



Digital power: Value chain upgrading in an age of digitization

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ABSTRACT

We investigate whether and how digitization may affect the power relationships that constrain the upgrading of small and medium-sized enterprises (SMEs) in global value chains (GVCs). Combining GVC literature and Resource Dependency Theory, we examine the three features that shift upgrading constraints: asset-specificity, market disintermediation, and innovation sources. The outcomes of a multiple case study encompassing Brazilian firms intentionally sampled from the Digital Games Industry refine our propositions, leading to the concept of *digital power* as the potential difference in the power imbalance that a supplier may experience in relation to lead firms when performing similar functions in value chains with different digitization degrees. We contribute to International Business literature regarding the relatively unaddressed effects of digital technologies on power relationships in value chains, and deepen the extant understanding of value chain upgrading as a phenomenon. For practitioners, our results inform ways of benefiting from digital industries.

1. Introduction

Both the International Business (IB) literature interested in global value chains (GVCs) and studies properly focused on GVCs tend to portray small and medium-sized enterprises (SMEs) as dependent suppliers operating in ancillary positions in value chains and networks led by large multinational companies (Buckley & Prashantham, 2016; Buckley & Strange, 2015). Those studies rely on two major assumptions: a) SMEs depend on relationships with large multinationals to get the complementary resources that enable their internationalization processes; b) SMEs may try to upgrade in the GVC but that involves huge efforts and, anyway, it is bounded by their dependence on leading MNEs' resources and strategies (Buckley, 2009; Murphree & Anderson, 2018; Soontornthum, Cui, Lu, & Su, 2020). In other words, leading MNEs exert unquestionable power over internationalized SMEs.

That perspective may be changing with *digitization*, i.e., the transformation of products and services through the use of digital technologies to enhance their features or replace them entirely (Nambisan, 2017; Tilson, Lyytinen, & Sørensen, 2010). Digitization is the technical dimension of *digitalization*, which includes the cognitive, social, and institutional impacts of digital technologies. Among other effects, digitization is said to reduce asset-specificity in firms' activities by making knowledge and technology more modular and mobile (Banalieva &

Dhanaraj, 2019), to promote open and collaborative arrangements for value creation (Li, Chen, Yi, Mao, & Liao, 2019; Nambisan, Wright, & Feldman, 2019), and to reduce resource constraints to entrepreneurial action, thanks to technology convergence and generativity (Nambisan, 2017). In principle, such effects would release SME initiatives due to the reduction of their dependence on leading MNEs (Pananond, Gereffi, & Pedersen, 2020; Sturgeon, 2021) and the generation of new links with actors other than those MNEs. That shift in the power dynamics within GVCs has not yet been under scrutiny, even in recent studies that looked at impacts of digital technologies on GVCs (Kano, Tsang, & Yeung, 2020).

In this paper, we investigate whether and how digitization may affect the power relationships that constrain SMEs' upgrading possibilities in GVCs. We do this by following authors previously quoted and retrieving Resource Dependency Theory to assist the analysis of the power dynamics underlying GVC literature (Magnani, Zucchella, & Strange, 2019; Murphree & Anderson, 2018). Moreover, we differentiate fully digitized value chains from the partially digitized ones, assuming that non-digitized value chains no longer exist. The value chain's digitization degree is the share of its value that is created in digital form (Ekeledo & Sivakumar, 2004; Kollmann & Christofor, 2014). In fully digitized value chains, all activities and products/services only exist virtually, like in the case of financial services and digitally distributed media. Partially

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digitized value chains combine online activities with non-digital products or move digital goods in the physical world, like with the online sales of cars or the physical distribution of software. Based on these ideas, our research question is: *How do differences in power relationships deriving from the distinct resource dependence levels of fully and partially digitized value chains affect the way SMEs upgrade?*

We address our research question with a multiple cases study, acknowledging its advantages for theoretical generalizations from complex phenomena (Piekkari, Welch, & Paavilainen, 2009; Yin, 2014). Our fieldwork is guided by theory-driven propositions, which we refine into new propositions using insights from the empirical data. We build upon 15 upgrading cases embedded in four theoretically selected Brazilian SMEs, operating in partially and fully digitized value chains of the digital games industry (DGI). DGI offers a natural laboratory for this study, encompassing value chains with various digitization levels and exhibiting fast-paced technological changes and unique hardware-software integration challenges (Johns, 2006; Parker, Cox, & Thompson, 2014). By building on well-known examples of successful Brazilian developers, our study also illustrates how digitization may provide opportunities for actors in the periphery of a global industry.

Even though both the partially and fully digitized value chains exemplified in our cases are much more digital than most conventional industries, their contrast draws important lessons not acknowledged in GVC-related IB literature. Particularly, our findings suggest that higher value chain digitization promotes SMEs' upgrading autonomy due to: i) reductions in asset specificity thus confirming arguments advanced by Banalieva and Dhanaraj (2019); ii) market disintermediation, and iii) the possibility of broader innovation processes. We associate this greater strategic autonomy to a change in the balance of power in favor of SMEs caused by digital technologies, which we perceive in the discussion of our cases and label as *digital power*. Such results contribute to advance the GVC-related IB research regarding the relatively unaddressed effects of digital technologies on power dynamics in value chains (Kano et al., 2020), and deepen the extant understanding of the dynamics and nature of value chain upgrading as a phenomenon. Besides, our findings may inform practitioners about ways of extracting superior benefits from digital industries and policymakers about ways to support them.

The next section outlines impacts of digitization on SME upgrading, offering initial propositions that clarify dimensions of these firms' resource dependence. The characterization of the DGI as our fieldwork and methodological considerations come after that, followed by our results and discussion. We conclude with final remarks, research opportunities, and limitations.

2. Theoretical background and propositions

Most GVC-related IB studies focusing on GVC suppliers see *upgrading* as the outcome of processes that improve suppliers' participation in the value generation process (Kano et al., 2020). This is the perspective that we follow in this paper. For instance, supplier SMEs can upgrade by developing more efficient processes (process upgrading), more sophisticated products (product upgrading), more skilled functions (functional upgrading), or diversifying into new industries (inter-sectorial upgrading) (De Marchi, Di Maria, & Ponte, 2014; Humphrey & Schmitz, 2002). Despite extensive research on this topic, however, there is no dominant GVC theory and influential GVC frameworks lack detailed causal mechanisms (Kano et al., 2020). Resource Dependency Theory (RDT) becomes useful in this context, specifying power dynamics that may influence SME upgrading (Magnani et al., 2019; Murphree & Anderson, 2018).

RDT sees firms as open systems that must obtain in their environments the resources that they need, including physical and financial ones, information, and legitimacy (Hillman, Withers, & Collins, 2009). Those in control of the resources that a firm needs wield power over it and may thus influence its behavior (Pfeffer & Salancik, 1978). External dependence reduces autonomy of action and creates uncertainty in

resource acquisition, which is a situation that the dependent firm may try to attenuate by acquiring control over the resources that it needs or resources that could make others dependent on it (Pfeffer, 1992; Ulrich & Barney, 1984). Following these ideas, SME-MNE relationships are typically one of power imbalance benefiting MNEs, since SMEs' dependency on MNEs' knowledge and competences tends to be higher than any dependency in the opposite direction (Buckley & Prashantham, 2016; Buckley & Strange, 2015).

By involving the development of sophisticated competences and knowledge, upgrading may recalibrate this power imbalance that SMEs experience by either reducing their dependence on their focal MNE or by making them more valuable suppliers on which MNEs may depend more. However, although upgrading can be driven by suppliers' strategy (Sinkovics, Hoque, & Sinkovics, 2018), their institutional environment (Kumaraswamy, Mudambi, Saranga, & Tripathy, 2012), and relationships with lead firms (Golini, De Marchi, Boffelli, & Kalchschmidt, 2018), this last option is viewed as particularly relevant for resource-constrained SMEs in underdeveloped markets, where upgrading is seen as extremely difficult (Buckley, 2009). Hence, even for upgrading SMEs may depend on MNEs interested in having more qualified and innovative suppliers (Inemek & Matthysens, 2013; Jensen & Petersen, 2013).

When researchers have addressed SMEs' strategies to deal with asymmetric power relationships with MNEs, they focused on solutions employed by firms in traditional industries—like building relationships with large buyers (Sinkovics et al., 2018) or avoiding becoming dependent in the first place (Murphree & Anderson, 2018). Given the transformative effects of digital technologies on the organization of economic activity (Autio, Nambisan, Thomas, & Wright, 2018), we contend that digitization can affect mechanisms that regulate SMEs' resource dependence and, thereby, their access to upgrading opportunities. We follow this line of inquiry and draw on Yin's lessons to derive next some initial, theory-driven propositions to guide our qualitative investigation (Welch, Piekkari, Plakoyiannaki, & Paavilainen-Mäntymäki, 2011; Yin, 2014). Our model (Fig. 1) assumes SME upgrading as an outcome of innovative efforts that are affected by both MNEs' influence and value chain digitization.

2.1. Digital technologies and asset specificity

In traditional industries, asset specificity reduces the possibility of employing a given asset for alternative uses without losing productive value, making the supplier dependent on the client which its assets fit (De Vita, Tekaya, & Wang, 2011). Comparatively, bits and bytes of information can be repurposed and recombined to fit various ends with much less effort and losses. Such dematerialization may result in products and services that can be reused and customized indefinitely and processed with minimal marginal costs (Choi, Whinston, & Stahl, 1997; Ekeledo & Sivakumar, 2004; Vendrell-Herrero, Gomes, Collinson, Parry, & Bustinza, 2018). Digital assets are also modular, featuring standardized interfaces that improve information exchange and enhance flexibility (Yoo, Henfridsson, & Lyytinen, 2010). On the one side, modularity has been indicated as a potential substitute for relational governance in interfirm alliances, facilitating the codification and sharing of specialized knowledge (Lew, Sinkovics, Yamin, & Khan, 2016). On the other side, it allows products, services, and capabilities to be easily plugged into different value chains as self-contained modules (Pagani, 2013).

Digital technologies have additionally redefined what can be deemed strategic resources, as valuable knowledge is suddenly available and can be obtained from various sources with a mouse click (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013; Nakano & Fleury, 2017; Schroeder & Kotlarsky, 2015). These transformations break SMEs' dependency on MNEs, making it easier for them to internalize new activities and valuable knowledge on their own. With modular capabilities and easier access to valuable resources and activities, SMEs' autonomy to participate in the economy can be expected to be less constrained by external

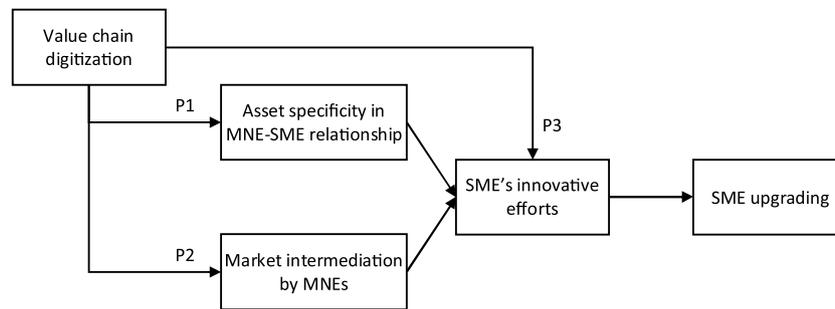


Fig. 1. Conceptual model.

dependencies when value chains exhibit higher digitization. Therefore:

- **P1.** SMEs from fully digitized value chains experience greater autonomy to pursue upgrading opportunities than SMEs in partially digitized ones, due to increased accessibility to valuable resources and modularity patterns.

2.2. Digital technologies and market disintermediation

For MNEs, the intermediation of product and market information can be a relevant source of power over their networks (Coe & Young, 2015). However, digital technologies may reduce SMEs' dependency on intermediaries for information to operate and access final markets (Autio et al., 2018). The internet supports direct interactions between suppliers and final consumers, in addition to dissociating the flow of goods from the information flow. One could say that digitization nearly releases SMEs' from following MNE's market strategy, given the multiplicity of activities and value generation approaches that it can access with minimal resource commitment (Pagani & Pardo, 2017). This enables SMEs capable to experiment with alternative ways of organizing strategies to create value for final markets.

Internet-related technologies promote complex business activities that create value from the close collaboration among firms and the co-creation with final customers (Gyrd-Jones & Kornum, 2013; Shaheer & Li, 2019). Accordingly, digital industries oftentimes configure ecosystems involving actors other than the firms' immediate vertical partners, which can be engaged in planning and structuration efforts (Bharadwaj et al., 2013; Nambisan, 2017). By establishing direct connections with actors in other parts of the chain, SMEs not only find new potential sources of resources but may gain access to new sources of value drivers (Chesbrough & Rosenbloom, 2002). Value chains with higher digitization therefore provide SMEs with more autonomy to allocate their resources in value propositions that they find meaningful. Hence:

- **P2.** SMEs from fully digitized value chains experience greater autonomy to pursue upgrading opportunities than SMEs in partially digitized ones, due to the possibility to experiment with new business models and value drivers outside lead firms' influence.

2.3. Digital technologies and innovation processes

Digitization also strengthens SMEs' position by broadening their scope of action and inducing non-systematic innovation (Autio et al., 2018). One reason for that is *convergence*, representing the confluence of experiences and features previously dispersed across multiple media, products, and industries (Tilson et al., 2010; Yoo, Boland, Lyytinen, & Majchrzak, 2012); another one is *generativity*, meaning the possibility of recombining resources and employing them creatively for unforeseeable purposes (Nambisan, 2017). Thanks to convergence, firms can incorporate distinct media such as music, videos, and books into the same platform, thus combining intellectual properties (IPs) and features from

various sources to operate in novel market niches (Bharadwaj et al., 2013). Generativity, in turn, makes innovations inherently fluid and converts them into triggers for further innovation (Zittrain, 2006). This effect results in unforeseen applications of resources and in the repurposing of technologies that can produce cascades of innovation (Nylén & Holmström, 2015).

Convergence and generativity change the rules of competition and create "unexpected strategic choices at product and platform levels" (Warner & Wäger, 2019, p. 344). Convergence multiplies the combination of resources accessible to SMEs, empowering them to materialize their strategies with fewer constraints. When SMEs exploit generativity, their upgrading efforts represent potential triggers for additional upgrading paths. This scenario is different from value chains featuring limited digitization, where suppliers are tied to path-dependent lines of action associated with their industries and lead firms. Hence:

- **P3.** SMEs from fully digitized value chains experience greater autonomy to pursue upgrading opportunities than SMEs in partially digitized ones, due to the effects of digital convergence and generativity.

3. Research context

3.1. The structure of DGI

The modern DGI encompasses both games that focus on entertainment and games with practical purposes (Bellotti, Kapralos, Lee, Moreno-Ger, & Berta, 2013; De Prato, Feijoo, Nepelski, Bogdanowicz, & Simon, 2010). Entertainment games can be divided into core and casual, with the former offering complex narratives and engagement levels that contrast with casual games' short play sessions and ease-of-use. Games with practical purposes, in turn, can be classified as serious games or advergames. Serious games are often related to capabilities development (such as education, training, or simulation), whilst advergames advertise products or organizations.

Value chains for core and casual games feature full digitization, given that all of their products and activities are online. Fig. 2 illustrates these value chains, with arrows indicating the flow of core and casual games from development to consumption. Developers distribute these games to final users with the intermediation of platform providers, who control the access to final markets and hence hold the position of chain leaders (dark circle in Fig. 2). The most relevant platforms for modern DGI are Google's Android and Apple's iOS, for mobile technology, and Sony's PlayStation, Nintendo's Wii, and Microsoft's Xbox, for home consoles (Laakso & Nyman, 2014; Marchand & Hennig-Thurau, 2013). These value chains may still include specialized actors ("Publishers") who help developers find funding, handle IP rights, and publish their games. However, a growing number of developers operate independently, developing their own IP and submitting their games directly to platform owners (dashed arrow in Fig. 2) (Broekhuizen, Lampel, & Rietveld, 2013).

Comparatively, value chains for serious and advergames can be said

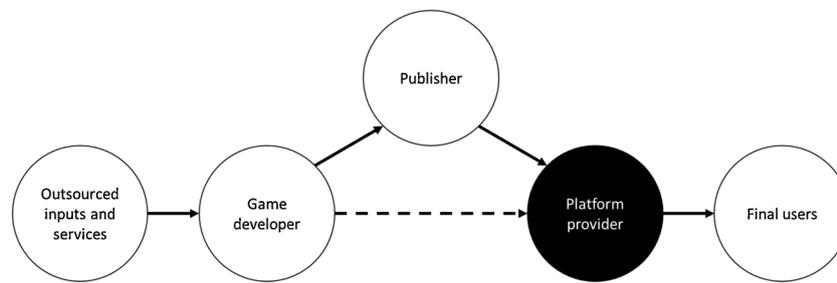


Fig. 2. Value chain for fully digitized segments of the DGI.

to be partially digitized since their games rely on activities or relationships in the physical world to create value. Accordingly, advergaming oftentimes work as advertising channels for non-digital goods such as toys, food, and apparel (Caugherge & De Pelsmacker, 2010), while serious games may be combined with classroom training and aim the development of real-world capabilities like spatial and psychomotor skills (Susi, Johannesson, & Backlund, 2007). Fig. 3 illustrates the value chain for these games, with arrows indicating their flow from development to consumption. Each of these games is a unique project, purchased by corporate clients, non-governmental organizations, or governments to be delivered to final users inside or outside platforms.

Bi-directional arrows between developers and project clients in Fig. 3 indicate that practical games require input from clients, often related to products and services that these clients trade in the physical world. Therefore, the participation of project clients in the value generation process is what makes these value chains partially digitized. When serious and advergaming are commercialized on platforms, developers can handle such process on behalf of their clients (hence, the dashed arrow in Fig. 3). The possibility of including platform providers in these value chains is a technical issue specified in each project’s requirements, hence project clients are the true value chain leaders (dark circle in Fig. 3).

3.2. DGI in Brazil

All over the world, the development of the digital games industry has been considered an important entry gate for the digital world. It allows almost free experimentation in the different disciplines that support a digital culture and the formation of digital capabilities at all levels and fields. Chronologically, countries engaged in that movement along four waves: Japan and the USA were the precursors; Korea, Canada, and France followed suit. The third wave included Australia, England, and Nordic countries, and the fourth wave China, India, and Brazil (Fleury, Nakano, & Sakuda, 2014; Fung, 2017).

Brazil is currently considered one of the largest consumers of digital games and one incipient producer. The total number of local producers

is estimated in around 300 formalized firms and, as it happens in other countries, the vast majority is constituted by micro and small enterprises (Sakuda & Fortim, 2018). These are mainly concentrated around technological poles, in Recife (northeastern region), Sao Paulo (southeast region), and Florianopolis (southern region). The leading group of producers created ABRAGAMES – Brazilian Gamers Association which speaks for the industry as a whole.

The main problem with the industry is the lack of governmental support. In every other country previously mentioned, policies were implemented to stimulate the games industry, seen as part of the digital economy, and also classified as a creative industry (Fung, 2017). In Brazil, there is a different interpretation of creative industry that is primarily linked to handicraft; therefore, digital games are not suited to use policies that stimulate creative industries (Fleury, Nakano et al., 2014). In areas that are digital and convergent with games, for reasons that are not relevant to this study, there are policies to stimulate the audiovisual industry but, again, the digital games industry is not included.

All those factors put Brazilian game producers in a delicate situation where their scope of action is limited by the institutional context. On the one hand, there is installed competency as those firms have been operating as suppliers of other firms along the value chain but, on the other, their movements towards expansion or upgrading are constrained by the lack of financial resources and appropriate legislation. One indicator of that situation is the “talent drain” where the most creative people are absorbed by game producers in other parts of the world.

In that context, the Brazilian digital game producers that thrive are those resilient in relation to local conditions and well connected with the other actors in the Global Value Chains. Those characteristics enable those firms as the ideal field to refine the propositions previously stated.

4. Methodology

4.1. Research design

Digitization represents an emerging phenomenon that has blurred

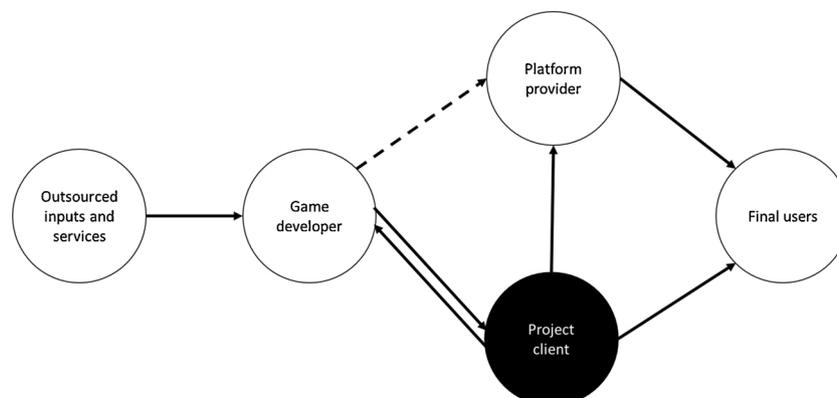


Fig. 3. Value chain for partially digitized segments of the DGI.

businesses' frontiers and configured contexts that challenge extant theories (Banalieva & Dhanaraj, 2019; Strange & Zucchella, 2017). Among the distinct field research approaches, case studies are suitable for the investigation of contemporary topics like the one we are proposing, allowing for the discussion of existing research bodies in light of new empirical insights (Welch et al., 2011). In this study we rely particularly on the example of Ahi, Baronchelli, Kuivalainen, and Piantoni (2017), who studied how SMEs make decisions for international market entry. Like those authors, we leverage insights from the case studies to refine the three propositions that we derived from the literature (P1, P2, and P3).

Our study builds on 15 embedded upgrading cases collected from four SMEs operating in the Brazilian Digital Games Industry. The number of cases in a multiple cases study is not a quality criterion per se but must only provide theory-driven variance and divergence in the data (Pauwels & Matthyssens, 2004; Tsang, 2014). Therefore, instead of representing the population of digital game developers in a statistical sense, we looked for case firms that could help us in identifying upgrading events for which expected results are similar to each other, along with cases that may produce contrasting results for predictable reasons. We thus used digitization degree as a criterion for theoretical sampling and took upgrading events as embedded cases in each firm (Fletcher, Zhao, Plakoyiannaki, & Buck, 2018; Yin, 2014). These choices follow an understanding that higher digitization degrees should allow for power dynamics that increasingly differ from predictions of mainstream theories, besides the idea that upgrading events can be analyzed independently for being reasonably unique (Gereffi, 2019; Pietrobelli & Rabellotti, 2011).

We handpicked our firms among the 133 developers that replied to the I Census of the Brazilian Digital Games Industry (Fleury, Sakuda, & Cordeiro, 2014), using their responses to evaluate the sophistication of their operations and relying on advice from industry experts. We initially identified eight firms with a similar potential to report upgrading events based on their answers to the census and ultimately selected four of them for their willingness to participate in our study (Table 1). This sample includes firms both from DGI segments featuring partially digitized value chains (serious and advergaming) and full digitization (casual and core games).

The four selected firms (henceforth, ALPHA, BETA, GAMMA, and DELTA) have game development as their major activity. ALPHA and GAMMA operate primarily in partially digitized value chains led by corporate customers who order unique games, while BETA and DELTA have their major operations in fully digitized value chains led by platform providers such as Apple (iOS), Google (Android), and Microsoft (Xbox). ALPHA's and GAMMA's narratives state that, at some point, they started to diversify into segments characterized by fully digitized value chains. This provided us with the opportunity to not only compare operations in different types of chains but also observe the benefits of shifting between chains. The data collected from these firms yielded 15 embedded upgrading cases in total, as we explain in the results section.

4.2. Data collection

Our major data comes from semi-structured face-to-face interviews with the CEO or a director of each firm between July and November of 2015. We had one in-depth interview with each executive, which we complemented with secondary data and e-mail contacts focusing on

issues requiring clarification during data analysis. The individuals that we interviewed can be considered to be the most knowledgeable informants for our investigation, given the strategic nature of our study, the smallness of Brazilian game developers, and the concentration of decision power in SMEs (Kumar, Stern, & Anderson, 1993; Lefebvre, Mason, & Lefebvre, 1997). Following an interview protocol (Miles, Huberman, & Saldaña, 2014), we started each interview by explaining the research context, getting permission to tape-record the conversation, and guaranteeing anonymity. We then asked the interviewees to briefly characterize their firms' background and current operations and to describe their value chains.

To obtain narratives about potential upgrading events, our interview script included open-ended questions about strategic changes experienced by the companies as well as about their motivations and enabling factors. Each interview lasted between one and two hours and was transcribed verbatim subsequently, amounting to nearly 60,000 words after complemented with field notes. For minimizing respondent bias, we relied on additional sources for confirmatory data, including onsite visits, documents from specialized media (30 in total), and the firms' websites. Furthermore, at the time of the fieldwork, one of this paper's authors coordinated a project involving more than one hundred Brazilian developers, which gave us the opportunity to interact with industry actors and collect contextual information before the interviews. Hence, we were able to use most of our interview time to understand the firms' upgrading events.

4.3. Data analysis

Starting with within-case analyses, we focused on identifying and understanding events that represented actual upgrading cases in each firm's narrative (Miles et al., 2014). We identified such events by highlighting interview passages and associating them to codes derived from literature relevant to value chains and the DGI, distinguishing among process, product, functional, and inter-sectorial upgrading. For instance, under process upgrading, we coded "improved worker skills", "improved efficiency", "new management practices", "new technology/tools", and "new forms for financing/monetization". We also coded quotes and notes related to strategic motivations and enabling factors associated with these events, which we used in causal maps that characterized each upgrading event as an individual case. To build confidence in the outcome of our analyses, we cross-checked the identified events with secondary data on the competitive dynamics of the DGI.

Cross-case analysis followed with the help of a centralized case study database, organized in a spreadsheet for comparing and contrasting upgrading cases while looking for patterns. The identification of patterns followed the analysis of the mechanisms behind each upgrading case, which we used to group these cases around attributes of digital industries that we retrieved from the theory informing our initial propositions (e.g., modularity, business model innovation, convergence). After several rounds of interactions and comparisons using data display tables, we asked each interviewee to validate our preliminary results. Some of our display tables appear in the results section as summarizing tools.

Table 1
Characteristics of the sampled firms.

Firm	Foundation	Revenues (2015, USD)	Number of employees	Primary segment	Secondary segment
ALPHA	2001	> 3 million	30–50	Advergaming, Serious	Casual
BETA	2010	0.5–1.5 million	30–50	Casual	–
GAMMA	2013	< 0.5 million	10–30	Advergaming, Serious	Traditional
DELTA	2010	N.A.	< 10	Traditional	–

5. Results

To provide an audit trail (or *chain of evidence*) to our data analysis (Yin, 2014), this section starts by presenting the main evidence that emerged from the within-cases analysis. Next, the cross-cases analysis allows assessing our propositions.

5.1. Results of the within-cases analysis

5.1.1. ALPHA

ALPHA started operating with a focus on serious and advergaming and later expanded into casual games, with the latter now responding for 40 % of its revenues. It has various multinationals as clients and the influence of these companies on ALPHA's resource allocation emerges clearly from its interview:

ALPHA's CEO: "It is good that you have this 360-view of all possible technological innovations but the customer is the one who will determine what expertise you must have to be accepted and you have to place your bets [on technology options], be it Unity games, native games, or HTML games."

Nevertheless, ALPHA's operations with serious and advergaming included improvements that were driven mainly by its autonomy. For instance, although it builds a close relationship with clients to understand their requirements, ALPHA leveraged the modularity of digital technology to fulfill those requirements more easily:

ALPHA's CEO: "[When a client asks us to] include a ranking, include a new mission... You can do it because you have already thought about the product in a modular way, so it can grow over time (...) Thinking about it in blocks and thinking about the module is the best way for you not to frustrate the other side and also not to harm yourself financially because every time the guy says 'Change this, change that ...' it is almost like redoing the project."

ALPHA also uses a modular thinking to allocate its technical staff, using them to accelerate ongoing projects or develop new projects according to their skills. Another initiative to improve internal processes emerged from ALPHA's efforts to look abroad from suppliers with competencies demanded in particular projects, resulting in partnerships in Argentina, India, and the United States. In addition to that, ALPHA also started to cultivate capabilities for publishing digital games after acknowledging that this could be a service additional to game development:

ALPHA's CEO: "We publish because some clients do not want to do it by themselves or do not have the expertise (...) We do all this marketing role for companies that don't necessarily have the expertise to publish a game."

In fact, according to ALPHA's CEO, game publication requires understanding platform guidelines that are usually complex and not always clear. Having accumulated this experience and understanding its value for other types of games, ALPHA started to offer publishing services to independent developers of casual games, adopting a collaborative approach:

ALPHA's CEO: "We have marketing expertise, we have relationships with large companies, be it Google, Microsoft, Apple... and what do you know? You know how to develop but you don't know to publish (...) it is a business opportunity for those that have this experience. (...) We promote some modifications [to the independent games that we publish] without changing their DNA but to somehow improve them."

Finally, although ALPHA has been developing proprietary IP on a non-systematic basis for almost a decade, over the last few years they decided to see this activity more seriously as an opportunity to diversify and grow with casual games:

ALPHA's CEO: "The IP area, which we are calling 'Own Products', works almost as if we were the investors in our own products. When the product starts to work very well, we separate it from the company, set up an 100 % separate structure, and go to the market to raise money."

Based on this material, we consider that ALPHA's narrative provides evidence for five upgrading events, including process (modular thinking and international partnerships), product (proprietary IP development), and functional upgrading (development of publication skills and its deployment as a service to independent developers).

5.1.2. BETA

BETA started as a software services company but soon focused on developing and publishing its own casual games. It is acknowledged as one of the major developers in the national industry, having already released more than 100 games to the global market and counting on about three million users playing its games daily. BETA's focus on casual games provides us with detailed insights on the relationship between game developers and platform owners:

BETA's director: "[Apple's approval process] may take up to two weeks (...) They are going to test every feature in the game to check if it complies with their guidelines (...) You must use a program Apple makes available to develop for iOS platform and the programming language is also the one they use there."

"Google does not have this review system [but] they have a process afterward. After you have already uploaded your game and it has been there for months, they can send you an email saying 'Look, you are doing something that goes against our guidelines' and then ask you to change it"

For a developer operating in this kind of value chain, where platform owners control distribution and competition is fierce, success criteria seem to be clear:

BETA's director: "There are two attributes, being retention and how much [developers can] earn per user. [Some companies'] game is free, but they earn five dollars per user, so long they retain the player in their game and give them new content to spend inside the game. (...) This is something that we are still learning."

After realizing difficulties to improve user retention and charge users for content, BETA decided to monetize games with advertising. Looking abroad for partners was necessary due to the lack of specialized domestic firms in this field. This was a stressful process, because of time zone and currency issues, but facilitated BETA's entrance in new markets. Meanwhile, BETA works on product development to increase its capacity of retaining users and making them profitable:

BETA's director: "We're making larger, more complex games ... with better quality art, sound ... all the game features designed to try to keep users in our game longer so that they want to play more and, in this case, also spend more."

"We run a lot of tests [using our userbase]. We have an analytics system from which we take data to analyze."

BETA also found a way to systematize the knowledge that resulted from its development efforts and organize it in a way that it can be retrieved easily:

BETA's director: "We improved so much, creating libraries, creating ready-made packages ... that now it's easy to incorporate them into a game (...) I even think this is our differential, this knowledge that we already encapsulated."

In this sense, we consider that BETA's narrative features evidence of three upgrading events, two related to processes (development of a library of features and international partnerships for monetization) and one to products (development of more complex games).

5.1.3. GAMMA

GAMMA started operating with a focus on serious and advergaming and has several multinationals as clients. Close communication with clients seems key to its main activities:

GAMMA's director: "Many times the client just wants us to do it, they do not want work. (...) Other clients want to participate, to get involved in the project. We prefer when the client gets involved (...) otherwise it always results in rework".

However, the importance of close contact with clients did not prevent GAMMA from systematizing its approach to game development in leveraging the modularity of digital technologies. This makes it able to customize its games quickly and at scale:

GAMMA's director: "We have something that is almost a game template, and we have the know-how... our team can adapt this template quickly. So, we are able to reduce our price and make it almost like in a production line."

In the spirit of looking for opportunities with more scalability, GAMMA recently started to produce core games as well and already makes at least 10 % of its revenues in this segment, developing proprietary IP. The dynamics of this segment is different from what it was used, so GAMMA decided to rely on specialized partners to publish these games:

GAMMA's director: "Working with a Publisher is something optional, but they will bring you money, contracts, networking, marketing budget for advertising your game... some things that sensibly enhance your project's success rates, commercially speaking. (...) If you just think of uploading your game to the store, publishing is easy... but the discoverability of your game, or the ability to be discovered, is zero when you publish it."

By partnering with an Italian publisher, GAMMA has been able to take its games to exhibitions abroad and do business with foreign clients, including one from Germany and another one from the Netherlands. On its side, GAMMA has been investing in features that it believes can make its games globally competitive:

GAMMA's director: "You must have a good product to obtain some result... And 'good' stands for technically competent but it must also exhibit some differential (...) This quiz which we are developing is reaching a global level".
"Our game is filled with analytics tools. (...) We monitor everything in the game, everything... and this will generate a lot of insights"

To sum up, GAMMA's report includes four upgrading events, two corresponding to process (template for game solutions and partnership with foreign publisher) and two to product upgrading (development of proprietary IP and games targeting a global audience).

5.1.4. DELTA

DELTA started operating with software services and soon moved into game development, first developing for computer platforms and then for consoles. It has always worked with core games and is one of the most well-known independent Brazilian developers. DELTA was originally assisted by an external publisher but a bad experience with this model made it choose to internalize this function:

DELTA's director: "The publisher we used not only cheated us but did not pay us either. It still sells our game without paying us. It never provided a sales report (...) This intermediary is a black box that does what it wants (...) It will take all information and you end up on its hands".

Relying on its own resources, DELTA's revenues are only marginally sufficient to cover its expenses. However, this has not prevented it from collecting multiple awards with its games and being the first Brazilian developer to integrate the global community of developers of one of the three major global console manufacturers. Co-creation with final users

was part of this success, as it drew DELTA's attention to important features missing in its games.

DELTA's limited resources did not keep it from diversifying into other industries either, leveraging competencies developed through its main activity. Specifically, DELTA's director edited a book that brings together technical and managerial advice for independent developers:

DELTA's director: "It comes with six digital interviews, four written interviews, management programs documentation, market research documentation. (...) I make a basket of products in which each one generates a slightly higher value [to users]. (...) You need to make it in a way that a person reaching your company receives more than a game".

In this sense, it is possible to perceive evidence of three upgrading events in DELTA's trajectory, one product (award-winning game), one functional (internalization of publishing activities), and one inter-sectorial (development of game-related products in other industries).

5.2. Results of the cross-cases analysis

The four firms totaled 15 upgrading cases (five from ALPHA, three from BETA, four from GAMMA, three from DELTA). Besides reflecting major upgrading types reported in the literature, these cases reproduce attributes of digital industries that appeared in our previous discussion. The cross-cases analysis allowed us to group the reported upgrading events according to their technology scope and relate them to the themes addressed in our initial propositions. In some situations, a given upgrading case fitted more than one theme. This was predictable since our model (Fig. 1) implied that SME upgrading may benefit from digital technologies in various ways. We go through this analysis for each proposition.

5.2.1. Digitization and reduced asset specificity

Based on the effect of digital technologies on the dynamics of asset specificity in value chains, we initially anticipated that fully digitized value chains empower suppliers to pursue upgrading opportunities more than do partially digitized ones, thanks to an increased accessibility to valuable resources and modularity patterns. Our empirical evidence (Table 2) seems to support such ideas and allows us to further refine them. For instance, the investigated firms indeed take advantage of digital transactions to explore new possibilities, turning to foreign markets to procure development capabilities (ALPHA), monetization services (BETA), and publishing services (GAMMA). The internationalization reported by ALPHA, which exemplifies the only partially digitized value chain among these cases, involved an activity that benefits from digitization (i.e., technology development). These results illustrate Pagani and Pardo's (2017) discussion about digitization's effects related

Table 2
Effects of digitization for value chain organization and coordination.

Attributes of digital industries	Specific effects	Upgrading promoted	Firms featuring upgrading cases (Digitization degree)
Easier access to valuable resources and activities	Reduced costs for complex transactions	Internationalization of activities (Process)	ALPHA (Partial)
	Easier ways for monitoring final users	Production of globally competitive games (Product)	BETA (Full)
Modularity	Simplification of requirements and information exchange	Modularization of resources and capabilities (Process)	GAMMA (Full)
	Resources released to new projects	Development of proprietary IP (Product)	DELTA (Full)
			ALPHA (Partial)
			BETA (Full)
			GAMMA (Partial)

to a reduction in the costs of complex transactions. Similarly, the full digitization of casual and core games' value chains allows BETA, GAMA, and DELTA to easily track their end-users and identify relevant ways to explore their markets. In DELTA's case, it was the use of analytics tools to map users' behavior that allowed this firm to find out that its major game was being illegally commercialized.

ALPHA, BETA, and GAMMA also provided support for the modularity argument. ALPHA's and GAMMA's approach to modularity did not release them from the influence of their clients' requirements but allowed them to address these requirements more easily. Accordingly, ALPHA's modular product development and GAMMA's game template reduce the need for the relational governance that GAMMA's director suggested as important. For BETA, however, modularization represents true autonomy and helps it in operating across various platforms, as put by BETA's director: "It is almost like only pushing a button, so it does not make sense for us to not put our games also into [Windows Phone and Android] (...) If it represented an enormous effort, I would say we would use only Apple's iOS." This kind of autonomy makes the attraction and maintenance of key developers a concern for platform owners (Hyrynsalmi, Suominen, & Mäntymäki, 2016). For ALPHA, modularization in the organizational domain also enabled product upgrading by releasing resources to IP development.

Despite these reports, it is noticeable that the upgrading cases that relate to an easier access to valuable resources and activities promoted by digital technologies are more numerous than those based on modularity. Moreover, they also include cases reported by the four firms. This does not mean necessarily that modularization is a less relevant upgrading mechanism, particularly because this is not quantitative evidence. Yet, such a scenario may indicate that resource access is more directly connected with upgrading opportunities than modularity. In fact, modularization may have a dangerous side if one considers that it simplifies the link between design and performance, facilitating imitation and reducing the competitive advantage of investments (Pil & Cohen, 2006). Modularity can also induce commoditization of processes and designs if it implies standards that lead most companies in an industry to operate essentially the same way (Markus & Loebbecke, 2013). Therefore, it makes sense to consider that upgrading may be more likely when firms explore the reduced asset specificity promoted by digital technologies specifically to access valuable resources and activities. Our empirical evidence suggests that this can result in both processes and product upgrading. In light of this, we rewrite our original proposition as follows:

- **Updated P1.** By focusing on accessing valuable resources and activities through transactions simplified by digital technologies, SMEs in fully digitized value chains experience greater autonomy to pursue process and product upgrading opportunities than SMEs in partially digitized ones.

5.2.2. Digitization and market disintermediation

From our discussion of the effects of digital technologies on the (dis)intermediation of markets, we initially expected that fully digitized value chains benefit suppliers' autonomy more than partially digitized ones thanks to the possibility to experiment with new business models and value drivers outside lead firms' influence. Our empirical evidence (Table 3) also seems to support this line of reasoning and offers insights that refine it.

A major example of the dynamism in business model choices is ALPHA's and GAMMA's expansion into fully digitized value chains with proprietary IP, following their search for better business opportunities. Differences in firms' approaches to publication activities provide another example and contrast the internalization choices made by ALPHA and DELTA with GAMMA's preference for keeping it external. Regardless of their choices, these cases indicate decisions manifesting firms' autonomy. The mentioned examples come mostly from fully digitized value chains, which have been associated with multiple

Table 3
Effects of digitization for value creation drivers.

Attributes of digital industries	Specific effects	Upgrading promoted	Firms featuring upgrading cases (Digitization degree)
Business model innovation	Diversification of offerings in new business segments	Development of proprietary IP (Product)	ALPHA (Full) GAMMA (Full)
	Facilitated internalization of new functions	Internalization of publication activities (Functional)	ALPHA (Partial) DELTA (Full)
Value in collaboration and communities	Improved value generation from products with the interaction with communities of users	Production of globally competitive games (Product)	BETA (Full) GAMMA (Full) DELTA (Full)
	Improved value capture when collaborating with firms in other positions of the value chain	Moving into a position of publisher company (Functional)	ALPHA (Full)

alternatives for monetization and marketing strategies (Rietveld, 2018; Yi, Lee, & Kim, 2019).

The importance of developing and maintaining communities for value creation in fully digitized value chains appears in the relevance of BETA's large base of users as one of its most strategic assets, making it possible to run experiments and capture insights to upgrade its games. GAMMA and DELTA are in a similar situation, as they also use analytic tools to map their final users and interact with them to get insights for new features. In addition to that, ALPHA's transition into a publisher function exemplifies the relevance of collaboration for value generation. This is a value chain position that has been weakened by the advent of digital distribution (Broekhuizen et al., 2013; Parker et al., 2014) and can be used to exploit developers (like attested by DELTA). ALPHA not only provides arms-length services but assists developers in maximizing their games' commercial potential while preserving their products' identities.

It is interesting to see that the evidence in Table 3 encompasses both product and functional upgrading cases. This empirical result may shed some light on different ways through which firms can take advantage of markets disintermediated by digital technologies to upgrade in their value chains. According to Gu & Zhu, 2021, little is known about what firms do and how they survive in disintermediated markets, "perhaps because of the difficulty of observing and measuring disintermediated transactions." To this extent, our empirical evidence suggests that the freedom of action enabled by digital technologies allow firms to focus on developing new products at their discretion and equipping these with features that feed from information collected in distant parts of the chain. It also seems that these firms can take advantage of disintermediated markets to internalize new functions and move along the value chain. We thus update our original proposition to reflect these insights:

- **Updated P2.** Freedom to experiment with new business models and value drivers outside lead firms' influence allow SMEs greater upgrading autonomy in fully digitized value chains than in partially digitized ones, which they can leverage through product development efforts or by internalizing new functions.

5.2.3. Digitization and broader innovation processes

Due to effects of digital technologies on innovation processes, we initially considered that fully digitized value chains foster SMEs'

upgrading autonomy directly more than partially digitized ones, thanks to the effects of digital convergence and generativity. Again, our empirical evidence (Table 4) seems to support this understanding and enriches it.

At the time of the interview, ALPHA was investing in a game to leverage users' experience inside cinemas with quizzes to be played before movies started. GAMMA, in turn, invested in a game that would use up-to-date information from football championships to stimulate competition among friends. These anecdotal examples show how firms may coordinate experiences from distinct media in proprietary products and promote superior value for end-users in fully digitized value chains (Marchand & Hennig-Thurau, 2013; Nylén & Holmström, 2015). DELTA's inter-sectorial upgrading is even more sophisticated in this aspect, as it materialized the aim of coordinating the firm's different offerings as parts of a unique experience from the users' viewpoint.

Generativity can also be detected in previous examples. When talking about ALPHA's IP development, for instance, its CEO described the potential of internal spillovers from other projects: "If a customer is asking [for a new feature or product], why don't we already develop it considering to turn it into a product?" The modular thinking that ALPHA applies to product design injects further generativity into its development process and opens its games to unplanned expansions. The monitoring of users reported by BETA, GAMMA, and DELTA also represents generativity mechanisms, as they provide channels for insights that can motivate product adaptations that inspire superior products.

The fact that the upgrading cases in Table 4 only illustrate fully digitized value chains could raise validity concerns, particularly regarding whether they map the phenomenon of interest correctly (Welch & Piekkari, 2017). In this sense, it is important to remember that partially digitized DGI value chains are characteristic of games produced to meet clients' requirements. These games are bounded by clients' IP and scope, and target specific groups of end-users, which reduces the likelihood of the upgrading events featured in Table 4. This does not imply that convergence and generativity cannot benefit firms in partially digitized chains, but only indicates the stronger influence of project clients as leaders of such chains. It may be possible, for instance, that developers can explore convergence when their clients give them freedom to create using resources from multiple media. They may also receive orders for a game that targets the global market, which will favor generativity. Hence, one should consider that our results actually reflect effects of the digitization degree of SMEs' value chains (fully vs. partial) instead of differences in their market segments (entertainment vs. practical games).

Yet, it is worth noticing that product upgrading cases dominate the

empirical evidence listed in Table 4. Even the intersectorial case reported by GAMMA can be related to product development, given that such an upgrading was supported by new products that the firm offered to value chains of the new industries it was entering. Accordingly, upgrading events sometimes build on one another and can be difficult to distinguish entirely (Gereffi, 2019). For the present discussion, noticing that the cases in Table 4 are mostly about (or related to) products helps us narrow our initial arguments about how firms can leverage the convergence and generativity that digital technologies introduce in innovation processes. Although such innovation processes may, theoretically, enable various kinds of upgrading opportunities, including acting in value chains of different industries, it seems that product development is a mechanism through which such opportunities can be pursued. This is especially interesting to notice here, with cases collected from firms operating in an industry where products are not physical. Against this background, we suggest a new specification for our proposition:

- **Updated P3.** Digital convergence and generativity allow SMEs greater upgrading autonomy in fully digitized value chains than in partially digitized ones, which they can leverage through product development efforts.

6. Discussion

As it is usual with case studies, our analyses do not allow general population inferences. Nevertheless, the empirical evidence that we collected suggests that the autonomy enabled by digitization is a key element that SMEs can leverage in their value chain upgrading. Received GVC-related IB literature does not include specific theoretical mechanisms to account for upgrading efforts such as those reported by our case firms, whose existence challenges the traditional IB's focus on leading multinationals over supplier SMEs, as well as the idea that SMEs' initiative depends on their lead firms' strategies and incentives. Conversely, it is necessary to acknowledge that these firms may demonstrate autonomy, which according to Oliver (1991, p. 945) "reflects extensive organizational control over internal decision processes and minimal commitment of resources to satisfying an external demand or sustaining an external linkage." For RDT, a firm achieves autonomy by offsetting external power imbalances and becoming more powerful on its own (Pfeffer, 1992; Ulrich & Barney, 1984). If high value chain digitization increases a firm's autonomy compared to a situation of lower digitization, therefore, one could identify a corresponding difference in the power levels that a supplier enjoys in relation to the value chain leader in each situation.

The higher autonomy of game developers to upgrade in fully digitized value chains, for example, reveals a reduced dependence on their lead firms compared with what a developer experiences in partially digitized value chains. We see in this situation an opportunity to establish the concept of *digital power*, meaning the potential difference in the power imbalance that a supplier may experience in relation to its lead firm when performing similar functions in value chains with different digitization degrees. Digital power summarizes the mechanisms outlined in our propositions and implies a change in the balance of power in favor of suppliers when digitization increases. This change is said *potential* as it is likely to depend on the SME's ability to leverage digital technologies, as well as on the actual exercise of its possibilities. While the first point accepts that not all SMEs can mobilize digital technologies in their benefit (Foster, Graham, Mann, Waema, & Friederici, 2018), the second one acknowledges that not all firms that can do so actually do it (Provan, 1980). Therefore, digital power represents latent potential that needs to be accessed and enacted.

Although digital power could be deployed by any firm in subordinate value chain positions in different industries, the narratives of our case firms reveal two potential contingencies. One is the business model of the lead firm in the highly digitized value chain. Our case firms were

Table 4
Effects of digitization for suppliers' upgrading strategies.

Attributes of digital industries	Specific effects	Upgrading promoted	Firms featuring upgrading cases (Digitization degree)
Convergence	Coordination of experiences from distinct media in a single product	Development of proprietary IP (Product)	ALPHA (Full) GAMMA (Full)
	Coordination of experiences from distinct media across combined offerings	Entering value chains of other industries (Inter-sectorial)	DELTA (Full)
Generativity	New products generated from byproducts of the development process	Development of proprietary IP (Product)	ALPHA (Full)
	Adapted products incorporating market insights from the monitoring of users	Production of globally competitive games (Product)	BETA (Full) GAMMA (Full) DELTA (Full)

able to take advantage of the full digitization associated with entertainment games particularly because these segments are led by platform firms, which allows for a scalable and efficient use of digital resources. It is theoretically possible to find highly digitized value chains not led by platform firms, since the definition of digitization degree does not impose requirements on the business model of any firm in the value chain. In that case, supplier SMEs may find limitations in the exploration of digital assets.

Another contingency is given by additional dependence relationships that may tie SMEs' autonomy besides that with lead firms, as it was illustrated by DELTA (and to some extent by GAMMA as well) regarding publishers' influence over developers. It was interesting to identify this theme in our empirical study, since accounts of the DGI indicate a declining relevance of publishers with the advent of digital publication. One could expect to find similar phenomena in other industries, since firms act embedded in a network of dependencies, as put by Pfeffer (1992). The same idea is present to some extent in the GVC framework (Sturgeon, Van Biesebroeck, & Gereffi, 2008) and is clear in the explicit representation of networked production structures in the GPN framework (Coe & Young, 2015). Such additional dependencies may limit the possibilities unveiled to suppliers by digital power.

Altogether, we propose an updated model (Fig. 4) that merges our updated propositions with these lessons from our empirical cases. This model sees SMEs' upgrading autonomy as a function of their digital power, their lead firms' business models, and other external dependencies possibly affecting them. Following our updated propositions, SMEs' digital power seems to be wielded mainly when these firms leverage their available autonomy by developing their processes, internalizing new functions, or investing in product development. The influence of lead firms' business models and other external dependencies are likely to be industry-dependent and could offer interesting research paths.

7. Final remarks

In this paper, we investigated whether and how digitization affects the power dynamics involved in SME upgrading. Our cases supported that value chains with higher digitization degree amplify SMEs' upgrading autonomy and added insights that refined and developed our theory-driven propositions. In doing so, our paper contributes to advance the GVC-related IB research regarding the relatively unaddressed effects of digital technologies on power dynamics in value chains (Kano et al., 2020). Among the few attempts to understand this issue, one showed how digitization may impose requirements beyond the capabilities of marginalized suppliers in traditional industries (Foster et al., 2018), while others acknowledged that small providers may find development opportunities in digitized industries but tied these opportunities to lead firms' incentives (Li et al., 2019). In our study, digitization not only holds positive outcomes for SMEs but allows them room to act autonomously. Although our results may benefit from the fact that we selected an industry that is on average more digitized than traditional ones, scholars should see our results as a reminder of the possibilities that digitization could configure. They should view digital power as a potential to be accessed and unlocked.

Besides that, we contribute to advancing the extant understanding of the dynamics and nature of value chain upgrading as a phenomenon. Because digital power can be conducive to opportunities outside lead firms' influence, it may lead to upgrading that generates more value than that which existed previously in the chain. Such upgrading produces a surplus that in principle does not need to be shared with lead firms, with value creation being a more relevant issue than value capture. This is an important change of perspective, since extant literature see upgrading mostly as involving some dispute or bargain between supplier and lead firm for value capture (Coe & Yeung, 2019; Dindial, Clegg, & Voss, 2020; Gereffi, 2019). It is true that authors such as Foster and Graham (2017) criticize a focus on digitally-enabled value creation and enhancement in value chains over analyses of how value capture happens. We nonetheless maintain that, when it comes to initiatives within the scope of the autonomy available to SMEs, it seems reasonable to expect that (mostly) all value created is also captured by them.

We encourage future research testing our updated conceptual framework (Fig. 4) across industries, especially to specify the influence of lead firms' business models and additional external dependencies on SMEs' autonomy in digitized value chains. Non-platform firms have captained the digitization of traditional industries like automotive, consumer goods, and healthcare, updating old practices and introducing new ways to deliver value using digital technologies (World Economic Forum, 2016). Each of these industries may offer different scale and scope constraints on suppliers' initiative. Besides actors providing financing and advice to suppliers like do publisher firms in the DGI, actors enforcing ethics and privacy principles may also operate to different extents in each industry context and could be important to fully understand suppliers' use of digital power.

Practitioners may be interested in our findings as they point to the existence of a latent potential to be collected by SMEs in highly digitized industries, and which can be accessed in different ways. In fact, the dimensions of digital power detailed in our propositions seem relatively independent of each other, as we saw that upgrading events can be driven by only one or a combination of them. Hence, managers should access their power imbalance situation and focus efforts on the dimension of digital power that is more favorable to them. Policymakers may have important roles to play in helping SMEs in this process of seizing and enacting digital power. In reasonably well-digitized industries like DGI, SMEs may already have the capabilities to access the potential of their digital power, or these capabilities may be easily available to them through the circulation of knowledge and technology in their industries. Public policies in such a context should focus on helping SMEs understand ways to convert the potential of digital power into action. In more traditional industries, in turn, the scope for digital power is probably lower and SMEs may need specific aid to build the capabilities to seize such potential in the first place. This implies the need for more basic and focused training for the development of the required capabilities, which is an issue that policy-making actors could address.

Our study has several limitations, starting with the qualitative methodological design. Such a choice means that our findings can uncover new theoretical mechanisms for the phenomenon in focus but say little about population patterns (Pauwels & Matthyssens, 2004; Tsang, 2014; Yin, 2014). Although our research design is aligned with our

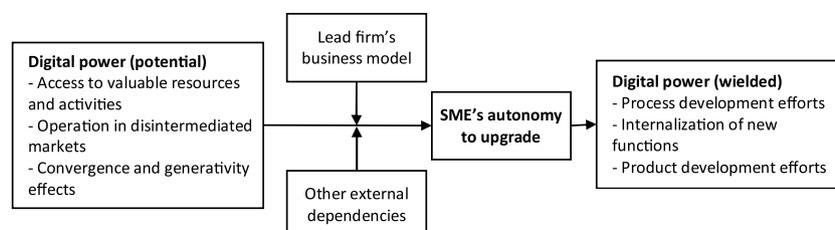


Fig. 4. Updated conceptual model for upgrading in a digitized industry.

research goals, future studies should explore our findings with quantitative designs if statistical inferences are desired. Besides, our findings are also bounded by our focus on small firms vested in the role of value chain suppliers. In what concerns large suppliers, additional research is needed, especially in traditional industries that are going digital.

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