

WHERE THE STREETS HAVE NO NAME: EXPLORATION AND EXPLOITATION IN NOVEL DIGITAL SETTINGS

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Niamh O Riordan, Frederic Adam, and Phillip O'Reilly, 2014, "WHERE THE STREETS HAVE NO NAME: EXPLORATION AND EXPLOITATION IN NOVEL DIGITAL SETTINGS," Proceedings of the European Conference on Information Systems (ECIS) 2014, Tel Aviv, Israel, June 9-11, 2014, ISBN 978-0-9915567-0-0
<http://aisel.aisnet.org/ecis2014/proceedings/track01/11>

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WHERE THE STREETS HAVE NO NAME: EXPLORATION AND EXPLOITATION IN NOVEL DIGITAL SETTINGS

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Complete Research

Abstract

Organizations are caught in a struggle to capitalize on existing strengths and competencies whilst pursuing new opportunities. To succeed, they must strike a balance between exploration and exploitation (March, 1991). A significant amount of research looks at how ambidextrous organizations do both simultaneously; but fails to address key questions about exploration and exploitation (i) in novel settings, (ii) at a micro level, (iii) over time. In particular, few studies take the impact on environment novelty into account or look at the role of Information and Communication Technologies (ICTs). This study therefore investigates the dynamics of organizational exploration and exploitation in the virtual world of Second life. The study reveals that transitions between exploration and exploitation are triggered by changes in perceived environmental complexity over time. The paper presents a new conceptual framework which identifies some of the main factors affecting the dynamics of this process and shows how their significance changes over time.

Keywords: exploration, exploitation, novelty, digital environments, organisational innovation

1 Introduction

Organizational life is a struggle between two competing forces: on the one hand, the need to identify and seize new opportunities through radical innovation and value creation; on the other, the need to capitalise on existing strengths and competencies through incremental innovation and value capture. In order to succeed, firms must therefore find an appropriate balance of exploration and exploitation (March, 1991). To date, the literature focuses on two main strategies for achieving this balance: the first is to pursue both goals simultaneously (organisational ambidexterity); the second is to pursue them sequentially (punctuated equilibrium) (Raisch, Birkinshaw, Probst and Tushman, 2009). Existing research focuses on understanding when, where and how these two strategies should be implemented (Simsek, Heavey, Veiga and Souder, 2009) and almost completely overlooks exploration and exploitation (i) in novel settings, (ii) at a micro levels, and (iii) over time (Gupta, Smith and Shalley, 2006). At the same time, previous literature has noted (e.g. Kane and Alavi, 2007) but fails to systematically investigate (Durcikova, Fadel and Galletta, 2011) the impact of Information Systems (IS) on exploration and exploitation in firms.

To address these shortcomings, this paper investigates exploratory and exploitative activities in a digitally mediated environment. The findings reveal that in practice, transitions from exploration to exploitation are triggered by changes in perceived environmental complexity over time (which are a function of prior knowledge) and also suggest that this process can be accelerated if individuals and teams can successfully utilise ICTs to work ‘outside’ traditional organisational boundaries and thereby leverage interorganizational networks. These findings are used to derive a new conceptual framework to focus future research in this area.

2 Background and motivation

Fundamentally, organizations are goal-directed social entities that are linked to the external environment and are designed as deliberately structured and coordinated activity systems (Daft, 2009, p. 10). Organizational design has traditionally been seen as a question of pooling resources and coordinating activities but is also usefully viewed as a question of adapting to changes in the external environment. With this evolutionary lens, the challenge is to find ways of trading off the pursuit of efficiency and effectiveness today against the need for change and renewal tomorrow. In other words, organizational life is a struggle between two forces: on the one hand, the need to recognise and seize new opportunities; on the other, the need to fully capitalise on existing strengths and competencies. In the language of evolutionary theory, it is a question of variation and selection (Levitt and March, 1988); in decision making, it is a question of intelligence and choice (Simon, 1976); and in organizational studies, it is a question of incremental and radical innovation. In the language of March (1991), it is a question of exploration and exploitation.

According to March (1991), the essence of exploitation is “the refinement and extension of existing competencies, technologies and paradigms”; “the use and development of things already known” (Levinthal and March, 1993). Exploration, on the other hand, is about “the pursuit of new knowledge, of things that might come to be known” (Levinthal and March, 1993); in essence, it is about “experimentation with new alternatives” (March, 1991). Thus, exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, and execution; whilst exploration is captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation (March, 1991).

Over the past three decades, research on exploration and exploitation has gained considerable momentum (Kane and Alavi, 2007; He and Wong, 2004). More specifically, the concepts of exploration and exploitation have been used to underpin research on topics including technological

innovation (e.g. Garcia, Calantone and Levine, 2003; Whelan *et al.*, 2010); entrepreneurship (Shane and Venkataraman 2000); dynamic capabilities (e.g. O'Reilly and Tushman, 2006); organizational learning and adaptation (e.g. Vera and Crossan, 2004); absorptive capacity (e.g. Jansen, 2006); competitive advantage (Ireland and Webb, 2007); and organizational survival (Gupta *et al.*, 2006). Indeed, a recent study (Raisch, *et al.*, 2009) reveals that between 2004 and 2009, the number of leading management journals explicitly addressing this topic increased eight fold. From a more practical perspective, these concepts often underpin the prescriptive advice designed to maximise firm performance, improvement and survival (Simsek *et al.*, 2009).

There is a consensus in the literature that both activities are critical for firm performance but that firms typically overemphasize exploitation (the use of known solutions) at the expense of exploration (the search for new solutions) because it provides more immediate and certain returns (Fang, Lee and Shilling, 2010) and therefore reduces the risk that effort will lead to dead ends (March, 1991; Levinthal and March, 1993). As a result, most studies in this area are based on the assumption that regulating the balance between exploration and exploitation is a fundamental need for effective adaptive behaviour in a changing and complex work (Gupta *et al.*, 2006; cf. Cohen and Levinthal, 1990). March (1991) is very clear: when organizations engage in exploration to the exclusion of exploitation, they are likely to “suffer the costs of experimentation without gaining many of the benefits and to exhibit too many undeveloped new ideas and too little distinctive competence”; conversely, organizations that engage in exploitation to the exclusion of exploration are “likely to find themselves trapped in suboptimal stable equilibria”.

To date, the literature suggests two main strategies for achieving this balance between exploratory and exploitative work. The first is that organisations should pursue both goals simultaneously (Simsek *et al.*, 2009). This is the strategy of organisational ambidexterity (cf. O'Reilly and Tushman, 2006). The second suggests that organisations should pursue both goals sequentially (Simsek *et al.*, 2009). This strategy is based on punctuated equilibrium (cf. Burgelman, 2002). Most research in this area focuses on understanding how these strategies should be implemented and on understanding how various organisational characteristics (e.g. size, age, structure, norms and routines) affect them.

This research has revealed important insights on how each strategy should be implemented and on the various organisational characteristics (e.g. size, age, structure, norms and routines) that affect them. However, as a result of its singular focus on selecting optimal strategies for balancing the two activities, it has developed a number of significant blind spots that need to be further investigated. Three of these blind spots are identified and investigated in this research.

First, researchers have only recently begun to pose the question of whether or not all organisations should strive to achieve balance or if there are particular cases where specialisation (rather than dualisation) in exploration or exploitation is actually sufficient for long term success (cf. Simsek *et al.*, 2009). Indeed, there is a growing debate about whether or not exploration and exploitation are continuous (complementary) or orthogonal (mutually exclusive) concepts (Gupta *et al.*, 2006). This question is far more salient in today's business environment, which is characterised by digitally enabled and networked forms of business, than it would have been when March (1991) was initially developing his theories. As a result of the Internet and related technologies, firm boundaries have never been more porous and opportunities for successful interorganizational collaboration have never been greater. As such, there is a need for research to investigate the opportunities for businesses to succeed through specialisation have never been greater. In this study, we shed light on this question by investigating the intersection of (i) exploratory and exploitative activities with (ii) endogenous (internal) and exogenous (external) activities in order to explore opportunities for smart specialisation in the digital era.

Second, the existing literature is largely silent on the impact that environmental factors are likely to have on the long-term performance of exploration and exploitation in firms (Gupta *et al.*, 2006). This is a serious oversight because even though exploration may be inherently uncertain and risky (March,

1991), the risk associated with it is naturally higher in an uncertain, complex or highly dynamic environment. Given the rate of economic and social change that has been triggered by digital technologies and the consequent imperative for faster innovation, there is a particular need to find new ways of improving the returns from exploratory activities in novel settings (Kane and Alavi 2007). In the meantime, it is most likely that the firm with high absorptive capacity (cf. Cohen and Levinthal, 1990) - the capacity to quickly recognize, assimilate and apply new external knowledge - rather than the firm with a purely exploitative focus - is most likely to succeed in novel settings. In this study, we shed further light on this question by investigating the relationship between perceived novelty in the environment and the choice between exploratory and exploitative activities. We also focus on how this relationship changes over time because the literature on learning curves clearly demonstrates that the relationship between pace, effort, and return changes over time but very few empirical studies have looked at how organisations switch from exploration to exploitation (Raisch *et al.*, 2009) or from one form of ambidexterity to another (Simsek *et al.*, 2009) over time.

Finally, the existing literature is largely silent on the question of how exploratory and exploitative strategies are enacted at a micro (individual and team) level (Crossan *et al.*, 1999). According to Simsek *et al.*, (2009), it is simply not known how business units or small organizations simultaneously attain exploitation and exploration:

Do they first emerge in an independent unit and diffuse across other units as part of an autonomous strategic initiative? Or perhaps the choice to pursue ambidexterity across interdependent units is a managerial impetus, part of a deliberate strategic initiative?

- Simsek *et al.*, 2009, p. x.

This is significant because in the final analysis, an organisation acts only by way of the actions of the individuals who comprise it. At the same time, it makes it all the more difficult to understand whether or not organisations should achieve ambidexterity through differentiation (the separation of exploitative and explorative activities into distinct organizational units) or through integration (enabling organizations to address exploitative and explorative activities within the same organizational unit) (Raisch *et al.*, 2009). One study at least has looked at ambidexterity at multiple levels of analysis and presents new evidence that organizations divided into semi-isolated subgroups may be better able to strike the balance between exploration and exploitation (cf. Fang *et al.*, 2010). Again, digital information and communication technologies are likely to play an important role in shaping the kinds of exploratory and exploitative activities that individuals in firms pursue and also in shaping the kinds of coordination strategies that are used within and across business units (Jansen, 2006). Whilst Information Systems scholars (e.g. Kane and Alavi, 2007) have noted this in their work, they have not yet systematically investigated (Durcikova *et al.*, 2011). In this study, we shed further light on this question by investigating exploration and exploitation at the individual and group level of analysis and analyse changes and reconfigurations of individual and group activity over time.

The goal of this research, then, is to investigate organizational exploration and exploitation in novel settings, (ii) at a micro level, and (iii) over time. In particular, we aim to explore the impact of Information and Communication Technologies (ICTs) on these core processes.

3 Research design

In order to achieve our research objective, we conducted six case studies in the virtual world of Second Life. Virtual worlds are shared, interactive, immersive environments where participants can communicate, collaborate, innovate and trade (O Riordan, 2009; O Riordan, 2011). Our decision to collect data in this environment was motivated by three main considerations. First, we needed to ensure that our data was collected in a novel environmental setting. None of the organisations we worked with had significant prior experience working in virtual worlds and at the time that the data was collected, virtual worlds were still a comparatively new and poorly understood technology. Second, we wanted to investigate the impact of information and communication technologies on

exploration and exploitation in firms and previous research on virtual worlds has demonstrated that they are effective tools for (i) communication (O Riordan *et al.*, 2013; Fetscherin, Lattemann and Lang, 2008; Noveck, 2004, p. 4), (ii) interaction (O Riordan *et al.*, 2012a; Chaturvedi, Dolk and Drnevich, 2011; de Freitas and Veletsianos, 2010; Mueller, Hutter, Fueller and Matzler, 2010; Messinger *et al.*, 2009), (iii) collaboration (de Freitas and Veletsianos, 2010) and (iv) co-operation (O Riordan *et al.*, 2012b; Giovacchini, Kohler, Teigland and Helms, 2009; Kahai, Carroll and Jestice, 2007). Third, we wanted to maximise our capacity to monitor individuals' and groups' exploratory and exploitative activities regardless of whether they took place endogenously (within the organisation and/or between organisational employees) or exogenously (outside of the organisation and/or with individuals outside of the organisation). In virtual worlds, researchers have unprecedented opportunities to collect and analyse data on individuals' behaviours and interactions that could not feasibly have been collected in other settings (cf. Cahalane, Finnegan and Feller, 2012). This is because virtual worlds facilitate the collection of inimitably detailed records on individuals' actions and interactions both with each other and with the environment itself, which could be used for the purposes of data analysis. In addition, data collected in virtual worlds can be used to make predictions about real world behaviour (Mennecke *et al.*, 2008).

A criterion sampling technique was used to whereby experienced Second Life users helped us to identify highly regarded and successful projects that had been carried out in Second Life by organisational customers. The six cases presented in this paper (summarised in Table 1) were all identified in this way. As is illustrated in Table 1, the case studies included diverse settings that eliminated common dependent results. The unit of analysis was "the project" because this approach allowed us to neatly bound each study in time. It also allowed us to clearly identify and then evaluate project outcomes with reference to individuals' and groups' behavioural strategies.

Table 1. Six case studies of successfully completed projects from Second Life	
BOF	Project guides students through existing "cultural landscapes" of virtual worlds (which are both cybernetic and fully artificial) in order to explore the implications of scientific and technical advances for the future of humanity
TEX	Project leverages the unique affordances of Second Life to create educational materials that cannot feasibly be created using other technologies and to package those materials by means of a Machinima video so that they could be published online for future use
TIR	Project uses Second Life as an immersive and interactive tool to demonstrate and simulate animation algorithm concepts that are difficult or impossible to create in the real world
GAL	Project uses scenario driven and problem based learning to improve nurses' skills in taking patient histories and undertaking physical examinations in real life
ZOM	Project follows a structured and formalized research agenda over a three year period in order to incrementally develop and use a virtual laboratory in Second Life to teach lab and experimental skills to science students
YOL	Project is designed to improve students' chances of being hired as border control officers by allowing them to rehearse the role of a border control officer in a virtual border setting

A combination of participant observation and interview methods were used to collect data. Within each case, we collected data from respondents in multiple roles (we coded them as 'educator',

‘developer’ and ‘facilitator/project manager’) and subsequently analysed it both within and across roles. This combination of participant observation with interview data was necessary in order to corroborate, validate and triangulate data collected in an unfamiliar research context.

Data was collected over a twelve month period. Multiple on-site visits were made to each project and detailed information was gathered on study participants’ activities and behaviors in Second Life. The researchers also had access to documentation on each project. At least three 90 minute guided interviews were carried out in each case according to Patton (1990). Each interview was broadly structured using a series of predetermined topics. These topics were: (i) the origins of each project (ii) project participation (iii) project execution and (iv) project outcomes (in general, in terms of innovation, in terms of knowledge creation). Interviews were recorded and transcribed. Case contact summaries were created after each interview. These summaries were periodically reviewed during the study to bring to mind the salient aspects of each case prior to each subsequent interview in that case.

Data was analysed using a variety of techniques developed using guidelines provided by Miles and Huberman (1994). In the early stages of the project, a variety of analysis materials were generated. These included field notes, memos, pattern codes, and methodological memos and were initially generated as voice memos that were subsequently transcribed into 172 pages of standard text. The researcher repeatedly reviewed these materials during data collection and data analysis phases of the study. In the latter stages of the study, interview data was coded. In accordance with Miles and Huberman (1994), the data was initially coded using a “start code list”.

Each code was numbered and dated and the source of the code was also recorded. The start code list was fully revised prior to coding the remaining cases. This meant that the code list evolved in an emergent fashion as data analysis proceeded. When each case had been coded in full, the codes were aggregated in Microsoft Excel (2003) according to construct. A series of within-case and cross-case data displays were subsequently developed to facilitate variable-oriented and process-oriented analyses. The researchers also developed a variety of data displays (tables, matrices, radar charts and line charts were all developed). These displays were an indispensable tool for escaping data overload during the study and proved to be a tangible, traceable and explicit means of addressing the study’s research objectives.

4 Findings

This study investigated the dynamics of organizational exploration and exploitation in novel settings over time. The findings shed light on the specific kinds of exploratory and exploitative activities that individuals and groups use both within and outside their own firms. In practice transitions between exploration and exploitation take place over time and are primarily triggered by changes in perceived environmental complexity over time. The results also shed light on the capacity of ICTs to facilitate or prevent particular types of transition, revealing that even in virtual worlds – which are thought to be highly conducive to open work practices – individuals struggle to engage in exploitative activities in exogenous (external) settings. The findings have been synthesized into a conceptual framework and are presented in detail in the paragraphs that follow.

4.1 The breakdown of exploratory and exploitative activities in the cases

The findings show that study participants in the six cases engaged in 15 distinct types of activity that could be classified as (i) exploratory and endogenous, (ii) exploratory and exogenous, (iii) exploitative and endogenous or (iv) exploitative and endogenous (see Appendix A).

Endogenous exploratory activities included brainstorming, self-directed learning and DIY/practice and were more commonly conducted in the earliest stages of projects when prior knowledge was lowest.

Endogenous exploitative activities were the most common class of activities, manifesting in thirty-seven instances across the six cases. Unlike other kinds of activity, which were considered discretionary, these activities were considered necessary to complete projects. Exogenous exploratory activities were also common and were considered vital in terms of allowing participants to gain new insights into how Second Life could potentially be used. Nevertheless, exogenous exploitative activities were least commonly used in this study. This finding (explored in greater detail in Section 4.3) is somewhat surprising given the communicative and collaborative affordances of virtual worlds.

4.2 Transitioning between different types of activities

In the next stage of analysis, we used process diagrams of individuals' and groups' activities over time to identify temporal patterns in how individuals and groups transitioned from one type of activity to another. The findings revealed that transitions between exploration and exploitation are associated with changes in perceived environmental complexity. This association is captured in Figure 1 by combining our analysis of exploratory and exploitative activities with Snowden's Cynefin framework (2000), which distinguishes between the chaotic (where practices are novel), the complex (where practices are emergent), the complicated (where good practice begins to emerge) and the simple (where best practice begins to emerge).

In the early stages of projects (the left hand side of Figure 1), study participants typically relied on exploratory behaviours. In these early stages, every activity was novel and the environment was perceived to be highly chaotic. Participants were initially "fumbling around in the dark", hoping to establish an overall vision of what they were hoping to accomplish. As such, it was in these early stages that opportunities for radical innovation were highest but investments in projects were also smallest in these stages and learning was difficult and incremental.

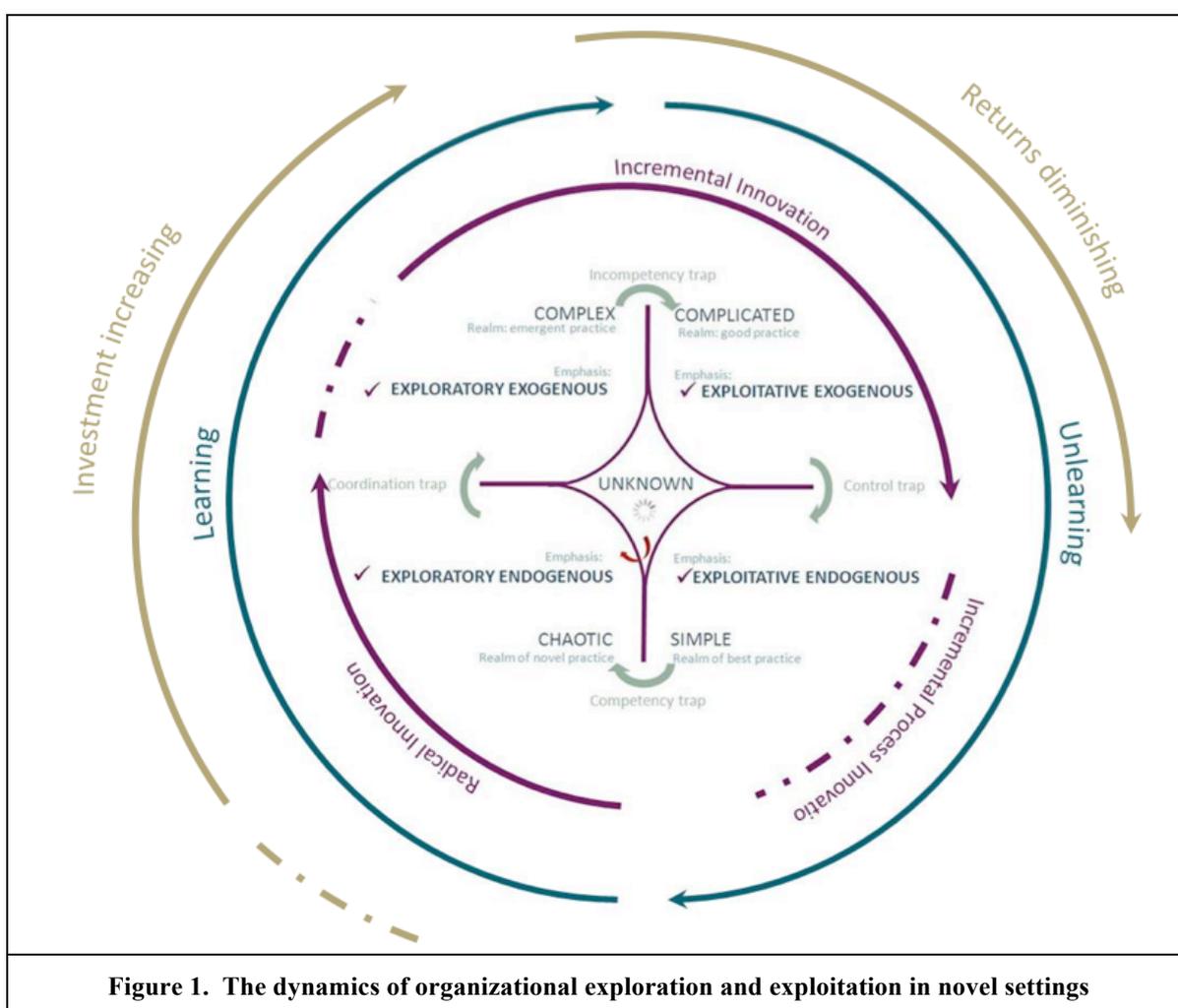
In the latter stages of projects (the right side of Figure 1), exploratory exogenous behaviours tended to give way to exploitative behaviours. Individuals and groups no longer perceived the environment to be chaotic or complex and as a result, there was a strong impulse to assert control over environmental uncertainty, to develop more effective and efficient work practices and to find better ways of managing projects. As such, opportunities for radical innovation diminished and opportunities for incremental innovation began to increase.

As predicted by March (1991), several groups transitioned prematurely (premature equilibrium). But where March (1991) suggests that this is a problem associated with "fast learner", our findings suggest that there may have been insufficient intrinsic motivation to sustain people's interest in activities that were considered discretionary (exploratory and exogenous activities) rather than obligatory (exploitative and endogenous activities). At the same time, several groups transitioned from exploratory activities quite late. The first is described in Figure 1 as the incompetency trap: individuals and groups found it difficult to acquire the technical know-how, the procedural knowledge in the language of Ryle (1945) to make the transition. The second is was identified by one of the study participants as "the tyranny of freedom": with so many possibilities and opportunities, it became impossible to pursue a single idea, a single path. Both of these explanations support March's (1991) suggestion that a delayed transition could be caused by "slow learners" who are unwilling (or in this case, unable) to quickly adopt ideas or practices and who instead prefer to maintain more diverse beliefs.

4.3 The role of ICTs

As indicated in Section 3, one of our main motivations for conducting our study in Second Life was that numerous studies on virtual worlds had shown that they are effective tools for communication, interaction, collaboration, co-operation and open innovation. As a result, it was something of a

surprise that exogenous activities accounted for less than a third of all observed activities and that exploitative endogenous activities were the least common activities across all six cases. Our first thought was that perhaps these activities were not useful but the detailed case analyses clearly demonstrated that any exogenous activity led to accelerated learning. However, subsequent analysis showed that where participants succeeded in breaching organisational boundaries, external interaction led to accelerated learning. In the final stages of the research, we re-examined the interview transcripts and observed that several study participants had unsuccessfully attempted to identify and partner with potential collaborators. These participants reported that the ability to stimulate effective collaborations in Second Life is a skill in itself and it takes time to develop it. This finding has important implications for Information Systems (IS) research because it contradicts the conventional wisdom that ICTs have reduced barriers to communication and collaboration beyond the boundaries of the firm.



5 Discussion and implications

Thirty years after March's seminal work, it is prudent to redefine and refocus research on his important constructs. To that end, the primary purpose of this paper has been to identify and shed light on a number of key gaps in the existing literature on balancing exploratory and exploitative activities in firms. Our study makes an important contribution to research in this area by identifying and investigating the impact of perceived environmental uncertainty on exploratory and exploitative

activities albeit in the specific context of virtual worlds. In particular, it addresses key questions about exploration and exploitation (i) in novel settings, (ii) at a micro level, (iii) over time. Its findings, which have been synthesised into a new conceptual framework, indicate that in practice, transitions between exploration and exploitation take place over time and are primarily triggered by changes in perceived environmental complexity over time. In addition, the study's findings contribute to our understanding of the role of a particular class of ICT in facilitating exploratory and exploitative activities at the individual and group level. It reveals, for example, that for immersive teams at least, ICTs do have the capacity to either facilitate or prevent particular types of transition and that even in virtual worlds, individuals continue to struggle to engage effectively with others outside the boundaries of the firm.

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Appendix A

Table A1 identifies 15 distinct behaviors and classifies them into four types. The columns list each case, showing how many individuals used a particular behavior in each case.

Table A1. Classification and analysis of knowledge creating activities								
TYPE*	DESCRIPTION	CASE						TOTAL
		C1	C2	C3	C4	C5	C6	
Endogenous Exploratory	Brainstorm	2	3	2	0	0	3	10
	DIY / Practice	2	1	1	3	1	1	9
	Self direction	0	1	1	2	1	1	6
	<i>Subtotals</i>	4	5	4	5	2	5	25
Endogenous Exploitative	Internal collaboration	3	3	3	3	3	1	16
	Meetings	3	0	0	0	2	0	5
	Formal methodology	1	0	0	0	2	2	5
	Pilot project(s)	2	0	0	0	2	2	6
	Experiment	1	1	1	1	0	1	5
	<i>Subtotals</i>	10	4	4	4	9	6	37
Exogenous Exploratory	Community participation	1	0	1	2	3	1	8
	Opportune inworld search	2	1	1	2	0	1	7
	Research	1	2	0	1	1	0	5
	<i>Subtotals</i>	4	3	2	5	4	2	20
Exogenous Exploitative	External collaboration	1	0	0	1	2	1	5
	Purposeful inworld search	0	1	0	1	0	1	3
	Imitation	1	0	0	1	0	1	3
	Formal training	0	0	1	2	0	0	3
	<i>Subtotals</i>	2	1	1	5	2	3	14
Totals		20	13	11	19	17	16	96
* Endogenous exploratory	Activities leading to the creation of knowledge that is substantively different from existing knowledge and occur internally within the team or within their location in Second Life							
* Endogenous exploitative	Activities leading to the creation of knowledge that is not substantively different from existing knowledge and occur internally within the team or within their location in Second Life							
* Exogenous exploratory	Activities leading to the creation of knowledge that is substantively different from existing knowledge and occur externally of the team or outside their location in Second Life							
* Exogenous exploitative	Activities leading to the creation of knowledge that is not substantively different from existing knowledge and occur externally or outside their location in Second Life							