Innovating in Digital Platforms: An Integrative Approach

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Abstract: Increasing competitive pressures are leading companies to innovate through digital platforms. The dominant theme within extant research on innovation in these platforms conceptualises two different processes: Generativity (Tilson et al., 2010; Yoo et al., 2012) and generification (Hanseth and Bygstad, 2015; Pollock et al., 2007). Each of the conceptualisations gives extensive accounts separately, but they have questionable ability to provide a full understanding of innovation in digital platforms when there is a plural occurrence of these processes (Sørensen and Williams, 2002). Drawing on an analysis of rich archival data complemented by interviews reporting five-year relationship between a platform owner and its customer, we revisited underlying assumptions of its processes. We argue that generativity and generification are related to each other in a constant flux in which one fuels the other. In this relation, control has new roles other than as key factor for innovation productivity (cf. Eaton et al., 2015; Yoo et al., 2012), and it is subordinated to the purpose of innovation. As a consequence, innovation purpose seems to constrain the 'control vs autonomy' paradox (Lyytinen et al., 2017).

1 INTRODUCTION

Scholars in Information Systems (IS) argue that competition today is increasingly promoting innovation associated with a platform (de Reuver, Sørensen, and Basole, 2018). Large-scale 'consumer' platforms of leading digital companies "such as Google, Facebook, and Apple" (Yoo 2013) seem to aim at attracting the largest crowd of consumers possible by becoming the 'one-stop shop' for any possible computing need. The type of innovation that surrounds these platforms has been called 'generativity' (Tilson et al., 2010; Yoo et al., 2012). Generativity presents not just innovative and often disruptive outcomes, but also struggles to generate them. These conflicts conform a set of intertwined paradoxes intrinsic to digital platforms (Lyytinen et al., 2017), which generative performance depends on the delicate balancing and reconciliation of these tensions.

In 'corporate' digital platforms such as Enterprise Systems (ES), there is another type of innovation process, known as 'generification' (Hanseth and Bygstad, 2015; Pollock et al., 2007), which makes digital platforms able to work across many different contexts, accessing new markets and new customers.

While sympathetic to these two conceptual frameworks, we are dissatisfied with their research approaches: Generativity and generification were studied as if they occur in isolation. Innovation — its processes and outcomes — are shaped by the interrelationships of an array of social and technical factors that are all configured *together* (Sørensen and Williams, 2002). Therefore, as long as there are evidences that generativity is also found in corporate digital platforms (e.g. Törmer, 2018) along with generification, isolated frameworks are doomed to capture only partial accounts of innovation. We thus want to know, how do generativity and generification relate to each other? How are they performed and what does motivate such performances?

In this paper, we address these questions through a case study of a five-year relationship between two organisations (a platform owner and its customer) around co-developments in a corporate digital platform — Enterprise Resource Planning (ERP), a type of ES. By exploiting rich archival data complemented by interviews, we could look across the processes of generification and generativity, identifying how and why those two firms innovate. The evidence presented in this article suggests that there are new roles for 'control' other than as key

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factor for innovation productivity (cf. Eaton et al., 2015; Yoo et al., 2012), in which control is subordinated to the purpose of innovation. As a consequence, innovation purpose seems to keep the 'control vs autonomy' paradox (Lyytinen et al., 2017) latent (Smith and Lewis, 2011), expanding our knowledge on how these paradoxes (not) manifest themselves. Through linking all these elements, we derive a model of the circular dynamics of innovation in large-scale corporate digital platforms in which generativity and generification work in tandem and fuel each other.

2 PLATFORM INNOVATION

Organizations are immersed in a world in which its very fabric is increasingly composed of digital platforms (Parker et al., 2016; Tiwana, 2014). Virtually all organizations have some degree of digital technologies taking care of their operations (Orlikowski and Scott, 2008), and many have digital platforms as part of the core of their products and services (de Reuver et al., 2018). These platforms are said to produce innovation "that were not originally imagined by themselves" (Yoo 2013, p.230).

Digital platform is a concept in development. It can be seen as a sociotechnical association involving technical components (e.g. software and hardware) and related organisational processes and standards (Tilson et al., 2010) that enable value-creating interactions between external producers and consumers (Constantinides et al., 2018). We unpack innovation processes — generativity and generification — found in the IS literature of digital platforms as follow.

2.1 Generativity

The notion of generativity was originally coined by Zittrain as "a system's capacity to produce unanticipated change through unfiltered contributions from broad and varied audiences" (Zittrain 2008, p.70). The key examples often discussed in the literature are of how Google, Facebook, and Apple deliberately created digital platforms that were generative, acting as a 'disrupting force' (Remneland-Wikhamn et al., 2011).

Although the original idea suggests rather chaotic developments, recent accounts of the term propose that generativity can have a 'balance of controls' (Tilson et al., 2010), or a 'curation' (Eaton et al., 2015; Parker et al., 2016) of its innovation. By curating the supply of complements, a platform owner at the same time keeps centralised control over apps acceptance and facilitates (reasonable) developer autonomy to innovate (Lyytinen et al., 2017).

Despite platform owner's agency, curation effectiveness is determined by the action and reaction of other (multiple) actors as well, i.e. the understanding of the dynamics can only be possible if all actors are observed simultaneously (Eaton et al., 2015). Bygstad (2017) argued that generative technology per se has only 'latent' generative capacity, which is unleashed when collective actions of agents on their interpretation and use of technology eventually produce innovation.

Bygstad (2017) also discussed generativity concept under 'heavyweight IT' knowledge regime, the one that we relate to 'corporate' platforms since it is "enabled by systematic specification and proven digital technology" and focused "on requirements, reliability and security" (pp.181-182). Yet these examples have induced different kinds of insights, e.g. generativity is very different when the co-developer is a customer. Through licensing that grants a right to use (and modify) the platform (Machal-Fulks and Barnett, 2012), software vendors make available 'copies' of their platforms to customers, which then become in charge of the platform management. At firm level of analysis, generativity seems to be an autonomous, 'private' process in which customer acts similarly as software vendors in selecting and maintaining all add-ons. Generative components are in general co-developed in commissioned projects with software vendors and/or partners (IT consulting firms).

What the literature points to is how generativity within the organisational context seems to be substantially different from its initial application in the Google, Facebook and Apple cases. We foreground some of these differences through describing a concept that in many respects sits at the other end of the spectrum to generativity – that of 'generification'.

2.2 Generification

The notion of 'generification' was a conceptualisation that sought to show how the same software platform could be extended and applied for use by the broadest set of users (Hanseth and Bygstad, 2015; Pollock et al., 2007). Whilst software technologies are often born for single organisations (e.g. Ellingsen and Monteiro, 2012), they can be

suitable for more than one customer or sector. This scalability compels software vendors to gather requirements for the broadest set of possible needs, e.g. firms in the same industry, and the interconnection among them (Bygstad, 2017). It represents an increasing challenge to continuously evolve specialised industry skills to keep servicing many markets (Evans et al., 2006) while promoting an integration of this varied expertise (Tiwana, 2014). To approach this challenge, vendors usually involve customers and partners early in the design phase. However, rather than incorporate unfiltered contributions (cf. Zittrain 2008) they would carefully select and control which customers (Johnson et al., 2013), partners (Ceccagnoli et al. 2012; Sarker et al. 2012), and their respective innovations to include in the actual platform. They chose not only those bits of functionality that were missing from the platform and necessary for the new context but those that would make the system more 'global' (e.g. attractive to the largest number of existing and potential users in any geography).

Likewise, in contrast to the idea that products and services would move in direction not originally imagined by themselves (cf. Yoo, 2013, p.230), the vendor would make strategic choices about which sectors and industries they wished to enter. In travelling to a new sector, the platform would be incomplete by design (Scott and Kaindl, 2000). Being global means capturing the most common functionalities for the targeted market, leaving idiosyncratic demands behind. Some abandoned functionalities may be considered compulsory to some customers, opening room for procurement of alternative, off-the-shelf solutions (Light et al., 2001), or for 'home-made' developments. One way or the other, generification process would begin again, selecting further user innovations that would help it to move to the next user, sector, industry, etc. (Pollock and Williams, 2009).

Generification is not unproblematic (cf. Ellingsen and Monteiro, 2012; Pollock et al., 2007), nor is generativity (cf. Eaton et al., 2015; Remneland-Wikhamn et al., 2011). The performance of both processes is surrounded by struggles and conflicts, which can be viewed as 'paradoxes'.

2.3 Paradoxes

Over the last decade IS scholars have so far revealed a great concern on issues related to the expansion (heavily based on innovation) and control of digital platforms (e.g. Boudreau 2012; Hanseth and Bygstad 2015), identifying some of them as paradoxes (e.g. Tilson et al. 2010; Wareham et al., 2014; Zittrain, 2008). Lyytinen et al. (2017) acknowledged the importance of the issues related to the expansion and control of digital platforms. The authors argued these issues are part of a more complex interaction of four different paradoxes entwined and mutually constitutive of the dynamics of digital platforms: (1) fixity vs variety, (2) stability vs change, (3) local vs global, and (4) control vs autonomy. The last one seems to be especially relevant to our research here.

Control vs autonomy paradox presents conflicting forces opposing centralised and distributed control (or individual autonomy). Empirical studies on this matter (e.g. Eaton et al., 2015; Lyytinen et al., 2017; Tilson et al., 2010) had consumer digital platforms as their settings, and affirmed that control is a key factor for generativity performance. Authors argued that, on one hand, many innovative apps may not survive platform owner's curation, and the more it gets restrictive, the more it discourage further developments (Eaton et al. 2015; Yoo et al. 2012). On the other hand, less restrictive curation may allow low-quality or even malicious apps to enter (Eaton et al. 2011), leading to negative customer experience and potentially harming platform's reputation and economic sustainability (Boudreau 2012).

It is not clear to what extent this paradox can be seen in corporate digital platforms. We will examine these characteristics further with empirical material.

3 RESEARCH CONTEXT AND METHODS

The following is a single instrumental case (Stake, 1995) in which an ERP is crafted by a global software vendor and a large British university. The case was chosen because it involves fundamental elements of the studied phenomenon (cf. Yin 1994): both generification and generativity innovation processes are present. The data are archival, composed of 2,000 e-mails, contracts, business presentations, along with information from the websites of the co-development actors, other ERP vendors, industry analysts and specialised IT media, all collected over five years. Eight additional interviews with key actors (operational and C-levels), ranging from 29 to 137 minutes with an average length of 68 minutes, were recorded, transcribed and added to the body of data.

The data, then, was inductively analysed following the assumptions of grounded theorising (Eisenhardt, 1989; Glaser and Strauss, 1967) and continually compared with insights from the literature. In vivo phrases and terms mentioned by informants produced first-order codes (Van Maanen, 1979) with the use of NVivo 12, a qualitative data analysis software. The goal was to understand what actors did in their interactions for technology co-development and how they justified them.

The second round of coding was a result of the comparison of in vivo codes with both themselves, to underline emerging concepts and their interrelationships. At this point, we also derive the emergent categories by comparing our data with existing theoretical frameworks. This favoured a consolidation of some in vivo categories into a set of second-order notions. This included identifying various ways whereby co-development activities are performed and the motivation underlying such performances.

As we recognised links and interrelations between second-order categories, we could consolidate these into larger groupings, which conforms our insights at a more abstract level (Ryan and Bernard, 2003). This more logically ordered set of categories thus obtained focused on how organisations manage the innovation in corporate-type platform. This finally led us to identifying as overarching themes the controlling mechanisms and the purposes of the innovation. The final coding structure for each innovation process is brought by Table 1 (the controlling mechanisms) and Table 2 (the purposes).

Table 1: Controlling Mechanisms - What Actors Do.

	First Order	Second Order	Overarching Theme
GENERATIVITY	"design, specification, templating, documentation", "workshops, notes, sign-off, specifications", "an idea of the scale of the work", "Blueprint", "scope for the project"	definition of innovation scope	controlling mechanisms of innovation processes in corporate digital platforms
	"The HE market is particularly difficult for a generic software house to crack", "most high-profile of the suppliers around", "market leader", "address our business problem"	identification and allocation of suitable resources	
	"symbiotic partnership", "cannot accept the revised wording", "do not see the same scope for the project", "Blueprint is now 4 weeks later than originally planned", "The financial projections for the project have gone horrendously awry", "polarised state", "transfer our knowledge, documentation and other resources", "fighting to keep the costs down", "cutting out functionality to meet a specific price", "developed/implemented"	resource orchestration and conflict management	
	"not only in the UK, but also in Europe and probably worldwide", "a lot of firsts", "70% overall discount", "reduce the cost of the over-run on the project", "Lower total cost of ownership", "really attractive product", " revenue stream", "change their business", "making a value out of an IT implementation", "something which creates a real win-win", "superb solution to a vitally important issue which faces all Universities"	identification and exploitation of benefits emerged from co-development	
GENERIFICATION	"methodology in … software development", "you do a plan for that product", "scenario descriptions", "use cases", "The specification describes how the software should work", "Depending on the requirement", "customer requirement", "verify what you know about the process", "to put something in the standard product, it must be so much more general, must be customise-able, there must be some configuration options in it", "community meetings"	definition of innovation scope	
	"certain sense of cooperations", "a bit visionary", "leader or early adopter", "experts on the subject", "somebody who is kind of in the mainstream"	identification and allocation of suitable resources	
	"sense of cooperation", "partnership", "overlaps with your interest", "committed", "too costly", "not manageable", "software costs", "implementation costs", "development partners", "need our support", "idiosyncrasies could be accommodated", "being able to influence"	resource orchestration and conflict management	
	"business case", "strong reference", "intended to be a global product", "entering the HE market globally", "win new customers", "they want to sell it more", "make money on it", "there's a need for a product", "value of the development", "as flexible as possible", "functionality can be configured in more than one way"	identification and exploitation of benefits emerged from co-development	

Table 2: Innovation Purpose - Why Actors Do What They Do.

	First Order	Second Order	Overarching Theme
GENERATIVITY	"commercialisation to mutual benefit", "toss in the MBA item", "potential 'win bonuses' or 'payments'", "becoming a 'Centre of Excellence'", "shared financial rewards", "we receive £1,000 per visit for this"	additional opportunities emerged from co-development	purposes for co-innovating in corporate digital platforms
	"role as a 'partner' in the 'development' of leading edge . . . applications", "if we block their development in the HE sector them we are doing a dis-service to the community...", "Best Public Sector Project", "improve our position as a reference site"	increase of influence and reputation	
	"address the most critical Business issue within the University". "maximise the benefits", "The purpose: to drive growth and enhance its competitive edge", "very best back-office systems (to support students, researchers and administrators) in the world", "the VALUE which the . . . solution is bringing to our recruitment Income stream", "This has a real value to a seller"	achievement of organisational goals	
GENERIFICATION	"able to influence campus management", "policy meetings and practition meetings", "every major UK University is very aware of what we are doing!", "we continue to enhance our reputation as one of the United Kingdom's leading educational institutions", "the first of a very small number of global Universities to become 'development partners'"	increase of influence and reputation	
	"it brings in revenue", "leverage our investment . . . to support our strategy for profitable growth", "it needed to replace its Student Record system", "The new integrated solution covers nearly all student administration and accounting processes", "replaces a number of disparate in-house and niche products, and their associated interfaces"	achievement of organisational goals	

4 FINDINGS

Universities are no different from other large organisations. They have complex operations and the adoption of a corporate digital platform – an ERP – was the chosen alternative for many of them to confront this complexity. It was the case of a large British university, UniBrit, which selected their ERP from GlobalSw, a global leader in corporate platforms. Until then, GlobalSw's market leadership was reached in sectors other than Higher Education, and so the vendor had signalled intent to invest in developing its software to meet specific needs of this new market.

Short after, during the implementation of UniBrit's ERP, the university was invited by GlobalSw to take part in the development of the Higher Education System (HES) as a 'developer partner' in a small group composed of analysts and programmers from GlobalSw and few other large, famous universities from diverse countries. UniBrit engaged quickly and was particularly active in the development, contributing materially and critically.

HES was meant to be the complimentary system specific for campus management that would be seamlessly integrated into the ERP platform. Therefore, it comprised not only developing new functionalities but also tailoring some of existing modules in a way to meet new requirements and provide necessary integration.

4.1 Recipe for Generification: Recycling, Creating, Failing, Trying Again

A new development does not necessarily starts from scratch. GlobalSw has grown its software portfolio overtime largely enough to employ its components as recyclable building blocks of new products. A GlobalSw's developer explained the relevance of recycling in new system developments:

... we have our subsidiary's sales organisations and we have industry solution management, which [manages] 27 industry solutions, one is Higher Education and Research. ... [W]e have customers requiring software here, and industry solution management tries to fit the different products together or to say, here we have a blank space, we should develop a product ... And they do the gap analysis and [confirm the necessity of development], or sometimes it's only a reconfiguration required. So, industry solution management is really linking the two together [, recycling and new development]. (interview, GlobalSw's Developer)

GlobalSw's 'gap analysis' pointed out several modules (originally developed for large corporations of other industries) that could be recycled for the project. However, they were rejected by the developer partners. The Real Estate Management module, for instance, was scrutinized by UniBrit. In an internal memo, it was considered so *"far*

removed" from the university's needs the suggestion was to *"start again from scratch than try to adjust the existing module."* Most of the work was, then, in creating the new pieces specific to Higher Education. Despite the small number of participants in the development group, the effort was by no means straightforward. For instance, any of the developer partners could individually suggest a change in the system (e.g. inclusion of a functionality), which would circulate back and forth in a closed network of participants under the coordination of GlobalSw, who wanted to make sense of each of the suggestions to find those that are as generic as possible. The following example is about the business process known as 'progression', which was intended to measure students' performance over time. The vendor tried to consolidate different processes into a single, global business process with variants that could keep major national idiosyncrasies. However, it did not end up as expected, according to a GlobalSw's developer:

... we realised the US model of progression and the UK-based model of progression was very different. ... And that took a bit of time for us to realise that we shouldn't build one process with two variants but really we should build two different processes. ... Now we have what we call a programme type progression, which is used by US universities, and we have a programme progression, which is stage based, which is mainly for UK universities... (interview, GlobalSw's Developer)

The software vendor had to give up from having one single progression process. Instead, GlobalSw allowed the coexistence of different processes separately.

4.2 When Generification Fails… Generativity!

In the next two years, the HES system was fully developed, tested at UniBrit's premises, and then became operational in the university. A formal contract related to the HES system, called licensing agreement, was signed. It stated general grounds of the relationship between GlobalSw and UniBrit about uses, copyright, and liabilities. Specifically in terms of co-development, the contract allowed UniBrit to create and/or modify the systems that compose the platform. For doing so, UniBrit needed a special code key from GlobalSw, with which the vendor identifies the author of any update in the platform.

The contract determined the intellectual property rights (IPR) of the creations and changes made by UniBrit shall belong to the university but subject to the following restrictions:

[UniBrit] shall only be entitled to assign the Intellectual Property Rights in such modifications to third parties after first obtaining the written consent of [GlobalSw] (such consent not to be unreasonable withheld).

[GlobalSw] may at any time demand the assignment to it of all Intellectual Property Rights in such modifications (or any of them) in return for the payment by [GlobalSw] to [UniBrit] of suitable compensation in which case [GlobalSw] will grant to [UniBrit] an irrevocable royalty-free license-back to use the Intellectual Property Rights in such modifications. (licensing agreement clauses)

UniBrit used HES extensively during the first year of operation. The university had an ambitious growth plan for its post-graduation courses with international students. However, UniBrit failed to achieve the projected volume, causing a huge financial impact. The failure was rooted in poor hiring processes (still fully manual). UniBrit, then, started procuring systems that could add those functionalities to HES. Two firms came to the short list: an American software vendor and GlobalSw. The American vendor's proposition was technically superior, but the balance eventually fell to GlobalSw due to the strength of its influence:

There was considerable pressure from within the University to adopt a third party product, [American vendor's product], but I managed to persuade my colleagues on our Executive Board to stick with [GlobalSw] on the understanding that you were fully committed to the project. (e-mail from UniBrit's Deputy Vice Chancellor to GlobalSw's Business Development Director)

Different from traditional licensing when the software is already developed and ready for use, custom development project is a service paid by customer as project advances. Therefore, the project was grounded in a different type of contract, which one of the clauses originally stated that:

All intellectual property rights arising from the provision of the Services shall automatically vest in [GlobalSw] or its licensors and [UniBrit] undertakes to execute such documentation as may be necessary to perfect the title of [GlobalSw] (or its licensers) to such rights. (services contract clause)

The signed version, however, did not have such clause. It was suppressed by UniBrit during the contract negotiation and GlobalSw did not notice that. By abolishing it, the university hoped they could own the IPR stemmed from the development,

as stated in the previous (and still valid) licensing agreement contract.

Because "*[GlobalSw] had misunderstood the size of the gap between what [UniBrit]'s business requirements stated and what their standard software modules could deliver*" (UniBrit's CIO internal e-mail), the costs of the project grew dramatically. GlobalSw charged more because it had to employ additional resources to develop several functionalities that were considered for granted (recyclable) at the outset. These resources came from a commissioned third party: SwServices, a consulting firm specialised in Human Resources that was GlobalSw's partner.

4.3 Custom Development Opens Room for Generification

UniBrit was very concerned about the participation of a third party in the development because of a potential leak of IPR, since SwServices was not legally entitled to that IPR. The university's concern was based on the market practise (cf. Wareham et al., 2014). Consulting firms like SwServices usually lead custom developments by themselves, which resulting software eventually becomes a product that is sold to other customers, just like GlobalSw does with their own products. Some are even marketed and sold by software vendors themselves, as an executive of GlobalSw explained:

… consulting companies … they make … their own IP, their own development an important part of their business. So saying that instead of developing one by one to each customer, why not to add pieces of software to the standard [GlobalSw's] software? … [T]hey can transform it also in a product to sell to the market. Of course to sell it … in conjunction, adding it as a component, a kind of add-on to the … technology vendor's software. (interview, GlobalSw's VP of Customer Experience)

There was no evidence that SwServices had developed similar software based on non-authorised information from UniBrit's project. But it was clear that GlobalSw generified co-created complements. The following e-mail was sent from GlobalSw asking UniBrit permission for sharing some developments of the project with an American university that was also a customer of the software vendor (in another development project). The software vendor justified its claim by arguing that UniBrit's development was already benefited by some information from that American university:

[The American university] … has been very helpful during the blueprint phase providing me information about their admission process workflow, which I have also shared with [UniBrit] project team and taken as input for the blueprinting and further process. In return I would like to send [them] some of the functional and technical specifications as they are thinking about enhancements to their process. … Would be o.k. from your side? (e-mail from a GlobalSw's Developer to UniBrit's Project Manager)

A GlobalSw developer briefly explained the future generification of scanning and management functionality:

… If I notice, okay, this requirement hasn't been considered in our standard product … I kind of feed it back for the future. … [UniBrit] now attaches documents to applications, like this document scanning piece, this is something we look at in our next release. (interview, GlobalSw's Developer)

Meanwhile, UniBrit's CIO was trying to seek alternatives to finance the continuity of the project, since the costs were going to exceed the budget. Because of the software's commercial potential, the executive thought it would be a good idea to sell university's IPR to GlobalSw as a deduction of project costs. The negotiation about cost reduction took several months and eventually led the vendor to lower them a bit. During the negotiation, UniBrit was forced to sign an additional contract, which replaced the first one and had back the (missing) clause securing all IPR to GlobalSw, effective from the signature date onwards. On the other hand, GlobalSw agreed to pay UniBrit per its services as 'reference actor' (Pollock and Hyysalo, 2014) each time the university hosted visitors interested in the system. In the short term, these payments represented only a small relief on the project's costs. But they were approached in a different way by both firms, as a long-term 'partnership':

As we discussed, let's plan on you and [UniBrit's Dean] meeting with us (myself, [VP of Development], and [Development Director]) in Paris around the Advisory Council meeting, depending on travel schedules. This will give us a chance to discuss in detail how we can work together in the coming months and years to achieve our common goals. … I Will go ahead and give the "green light" to the visit from the Norwegian customer … based on our standard reference bonus… (e-mail from GlobalSw's Business Development Director to UniBrit's CIO)

I have maintained throughout this project that this must be viewed as a "Partnership" between [GlobalSw] and [UniBrit]. [UniBrit] positively wants [GlobalSw] to become increasingly successful

across the Higher Education sector both in the UK and elsewhere. (e-mail from UniBrit's CIO to GlobalSw's Head of Consulting)

For GlobalSw the partnership meant business development led by an expert, UniBrit. For the university, the partnership meant at the same time a new source of revenue and, most importantly, an enhancement of university's reputation in its market:

We will leverage our investment in [GlobalSw] software to support our strategy for profitable growth as we continue to enhance our reputation as one of the United Kingdom's leading educational institutions. (UniBrit's Assistant Director or Information Systems and Services in a GlobalSw's advertisement material)

You may be aware that we expect to have a very large number of [visitors] in October (ie every major UK University is very aware of what we are doing!...) (e-mail from UniBrit's CIO to GlobalSw's Services Director)

Despite the relative success in exploring new opportunities that emerged from co-development, the negotiation about the value of the IPR entitled to both firms (supported by the first co-development contract) and how to realise it did not settle when the data collection for the case was finished.

5 DISCUSSION AND CONCLUSIONS

In order to stay competitive, organisations today are increasingly promoting innovation associated with a platform (de Reuver et al., 2018) that eventually produce unplanned products and services (Yoo 2013, p.230) through an innovation process known as generativity (Tilson et al., 2010; Yoo et al., 2012). Studies of leading consumer platform have sharpened our understanding of not just the innovative and often disruptive outcomes, but also paradoxes faced whilst generating them (Lyytinen et al., 2017). On corporate platforms, the studies have shown how platform leaders travel their platforms to new contexts by performing a different innovation process, called generification (Hanseth and Bygstad, 2015; Pollock and Williams, 2008; Pollock et al., 2007). Generification is also said to face struggles during its course.

These conceptualisations worked well enough when only one innovation process is performed in a given digital platform, but fall short when there are multiple innovation processes occurring in that setting (Sørensen and Williams, 2002). We argue that more recent evidence is beginning to question previous knowledge on digital platform innovation, inviting us to revisit underlying assumptions of its processes.

5.1 Innovation in the Digitised World Revisited

Evidences from our empirical case showed generativity and generification are not as straightforward as one might imagine. That is, generativity goes hand in hand with generification. Let us first summarise the two processes as distinct and then reflect how they work in tandem.

5.1.1 Generification in Corporate Platforms

Digital platforms, we argue, are purposeful artefacts (Rosenblueth et al. 1943), having goals to be attained attributed by platform owners and users. Large-scale corporate platforms are strictly focused on business management. Generification brings together actors that have clear orientation towards the achievement of organisational goals and increase of influence and reputation. In their ambition to extend platform's reach to new markets (Pollock et al., 2007), platform owners attract influent customers for co-development, hoping to add both consistent specialised knowledge and reputation (Ravasi et al., 2018), i.e. signalling their new strengths to the market. Customers, in turn, look for return on investment, i.e. cope with the business benefits the platform promised to deliver, and also try to leverage their reputation (ibid) over platform owners and other players in their market.

Platform owners purposefully control generification by selecting who will take part in the co-development (Ceccagnoli et al., 2012; Johnson et al., 2013; Pollock et al., 2007; Sarker et al., 2012) and which innovations will be part of the platform. Boundary resources (Ghazawneh and Henfridsson, 2013) like contracts and code keys are used to control how both generification and (potential) generativity unfold. However, this closer control does not make the development unambiguous. For instance, recycling failed to accommodate the (specialised) requirements of the new industry, and co-created piece had to be 'de-generified,' allowing coexistence of multiple particular templates (Pollock et al., 2007).

5.1.2 Generativity in Corporate Platforms

Generativity in large-scale corporate platforms is closer to earlier software traditions of bespoke development. Customers' objective is to fill critical gaps of products and services caused by platform incompleteness (Scott and Kaindl, 2000), i.e. generification, with personalised pieces that address their idiosyncratic needs, making the platform more specialised. In this way, they lead generative co-developments that encompass the same core motivation found in the generification process (achievement of business goals and reputation increase). The level of control is similar to generification as well (selection of partner, innovation definition, contracts and development keys). Interestingly, tight control, boundary resources, and asymmetric relationship did not discourage customer to lead a generative venture. Generativity, in our case, was fuelled by customer necessity of complementing the platform with key functionalities for its operations, suggesting that 'control' may have new roles.

5.1.3 The New Roles of Control

IS literature (e.g. Eaton et al., 2015; Tilson et al., 2010; Wareham et al., 2014; Yoo et al., 2012) presented generativity and control as entities that seat at different ends of a see-saw: higher control leads to lower generativity and lower control allows higher generativity. Lyytinen et al. (2017) proclaimed the paradox of centralised and distributed control (or individual autonomy) is one of the four paradoxes that compose the emergent property of generativity.

We see it differently. In corporate platforms generativity and control are not inversely proportional. Control can be found in a more fine-grained characterisation: inside the innovation process. There, control is part of the very fabric of generativity. It starts by defining the scope of what, how and when is to be jointly developed along with who becomes entitled for which value created. The *innovation definition* is usually inscribed in the format of contracts and blueprints. It is then followed by *resources allocation*, when necessary components for the co-innovation venture are identified and mobilised. After allocation, resources are managed to produce innovation. The *co-development* supervision involves the build-up of the planned generative component with planning reviews and conflict management along the way. At the end participants assess benefits emerged from the co-development venture, which includes but is not restricted to IPR, and (try to) *appropriate* them. Innovation definition, resources allocation, co-development and value appropriation are controlling mechanisms found in both innovation processes (generativity and generification), which we define as the micro-foundations of large-scale corporate platform innovation.

Additionally, we saw how influence played a decisive role in the whole generative process. There was a notable influence asymmetry between the platform owner and the customer (cf. Eaton et al., 2015). When platform owners become one of the few large and resourceful vendors, customers may find more attractive to collaborate with them other than competitive alternatives in the ecosystem. However, generative ventures with influential vendors may lead to one-sided abuse (Eaton et al., 2015). Since platform owners' priorities "are to protect their own interests and secure their competitive positions" (Constantinides et al., 2018, p.4), boundary resources (Ghazawneh and Henfridsson, 2013) such as contracts may be designed and enforced in a way that vendor's interests are primarily (or solely) contemplated. Even when co-authors retain rights of authorship, "[t]here is strong precedent for platform [owners] to appropriate developer innovations" and "make these features available to the entire market" (Parker and Van Alstyne, 2018, p.3016), i.e. generifying the generative complement.

Incompleteness of generified platform leads to generativity, which in turn can be generified. We argue that corporate platform innovation follows a cycle, a moto continuum in which generativity and generification are entwined and successively fuel each other. Figure 1 shows the dynamics of large-scale corporate platform innovation.

We can now draw a picture for scholars interested in digital platform innovation by reflecting on the implications of the different kinds of innovation that occur in digital platforms.

5.2 Conclusions and Future Directions

Yoo et al. (2012), Eaton et al. (2015) and Lyytinen et al. (2017) asserted that organisations should structure themselves to oversee the delicate and paradoxical balance of generativity and control in the platform. We see some aspects in a different way.

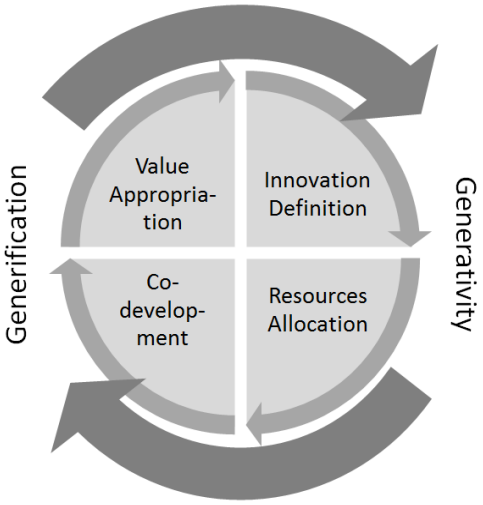

Figure 1: The Innovation Processes Dynamics in Large-Scale Corporate Platforms.

We suggest that platform innovation produces different outcomes depending on the *purpose* of the platform rather than control. Purpose is the basis for (strategic) actions (Mintzberg, 1987), and a strategy is required to enable the ongoing innovation management (Dougherty and Dunne, 2011). Different purposes may lead, we argue, to different innovation dynamics. Therefore, rather than control, it is the purpose that orientates strategy that, for its turn, encourages innovation to walk unimagined paths, e.g. in iOS and Android platforms, or to (roughly) follow a road map, e.g. in an ERP platform, since many gaps are known.

Consequently, we acquire a window onto the view of new roles of control in digital platforms. We see control serving as strategy enabler, having boundary resources (Ghazawneh and Henfridsson, 2013) as instruments for its implementation, ordering how innovation processes unfold. The four micro-foundational mechanisms of platform innovation we have found – innovation definition, resource allocation, co-development and value appropriation – can serve as a foreground, we hope, to help the understanding of innovation governance, especially because innovation is often problematic, as we saw in our empirical case and is supported by the extant of IS literature (e.g. Lyytinen et al., 2017; Pollock et al., 2007). These certainly do not constitute the full pack of platform innovation mechanisms, but they can serve as steppingstone for a further investigation on, for instance, the practices (e.g. Vaast and Walsham 2005) around these processes, how actors perform them, and respective interaction with platform governance at higher levels (e.g. Tiwana et al., 2010).

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