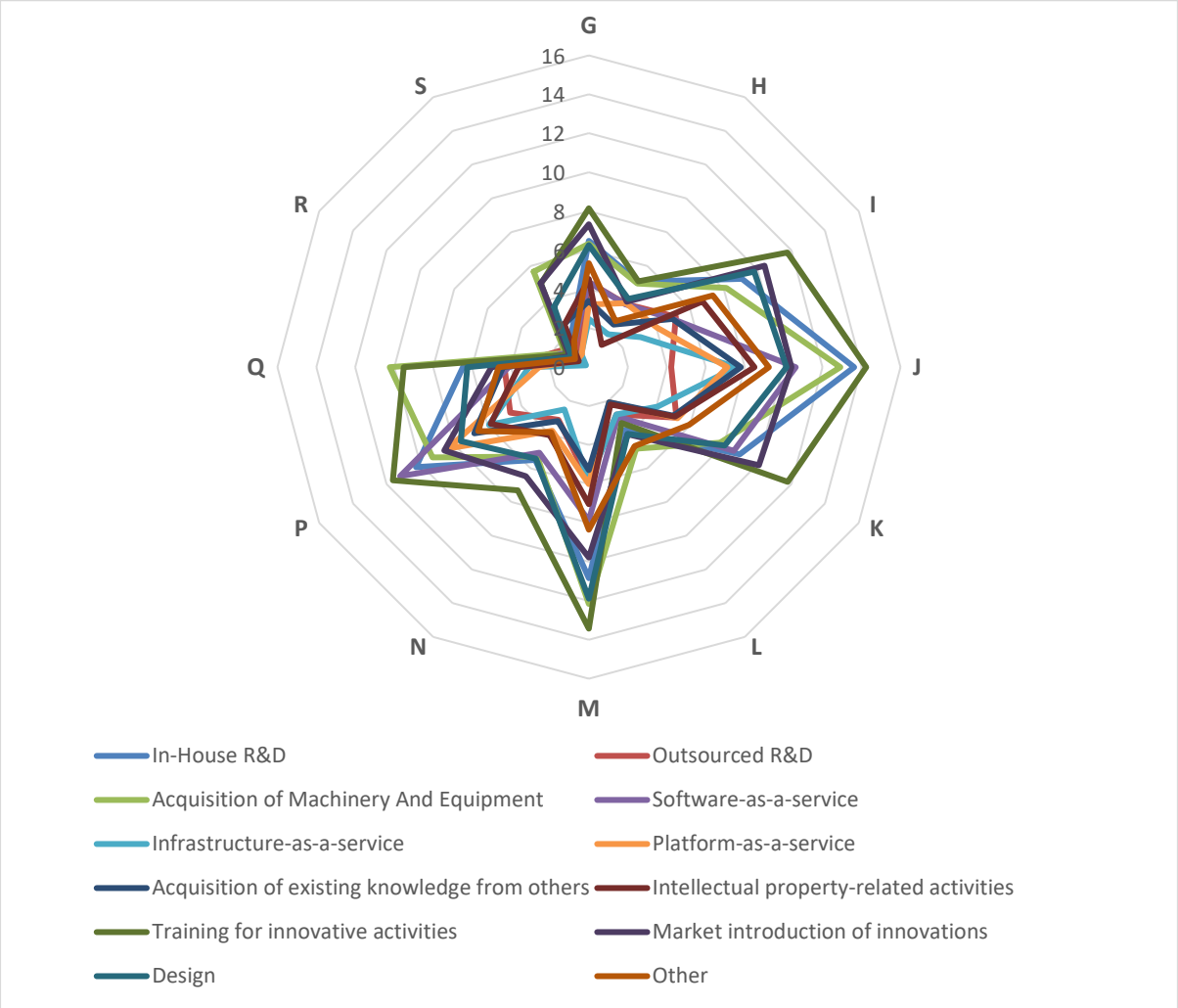
4. Innovation behavior

4.1 Types of innovation activity, expenditure and sources of financing

For most of the services subsectors, the most common innovation activity of the establishments was "Training for innovative activities" while "Infrastructure-as-a-service" or cloud infrastructure service was among the least common. In addition, across services subsectors, the Information and Communication sector had the highest proportion of firms that engaged in In-

House R&D, Acquisition of Machinery and Equipment, Infrastructure-as-a-Service, Acquisition of Existing Knowledge from Intellectual Property-Related Activities, and Training for Innovative Activities. The Professional, Scientific, and Technical Services sector had the highest proportion of firms that engaged in Outsourced R&D. The Education sector had the highest proportion of firms that engaged in Software-as-a-Service and Platform-as-a-Service. The Accommodation and Food Service Activities sector had the highest proportion of firms that engaged in the Market Introduction of Innovations (see Figure 5 and Appendix 1).

Figure 5. Proportion of firms that engage in the following innovation activity (in percentage)



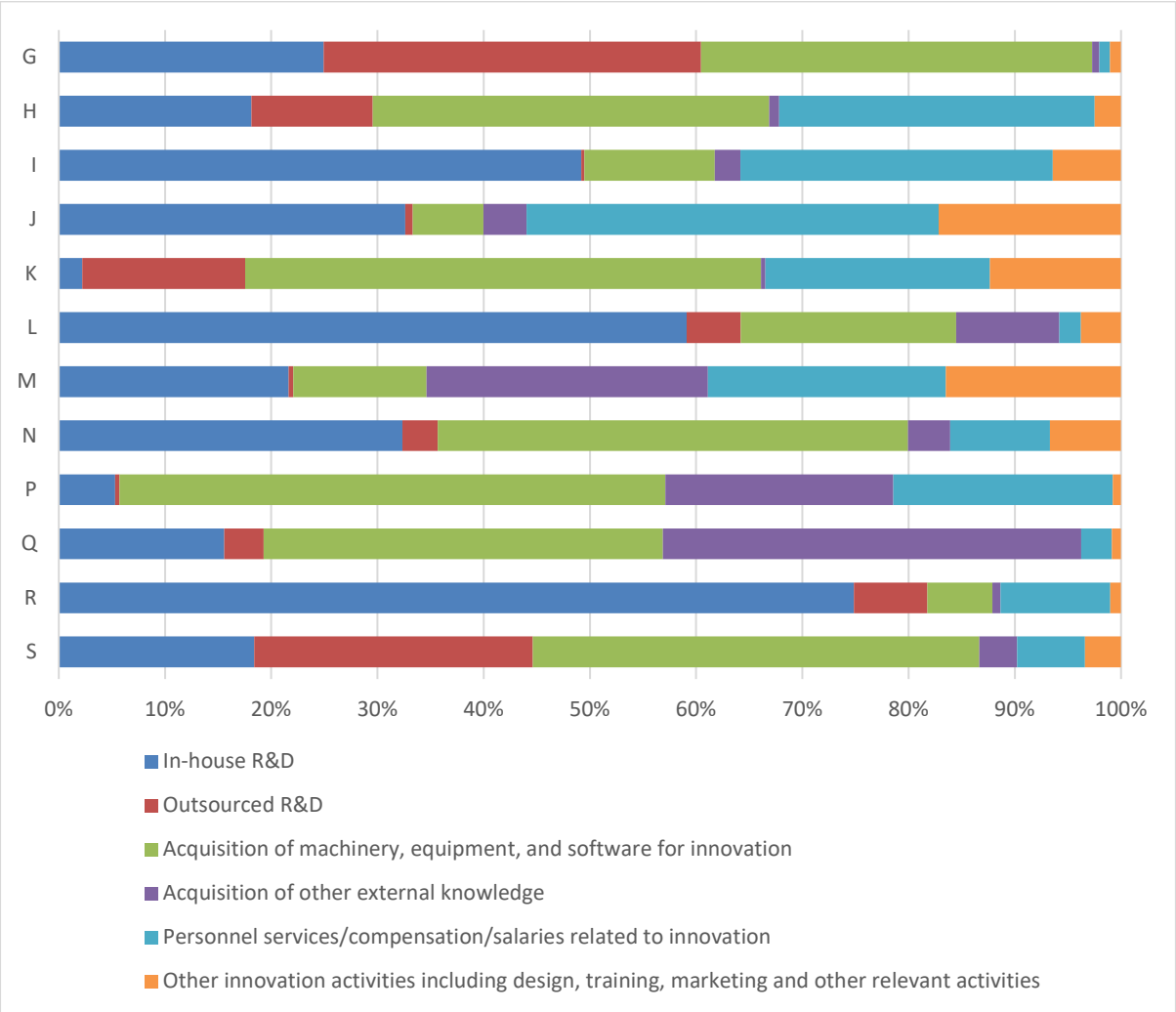
Notes: G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical services; N - Administrative and support service activities; P – Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities
Source: 2021 PSIA, PIDS

Based on the average expenditures of firms, the majority of the services subsectors spent most in the acquisition of machinery, equipment, and software compared to other innovation activities. In contrast, Accommodation and food service activities; Real estate activities; Arts, entertainment and recreation sectors spent the most on in-house R&D among all innovation activities. Information and Communication spent most in Personnel

services/compensation/salaries related to innovation, while Professional, scientific and technical services spent most in Acquisition of other external knowledge.

Among all services subsectors, the Professional, scientific and technical services and Information and Communication sectors had the highest average expenditures on in-house R&D. Wholesale and retail trade had the highest average expenditures on Outsourced R&D. The Education sector had the highest average expenditures in Acquisition of machinery, equipment, and software for innovation. Professional, scientific and technical services had the highest average expenditures in Acquisition of other external knowledge and Other innovation activities including design, training, marketing and other relevant activities. Information and Communication sector had the highest average expenditures in Personnel services/compensation/salaries related to innovation. The computation of average expenditure was based on firms that utilized the specific innovation activity (See Figure 6 and Appendix 2).

Figure 6. Average firm expenditure by innovation activity (in millions)



Notes: G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical services; N - Administrative and support service activities; P – Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities
Source: 2021 PSIA, PIDS

The Professional, Scientific, and Technical Services sector and the Information and Communication sector had significantly higher expenditures on in-house R&D compared to outsourced R&D. In contrast, the Wholesale and Retail Trade sector and the Financial and Insurance Activities sector had significantly higher average expenditures on outsourced R&D compared to in-house R&D (see Table 12).

The difference in the proportion of firms engaged in certain innovation activities and their respective expenditures suggests that services subsectors have varying demands (e.g., prioritized innovation activities) and approaches to innovation (e.g., expenditure levels on specific innovation activities). This could inform how incentives are designed to encourage innovation in these sectors.

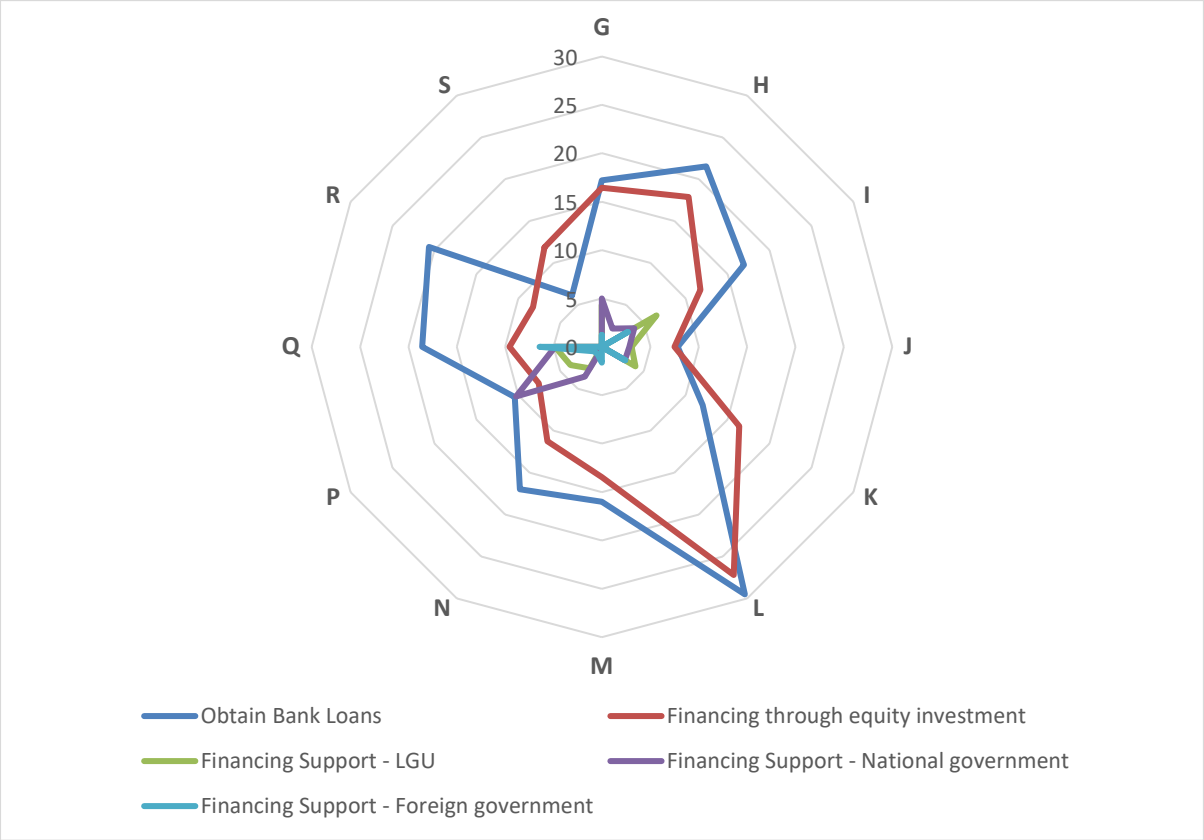
Table 12. R&D Utilization and Expenditures (in PHP millions)

Services subsector	In-house R&D		Outsourced R&D	
	Proportion of firms	Average expenditure	Proportion of firms	Average expenditure
Wholesale and retail trade; repair of motor vehicles and	6.48	4.22	4.36	6.01
Transportation and Storage	5.07	0.98	3.74	0.62
Accommodation and food service activities	9.07	13.60	5.15	0.08
Information and Communication	13.62	31.70	4.23	0.69
Financial and insurance activities	8.95	0.58	5.19	4.04
Real estate activities	3.72	13.20	2.81	1.14
Professional, scientific and technical services	10.84	35.30	5.85	0.72
Administrative and support service activities	5.5	1.35	3.13	0.14
Education	10.26	2.57	4.67	0.20
Human health and social work activities	6.47	1.96	4.34	0.47
Arts, entertainment and recreation	1.5	0.59	1.68	0.05
Other service activities	1.84	0.07	1.05	0.10

Source: 2021 PSIA, PIDS

Most of the services subsectors commonly utilize bank loans to obtain financing for innovation-related purposes, except for the Financial and insurance activities and Other services sectors, which use financing through equity investment more than other subsectors. Moreover, the Education sector also commonly obtains financing support from the national government. See Figure 7 (see also Appendix 3).

Figure 7. Proportion of firms that obtain loans and financing (in percentage)

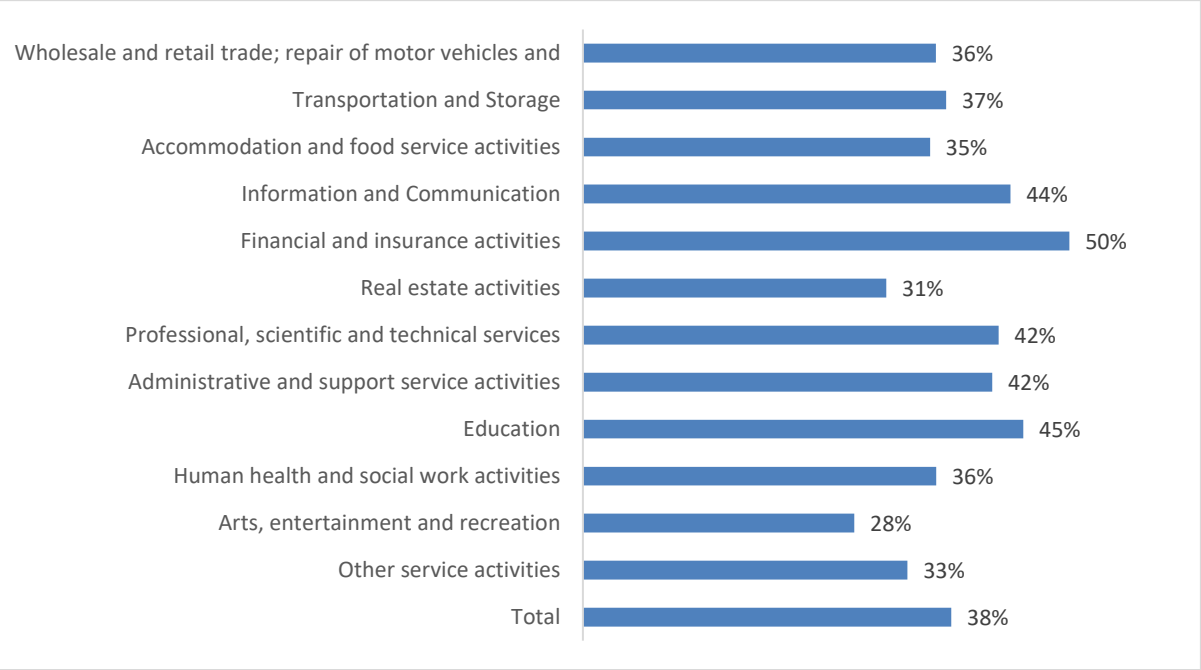


Notes: G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical services; N - Administrative and support service activities; P – Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities
Source: 2021 PSIA, PIDS

4.2 Knowledge management and ISO

Less than the majority of firms across all the services subsectors use knowledge management practices (see Table 13). For those that use knowledge management practices, the most common knowledge practice across all services subsectors was "Regular updates for internal databases or manuals of good work practices, lessons learned, or expert advice", except for Arts, entertainment and recreation sector where "A written knowledge management policy" was the most common. Excluding "Other practices", a policy to bring in external experts was the least common knowledge management practice across the subsectors. See Figure 8 and Table 13.

Figure 8 . Proportion of firms that used knowledge management practices



Source: 2021 PSIA, PIDS

Table 13. Knowledge management practices

Services subsector	A written knowledge management policy	Incentives for employees to share knowledge within this establishment	Dedicated resources to monitor and obtain knowledge from outside this establishment	A policy to bring in external experts from universities, research institutes, or other establishments to participate in project teams, as needed	Regular updates of internal databases or manuals of good work practices, lessons learned, or expert advice	Other practices
Wholesale and retail trade; repair of motor vehicles and	19	16	21	12	24	19
Transportation and Storage	23	20	20	12	25	50
Accommodation and food service activities	19	17	23	14	26	36
Information and Communication	26	22	24	14	35	42
Financial and insurance activities	31	26	30	19	38	50
Real estate activities	22	15	20	15	28	0
Professional, scientific and technical services	24	22	26	14	31	0
Administrative and support service activities	28	22	24	15	31	36
Education	27	23	27	20	32	14
Human health and social work activities	22	16	20	13	26	28

Arts, entertainment and recreation	23	19	15	7	17	0
Other service activities	19	17	15	9	20	0

Source: 2021 PSIA, PIDS

The proportion of establishments without ISO certification is quite high across the different subsectors. The subsector with the highest proportion of firms that are certified or under certification was the Financial and insurance activities sector (see Table 14).

Table 14. Proportion of establishments with compliance to ISO standards

Services subsector	Yes, certified	Yes, under certification	No certification at all
Wholesale and retail trade; repair of motor vehicles and	13.92	3.04	83.04
Transportation and Storage	8.83	1.77	89.39
Accommodation and food service activities	13.79	2.28	83.93
Information and Communication	12.61	1.93	85.45
Financial and insurance activities	21.7	2.87	75.43
Real estate activities	8.64	0.95	90.41
Professional, scientific and technical services	10.17	4.45	85.38
Administrative and support service activities	13.54	2.78	83.68
Education	9.43	2.77	87.8
Human health and social work activities	10.28	1.37	88.35
Arts, entertainment and recreation	7.02	1.2	91.79
Other service activities	8.52	2.53	88.95

Source: 2021 PSIA, PIDS

For those that are implementing ISO, the most common reasons for implementing ISO are for "Better efficiency of systems", followed by the "Promotion and standardization of good working practices". For those that are not implementing ISO, the most common reasons for not implementing ISO are due to not being aware of ISO and costly to obtain and maintain. See Tables 15 and 16.

Table 15. Reasons for implementing ISO

Services subsector	Better efficiency of systems	Managed control of key processes	Promotion and standardization of good working practices	Greater marketing appeal and improved public relations	System for managing employee training	Effective management of risk	Others
Wholesale and retail trade; repair of motor vehicles and	66.44	48.42	58.72	49.93	42.44	44.37	0.94
Transportation and Storage	64.05	60.45	78.82	66.9	67.3	58	
Accommodation and food service activities	70.55	55.46	65.59	51.88	46.81	42.07	0.06
Information and Communication	84.43	47.23	58.36	50.06	40.69	48.16	
Financial and insurance activities	70.76	56.21	59.61	43.96	44.13	42.16	0.04
Real estate activities	72.09	50.91	68.96	62.22	24.68	35.99	9.87
Professional, scientific and technical services	81.09	50.86	60.65	37.58	31.44	33.84	3.96
Administrative and support service activities	68.19	47.95	56.8	50.18	51.45	52.05	1.83
Education	78.86	51.68	58.21	50.05	50.42	53.66	2.9
Human health and social work activities	85.65	60.38	58.46	56.07	44.15	46.54	2.39
Arts, entertainment and recreation	62.9	64.54	36.51	30.13	29.41	24.74	
Other service activities	54.02	26.11	59.18	46.84	22.85	32.61	

Source: 2021 PSIA, PIDS

Table 16. Reasons for not implementing ISO

Services subsector	Costly to obtain and maintain	Lengthy time-scale to develop and obtain certification	Difficult to implement	Organizational resistance to change	More documentation	Not aware of the ISO	Others
Wholesale and retail trade; repair of motor vehicles and	33.91	15.69	16.24	4.93	20.61	48.91	11.23
Transportation and Storage	31.87	19.05	16.54	5.39	22.87	38.94	11.58

Accommodation and food service activities	37.03	16.85	14.19	5.65	18.49	45.28	10.88
Information and Communication	31.58	16.93	12.49	4.47	18.38	42.08	14.35
Financial and insurance activities	25.19	13.74	11.05	4.59	18.6	49.1	12.32
Real estate activities	28.76	16.3	10.45	7.12	14.32	47.71	16.99
Professional, scientific and technical services	34.94	20.14	13.67	5.9	19.41	33.59	15.79
Administrative and support service activities	29.12	16.57	10.98	4.76	21.21	39.88	19.5
Education	38.77	16.23	16.87	3.39	21.67	36.36	14.52
Human health and social work activities	36.16	18.9	17.08	4.26	26.61	37.16	13.52
Arts, entertainment and recreation	31.02	8.69	14.52	7.04	18.02	48.33	8.71
Other service activities	30.85	13.23	12.65	6.5	21.1	55.39	10.23

Source: 2021 PSIA, PIDS

4.3 Sources of Information and Co-Operation for Innovation Activities

The top three sources of information were internal, market customers, and market suppliers. Market competitors were also a source of information, particularly for the Accommodation and food service activities, Financial and insurance activities, and Other service activities sectors. See Figure 9.

Figure 9. Proportion of firms that utilize the following source of information (in percentage)

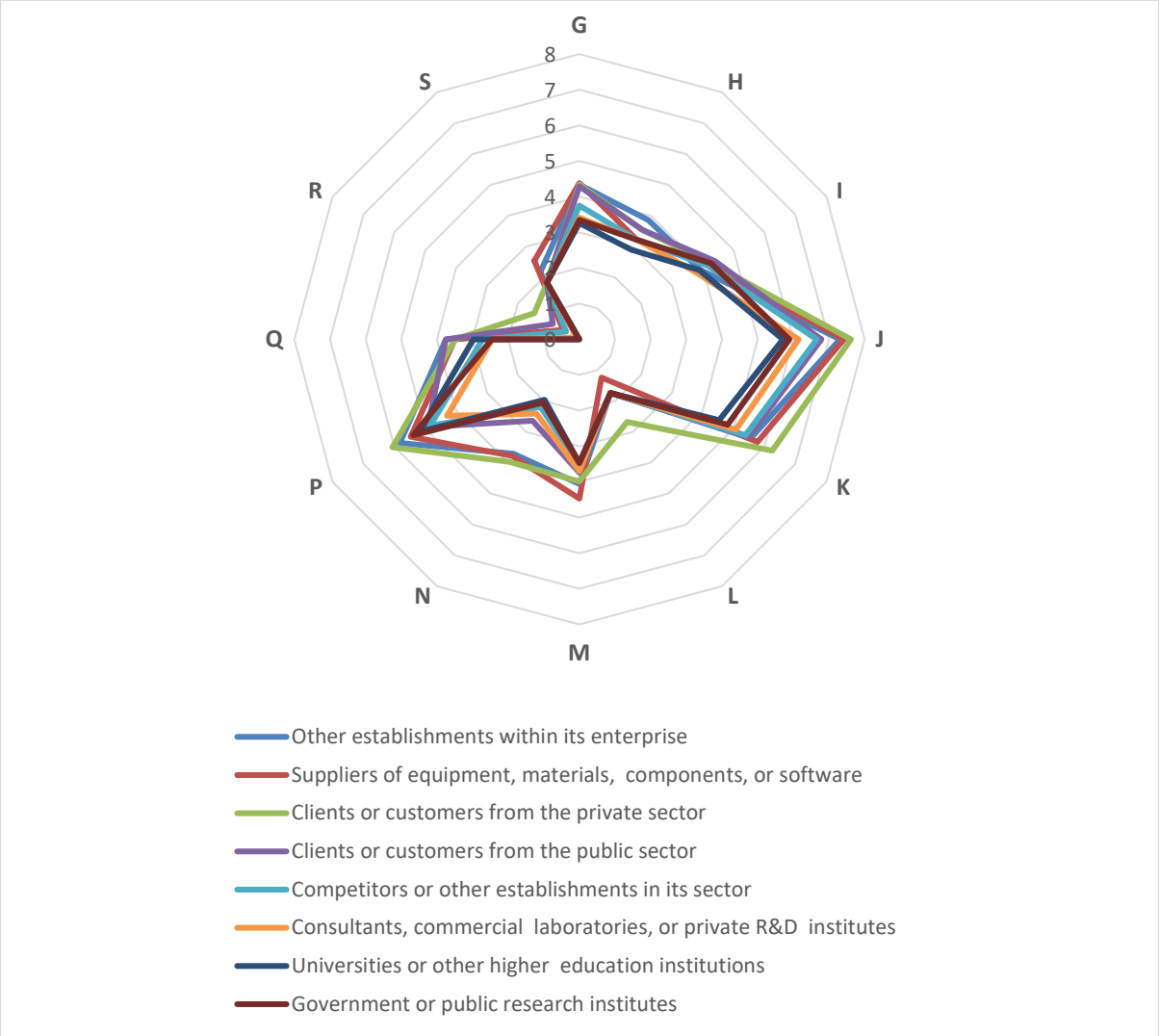
Source of information	**Wholesale and retail trade; repair of motor vehicles and motorcycles**	**Transportation and Storage**	**Accommodation and food service activities**	**Information and Communication**	**Financial and insurance activities**	**Real estate activities**	**Professional, scientific and technical services**	**Administrative and support service activities**	**Education**	**Human health and social work activities**	**Arts, entertainment and recreation**	**Other service activities**
Internal												
	29	18	29	50	38	59	39	38	31	38	14	19
Market source												
Supplier	24	12	18	30	23	16	19	29	22	26	19	25
Customer	34	27	28	32	44	32	46	40	31	30	37	34
Competitors	22	2	21	21	32	3	12	21	13	17	16	21
Consultants, Labs or Private R&D Institutes	12	4	17	10	16	14	9	15	14	21		15

Institutional source												
Educational Institutions	7		7	3	13		12	9	17	18		4
Government or Public Research Institutions	7		8	4	12		10	6	13	12	11	7
Other sources												
Funders (e.g. grant providers, VC, investors)	11	3	13	6	15	5	9	12	5	14	18	16
Infrastructure (e.g., Fablabs/ living labs, incubators, shared facility/co-working spaces)	7	1	9	6	9	3	4	6	5	12	7	13
Innovation Hubs (e.g. technology business incubators, startup accelerators)	7	1	6	11	15	3	5	11	6	9	7	16
Regulatory Bodies (e.g. regulatory sandboxes, LGUs)	6	1	7	5	11	5	8	5	8	9	16	3
Conferences Trade Fairs and Exhibitions	10	3	7	12	15	3	10	11	8	16		3
Scientific Journals and Trade or Technical Publication	6	1	5	11	12	3	10	6	7	15		3
Professional and Industry Associations	8	1	9	12	14	16	12	11	11	20		7

Source: 2021 PSIA, PIDS

Cooperation partners were not heavily utilized across all the subsectors. For those that did, the top cooperation partners were (1) Clients or customers from the private sector, (2) Other establishments within its Enterprise, and (3) Suppliers of equipment, materials, components, or software. In addition, for the Transportation and Storage, Accommodation and food service activities, and Human health and social work activities, clients or customers from the public sector were one of the most significant cooperation partners. See Figure 10 (Appendix 4).

Figure 10. Type of co-operation partner



Notes: G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical services; N - Administrative and support service activities; P – Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities
Source: 2021 PSIA, PIDS

4.4 Awareness of government policies and incentives

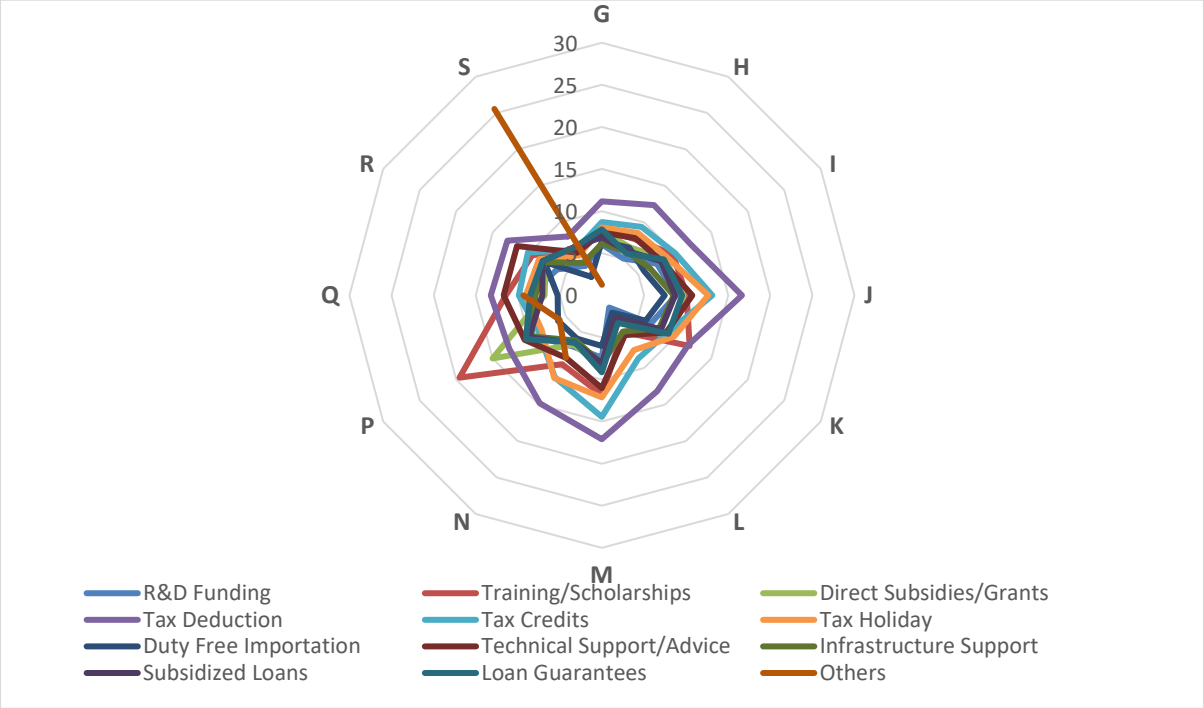
On average, only a quarter of firms in the services sector are aware of government innovation policies, while a tenth of firms availed any government support or assistance in their innovation activity (see Table 17). For most of the services subsectors, "Tax Deductions" is perceived as the most important government support program for firms' innovation, while "Training/Scholarships" is the most important for the Financial and insurance activities and Education sectors (see Figure 11). Among these government support programs, "Tax Deduction" was the most availed. However, only less than 15 percent of the firms in the services sector availed it (see Table 18). See also Appendix 5.

Table 17. Proportion of establishments that are aware of government innovation policies

Services subsector	Awareness	Availed
Wholesale and retail trade; repair of motor vehicles and motorcycles	27.72	9.19
Transportation and Storage	22.25	8.68
Accommodation and food service activities	23.49	12
Information and Communication	24.86	10.5
Financial and insurance activities	28.84	8.23
Real estate activities	14.97	
Professional, scientific and technical services	25.08	14.76
Administrative and support service activities	22.73	11.79
Education	30.18	17.49
Human health and social work activities	23.22	8.29
Arts, entertainment and recreation	16.7	12.09
Other service activities	18.06	7.81

Source: 2021 PSIA, PIDS

Figure 11. Proportion of establishment that perceived the following government support programs as highly important for its innovations



Notes: G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical services; N - Administrative and support service activities; P – Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities

Source: 2021 PSIA, PIDS

Table 18. Proportion of firms' availment of financial and other incentives, services sector

	2021	Ever since registration	Did not ever avail
Deduction For Reinvestment Allowance to Manufacturing Industry	0.75	3.02	96.23
Enhanced Net Operating Loss Carry-Over (NOLCO)	0.91	3.42	95.66
Subsidized loan	0.89	3.43	95.68
Direct subsidy/grants	0.8	3.58	95.62
Deduction On R&D	0.88	3.8	95.32
Deduction On Domestic Input Expense	0.85	4.43	94.72
Loan guarantees	0.97	4.46	94.57
Deduction On Training Expense	0.98	4.7	94.32
Deduction On Power Expense	1.12	5.08	93.8
Duty exemption on importation of capital equipment, raw materials, spare parts or accessories	0.76	5.09	94.15
Special Corporate Income (SCIT)	0.83	5.44	93.73
Vat Zero-Rating On Local Purchases	0.94	6.03	93.03
VAT exemption on importation	0.91	6.1	92.99
Deduction On Labor Expense	1.48	6.23	92.29
Others	2.97	6.32	90.71
Depreciation Allowance of Assets	1.4	6.4	92.2
Income Tax Holiday	0.87	7.05	92.08
Tax Deduction	2.03	12.26	85.71

Source: 2021 PSIA, PIDS

4.5 Factors hampering innovation activities

Across all services subsectors, the top three impediments to innovation that were considered of "high" importance were "High Innovation Costs", "Lack of Funds Within the Establishment or Enterprise", and "Lack of Finance from Sources Outside the Establishment". In addition, "Market Dominated By Established Enterprises" is also a significant impediment specifically for the Wholesale and retail trade; repair of motor vehicles and motorcycles; Information and Communication; and Financial and insurance activities sectors. See Table 19.

Table 19. Proportion of firms that perceive the importance of the following factors as "high" for hampering innovation activities of projects or influencing a decision (in percentage)

Services subsector	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Cost factors												
Innovation costs too high	17	21	21	17	9	14	16	15	22	19	17	21
Lack of funds within this establishment or enterprise	15	18	18	15	10	12	15	14	25	12	15	18
Lack of finance from sources outside this establishment	13	13	16	13	7	9	10	11	19	9	13	13
Knowledge factors												
Lack of qualified personnel	10	8	11	11	6	10	9	9	8	7	10	8
Lack of information on technology	10	9	11	9	7	8	7	8	8	7	10	9
Lack of information on markets	8	7	10	7	6	8	7	7	7	6	8	7
Difficulty in finding cooperation partners for innovation	8	8	10	9	5	9	7	8	11	8	8	8
Market factors												
Market dominated by established enterprises	12	7	10	12	8	8	7	8	7	9	12	7
Uncertain demand for innovative goods or services	9	5	10	8	6	8	6	7	6	8	9	5
High incidence of counterfeit/ infringement issues in the sector	7	3	7	4	4	8	6	4	3	5	7	3

Reasons not to innovate												
No need due to prior innovations	7	6	9	6	5	7	6	7	5	6	7	6
No demand for innovations	8	8	10	8	6	8	6	8	7	5	8	8
legal issues such as regulations or tax rules	7	4	6	6	6	5	5	5	5	5	7	4
Others												
	11		8	17	26		26	33	38	37	11	

Source: 2021 PSIA, PIDS

5. Technology adoption

Overall, about 29 percent of firms in the services sector use platforms. The proportion of innovation-active firms using platforms is higher than that of non-innovation-active firms, at 47 percent and 20 percent, respectively. A higher utilization rate among innovation-active firms is consistent with the results of Albert et al. (2023). Table 28 shows further a breakdown according to services subsectors. In terms of innovation-active firms, the majority in the Accommodation and food service activities; Education; Information and Communication; and Professional, scientific and technical services sector use platforms. Among non-innovation-active firms, only Education sectors exceed 40 percent of firms that use platforms. See Table 20.

Table 20. Proportion of firms that used platform

Services subsector	Non-innovation-active	Innovation-active
Wholesale and retail trade; repair of motor vehicles and motorcycles	17.1	40.87
Transportation and Storage	16.9	30.04
Accommodation and food service activities	25.96	61.52
Information and Communication	27.22	51.92
Financial and insurance activities	16.86	45.56
Real estate activities	10.88	47.41
Professional, scientific and technical services	21.05	50.88
Administrative and support service activities	26	46.49
Education	42.74	61.39
Human health and social work activities	26.1	49.93
Arts, entertainment and recreation	14.93	38.5
Other service activities	22.29	45.17

Source: 2021 PSIA, PIDS

Among the platform users, more than 30 percent of firms in both services and industry sectors own or manage platforms and more than half sells products/services in platforms. About 23 percent purchase products/services in the services sector, while 36 percent in the industry sector. More than half in both industry and services sectors advertise their firm or their products/services on a platform (Albert et al. 2023). Most of the services subsectors use platforms to advertise their products and services, except for Wholesale and retail trade; repair

of motor vehicles and motorcycles and Accommodation and food service activities which use platforms mostly for selling products and services (see Table 21).

Table 21. Proportion of firms that use platform for the following purposes

Services subsector	Own/manage platform/s	Sell products/ services	Purchase products/ services	Advertise firm or firm's products/ services
Wholesale and retail trade; repair of motor vehicles and motorcycles	7.30%	15.07%	5.90%	12.83%
Transportation and Storage	10.66%	9.57%	6.14%	14.34%
Accommodation and food service activities	12.25%	23.38%	8.93%	19.26%
Information and Communication	14.19%	12.12%	9.24%	21.88%
Financial and insurance activities	11.20%	11.70%	5.78%	16.82%
Real estate activities	5.75%	5.59%	3.45%	10.29%
Professional, scientific and technical services	12.07%	11.97%	12.08%	19.58%
Administrative and support service activities	12.60%	9.31%	6.56%	19.59%
Education	19.00%	10.74%	10.03%	29.28%
Human health and social work activities	13.31%	9.56%	7.68%	21.23%
Arts, entertainment and recreation	6.41%	6.90%	2.56%	11.48%
Other service activities	10.22%	11.29%	6.33%	18.00%

Source: 2021 PSIA, PIDS

Across all sectors, only about a fifth of firms are aware of the opportunities and challenges of using FIRe technology (Albert et al. 2023). In the services sector, awareness of FIRe is highest in Education (32.81%), closely followed by Information and Communication (31.29%). Less than 15 percent of the firms in the Transportation and Storage; Real estate activities; and Other service activities are aware of its opportunities and challenges (see Table 22).

Table 22. Proportion of establishments' awareness of the opportunities and challenges posed by advancements in technology (e.g., developments in the 21st century, Fourth Industrial Revolution)

Services subsector	Proportion of establishments aware of FIRe
Wholesale and retail trade; repair of motor vehicles and motorcycles	20.36
Transportation and Storage	14.5
Accommodation and food service activities	17.19
Information and Communication	31.29
Financial and insurance activities	27.29

Real estate activities	13.49
Professional, scientific and technical services	27.73
Administrative and support service activities	25.33
Education	32.81
Human health and social work activities	23.07
Arts, entertainment and recreation	19.4
Other service activities	13.18

Source: 2021 PSIA, PIDS

The Internet of Things (IoT) is the most utilized FIRe technology, followed by 5G networks in most of the services subsectors, except for the Accommodation and food service activities and Professional, scientific, and technical services which use 5G technology more than other FIRe technologies (See Table 23). Aside from utilizing IoT and 5G networks, Accommodation and food service activities; Financial and insurance activities; Education; and Arts, entertainment and recreation also use Artificial Intelligence (AI) and Machine Learning. Wholesale and retail trade; repair of motor vehicles and motorcycles; and Administrative and support service activities commonly use Automation. Real estate activities; Professional, scientific and technical services; and Human health and social work activities use 3D printing. Information and Communication use Cloud, Edge Computing, and Quantum Computing. Other service activities use Wearable Technologies. Transportation and Storage use Big Data.

On the utilization of FIRe technologies, the ambiguity of some terms used could lead to inaccurate results. For instance, the Internet of Things (IoT) might have been mistakenly construed as simply the internet, which may explain why IoT appears to have high utilization across sectors. Additionally, some sectors reported using genomics and gene editing, despite their limited applicability to these industries. Without proper definitions, there is a risk of misinterpretation. Hence, it is crucial to clearly define the characteristics and applications of these technologies to ensure the validity of the findings.

Table 23. Proportion of establishments that utilized FIRe frontier technologies/tools

FIRe technologies	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Internet of Things (IoT)	48	49	52	58	53	67	43	58	63	47	55	44
5G Network	41	42	55	39	37	32	49	47	36	45	27	44
Artificial Intelligence (AI) and Machine Learning	13	14	17	20	19	9	18	18	15	9	19	16
Automation	17	11	13	20	18	17	12	19	9	10	7	20

3D Printing	14	4	10	8	11	20	23	10	10	15	12	11
Cloud and Edge Computing, Quantum Computing	13	12	7	24	15	17	11	16	10	8	5	3
Wearable Technologies	12	5	12	11	13	15	6	9	7	12	13	22
Big Data	12	19	11	19	15	3	8	12	11	10	1	5
Voice Recognition	4	5	6	10	8	1	3	12	9	7	2	14
Augmented, Virtual and Mixed Reality	5	3	7	7	8	1	3	5	6	7	4	0
Robots and Cobots	3	2	5	4	5		4	6	4	1	1	14
SMART Factory	3	1	4	4	3	1	3	4	5	2		3
Blockchains	4		2	6	2	7		3	2	2	1	3
Genomics and Gene Editing	1		2	2	2		3	1		1		3
Others	4	6	3	6	11	13	1	5	5	6	3	

Source: 2021 PSIA, PIDS

Across all sectors, high costs of procuring technology were the highest barrier in using FIRe technology (47.5%), followed by lack of funds within the establishment or enterprise (Albert et al. 2023). For the services sectors, high costs of technologies, lack of funds within the establishment or enterprise, and lack of demand or need for using technology are the most common barriers in using FIRe technology. The most common barrier was High costs of procuring the technology, except for Real estate activities; Arts, entertainment, and recreation; and Other service activities where Lack of Funds Within the Establishment or Enterprise was the most common (see Table 24).

Table 24. Proportion of firms that encountered barriers in using FIRe technologies

Encountered barriers	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Lack of funds within this establishment or enterprise	30	29	35	34	20	42	32	36	53	40	48	53

Lack of finance from sources outside this establishment	17	20	23	16	13	13	13	16	28	19	27	20
High costs of procuring the technology	47	51	49	49	43	29	41	48	57	60	38	50
Lack of qualified and trained personnel	22	22	19	24	20	21	32	23	26	22	31	33
Lack of information on technology	20	24	27	21	17	20	20	18	23	20	18	28
Lack of information on markets	12	17	15	10	8	20	12	12	16	13	21	20
Difficulty in finding cooperation partners	9	10	11	15	8	26	13	14	19	13	10	11
No demand/need for using such technologies	25	23	35	28	25	34	26	31	17	22	21	20
Others	6	13	1	5	8	1	2	5	2	7	6	3

Source: 2021 PSIA, PIDS

6. Determinants of innovation

Probit regression was utilized to identify determinants of innovation. There were seven models to account for the dependent variables: whether firms are innovation-active using Albert et al.'s (2023) definition of innovation-active firms, whether firms are innovative or introduced at least one of the four types of innovation (i.e., innovative establishments), and whether firms are organizational, product–service, product–goods, process, or marketing innovators.

The set of independent variables was mainly based on the previous PIDS studies on innovation conducted in 2015 and 2021 (i.e., Albert et al. 2023 and Serafica 2016), as well as covering variables related to technology adoption. The independent variables include the firm's services subsector category, whether a firm has an international market share; age of firm; whether it used at least one FIRe technology; availed financing such as bank loans, equity investments, or public financial support; used platforms; have R&D activities; foreign ownership and knowledge management practices. Regarding the services subsector variable, the 12 services sectors are clustered into four (4) groups to make the data more manageable and interpretable (Browning and Singelmann 1975, as cited in Serafica et al. 2021):

- **Producer services**: The cluster includes 'Financial and insurance activities'; 'Real estate'; 'Professional, scientific, and technical activities'; and 'Administrative and support services'.
- **Distributive services**: The cluster includes 'Wholesale and retail trade', 'Transport and storage', and 'Information and communication'.
- **Personal services**: This cluster includes 'Accommodation and food service activities'; 'Arts, entertainment, and recreation'; and 'Other service activities'.
- **Social services**: This cluster includes 'Education' services and 'Human health and social work activities'.

Three (3) dummy variables are used ('Producer', 'Distributive', and 'Personal' services clusters), while the 4th cluster ('Social' services) serves as the reference category or baseline group (not explicitly represented by a dummy variable). Hence, the coefficients of these dummy variables are always compared with the reference category, 'Social' services. See Table 25 for the Probit regression model (coefficients) results, while Table 26 shows the average marginal effects.

The results of the Probit Regression, presented in Table 25, show that holding all other factors constant, 'Distributive' services are more likely to be innovation-active, innovative, and process innovators than 'Social' services. 'Distributive' and 'Personal' services are more likely to be product (goods) and marketing innovators than 'Social' services.

Firms with international market share are less likely to be product innovators (goods and services), while young firms are more likely to be innovation-active and process innovators. Firms utilizing at least one FIRe technology, availing financing, using platforms, engaging in R&D activities (whether outsourced or in-house), or implementing knowledge management practices are more likely to engage in all types of innovation. These variables also predict a higher probability of a firm being innovation-active.

Table 25. Probit regression (coefficients)

Variables	Innovation active	Innovative establishments	Product innovation - goods	Product innovation - services	Process innovation	Organizational innovation	Marketing innovation
Producer services	0.005	-0.011	0.063	-0.02	0.027	0.046	0.058
Distributive services	**0.156***	**0.162***	**0.371***	0.03	**0.218***	0.01	**0.333***
Personal services	0.063	0.071	**0.393***	0.05	0.119	-0.036	**0.309***
Social services	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
With international market share	-0.093	0.051	**-0.307***	**-0.164***	-0.001	0.082	-0.129
Young firm (0-10 years)	**0.078***	0.046	0.026	0.059	**0.116***	0.03	0.058
FIRe technology (used at least one)	**0.169***	**0.136***	**0.133***	**0.132***	**0.139***	**0.21***	**0.249***
Financing (i.e., bank loans, equity investments, or public financial support)	**2.175***	**1.994***	**0.552***	**0.564***	**1.235***	**0.691***	**0.657***
Platform use	**0.45***	**0.724***	**0.325***	**0.396***	**0.439***	**0.582***	**0.775***
In-house or outsourced R&D	**3.11***	**1.78***	**1.008***	**1.156***	**1.605***	**1.062***	**0.826***
Knowledge management	**0.523***	**0.792***	**0.379***	**0.422***	**0.546***	**0.854***	**0.764***
With foreign ownership	0.083	0.117	0.055	-0.054	0.037	0.069	-0.002

Constant	**-1.158***	**-0.617***	**-1.868***	**-1.443***	**-1.477***	**-1.151***	**-1.389***
Number of observations	6,852	6,278	6,839	6,827	6,722	6,173	6,794
LR Chi2(11)	2187.29	1834.68	898.58	1154.57	1840.41	1794.02	1914.89
Prob > chi2	0	0	0	0	0	0	0
Pseudo R2	0.2494	0.2134	0.1635	0.1707	0.2376	0.2216	0.2177
Log likelihood	-3292.3	-3381.3	-2299.4	-2804.9	-2952.9	-3151.1	-3441.4
Correctly classified	76.85%	73.24%	87.10%	83.87%	81.72%	75.38%	75.45%

Note: *Statistically significant at the 0.05 level
Source: 2021 PSIA, PIDS

Table 26 shows that 'Distributive' services are 4.3 percentage points more likely to be innovation-active, five percentage points more likely to be innovative, seven percentage points more likely to be product (goods) innovators, 5.4 percentage points more likely to be process innovators, and 9.5 percentage points more likely to be marketing innovators than 'Social' services. 'Personal' services are 8.1 percentage points more likely to be product (goods) innovators and 9.1 percentage points more likely to be marketing innovators than 'Social' services.

Firms with international market share are 4.9 percentage points less likely to be product (goods) innovators and 3.5 percentage points less likely to be product (services) innovators than those that do not. Young firms are 2.1 percentage points more likely to be innovation-active and 2.8 percentage points more likely to be process innovators than older firms.

Firms that utilize at least one FIRe technology are 4.7 percentage points more likely to be innovation-active, 4.2 percentage points more likely to be innovative, 2.5 percentage points more likely to be product (goods) innovators, 3.1 percentage points more likely to be product (services) innovators, 3.5 percentage points more likely to be process innovators, 6.3 percentage points more likely to be organizational innovators, and 7.4 percentage points more likely to be marketing innovators than those that do not.

Firms that avail of financing are 59.9 percentage points more likely to be innovation-active, 41 percentage points more likely to be innovative, 13 percentage points more likely to be product (goods) innovators, 15.7 percentage points more likely to be product (services) innovators, 39.2 percentage points more likely to be process innovators, 21.7 percentage points more likely to be organizational innovators, and 20.6 percentage points more likely to be marketing innovators than those that do not.

Firms that use platforms are 13.1 percentage points more likely to be innovation-active, 23.1 percentage points more likely to be innovative, 6.4 percentage points more likely to be product (goods) innovators, 9.7 percentage points more likely to be product (services) innovators, 11.7 percentage points more likely to be process innovators, 18.3 percentage points more likely to be organizational innovators, and 25 percentage points more likely to be marketing innovators than those that do not.

Firms that utilize R&D are 69.2 percentage points more likely to be innovation-active, 40.7 percentage points more likely to be innovative, 27.6 percentage points more likely to be product (goods) innovators, 37.3 percentage points more likely to be product (services) innovators, 52.8 percentage points more likely to be process innovators, 34.4 percentage points more likely to

be organizational innovators, and 26.5 percentage points more likely to be marketing innovators than those that do not.

Firms that implement knowledge management are 15.2 percentage points more likely to be innovation-active, 25.8 percentage points more likely to be innovative, 7.3 percentage points more likely to be product (goods) innovators, 10.2 percentage points more likely to be product (services) innovators, 14.5 percentage points more likely to be process innovators, 27.8 percentage points more likely to be organizational innovators, and 24.4 percentage points more likely to be marketing innovators than those that do not.

Table 26. Average marginal effects (coefficients)

Variables	Innovation active	Innovative establishments	Product innovation - goods	Product innovation - services	Process innovation	Organizational innovation	Marketing innovation
Producer services	0.001	-0.003	0.012	-0.005	0.007	0.013	0.017
Distributive services	**0.043***	**0.05***	**0.07***	**0.007**	**0.054***	**0.003**	**0.095***
Personal services	0.017	0.022	**0.081***	0.011	0.03	-0.01	**0.091***
Social services	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
With international market share	-0.024	0.016	**-0.049***	**-0.035***	0	0.024	-0.036
Young firm (0-10 years)	**0.021***	0.014	0.005	0.013	**0.028***	0.009	0.017
FIRe technology (used at least one)	**0.047***	**0.042***	**0.025***	**0.031***	**0.035***	**0.063***	**0.074***
Financing (i.e., bank loans, equity investments, or public financial support)	**0.599***	**0.41***	**0.13***	**0.157***	**0.392***	**0.217***	**0.206***
Platform use	**0.131***	**0.231***	**0.064***	**0.097***	**0.117***	**0.183***	**0.25***
In-house or outsourced R&D	**0.692***	**0.407***	**0.276***	**0.373***	**0.528***	**0.344***	**0.265***
Knowledge management	**0.152***	**0.258***	**0.073***	**0.102***	**0.145***	**0.278***	**0.244***
With foreign ownership	0.023	0.036	0.01	-0.012	0.009	0.02	-0.001

Note: *Statistically significant at the 0.05 level
Source: 2021 PSIA, PIDS

7. Key takeaways and recommendations

To craft suitable policies and strategies, it is important to recognize the unique characteristics of services, as well as understand the subtle differences in the innovation behavior across subsectors. This paper sought to fill a knowledge gap by examining the pattern of innovation of the different services subsectors using the 2021 survey on the innovation activities.

7.1 General patterns

Among the four **types of innovation**, organizational innovation was the most common type of innovation introduced in most service sectors, followed by marketing, process, and product innovation. Stay-at-home policies and restricted mobility during the pandemic could explain why **organizational innovation** was widely introduced, specifically "Increased Employee Decision Making and Responsibility," "Knowledge Management Systems," and "Management Systems for Production or Supply Operations".

Regarding **Marketing Innovation**, "Promotion: Target New Customer Groups or Market Segments," "Promotion: Digital and Interactive Media or Techniques to Promote Products," and "Pricing: New Pricing Methods" were most common.

Regarding **Process Innovation**, firms most commonly engage in new or improved supporting activities. Regarding product innovation, most firms most commonly develop new or significantly improved services.

The most common **effect** of product and process innovation was improved quality of goods and services. Organizational Innovation led to better quality of goods and services, improved communication and information sharing, and increased public awareness of the company, product, or service. Marketing Innovation enhanced customer satisfaction and strengthened relationships with customers.

The most common type of **innovation activity** is training for innovative activities. Firms most frequently obtain **information** from customers, internal sources, and suppliers. **Cooperation** is most common with customers from the private sector, other establishments within the enterprise, and suppliers. The majority of firms view tax deductions as a critical government **support** program. The most common **barriers** to innovation include the high cost of innovation, lack of funds within the establishment or enterprise, and lack of finance from sources outside the establishment.

The most common **knowledge management practice** is regularly updating internal databases or manuals. Firms usually implement **ISO** for better efficiency of systems and promotion and standardization of good working practices, while some firms do not implement ISO due to not being aware of the ISO and the cost of obtaining and maintaining it. In most service sectors, firms most commonly use **online platforms** to advertise their products and services, followed by using them to sell those products and services.

7.2 Subsector-specific results

For the **Wholesale and Retail Trade**, marketing innovation is the most predominantly implemented among the four types of innovation. Training for innovative activities is the most commonly practiced innovation activity, while infrastructure-as-a-service is the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 83 percent of firms do not implement ISO standards primarily due to a lack of awareness. Firms primarily obtain information from market sources, especially customers, while other sources, particularly regulatory bodies, are the least used sources of information. Cooperation is most common with suppliers of equipment, materials, components, or software, and least common with universities or other higher education institutions. Tax deduction is the most preferred

government support program, while high innovation costs are the most significant barrier to innovation. Firms primarily use platforms to sell products/services.

For the **Accommodation and food service activities**, marketing innovation is the most predominantly implemented among the four types of innovation. Training for innovative activities is the most commonly practiced innovation activity, while acquiring infrastructure-as-a-service is the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 84 percent of firms do not implement ISO standards, primarily due to a lack of awareness. Firms primarily obtain information from internal sources, while other sources, particularly scientific journals and trade or technical publication, are the least used sources of information. Cooperation is most common with clients or customers from the public sector and least common with consultants, commercial laboratories, or private R&D institutes. Tax deduction is the most preferred government support program, while high innovation costs are the most significant barrier to innovation. Firms primarily use platforms to sell products/services.

For **Transportation and Storage**, organizational innovation is the most predominantly implemented among the four types of innovation. Training for innovative activities is the most commonly practiced innovation activity, while intellectual property-related activities are the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 90 percent of firms do not implement ISO standards primarily due to a lack of awareness. Firms primarily obtain information from market sources, especially customers, while other sources, particularly regulatory bodies, are the least used sources of information. Cooperation is most common with other establishments within its enterprise and least common with universities or other higher education institutions. Tax deduction is the most preferred government support program, while high innovation costs are the most significant barrier to innovation. Firms primarily use platforms to advertise their products/services.

For **Information and Communication**, organizational innovation is the most predominantly implemented among the four types of innovation. Training for innovative activities is the most commonly practiced innovation activity, while outsourced R&D are the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 85 percent of firms do not implement ISO standards, primarily due to a lack of awareness. Firms primarily obtain information from internal sources, while institutional sources, particularly educational institutions, are the least used sources of information. Cooperation is most common with clients or customers from the private sector and least common with universities or other higher education institutions. Tax deduction is the most preferred government support program, while high innovation costs are the most significant barrier to innovation. Firms primarily use platforms to advertise their products/services.

For **Financial and insurance activities**, organizational innovation is the most predominantly implemented among the four types of innovation. Training for innovative activities is the most commonly practiced innovation activity, while acquiring infrastructure-as-a-service are the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 75 percent of firms do not implement ISO standards, primarily due to a lack of awareness. Firms primarily obtain information from market sources, especially customers,

while they obtain information from other sources, particularly infrastructure, the least. Cooperation is most common with clients or customers from the private sector and least common with universities or other higher education institutions. Training/scholarships is the most preferred government support program, while the most common barriers to innovation include the lack of funds within the establishment or enterprise. Firms primarily use platforms to advertise their products/services.

For **Real estate activities**, organizational innovation is the most predominantly implemented among the four types of innovation. Acquisition of machinery and equipment is the most commonly practiced innovation activity, while acquiring platform-as-a-service is the least commonly practiced. Regular updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 90 percent of firms do not implement ISO standards, primarily due to a lack of awareness. Firms primarily obtain information from internal sources, while other sources, particularly infrastructure, are the least used sources of information. Cooperation is most common with clients or customers from the private sector and least common with suppliers of equipment, materials, components, or software. Tax deduction is the most preferred government support program, while high innovation costs are the most significant barrier to innovation. Firms primarily use platforms to advertise their products/services.

For the **Professional, scientific, and technical services**, organizational innovation is the most predominantly implemented among the four types of innovation. Training for innovative activities is the most commonly practiced innovation activity, while the acquisition of existing knowledge from others are the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 85 percent of firms do not implement ISO standards, primarily because they are costly to obtain and maintain. Firms primarily obtain information from market sources, especially customers, while other sources, particularly infrastructure, are the least used sources of information. Cooperation is most common with suppliers of equipment, materials, components, or software and least common with universities or other higher education institutions. Tax deduction is the most preferred government support program, while high innovation costs are the most significant barrier to innovation. Firms primarily use platforms to advertise their products/services.

For the **Administrative and support service activities**, organizational innovation is the most predominantly implemented among the four types of innovation. Training for innovative activities is the most commonly practiced innovation activity, while acquiring infrastructure-as-a-service are the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 84 percent of firms do not implement ISO standards, primarily due to a lack of awareness. Firms primarily obtain information from market sources, especially customers, while other sources, particularly regulatory bodies, are the least used sources of information. Cooperation is most common with clients or customers from the private sector and least common with universities or other higher education institutions. Tax deduction is the most preferred government support program, while high innovation costs are the most significant barrier to innovation. Firms primarily use platforms to advertise their products/services.

For **Education**, organizational innovation is the most predominantly implemented among the four types of innovation. Training for innovative activities is the most commonly practiced

innovation activity, while outsourced R&D are the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 88 percent of firms do not implement ISO standards, primarily because they are costly to obtain and maintain. Firms primarily obtain information from internal sources and market sources, especially customers, while other sources, particularly funders, are the least used sources of information. Cooperation is most common with clients or customers from the private sector and least common with consultants, commercial laboratories, or private R&D institutes. Training/scholarships is the most preferred government support program, while the most common barriers to innovation include the lack of funds within the establishment or enterprise. Firms primarily use platforms to advertise their products/services.

For **Human health and social work activities**, organizational innovation is the most predominantly implemented among the four types of innovation. Acquisition of machinery and equipment is the most commonly practiced innovation activity, while acquiring platform-as-a-service is the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 88 percent of firms do not implement ISO standards, primarily due to a lack of awareness. Firms primarily obtain information from internal sources, while other sources, particularly innovation hubs, are the least used sources of information. Cooperation is most common with clients or customers from the public sector and least common with consultants, commercial laboratories, or private R&D institutes. Tax deduction is the most preferred government support program, while high innovation costs are the most significant barrier to innovation. Firms primarily use platforms to advertise their products/services.

For the **Arts, entertainment, and recreation**, marketing innovation is the most predominantly implemented among the four types of innovation. Outsourced R&D is the most commonly practiced innovation activity, while acquiring infrastructure-as-a-service is the least commonly practiced. A written knowledge management policy is the most prevalent knowledge management practice. About 92 percent of firms do not implement ISO standards, primarily due to a lack of awareness. Firms primarily obtain information from market sources, especially customers, while other sources, particularly innovation hubs, are the least used sources of information. Cooperation is most common with clients or customers from the private sector and least common with universities or other higher education institutions and government or public research institutes. Tax deduction is the most preferred government support program, while the most common barriers to innovation include the lack of funds within the establishment or enterprise. Firms primarily use platforms to advertise their products/services.

For the **Other services**, marketing innovation is the most predominantly implemented among the four types of innovation. Acquisition of machinery and equipment is the most commonly practiced innovation activity, while acquiring platform-as-a-service is the least commonly practiced. Regularly updating internal databases or manuals of good work practices, lessons learned, or expert advice is the most prevalent knowledge management practice. About 89 percent of firms do not implement ISO standards, primarily due to a lack of awareness. Firms primarily obtain information from market sources, especially customers, while other sources, particularly regulatory bodies, are the least used sources of information. Cooperation is most common with suppliers of equipment, materials, components, or software and least common with clients or customers from the private sector; clients or customers from the public sector; competitors or other establishments in its sector; consultants, commercial laboratories, or

private R&D institutes; universities or other higher education institutions; and government or public research institutes. Tax deduction is the most preferred government support program, while high innovation costs are the most significant barrier to innovation. Firms primarily use platforms to advertise their products/services.

7.3 Suggested next steps

The Philippine Innovation Act (R.A. 11293) provides different interventions to address the various impediments related to cost factors, knowledge factors, market factors, and legal or regulatory factors (Albert et al., 2023). In the services sector, cost factors have been identified as the most common barrier considered of high significance. The results of the probit regression also show that organizations that employ at least one FIRe technology, obtain funding, use platforms, engage in R&D activities (whether outsourced or in-house), or use knowledge management methods are more likely to be innovation active and produce at least one type of innovation.

The survey also reveals greater reliance on internal and market sources of information while the utilization of institutional and other sources of information, such as incubators, scientific journals or technical publications, and regulatory bodies was low for most subsectors. Universities or other higher education institutions were also not popular cooperation partners. In terms of knowledge management, a policy to bring in external experts from universities, research institutes, or other establishments to participate in projects teams was also the least common practice across the subsectors.

Promoting creative and innovative industries requires a lot of learning and discovery (World Bank 2010). Given the diversity of services, a one-size-fits-all strategy for the entire sector will not be effective. As the 2021 survey only provides an overview of the innovation activities of industries, in-depth analysis of the innovation ecosystem of specific subsectors should be undertaken to develop industry-specific innovation roadmaps. As a first step, for example, understanding the role of the following elements of the innovation environment will be useful in identifying critical success factors in each industry (World Bank 2010, p. 274-275):

- Vision and leadership - Political system and stability; strategic focus
- Framework conditions - Overall economic and institutional regime, taxation and incentives, competition
- Education and research - Human resource capacities, training, institutions of higher education
- Infrastructure - Business support and services, finance and venture capital, information and communication technology
- Industrial system - Type and mix of companies
- Intermediaries - Information brokers and disseminators, research institutions
- Demand - New markets, finding a niche, opportunity

The Information and Communication subsector and Financial and insurance activities are the top two subsectors that have the highest proportion of innovation active and innovative establishments. The performance of the **Financial and insurance activities** sector suggests that its enabling environment, including regulatory, market, and technological elements, is conducive to innovation compared to other subsectors. A more detailed case study could identify further actions needed to sustain its performance as well as offer insights and lessons, particularly for the regulators of other subsectors. The **Information and Communication**

subsector too performs well relative to other subsectors, but it covers several industries including Publishing activities; Motion Picture, Video and Television Programme Production, Sound Recording and Music Publishing Activities; Programming and Broadcasting Activities; Telecommunications; Computer Programming, Consultancy and Related Activities; and Information Service Activities.[2] The survey does not reveal if the pattern of innovation is the same across industries in the value chain or if there are critical differences. Given the vital role of this subsector in the growth and development of the digital economy, it would be useful to look at specific industries to examine its innovation behavior in response to technological disruptions. **Professional, scientific and technical services** rank second to Financial services in terms of product and organizational innovation, but this subsector too is composed of distinct disciplines such as Legal and Accounting; Management Consultancy; Architectural and Engineering Activities; Technical Testing and Analysis; Scientific Research and Development; Advertising and Market Research; Veterinary Activities; and various other Other Professional, Scientific and Technical Activities.[3] Each profession will need to craft their respective innovation strategies.

In contrast to the relatively good performers, Real estate activities and Arts, entertainment and recreation are consistently in the bottom two among the subsectors with the lowest proportion of firms that are innovation active and innovative. Also noticeable is the performance of Administrative and support services, a part of which caters to the Business Process Outsourcing industry. The subsector ranks third to the last in terms of being innovation active and process innovation. It is second to the last with respect to product innovation.

The comparatively poor performance of the **Arts, entertainment, and recreation** subsector must be given attention, in light of the government's focus on the creative economy. With the recent passage of legislation to support the sector, Philippine Creative Industries Development Act (R.A. 11904), it is important to increase awareness of the opportunities, assistance, and incentives that are available. Improving innovation performance of **Administrative and support service activities** should also be considered, given its employment size, role as a source of export revenues, and the threat from AI and reshoring of services.

The 2021 SIA includes additional data not included in this study. Further research could delve deeper into the complexities of services subsectors by examining variable interactions and how these interactions influence innovation. As the study is mainly focused on the cross-sectional analysis of services subsectors, a longitudinal analysis of innovation surveys could also provide valuable insights into the evolution of innovation among firms. This would allow tracking changes in innovation intensity and identifying potential patterns over time. Relatedly, more frequent surveys are recommended given the rapid pace of technological change.

[2] https://psa.gov.ph/classification/psic/section/J
[3] https://psa.gov.ph/classification/psic/section/M

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9. Appendices

Appendix 1. Proportion of firms that engage in the following innovation activity (in percentage)

Type of innovation activity	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
In-House R&D	6	5	9	14	9	4	11	6	10	6	2	2
Outsourced R&D	4	4	5	4	5	3	6	3	5	4	2	1
Acquisition of Machinery and Equipment	6	5	8	13	8	5	12	5	9	10	1	6
Software-as-a-service	4	4	5	11	9	3	8	5	11	4	1	1
Infrastructure-as-a-service	2	2	3	8	4	3	6	3	6	3	0	1
Platform-as-a-service	3	4	4	7	5	2	6	4	8	3	1	1
Acquisition of existing knowledge from others	3	3	5	8	5	2	5	3	7	4	1	3
Intellectual property-related activities	5	1	7	9	5	2	7	4	6	4	1	3
Training for innovative activities	8	5	12	14	12	3	13	7	12	10	1	5
Market introduction of innovations	7	4	10	10	10	4	10	6	9	5	1	5
Design	6	4	10	10	8	4	12	5	8	6	1	4
Other	5	3	7	9	6	5	8	4	7	5	1	2

Source: 2021 PSIA, PIDS

Appendix 2. Average firm expenditure by innovation activity (in millions)

Services subsector	In-house R&D	Outsourced R&D	Acquisition of machinery, equipment, and software for innovation	Acquisition of other external knowledge	Personnel services/compensation/salaries related to innovation	Other innovation activities including design, training, marketing and other relevant activities	Average expenditures
Wholesale and retail trade; repair of motor vehicles and motorcycles	4.2	6.0	6.2	0.1	0.2	0.2	9.0
Transportation and Storage	1.0	0.6	2.0	0.1	1.6	0.1	2.8
Accommodation and food service activities	13.6	0.1	3.4	0.7	8.1	1.8	17.7
Information and Communication	31.7	0.7	6.5	3.9	37.7	16.7	51.0
Financial and insurance activities	0.6	4.0	12.8	0.1	5.6	3.3	13.8
Real estate activities	13.2	1.1	4.5	2.2	0.5	0.8	18.2
Professional, scientific and technical services	35.3	0.7	20.5	43.2	36.6	26.9	90.5
Administrative and support service activities	1.3	0.1	1.8	0.2	0.4	0.3	2.6
Education	2.6	0.2	24.9	10.4	10.0	0.4	31.9
Human health and social work activities	2.0	0.5	4.7	5.0	0.4	0.1	7.5
Arts, entertainment and recreation	0.6	0.1	0.0	0.0	0.1	0.0	0.4
Other service activities	0.1	0.1	0.2	0.0	0.0	0.0	0.3

Source: 2021 PSIA, PIDS

Appendix 3. Proportion of firms that obtain loans and financing (in percentage)

Services subsector	Obtain Bank Loans	Financing through equity investment	Financing Support - LGU	Financing Support - National government	Financing Support - Foreign government
Wholesale and retail trade; repair of motor vehicles and motorcycles	17.19	16.44	4.33	5	1.22
Transportation and Storage	21.53	17.88	0	2.17	0
Accommodation and food service activities	16.96	11.76	6.51	3.85	3.08
Information and Communication	7.84	7.49	3.05	2.84	0
Financial and insurance activities	12.02	16.38	4.01	2.75	2.79
Real estate activities	29.53	27.22	0	0	0
Professional, scientific and technical services	16.01	13.45	0	0.2	1.63
Administrative and support service activities	16.98	11.28	2.56	3.54	0.88
Education	10.4	7.55	3.74	10.25	0.93
Human health and social work activities	18.58	9.56	4.85	4.85	6.45
Arts, entertainment and recreation	20.64	8.21	0	0	0
Other service activities	6.15	11.87	0	0	0

Source: 2021 PSIA, PIDS

Appendix 4. Type of co-operation partner

Services subsector	Other establishments within its enterprise	Suppliers of equipment, materials, components, or software	Clients or customers from the private sector	Clients or customers from the public sector	Competitors or other establishments in its sector	Consultants, commercial laboratories, or private R&D institutes	Universities or other higher education institutions	Government or public research institutes
Wholesale and retail trade; repair of motor vehicles and motorcycles	4.34	4.38	4.34	4.29	3.75	3.41	3.26	3.35
Transportation and Storage	3.86	3.22	3.54	3.54	3.22	3.22	2.9	3.22
Accommodation and food service activities	3.91	4.18	4.26	4.39	4.14	3.77	3.88	4.26
Information and Communication	7.31	7.42	7.62	6.79	6.66	6.15	5.71	5.89
Financial and insurance activities	5.55	5.77	6.25	5.47	5.38	5.07	4.53	4.8
Real estate activities	1.74	1.24	2.68	1.74	1.74	1.74	1.74	1.74
Professional, scientific and technical services	4.06	4.47	3.99	3.74	3.52	3.7	3.47	3.47
Administrative and support service activities	3.71	3.78	3.97	2.64	2.19	2.41	1.96	2.05
Education	5.82	5.47	6.06	4.92	4.84	4.29	5.19	5.39
Human health and social work activities	3.75	3.5	3.49	3.75	2.72	2.45	2.98	2.46
Arts, entertainment and recreation	0.52	0.52	1.46	0.86	0.43	0.09	0	0
Other service activities	2.18	2.54	1.83	1.83	1.83	1.83	1.83	1.83

Source: 2021 PSIA, PIDS

Appendix 5. Proportion of establishment that perceived the following government support programs as highly important for its innovations

Services subsector	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and Storage	Accommodation and food service activities	Information and Communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical services	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
R&D Funding	6	5	8	9	7	2	7	7	10	9	6	4
Training/Scholarships	8	8	10	10	12	5	12	9	20	11	10	6
Direct Subsidies/Grants	8	7	9	10	10	2	8	7	15	7	8	6
Tax Deduction	11	12	12	17	12	13	17	15	13	13	13	8
Tax Credits	9	9	10	13	9	9	14	11	9	10	10	6
Tax Holiday	8	9	9	13	10	8	12	11	8	9	9	5
Duty Free Importation	6	7	6	7	6	2	6	6	6	5	8	3
Technical Support/Advice	7	8	8	11	9	5	11	9	11	12	12	6
Infrastructure Support	6	6	7	9	8	5	8	6	10	8	8	4
Subsidized Loans	7	6	8	9	8	3	8	7	10	7	8	7
Loan Guarantees	8	6	9	10	9	4	9	6	10	9	8	7
Others	1				9			9	6	9		26

Source: 2021 PSIA, PIDS