
Internationalization potential in services: the case of T-KIBS in Brazil

This paper seeks to identify the potential for internationalization of services activities by analysing the case of T-KIBS in Brazil. Despite the evolution of internationalization theories of services, we still see inconsistencies and ambiguities, related not only to the grounds of internationalization theory but also to the own specificity of services, especially when it comes to knowledge-intensive business services. Considering the entry barriers in services (relational, technological, scale, and learning) we propose a model of Potential Internationalization based on the Dynamics of Technological-Knowledge content and Scaling. Data analysis included what is already exported in the group of T-KIBS and what should have been exported considering the use of technology mediation in a whole group of traditional services, comparing Brazil with Latin America and Advanced Economies (OECD countries). It was observed that despite the evolution that has occurred, Brazil still presents important gaps to be filled.

Este artículo busca identificar el potencial de internacionalización de las actividades de servicios a partir del análisis del caso de T-KIBS en Brasil. Considerando las barreras de entrada en los servicios (relacionales, tecnológicas, de escala y de aprendizaje) proponemos un modelo de Internacionalización Potencial basado en la Dinámica de contenido Tecnológico-Conocimiento y Escalado. El análisis de datos incluye lo que ya se exporta en el grupo de T-KIBS y lo que debería haberse exportado considerando el uso de la mediación tecnológica en todo un grupo de servicios tradicionales, comparando Brasil con América Latina y Economías Avanzadas (países de la OCDE). Se observó que, a pesar de la evolución ocurrida, Brasil todavía presenta importantes brechas por cerrar.

Artikulu honek Brasilgo T-KIBS kasuaren azterketaren bidez zerbitzu-jardueren nazioartekotzearen indarra aurkitzea bilatzen du. Zerbitzuetan sartzeko oztupoak (erlazionalak, teknologikoak, eskalenak eta ikasketenak) kontuan hartuta, Teknologia-Ezagutza- eta Eskala-edukiko Dinamika oinarritzat duen Nazioartekotze Potentzialeko eredu bat proposatzen dugu. Datuen azterketak T-KIBS taldean jada esportatzen dena eta zerbitzu tradizionalen talde oso batean bitartekaritza teknologikoaren erabilera kontuan hartuta esportatu behar zena jaso zuen, Brasil Latinoamerika eta Ekonomia Garatuekin (ELGAko herrialdeak) alderatuz. Bilakaera bat egon den arren Brasilek oraindik itxi beharreko ebaki handiak dituela ikusi zen.

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1. INTRODUCTION

The research strands in internationalization theories are based on different perspectives regarding the choice of the unit of analysis and variable to be explained. As observed by Dunning (1993), each strand is related to specific periods of the historical evolution of business, from the macro-economic perspective in the sixties and seventies, focused on the spatial distributions of resources, to the perspectives of industrial organization and firm behaviour in the eighties, focused on the market imperfections and transaction costs, until the rise of alliances and networks of collaboration during by the mid-1980s, based on the needs of knowledge acquisition and competence of partners (Dicken *et al.*, 2001; Johanson & Vahlne, 2009).

In the beginning of the twenty-one-century, with the evolution of technology and the increase of global value chains (Gereffi, 2001), internationalization has been seen as a way to improve competitive advantage not only in foreign markets but also domestic markets, with a connection to entrepreneurship theory (Jones & Pitelis, 2015).

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Nowadays we are experiencing a digital transformation in a society where we no longer conceive a simple office or any business activity, of any nature, not being connected with various new technologies and new equipment (World Economic Forum, 2016). All this results in greater interaction between suppliers and users, more and more use of collaborative systems by and between organizations, involving knowledge production and learning, especially learning through networking. This can be verified in the increasingly present and strong movement of use of remote labour for the development of computer programs that are embedded in equipment in various verticals of the industry, in the gaming industry, among others (Blagoeva, Jensen & Merchant, 2020).

The evolution of Information and Communication Technologies (ICT), with emphasis on Cloud Computing that allowed access to flexible IT resources, with low cost and payment through use (Buyya *et al.*, 2009), enabled all companies, especially small ones, to achieve economies of scale, with agility and without capital investments. Elasticity, one of the essential characteristics of Cloud Computing that provides resources in an almost instantaneous way (Mell & Grance, 2011), allows any type of business, including and especially service, to explore a great potential for internationalization, and allows small and new businesses to be born ready to compete with large companies.

These technological advances open opportunities also to emerging countries. However, emerging economies is still a research strand to be explored in internationalization literature, especially the strategic behaviour of service firms on international market entrance (Blagoeva, Jensen & Merchant, 2020). In fact, we have seen a constant increase in services exports in the World and Latin America, more specifically modern services, related to the knowledge economy (De Azevedo, 2018). In Brazil the same dynamism has been observed (SECEX, 2020). However, Brazil is far away to achieve the status of a country export of services, when we compare to the performance of OECD countries, or even between emergent economies, such as India.

Our research question here in this paper is: Is it possible to increase the potential of internationalization of services in Brazil?

Brazil was chosen because it is one of the largest economies in the world and is an emerging-market, and already presents some clusters of T-KIBS as mapped by (Guimarães, 2009).

Considering the internationalization of companies as a process of creating international business networks (Johanson & Vahlne, 2009), we defend here in this paper that the greater the capacity to operate in larger scale, using technological platforms, the greater the potential of service internationalization. As proposed by Gawer (2014), platforms create value through economies of scope in supply and innovation (engineering design view) and economies of scope in demand (economics view).

As the geographic distances become less relevant in internationalization of services, new approaches, based on a demand side perspective propose that the comprehension of local demand is the key to predict potential host countries (Siqueira *et al.*, 2015; Bailey and Li, 2015). Countries with more robust local demand are more likely to be considered for foreign direct investment (FDI), despite the geographic, administrative, or cultural distances considered in Uppsala model of internationalization expansion. In this regard, the nature of knowledge intensiveness is a key to understand the promotion of innovation (Seclen-Luna, Moya-Fernández, Barrutia & Ferrucci, 2022), especially for international business, since there is a combination of both domestic consumer knowledge and overseas consumer knowledge (Xie and Li, 2015). This, in part, explains the growing interest in KIBS as they deal with knowledge and knowledge is critical to innovation (Miles, Belousova & Chich-Kanov, 2018).

The objective of this paper is to identify the potential for internationalization of services activities in Brazil from its technological-knowledge content. In order to identify this content of technological knowledge we use the definition of technological intensive business services (Miles *et al.*, 1995; 2018), i.e., services connected with technology and with the production and transfer of knowledge about new technologies. Finally, we initiate reflections and discussions by proposing a model to analyze the Potential of Internationalization based on the Dynamics of Technological-Knowledge Content and Scaling. For this, we integrated three concepts. First, the definition of service proposed by Silva and Meirelles (2006), where services are activities based on a workflow (process nature); second, we adopted the classification of entry barriers in services; third, we propose that the development of these new mediating technologies for delivering services (Schumann *et al.*, 2012), especially digital platforms (Gawer, 2020; Wirtz, 2019) which provides real-time (online) services, breaks down location barriers and allows the exploitation of scale economies.

2. THEORETICAL BASIS

2.1. Internationalization theories and technological content

The field of internationalization theory has evolved around three main approaches, which are related to three level of analysis: the macro level, which explains internationalization mostly from economic models of international trade (classical and neoclassical); the industry level, which explains internationalization from market imperfections, including the aspects of market entry barriers from industrial organization and microeconomic theory; and the organization level, which includes aspects of the competitive advantage of firms from theories related to strategy and resource management (Table 1).

Table 1. INTERNATIONALIZATION THEORIES: LEVELS OF ANALYSIS, RESEARCH FOCUS, VARIABLES AND OUTCOMES

Level of analysis	Macro	Micro/Industry	Organization
RESEARCH FOCUS	Host-country characteristics	Market structure	Firm's activity and typology or industry classification
VARIABLES	<ul style="list-style-type: none"> - Culture - Legal Systems and Regulation (immigration, intellectual property rights, local contract law) - Infrastructure and government policies - Political stability, political stability - Availability of Resources (natural and intangible) - Market Size 	Market imperfection (cost and differentiation)	<ul style="list-style-type: none"> Technology Capital Intensity Asset Specificity Knowledge (Requirements and Asymmetries) Relationship with Customers
OUTCOMES	Location Decision	ENTRY BARRIERS (reputation, scale and scope, knowledge intensity)	MODES OF ENTRY (Internalisation, contractual collaboration or international trading)

Source: Adapted from Blagoeva, Jensen & Merchant (2020).

International Service Classification proposed by some authors (Boddewyn, 1985; Snape 1986; Snape, 1985; Vandermerwe & Chadwick, 1989; Buckley *et al.*, 1992) almost are defined according to micro or industrial organization level, considering three aspects: i) Physical Embodiement (involvement of goods); ii) Contact (degree of consumer/producer interaction; iii) People-embodied (degree of human labour), that is those services that do not require direct contact between supplier and consumer and the related kind of foreign market presence and control, that is the governance structure (Williamson, 1991; Teece, 1985).

As we can see at Table 2, basically there are three kinds of services and the related governance structure: service commodities (or separated services) exported directly or through some service overseas to distribute and sell the product; services mix of commodities (exported via intermediaries/third party representation) and service integrated (foreign direct investment through owned production subsidiaries or mergers and acquisitions).

Table 2. CLASSIFICATIONS OF SERVICE INTERNATIONALIZATION: MODES OF ENTRY

Services	Physical embodiment/ involvement of goods	Degree of customer- producer interaction	Governance
Service Commodities	Separated services with some physical embodiment	LOW	- Market (Exporting): Minimum presence and control
Services Mix of Commodities	Location-bound	MEDIUM	- Hybrid Form (licensee, franchisee, joint- venture): third party representation but with control of key assets (management know- how, training, brand names)
Services Integrated	People embodied	HIGH (demand movement of the factor of production or movement of consumers)	- Hierarchy (Foreign direct investment): control over delivery through subsidiaries or mergers and acquisitions

Source: Buckley (1992), adapted by the authors.

Since the seminal work of Vandermerwe & Chadwick (1989) regarding electronic delivery of services, new authors (Blagoeva, Jensen & Merchant, 2020) have mapped the scope for offshoring and/or automation of various types of service work, especially with researcher's categorization jobs (and sometimes tasks) in terms of their scope for automation and/or remote execution/delivery, which increase the potential to internationalization through exports. Technological innovations on Information and Communication Technologies - ICT, as well as the organizational innovations and the new commercialization ways between producer and consumer has driven deep transformations in services production and consumption aspects, especially those based on technological platforms (Gawer, 2014; 2020), or else e-business (Amit & Zott, 2001; Wirtz, 2019). And, also, T-KIBS favour technological innovation (Seclen-Luna, Moya-Fernández, Barrutia & Ferrucci, 2022) what is a key to internationalization.

2.2. Technological content and service classification

As the economy advanced throughout the XX century, it became increasingly evident that the adoption of information technology and telecommunications, as well as organizational innovations and new forms of commercialization, here referring to the relationship between producer and consumer, led to profound transformations in aspects of production and the utilization of services (Vandermerwe & Chadwick, 1989; Miles, 1993; Schumann *et al.*, 2012).

To adapt to the evolution of technological content a lot of new service classification has been proposed. As we see at Table 3, we can devise three stages in service classification, according to technological content. The first one was the work of Marshall (1988) and Miles *et al.* (1995; 2011) regarding information content or knowledge content. The other one was that of Schumann *et al.* (2012), regarding technology mediated services.

Table 3. **SERVICES CLASSIFICATION ACCORDING TO TECHNOLOGICAL CONTENT**

Authors	Service classification	Classification criteria
Marshall (1988)	<ul style="list-style-type: none"> - Information Processing Services - Services related to the production of goods and merchandise - Personal needs support services 	<ul style="list-style-type: none"> - Expertise content - Performed function
Miles <i>et al.</i> (1995; 2011)	<ul style="list-style-type: none"> - Personal Knowledge Business Services (P-KBIS) - Technological Knowledge Business Services (T-KIBS) - Creativity Intensive Business Services (C-KIBS) 	<ul style="list-style-type: none"> - Knowledge Intensiveness - Connectedness with technology and with the production and transfer of knowledge about new technology
Schumann <i>et al.</i> (2012)	<ul style="list-style-type: none"> - Self-services: provider-based (ex. ATM) or customer-based (ex. online banking) - Delivered services: remote provider-based (ex. long distance surgery) and customer-based (ex. Remote repair of it-systems) interactive consulting services provider-based (ex. E-learning) and customer-based (ex. Information systems on train stations) 	<ul style="list-style-type: none"> - Technology mediation/ application - Customer participation (self-service or delivered service)

Source: Elaborated by the authors.

According to Miles *et al.* (1995), technological knowledge-intensive business services (T-KIBS) are the services connected with technology and with the production and transfer of knowledge about new technologies. As we can see at Table 4, T-KIBS include not only the whole ICT equipment and related services, such as computer networks, telecommunications, software, training, management consulting, but also environmental services and research & development (R&D). Some personal services, previously classified as P-KIBS, C-KIBS or even NON-KIBS, may be now considered T-KIBS, since in its use they produce and transfer knowledge, also creating innovations in process and uses.

Table 4. KIBS CLASSIFICATIONS

PERSONAL KIBS P-KIBS (Administrative and Institutional Knowledge)	TECHNOLOGICAL KIBS -T-KIBS (Scientific and Technological Knowledge)	C-KIBS (Cultural and Creative Knowledge)	NON-KIBS
<ul style="list-style-type: none"> - Training (other than in new technologies); - Design (other than that involving new technologies); - Some Financial services (e.g. securities and stock-market-related activities); - Office services (other than those involving new office equipment, and excluding «physical» services like cleaning); - Building services (e.g. architecture; surveying; construction engineering, but excluding services involving new IT equipment such as Building Energy Management Systems); - Management Consultancy (other than that involving new technology); - Accounting and bookkeeping; - Legal services; - Environmental services (not involving new technology, e.g. environmental law; and not based on old technology e.g. elementary waste disposal services) 	<ul style="list-style-type: none"> - Computer networks/telematics (e.g. VANS, on-line databases); - Some Telecommunications (especially new business services); - Software; - Other Computer-related services - e.g. Facilities Management; - Training in new technologies; - Office services involving new office equipment); - Building services (centrally involving new IT equipment such a Building Energy Management Systems); - Management Consultancy involving new technology; - Technical engineering; - Environmental services involving new technology, e.g. remediation; monitoring; Scientific/laboratory services; - R&D Consultancy and «high-tech boutiques» 	<ul style="list-style-type: none"> - Marketing Services - Advertising Services - Design Services - Other Professional Scientific and Technical Services 	<ul style="list-style-type: none"> - Health/medical services; - Post, Transport and Distribution (although some specialized services may be included - e.g. priority delivery services, and transport logistics); - Consumer Financial and Real Estate services; - Education services (other than specialized training for industry); - Broadcast and other mass media (with possible exceptions, such as when these media are also used for specialised delivery of business services as in data broadcast or encoded business video transmissions); - Public administration (with possible exceptions in industry support schemes); - Repair/maintenance (with the exception of activities related to advanced IT); - Retail and wholesale; - Social welfare services; - Hospitality (i.e. hotels, etc. - not hospitals) and Catering; - Leisure/tourism; - Personal consumer services; - Entertainment

Source: Miles *et al.* (1995), Miles *et al.* (2011) and Miles *et al.* (2021) - Adapted by the authors.

Since this seminal classification proposed by Miles *et al.* (1995) 30 years ago, technological content of services has not only improved, as we can see in the whole new smart service providers related to Industry 4.0 (Frank *et al.*, 2019). The use of technology, together with the use of technologies such as Big Data, Cloud Computing, Artificial Intelligence (IA), Internet of Things (IoT), Blockchain, among others, are reshaping all kinds of activities, especially in the service sector. Some of them are nominated with «tech» at the end of the word, such as Healthtech, edtech, fintech, construtech, legaltech, and so on.

From 2000s ahead, the development of new mediating technologies in service delivery (Schumann *et al.*, 2012), especially digital platforms (Gawer, 2020; Wirtz, 2019), which provides real-time (online) services, breaks down location barriers and allows the exploitation of scale economies, even in creative services (Abecassis-Moedas *et al.*, 2012). At the same time, it allows for customization, which provides the full-service delivery and the exploitation of scope economies (Gawer, 2014), paving the way to increase the potential for internationalization in services, and even allows born global firms (Jones & Pitelis, 2015).

3. METHODOLOGY

To be able to measure the internationalization potential of T-KIBS activities in Brazil, we sought to analyse the performance of exports of Latin America and the Caribbean Aggregation Organisation for Economic Co-operation and Development (OECD).

The countries of Latin America and the Caribbean Aggregation were chosen because Brazil belongs to Latin America and the result of its performance within the geographical limits to which it belongs are fundamental. Finally, the results of the OECD countries were chosen for comparison not only because it is a grouping of countries that are aligned with global best practices but because this is our measure of potential development.

To obtain data on export performance we use the TRADEMAP platform. The data presented by TRADEMAP are obtained from several sources: the International Trade Center (ITC); United Nations Conference on Trade and Development (UNCTAD); World Trade Organization (WTO) trade in services database based on the stational office of the European Union (EUROSTAT); International monetary fund (IMF); OECD relevant statistical authorities' statistics from more than 220 countries. Trade Balance (TB) statistics are based on the sixth edition of the IMF's Balance of Payments Manual (BMP6). The analysis period of this study was from 2016 to the 2020.

Due to the widely discussed characteristic of the heterogeneity of services and the difficulty of obtaining data from official statistics that clearly and unequivocally

reflect what really are services and which ones are really knowledge intensive (Jennequin, 2007; Guimaraes & Meirelles, 2014; Miles, Belousova & Chichkanov, 2018), a completely realistic result can't be obtained.

Besides, the adequacies of official statistics do not follow the changes in the economy as quickly as necessary, and in the end, the authors make choices that better reflect the definition of what is KIBS – or any type of service – but despite this, various services are «hidden» in groups that are from the primary or secondary sector and do not clearly reflect reality (Miles, Belousova & Chichkanov, 2018).

As pointed out by Miles, Belousova & Chichkanov (2018), there are several problems to identify clearly within industrial classifications, KIBS, especially T-KIBS, in particular because of these classifications take into account what industries produce and not for whom they produce, since there is consensus that KIBS are, as stated by Miles, Belousova & Chichkanov (2018), «business services».

Another relevant point highlighted by Miles, Belousova & Chichkanov (2018) refers to computer services that since the beginning of research in the area have been defined as T-KIBS. With the evolution of the NACE2 classification that introduced important modifications, these services were removed from section M and included in section J, Information and Communication, based on the background of the transformation and digital convergence for which the conduct of theories and policies are focused on this new information society.

Moreover, obtaining data from export volumes in the official classifications to perform data collection and analysis is also an arduous task, since the international trade data source obtained for this research was based on the trade balance statistics based on the sixth edition of the IMF's Manual of Balance of Payments and International Investment Position (BPM6). The systematic classification of services is not completely equal to other official statistics which makes the task of obtaining data on T-KIBS even more complex. Services considered T-KIBS like Engineering Services, Design Services and Architectural Services are not available in the BMP6 statistics. Thus, for the purpose of this work, there are considered as T-KIBS for the collection and analysis of data that could measure the internationalization potential of Brazil the following BMP6 classification listed in Table 5, which presents the main classifications and its convergence:

Table 5. INDUSTRY CLASSIFICATIONS CONVERGENCE

T-KIBS	NAICS	NACE Rev. 2	ISIC	BMP6
R&D Services	5417	M72	7210, 7220	10.1
Computer-related Services	5415	J63	6311,6312,6391,6399	9.2
Data Processing and Information Services	518-519	J62	6201,6202, 6209	9.3
Engineering Services	541330	M71.12	71.12	Not available
Technical Testing Services	54138	M71.2	7120	10.3
Design Services	5414	M74.1	7410	Not available
Architectural Services	54131	M71.11	7110	Not available
Telecommunication	517	M61	6110,6120,6130,6190	9.1

Source: Elaborated by the authors.

In modern economies technological-knowledge content is increasing the whole set of T-KIBS activities. So, in this study, which seeks to verify the internationalization potential of services by analysing the case of T-KIBS Brazil, we consider technological content as an increasing tendency in all services activities, and not only ICT based.

As presented next, we analyzed the T-KIBS in the two main divisions on BMP6 classification:

- 9. Telecommunications, computer and information services, subgroups 9.1 Telecommunication Services, subgroup 9.2 Computer Services and 9.3 Information Services.
- 10. Research and development (R&D), subgroups 10.1 and 10.3 (Technical trade-related and other services).

4. DATA ANALYSIS

The data analysis here is divided into three steps. First, we analyse what is already exported in the group of already known services of high technology content. Second, we infer what should have been exported considering the use of technology mediation in a whole group of traditional services. And third, we analyse what should have been exported considering the exports of the advanced economies, with the highest level of economic development (OECD countries).

4.1. Exports of T-KIBS: ICT, R&D and technical trade related services

The exports of telecommunications services (Table 6) showed a fall in export volumes in general. When analysing the data between 2016 and 2020, there is a sharp fall in all groups of countries including Brazil. In fact, the results of 2018/2017 had positive results that showed growth. Brazil, due to the expressive growth presented in 2018, was the one with the lowest involution (%) when comparing the aggregate of all years surveyed.

Table 6. EXPORTED VALUE IN TELECOMMUNICATIONS SERVICES OVER THE PERIOD 2016-2020 (US\$ Dollar thousand)

Region	2016	2017	2018	2019	2020	Variation (%)				
						2017/2016	2018/2017	2019/2018	2020/2019	2020/2016
Latin American & Caribbean	3,057,864	3,051,360	3,225,844	2,921,819	2,411,935	-0.2	5.7	-9.4	-17.5	-21.1
OECD	61,014,286	60,102,927	60,340,754	53,116,598	44,243,047	-1.5	0.4	-12.0	-16.7	-27.5
Brazil	411,024	406,939	592,138	499,614	386,968	-1.0	45.5	-15.6	-22.5	-5.8

Note: Some of the data are reported according to the Balance of Payments and International Investment Position Manual (BPM6) methodology. Some of the members of the group of countries did not report some data.

Source: Elaborated by the authors.

Table 7. COMPUTER SERVICES: EXPORTED VALUE OVER THE PERIOD 2016-2020 (US\$ Dollar thousand)

Region	2016	2017	2018	2019	2020	Variation (%)				
						2017/2016	2018/2017	2019/2018	2020/2019	2020/2016
Latin American & Caribbean	4,753,132	5,931,327	6,498,857	6,530,664	5,467,993	24.79	9.57	0.49	-16.27	15.04
OECD	233,665,007	267,453,133	324,093,235	360,417,453	346,331,580	14.46	21.18	11.21	-3.91	48.22
Brazil	1,316,410	1,725,571	1,971,519	1,994,068	2,072,011	31.08	14.25	1.14	3.91	57.40

Note: Some of the data are reported according to the Balance of Payments and International Investment Position Manual (BPM6) methodology. Some of the members of the group of countries did not report some data.

Source: Elaborated by the authors.

Regarding Computer Services, as can be seen at Table 7, Brazil has shown an increase in its export volume in all years, including being the only one that did not experience a fall in 2020 over the results of 2019, a year completely out of the standards due to the COVID-19 pandemic. Another point worth mentioning is that

when compared to its neighbours in Latin America and the Caribbean it has achieved almost four times greater (%).

In another related subgroup (Information Services) we don't see the same performance. As we can see at Table 8, there is a discrepancy in performance between developed countries (OECD) and the others. Despite the still strong fall that occurred in 2020, again because of the COVID-19 pandemic, the groupings of Latin America and the Caribbean and Brazil also showed a fall in the previous years, only the results of the OECD were positive. Curiously, Brazil, despite a significant drop in the volume of exports when comparing the results of 2017 to 2016, shows a small growth in the following years. In 2019, the year before the pandemic, the results were very good, having the highest percentage growth when compared to the other clusters studied.

Table 8. INFORMATION SERVICES: EXPORTED VALUE OVER THE PERIOD 2016-2020 (US\$ Dollar thousand)

Region	2016	2017	2018	2019	2020	Variation (%)				
						2017/2016	2018/2017	2019/2018	2020/2019	2020/2016
Latin American & Caribbean	264,795	219,270	232,624	271,156	108,783	-17.2	6.1	16.6	-59.9	-58.9
OECD	23,581,904	30,019,413	36,138,429	38,758,143	26,871,599	27.3	20.4	7.9	-30.7	13.9
Brazil	76,322	53,689	53,820	80,111	65,248	-29.7	0.2	48.9	-18.6	-14.5

Note: Some of the data are reported according to the Balance of Payments and International Investment Position Manual (BPM6) methodology. Some of the members of the group of countries did not report some data.

Source: Elaborated by the authors.

Table 9 shows that, although the growth in the volume of exports of the R&D subgroup of services did not have a positive variation as marked as the subgroup of computer services, these services showed a growth in all aggregations of countries analysed. Brazil stands out with an increase in export volume of 16.8%, when comparing 2020 with 2016. This percentage growth is almost ten times higher than the Latin America and the Caribbean Aggregation – where Brazil accounts for 53% of the total volume of exports of this group – and almost twice the percentage growth achieved by OECD countries, which shows that the country is moving in great strides to become a relevant player on the world stage in research and development services.

Table 9. RESEARCH & DEVELOPMENT (R&D): EXPORTED VALUE OVER THE PERIOD 2016-2020 (US\$ Dollar thousand)

Region	2016	2017	2018	2019	2020	Variation (%)				
						2017/2016	2018/2017	2019/2018	2020/2019	2020/2016
Latin American & Caribbean	1,051,870	1,207,968	1,157,054	1,200,504	1,069,386	14.8	-4.2	3.8	-10.9	1.7
OECD	144,365,961	159,540,398	172,699,153	176,504,152	157,315,839	10.5	8.3	2.2	-10.9	9.0
Brazil	483,795	586,248	575,148	620,866	565,200	21.2	-1.9	7.9	-9.0	16.8

Note: Some of the data are reported according to the Balance of Payments and International Investment Position Manual (BPM6) methodology. Some of the members of the group of countries did not report some data.

Source: Elaborated by the authors.

Finally, the technical services, related to trade and other services to companies, shows how the maturity of an economy is important to export performance (Table 10). While all OECD countries showed growth, even in a smaller volume and with the decline in exports in 2019, all the others showed a decrease, which is probably to the whole exports in each country.

Table 10. TECHNICAL SERVICES RELATED TO TRADE AND OTHER SERVICES TO COMPANIES: EXPORTED VALUE OVER THE PERIOD 2016-2020 (US\$ Dollar thousand)

Region	2016	2017	2018	2019	2020	Variation (%)				
						2017/2016	2018/2017	2019/2018	2020/2019	2020/2016
Latin American & Caribbean	16,851,092	17,309,807	16,830,439	16,606,362	13,720,853	2.7	-2.8	-1.3	-17.4	-18.6
OECD	402,791,762	421,441,279	452,507,812	461,925,923	421,205,729	4.6	7.4	2.1	-8.8	4.6
Brazil	12,181,494	12,343,985	11,535,757	10,829,233	9,005,120	1.3	-6.5	-6.1	-16.8	-26.1

Note: Some of the data are reported according to the Balance of Payments and International Investment Position Manual (BPM6) methodology. Some of the members of the group of countries did not report some data.

Source: Elaborated by the authors.

Table 11. EXPORTS OF T-KIBS IN 2020 (US\$ Dollar thousand)

Group	Volume Exports		Brazil %Total World	Brazil Position (International Ranking)	Descriptive Statistics		
	Brazil	World			Average	Highest Value of Exports	Lower Value of Exports
Telecommunications services	386,968	63,837,720	0.61	26	651,405	7,852,568	5
Computer services	2,072,011	469,919,765	0.44	28	5,528,468	151,462,527	17
Information services	65,248	29,423,528	0.22	26	490,392	6,865,000	40
Research and development (R&D)	565,200	166,793,373	0.34	25	2,316,575	44,858,000	1
Technical, trade-related, and other business services	9,005,120	526,705,767	1.71	18	4,661,113	53,909,004	123
TOTAL T-KIBS-	12,094,547	1,256,680,153	0.96				

Note: Some of the data are reported according to the Balance of Payments and International Investment Position Manual (BPM6) methodology. Some of the members of the group of countries did not report some data.

Source: Elaborated by the authors.

As we can see in these tables presented, although the pandemic of COVID-19 catalyzes a whole reduction in economic performance, especially the volume of exports, it is interesting to realize that the year 2020 can be a track to the adoption of technology in order to provide service from a distance, such as a zero pinpoint.

In this regard the year of 2020 will be considered here our temporal pinpoint to detect the importance of technological content to overcome the natural barrier to service exports. So, next we will analyse how evolved the participation of all sectors in service exports, from 2016 to 2020, both in Brazil and OECD.

As we can see at Table 11, in 2020 Brazil was the top 30 in all types of T-KIBS exports. However, despite this good position in the world ranking of exporting countries of T-KIBS services, in all types of services analysed the volume of Brazilian exports is below the average of exporting countries. This shows that there is much still to be done.

The analysis of these data allows some relevant considerations. Despite presenting some growth figures in some T-KIBS services, these numbers are still very small when compared to the world's leading players. Using the metaphor of the glass full or empty glass, this can be seen from two perspectives: on the one hand, the results are very bad and this may indicate that it is not the country's vocation to export this type of service, or, on the other hand, this may indicate enormous possibilities for improvement in the development of the conditions necessary for the growth of exports of this type of service, with all the positive externalities resulting from these investments. As we present next, this potential of exports can be analysed through comparisons between Brazil and OECD countries.

4.2. The potential of internationalization of T-KIBS: ICT, R&D and technical trade related services

We analyse the potential of internationalization, i.e., what should have been exported in the new potential T-KIBS, first by considering the use of technology mediation in a whole group of traditional services, specifically in the year of 2020, since this is a turning point in technology use. Second, we analyse what should have been exported considering the exports of this new potential T-KIBS in OECD countries.

As we can see at Table 12, in Brazil most services that showed an increase was already a T-KIBS: Computer and Information Services and Charges for the use of Intellectual Property Services. Only one group of P-KIBS (Financial Services) had an increase in their participation in the total volume of services exported. Considering that many Financial Services, including traditional ones, are becoming technology-based companies including fintech's, it is perceived that the majority of T-KIBS, three out of four groups, presented this positive performance which may indicate that has already the technological basis to internationalization.

Table 12. TECHNOLOGY-KNOWLEDGE CONTENT OF SERVICE EXPORTS IN BRAZIL, LATAM AND OECD, 2016 AND 2020 Participation (%)

Knowledge Content	Service Activity	Brasil		LATAM & Caribbean		OECD	
		2016	2020	2016	2020	2016	2020
P-KIBS	Insurance and pension services	2.36%	2.04	2.91%	4.83	2,87%	3,13
P-KIBS	Financial Services	2.22%	2.91	2.65%	3.45	10,53%	12,68
T-KIBS	Charges for the use of intellectual property	1.96%	2.23	0.64%	0.94	9,36%	10,16
T-KIBS	Telecommunications, computer, and information services	5.42%	8.87	4.64%	8.35	9,27%	13,00
T-KIBS	Other business services	49.71%	47.62	18.04%	24.80	23,60%	26,77
NON-KIBS	Personal, cultural, and recreational services	1.71%	1.44	0.73%	1.01	1,49%	1,70
NON-KIBS	Government goods and services	2.20%	2.15	1.68%	2.22	1,32%	1,36

Note: Some of the data are reported according to the Balance of Payments and International Investment Position Manual (BPM6) methodology. Some of the members of the group of countries did not report some data.

Source: Elaborated by the authors.

The other groups, mostly NON-KIBS, showed a decrease in their participation in the total volume of services exported, which indicates that to improve the potential of internationalization these activities must engage in a digital transformation.

By the opposite, in Latin America and Caribbean and OECD all services had an increase in their share in the total volume of services exported, even NON-KIBS had an increase in participation, which means that these regions have managed to increase the use of technological content in exports. Brazil, on the other hand, demonstrates that it has not yet reached this stage.

Technological platforms make geographic barriers less relevant and eliminate other costs, especially those related to information asymmetry and governance (Amit & Zott, 2001), which increases the potential for market entrance through exports and licensing. But is technology content enough to overcome market barriers? Should it be the case to combine technology and knowledge to overcome entry barriers?

To answer this question we have to understand what are entry barriers in services activities, and how these barriers are relevant to comprehend international market entrance, as we show next in our conceptual model to understand the potential of the internationalization of services.

5. DISCUSSION OF RESULTS

As pointed out by Dunning (1993), the evolution of the internationalization theories reflects different questions and above all, different historical periods, reflecting the own evolution of internationalization practices and the requirement of competitive advantage. At the beginning of the internationalization theories, especially in the late 1950s, the most important aspect was localization, i.e., spatial distribution of production factors, and mode of entry. From 1970s and 1980s, authors began to be interested in aspects of the growth of international firms (transnational corporations), adopting perspectives of industrial organization and transaction cost theory.

As pointed by Buckley *et al.* (1992), the need for interaction between producer and buyer and the need to adapt to local characteristics creates market barriers which turns into cost disadvantages to foreign firms, be it related to costs of scale and scope (Hymer, 1976), differentiation (Enderwick, 1989) and, also, costs of market transactions related to information gathering and knowledge experience (Dunning, 1993).

Recent articles of internationalization of services are all based on a combination of these theories (Blagoeva, Jensen & Merchant, 2020). As a consequence, we see a lot of inconsistencies and ambiguities, since it adds other ambiguities, related to the own specificity of services, especially when it comes to knowledge-intensive business services (Miles, Belousova & ChichKanov, 2018).

5.1. Service as a Process: Technological content and market barriers

We see that the evolution of theories of internationalisation to services, still do not solve inconsistencies and contradictions. Most of them related to the problems

of service definition and classification or categorization, including definition of knowledge (Blagoeva, Jensen & Merchant, 2020).

The analysis of the potential of internationalization of services, specifically technological knowledge services, depends on two reflections. First, does the increase of technological content mean a change in the very nature of service? To answer this question, we must pose another question: what is service and how this concept helps us to understand the evolution of tradability of services?

The literature of service internationalization emphasizes some distinctive attributes of services, such as intangibility, inseparability and non-storability (Buckley *et al.*, 1992). Together, these attributes define some limitations to internationalization, or the degree of tradability. However, all these attributes are just external aspects of service, they do not reflect the essential characteristic of services.

We adopt here the definition proposed by Silva e Meirelles (2006), where services are activities based on a workflow (process nature), which can be performed either from human resources or machinery and equipment, defined respectively as human work and mechanical work.

The specific nature of service activities lies in the fact that service is essentially a workflow – independent of the formal characteristics of the production process (human-intensive or technology-intensive) and the related product (tangible or intangible). From this perspective, independently of the work carried out in service activities, based on more or less qualified human labour, provided in person or remotely, service providing is a process. It is not the way work is performed that characterizes a service activity, but rather the process of executing the work itself. Service is work in progress and not the result of the work process. For this basic reason, one does not produce a service, but rather provide service. As it is a work process, it maintains all the very well-known services characteristics. It is still intangible, simultaneous (production and consumption), and non-storable. It is supplied continuously in space and time and it is extinguished as soon as the work process has ended (Silva e Meirelles, 2006).

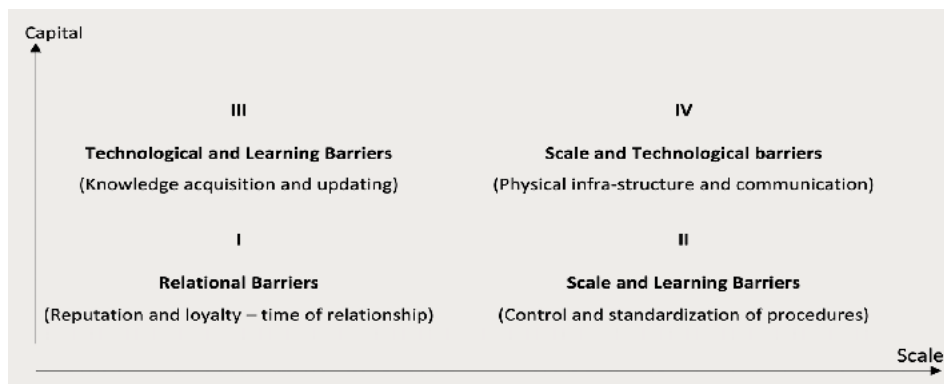
It is this nature of being a process that makes the service offering simultaneous to the demand and therefore non-storable. Therefore, users are always in the process, even in online services. To provide services remotely, it is necessary to provide a technological basis to support the workflow, for example through digital platforms.

This conceptual perspective is essential for an understanding of the composition of services in the modern economy, since the increase of technological content of services provides new «means» or new physical assets which support the carrying out of work that this brings. That is, new devices for carrying out work which fits in with human labour or substitutes it.

As proposed by Silva e Meirelles (2010), the variables of work process, expressed in capital intensity and scale, are the key to understand the four market entry barriers in services: relational, technological, scale and learning. As we can see at

Figure 1, relational barriers, constructed by strong ties between the service provider and user, are related to the uncertainty about the result of services. Technological barriers are related to knowledge acquisition and updating. The larger the capital intensity and scale, the larger the expenses in back office, related to the construction and operation of physical connection networks. In these cases, the associated strategy is to explore economies of scale together with technological investment. On the other hand, the smaller the capital intensity, the larger the investments in front office, related to the expenses in activities that provide satisfaction and loyalty, as is the case of expenses with training and marketing. In these types of services, relational barriers prevail and the associated strategy is differentiation, defined by expenses that guarantee the company's position in the market.

Figure 1. **THE FOUR MARKET ENTRY BARRIERS IN SERVICES: RELATIONAL, TECHNOLOGICAL, SCALE AND LEARNING**



Source: The authors. Adapted from Silva e Meirelles (2010)

These entry barriers suggest different evolutionary dynamics for different types of services. Whereas for some types of services, especially those labour-intensive in P-KIBS, C-KIBS or N-KIBS, it is possible to leave stage I by overcoming relational barriers and go to stage II through standardization and process control it can also evolve through increasing capital intensity and the use of new technologies to reach level III, but they will hardly reach level IV. Other types of services can follow this cycle until they reach level IV, using a high intensity of capital and scale, which can often go through the process of internationalization. As the characteristics of the services are varied, each activity has its own cycle and evolution time.

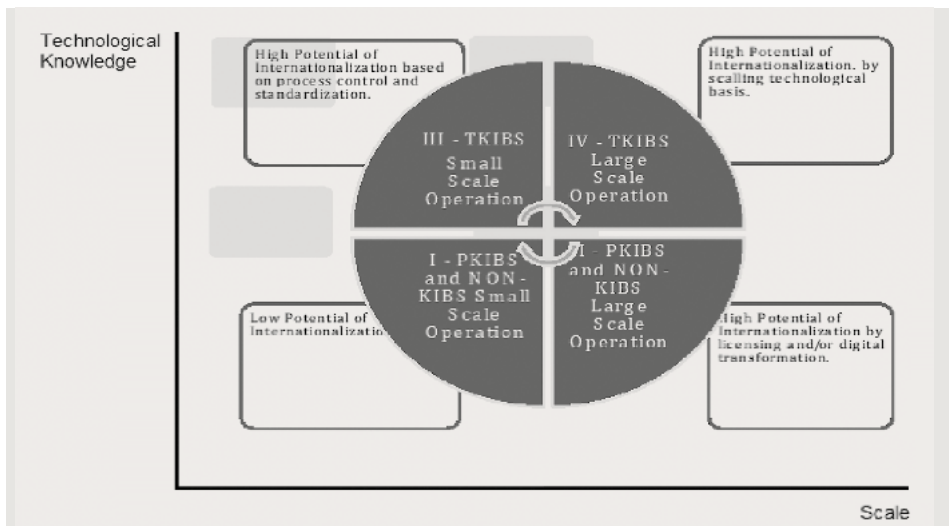
Technology is an important entry barrier, especially when combined with economy of scale, which is the case of technology mediated services (Schumann *et al.*, 2012) and digital platforms (Gawer, 2014; 2020), with the support of ICT services (Buyya *et al.*, 2009).

In this regard, it is interesting to notice that in the subgroups Telecommunications (Table 6), Computer Services (Table 7) and the R&D subgroup (Table 9), Brazil has a great potential for growth for the years to come, not only because it has already presented extremely higher results but compared to the other groupings has a huge market to develop.

5.2. A conceptual model

The thesis defended here in this paper is that the potential of service internationalization is a combination of increase in the technology content and scaling, through process control and standardization, to overcome both the barriers related to the very nature of service and market entry barriers.

Figure 2. **THE POTENTIAL OF INTERNATIONALIZATION OF SERVICES BASED ON THE DYNAMICS OF TECHNOLOGICAL-KNOWLEDGE CONTENT AND SCALING**



Source: Elaborated by the authors.

As we can see in Figure 2, there are three strategic positioning possibilities: i) scaling, based on process control and standardization; ii) technological updating, based on an already scaled operation; iii) scaling base on technological/digital transformation. The choice available depends on the nature of the activity (P-KIBS, NON-KIBS, T-KIBS and the C-CKIBS). The P-KIBS, C-KIBS and NON-KIBS which operate in small scale operation (quadrant I), with low capital intensity, must be engaged in a process of increasing technological-knowledge content and scale to be able to increase the potential of internationalization. By its turn, the P-KIBS, C-KIBS and NON-KIBS which are already operating in large scale (quadrant II), can

improve internationalization process through increasing technological content, by constructing, for instance, a digital platform. Finally, the T-KIBS (quadrant III), to achieve the highest potential of internationalization (full technological scaling process), have to be engaged in an effort of process control and standardization.

Technology provides the solution to explore economies of scale and scope but at the same time it requires knowledge acquisition and updating to overcome entry barriers. Countries that can train knowledge-intensive labour in technology have experienced an increased search for this workforce by international companies. In some cases, foreign companies themselves encourage the training of this workforce to fill the gap of skilled labour that exists today around the world.

KIBS, as services provided by highly trained specialists and based on relationships with their clients and, as a result of this interaction, generate new knowledge and are therefore considered fundamental to the promotion of development, both for companies on a micro level, as well as for regions and countries on a macro level (Guimarães, 2009). So, the identification of opportunities and barriers of the internationalization of KIBS is an important input to develop to industrial and technology policy to firms.

6. CONCLUSION

We are in the edge of a transition to a digitized and modularized production with very low-cost internet-based communication which promotes a paradigm shift in service offering. Since the pandemic of COVID-19 this tendency accelerated and we can devise the first signals of how countries are prepared to offer services in this new paradigm, specifically in international markets. Despite the evolution that has occurred, Brazil still presents important gaps to be filled, especially regarding P-KIBS and NON-KIBS. As presented here in this paper, the technological knowledge-intensive services performed better in exports during the pandemic, but when compared to our neighbours in Latin America, and specially OECD, our performance is far behind.

The technological-knowledge content, together with strategies to overcome entry barriers, are the fundamental drivers to the internationalization of services. So we proposed a conceptual model to analyze the Potential of Internationalization of T-KIBS based on the Dynamics of Technological-Knowledge content and Scaling.

We presented the natural barriers related to service characteristic (a flow of work) and the related entry barriers (relational, technological, scale and learning), but a better understanding of the potential of internationalization requires a deepening of research of other barriers, such as regulatory and cultural, such as language. Regarding regulatory barriers, it is important to notice that we here in Brazil are in the effort to adequate to OECD parameters. The initiatives have already resulted in an upgrade in the economic freedom ranking. Regarding cultural barriers, especially language, there are some interesting cases of digital platforms that are being developed, from the beginning, in a bilanguage. The domain of two languages can be an advantage in internationalization, especially to attend countries with the Portuguese language.

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