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Innovation determinants and barriers: A tri-perspective analysis of IT appropriation within an early childhood education and care organisation

Melinda Plumb
University of Wollongong, mplumb@uow.edu.au

Karlheinz Kautz
University of Wollongong, karlheinz.kautz@rmit.edu.au

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Keywords
early, within, appropriation, organisation, analysis, care, perspective, tri, barriers, determinants, innovation, education, childhood

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Innovation Determinants and Barriers: A Tri-Perspective Analysis of IT Appropriation within an Early Childhood Education and Care Organisation

Melinda Plumb
Faculty of Business
University of Wollongong
map016@uowmail.edu.au

Karlheinz Kautz
Faculty of Business
University of Wollongong
kautz@uow.edu.au

Abstract

Empirical studies on information technology (IT) in early childhood education and care organisations are scant, despite an increasing number of these organisations choosing to innovate with IT. This paper presents a framework to understand the appropriation of IT as an innovation within such an organisation. The framework consists of three perspectives on innovation: an individualist, a structuralist and an interactive process perspective. While the first focuses on concepts such as leadership, IT champions, previous IT exposure, the second focuses on organisation size, parents as stakeholders, competitors, government compliance and regulatory requirements. The third perspective views the innovation as a dynamic phenomenon of change, produced by the continuous interaction of the innovation content, its context, and the appropriation process as related in an interactive process. We demonstrate the framework's applicability and determine that the three perspectives supplement each other and together provide a deeper understanding of the IT appropriation process in terms of innovation determinants and barriers.

Keywords: Information technology, appropriation, early childhood organisation, educators

1 Introduction

The number of early childhood education and care (ECEC) organisations who are innovating with information technology (IT) is increasing, with interest and support for IT to be integrated into policy, curriculum and practice (Bolstad 2004; Barron et al. 2011; Palfrey and Gasser 2008, Preston and Mowbray 2008, Spears 2009 cited in Bourbour et al. 2014). To date there have been few empirical studies on IT in ECEC organisations. Plumb et al. (2013) found that the majority of existing research involves descriptive studies of use by the educators with the children and pedagogical benefits of the use of the IT as a teaching and learning tool with young children, interspersed with a few studies examining the acceptance of the IT by children and/or educators. The diversity of research in terms of theory and methodology is limited, as these studies have mostly relied on traditional individual-level adoption theories such as the Technology Acceptance Model and Diffusion of Innovations (see for example Al-Qirim 2011, 2012) and primarily focus on individual factors, although some studies make additional mention of organisational structure, environmental and contextual influences (e.g. Clark and Luckin 2013; Crichton et al. 2011). The studies employ these theories in a quantitative manner and provide useful information on factors and their contribution to the outcome of technology adoption, but these studies of correlates of variables neglect the "often messy process through which teachers struggle to negotiate a foreign and potentially disruptive innovation into their familiar environment" (Zhao et al. 2002 p.483). As Schroeder et al. (1986) note, many studies of innovation focus on the facilitators and inhibitors to, or outcomes of, innovation in a given setting, but few examine how "innovations emerge, develop, grow or terminate over time" (p.501-502).

This research aims to move beyond simply examining the adoption factors of IT; instead we undertake to understand the process of IT appropriation, "the way that users evaluate and adopt, adapt and integrate a technology into their everyday practices" (Mendoza 2010 p.6) as an innovation within an ECEC organisation. As part of understanding the process of IT appropriation, we seek to understand not only what innovation determinants and barriers are present, but additionally how they interact over time to influence the appropriation process.

2 Theoretical background

The word innovation is used to describe an object, idea or process that is new, such as a new IT device; however it is maintained that it is not whether an object or process is new to an environment, rather it is the perception that it is new by the adopting unit (Cooper and Zmud 1990; Rogers and Shoemaker 1971). Research on innovation has been carried out at a number of different levels of analysis such as individual, group, organisational and societal (Schroeder et al. 1986; Slappendel 1996). With our interest in ECEC organisations, we focus on the organisational level. Slappendel (1996) conducted an extensive review of the existing literature on innovation in organisations and developed a framework to classify the body of literature based on the assumptions of who and what causes innovation within an organisation. The framework affords three perspectives:

- The *individualist* perspective explains innovation determinants in terms of the actions and personality traits of the organisational participants. The perspective views individuals as self-directed agents who are rational beings, unconstrained by external factors, and make decisions which are guided by the goals that they set. Individual characteristics such as age, gender, educational level, and personality are of interest, in addition to concepts such as change agents, leaders and innovation champions.
- The *structuralist* perspective assumes that organisational characteristics such as size, task structure, and centralisation of power are influential in determining innovation. It presumes that organisations have goals, the most basic of which includes survival. This perspective highlights the relationship between the organisation and its environment, which is actualised by including stakeholders, competitors and government policy as structural elements that influence the innovation.
- The *interactive process* perspective views innovation as a dynamic, continuous phenomenon of change, produced by the continuous interaction of the actions of individuals and the structural influences over time. This view of innovation is in contrast to the previous two perspectives that view innovation as *either* being caused by individual actions, *or* by objective structures (Slappendel 1996). As Kautz and Nielsen (2004) and Saren (1987 cited in Slappendel 1996) note, the actions of innovative individuals cannot be divorced from the activities of other individuals nor from the organisational structures within which they operate. Unlike the previous two perspectives that perceive the innovation to be static and objectively defined, the interactive process perspective views the innovation as being subjectively perceived and subject to reinvention and reconfiguration.

This tri-perspective framework has been extended and tested in other information system (IS) related organisational change studies by Kautz and Nielsen (2004), Madsen et al. (2006) and Alaranta and Kautz (2012) and allows the identification and examination of both individual/human and structural/organisational elements influencing the innovation process. In particular, through the third perspective, the framework additionally affords the ability to understand how these elements interact with each other over time to influence the innovation process.

We draw on these three perspectives but further develop and refine their elements by combining and integrating existing contributions in the fields of innovation and IT

appropriation. Due to the paucity of literature on IT in ECEC organisations (Plumb et al. 2013) we look to the literature examining innovation (IT-based and non-IT-based) in other educational sectors (namely schools and universities) for elements of our framework, and also from the general body of organisational innovation literature, particularly those studies which included reviews of the literature (such as Crossan and Apaydin 2010; Frambach and Schillewaert 2002; Slappendel 1996; Wolfe 1994). In order to provide a more comprehensive understanding of the innovation process, we extend the framework to include not only innovation determinants but also potential barriers or constraints which we have identified from the small body of literature on barriers to IT integration in ECEC organisations. These studies identify a number of barriers related to an individual's internal characteristics and traits, and to organisational characteristics and elements of the environment surrounding an ECEC organisation. However the existing research does not investigate from a process perspective which barriers and constraints are present and influential at certain stages of the appropriation process which Ertmer (1999) suggests is worthy of investigation as "different barriers are likely to appear at different points" (p.53) of the process and barriers may never be eliminated completely, suggesting instead that they will "continue to ebb and flow" (p.52).

2.1 Individualist perspective

Although Baldridge and Burnham (1975) suggest that individual characteristics are poor predicators of adoption of innovations, our study of the IT appropriation process looks not just at adoption but also the adaptation and integration of IT, therefore we still consider it useful to examine a number of individual-level antecedents. The attitudinal state of an organisation's members is considered influential in organisational innovation (Pierce and Delbecq 1977), with studies on educational IT implementation demonstrating the dependency on the attitudes of educators (Bullock 2004, Kersaint et al. 2003, Woodrow 1992 cited in Albirini 2006). The existence of champions and their role in facilitating successful technological innovation is well-recognised in the innovation literature (Howell and Higgins 1990). A champion is defined as a person who makes "a decisive contribution to the innovation by actively and enthusiastically promoting its progress through the critical [organisational] stages" (Achilladelis, Jervis, and Robertson 1971 p.14 cited in Howell and Higgins 1990 p.317). In previous innovation studies within schools (Daft 1978; Grunberg and Summers 1992; Sharma 2001), leadership was considered influential in the success of innovation. In their examination of iPad adoption and use in the tertiary educational sector, Murphy (2011) found previous technology exposure promoted uptake of the innovative IT devices. As the individualist perspective focuses on an individual's internal characteristics and traits, the literature on barriers to IT integration identified negative educator beliefs and attitudes (Fenty and McKendry Anderson 2014; Ihmeideh 2009; Joshi et al. 2010; Li 2006; Lindahl and Folkesson 2012a; Tsitouridou and Vryzas 2004; Wood et al. 2008), a lack of knowledge and skills (Edwards 2005; Fenty and McKendry Anderson 2014; Ihmeideh 2010; Leung 2003; Li 2006; Nikleia and Despo 2005; Parette et al. 2013; Plowman and Stephen 2005; Tsitouridou and Vryzas 2004; Wood et al. 2008), the age of the educator (Parette et al. 2013; Ihmeideh 2010) and lack of confidence (Blackwell et al. 2014; Fenty and McKendry Anderson 2014; Joshi et al. 2010; Li 2006; Nikolopoulou and Gialamas 2013; Plowman and Stephen 2005; Tsitouridou and Vryzas 2004) as barriers to the IT appropriation process.

2.2 Structuralist perspective

Organisational size and complexity have been found to be significant in previous innovation studies in educational organisations (Baldridge and Burnham 1975; Corwin 1975; Daft 1978). The level of centralisation of decision making in an organisation and the formalisation, or the extent of the use of rules and formal procedures, has also been found to influence innovation (Hameed et al. 2012). Within the environment of schools and ECEC organisations, parents of children/students are considered influential stakeholders and play a role in influencing the organisation's innovativeness (Bidwell 1965 and Sieber 1968 cited in Baldridge and Burnham 1975; Burden et al. 2012 cited in Clark and Luckin 2013). As Larner and Phillips (1994) posit, "the traditional image of parents as relatively passive partners in programmes that care for

children has been joined by a new image of parents as consumers seeking to maximise their purchasing power in the childcare marketplace" (p.47). Other environmental elements include government compliance and regulatory requirements (Clark and Luckin 2013) and existing infrastructure (Clark and Luckin 2013). Competing organisations (Crocombe et al. 1991 cited in Slappendel 1996) have been noted in the innovation literature and may be influential in our study as the early childhood educational sector is comprised of organisations competing for the business of providing child education and care services to parents. A lack of equipment and resources (Fenty and McKendry Anderson 2014; Ihmeideh 2009, 2010; Joshi et al. 2010; Leung 2003; Liu and Pange 2014; Nikleia and Despo 2005; Nikolopoulou and Gialamas 2013; Wood et al. 2008), support (Blackwell et al. 2013; Fenty and McKendry Anderson 2014; Li 2006; Liu and Pange 2014; Nikleia and Despo 2005; Nikolopoulou and Gialamas 2013; Plowman and Stephen 2005; Wood et al. 2008), training (Blackwell et al. 2013; Fenty and McKendry Anderson 2014; Ihmeideh 2009; Li 2006; Nikleia and Despo 2005; Parette et al. 2013; Plowman and Stephen 2005; Wood et al. 2008), time (Fenty and McKendry Anderson 2014; Ihmeideh 2009, 2010; Li 2006; Wood et al. 2008), funding (Ihmeideh 2009; Li 2006; Nikolopoulou and Gialamas 2013; Parette et al. 2013; Plowman and Stephen 2005; Wood et al. 2008) and IT technical problems (Blackwell 2013; Edwards 2005; Fenty and Anderson 2014; Ihmeideh 2009; Li 2006; Nikolopoulou and Gialamas 2013) have also been identified as structuralist barriers or constraints to IT appropriation in the literature.

2.3 Interactive process perspective

The interactive process perspective is of particular interest as it permits the study of the organisational innovation process: the temporal sequence of events that occur as people interact with others and the structural elements of the organisation to appropriate the innovation within the organisational context. Events are instances when changes occur in the innovation ideas, people, transactions, contexts, or outcomes while an innovation develops over time (Van de Ven et al. 1989). According to Schroeder et al. (1986), the innovation process begins with a 'shock', something that stimulates efforts by organisational members to begin work on an innovation.

Although the environment as a context is under examination as part of the structural perspective, Walsham (1993) notes that it is important to see organisational change as "linked to both intraorganisational and broader contexts, and not to try to understand projects as episodes divorced from the historical, organisational or economic circumstances from which they emerge" (p.53). We therefore look to studies of innovation as a process to enrich our interactive process perspective, and draw on Pettigrew's 'triangle' of context, content and process (1987) from his work on studying strategic change, and on Schroeder et al.'s observations from the Minnesota Innovation Research Program (1986). We combine concepts from these studies into the following three elements of our interactive process perspective:

- The *content* of an innovation (the 'what') be it a product or a process, is perceived subjectively and is subject to ongoing reinvention and reconfiguration.
- The *context* of an innovation (the 'why') is subdivided into inner context: the structure, corporate culture, and political context within the organisation; and outer context: the social, economic, political, and competitive environment.
- The *process* of innovation (the 'how') refers to the actions, reactions and interactions from the various interested parties as they seek to move the organisation from its present to its future state.

These three perspectives summarised in Table 1 below form a comprehensive and coherent analytical framework that we will utilise to organise, describe and analyse our findings.

	Perspectives					
	Individualist		**Structuralist**		**Interactive process**	
	Concept	*Source*	*Concept*	*Source*	*Concept*	*Source*
Innovation determinants	Attitude towards IT	Bullock 2004, Kersaint et al. 2003, Woodrow 1992 cited in Albirini 2006; Pierce and Delbecq 1977	Size	Baldridge and Burnham 1975; Daft 1978	Shocks	Schroeder et al. 1986
	IT champions	Howell and Higgins 1990	Complexity	Baldridge and Burnham 1975; Daft 1978	Context (outer and inner)	Pettigrew 1987; Schroeder et al. 1986
	Leaders	Daft 1978; Grunberg and Summers 1992; Sharma 2001	Centralisation	Hameed et al. 2012	Content	Pettigrew 1987; Schroeder et al. 1986
	Previous IT exposure	Murphy 2011	Formalisation	Hameed et al. 2012	Process	Pettigrew 1987; Schroeder et al. 1986
			Parents as stakeholders	Bidwell 1965 and Sieber 1968 cited in Baldridge and Burnham 1975; Burden et al. 2012 cited in Clark and Luckin 2013		
			Government compliance and regulatory requirements	Clark and Luckin 2013		
			Existing infrastructure	Clark and Luckin 2013		
			Competitors	Crocombe et al. 1991 cited in Slappendel 1996		
Barriers and constraints	Negative educator beliefs and attitudes	Fenty and McKendry Anderson 2014; Ihmeideh 2009; Joshi et al. 2010; Li 2006; Lindahl and Folkesson 2012a; Tsitouridou and Vryzas 2004; Wood et al. 2008	Lack of equipment and resources	Fenty and McKendry Anderson 2014; Ihmeideh 2009, 2010; Joshi et al. 2010; Leung 2003; Liu and Pange 2014; Nikleia and Despo 2005; Nikolopoulou and Gialamas 2013; Wood et al. 2008	Temporality and influence of barriers to be identified by this study	
	Lack of knowledge and skills	Edwards 2005; Fenty and McKendry Anderson 2014; Ihmeideh 2010; Leung 2003; Li 2006; Nikleia and Despo 2005; Parette et al. 2013; Plowman and Stephen 2005; Tsitouridou and Vryzas 2004; Wood et al. 2008	Lack of support	Blackwell et al. 2013; Fenty and McKendry Anderson 2014; Li 2006; Liu and Pange 2014; Nikleia and Despo 2005; Nikolopoulou and Gialamas 2013; Plowman and Stephen 2005; Wood et al. 2008		
			Lack of training	Blackwell et al. 2013; Fenty and McKendry Anderson 2014; Ihmeideh 2009; Li 2006; Nikleia and Despo 2005; Parette et al. 2013; Plowman and Stephen 2005; Wood et al. 2008		
	Age of the educator	Parette et al. 2013; Ihmeideh 2010	Lack of time	Fenty and McKendry Anderson 2014; Ihmeideh 2009, 2010; Li 2006; Wood et al. 2008		
	Lack of confidence	Blackwell et al. 2014; Fenty and McKendry Anderson 2014; Joshi et al. 2010; Li 2006; Nikolopoulou and Gialamas 2013; Plowman and Stephen 2005; Tsitouridou and Vryzas 2004	Lack of funding	Ihmeideh 2009; Li 2006; Nikolopoulou and Gialamas 2013; Parette et al. 2013; Plowman and Stephen 2005; Wood et al. 2008		
			IT technical problems	Blackwell 2013; Edwards 2005; Fenty and Anderson 2014; Ihmeideh 2009; Li 2006; Nikolopoulou and Gialamas 2013		

Table 1. Our tri-perspective analytical framework

3 CASE SETTING

This research involves an exploratory, interpretive case study within an ECEC organisation in metropolitan New South Wales, Australia (herein referred to as BFS). BFS is responsible for 26 early childhood centres within the region, providing education and care services for children from birth to five years old.

The innovation under study is a software 'app' called Kinderloop that runs on tablets and mobile devices, in particular on Apple iPad tablets, but is also accessible on PCs via a web portal. It is promoted as a safe, secure and private way for early childhood educators to communicate with parents and families of children attending an early childhood centre, while also providing the functionality of documenting information on child activity and development. This combination of technologies will be herein referred to as *iPadKinderloop*. The Kinderloop app began development in 2012 in response to the founder's concern about not having appropriate times and opportunities to communicate with the educators at his children's early childhood centre in regards to being informed about his child's activity through the day.

iPadKinderloop aims to enhance early childhood centre-parent communications through the following process: 1. An early childhood centre installs the app onto their tablets or mobile devices, which are then made available to the educators during the day; 2. At appropriate times, the educator opens the app on the device, takes a photo and writes a short description about what is occurring; the educator can link to learning outcomes, practices and principles, centre philosophy, national quality standards, policies and procedures, educational visions etc.; 3. The child/ren are 'tagged' in the photo; 4. The photo and annotation are then uploaded to the centre's private Kinderloop instance; 5. Kinderloop automatically and securely posts update notifications to the tagged child/ren's parents; 6. Parents can then login to the centre's private Kinderloop instance using their own device with the app installed, or navigate to the online web portal using any Internet-accessible computer and see all of their child's updates and can 'like' or comment on the posts that are visible to them.

4 RESEARCH APPROACH

This research aims at obtaining a deeper understanding of organisational innovation through the process of appropriating IT into an ECEC organisation. We also aim to assess the applicability of the presented analytical framework, in particular the suitability of the interactive process perspective as a lens into the IT appropriation process, and as such we have used the framework as background for our data collection, the coding of the data and the data analysis.

Data collection occurred at eight BFS centres that were appropriating iPadKinderloop between November 2013 and March 2015. Not all centres were at the same 'stage' or level of appropriation due to differences in the timing of the roll-out; although the BFS Head Office mandated the use of iPadKinderloop, it was left to centre directors to decide when they would start using it. The empirical data was collected via semi-structured interviews with two or three educators at each centre, each centre director, and the Chief Executive Officer (CEO) of the BFS organisation, resulting in a total of 24 interviews. Each of the interviews lasted between 30 and 50 minutes and were recorded and transcribed verbatim to prepare the data for coding and analysis. The interview data was complimented by a collection of 12 short videos provided by the Kinderloop software founder which were comprised of short testimonials from current Kinderloop users, including educators, centre directors and parents/family members. These videos are publicly available on the Vimeo website (http://vimeo.com/kinderloop). Complimentary data (Eisenhardt 1989; Yin 2009) was also obtained via researcher notes of observations of current practices and the examination of secondary documents used by early childhood centres in Australia including the Early Years Learning Framework and National Quality Framework.

The transcriptions of the 24 interviews were coded and analysed utilising the concepts from both the analytical framework and the data, in a constant comparative method (Lincoln and Guba 1985). First the transcripts were coded according to the elements of the individualist and structuralist perspectives, including both innovation determinants and barriers. In regards to barriers, we checked for synonyms such as 'constraints', 'problems' and 'issues', to allow for newly identified barriers to emerge. Second, we coded the transcriptions according to the elements of the interactive process perspective, enfolding the individualist and structuralist elements within a processural analysis of the data. The 12 short videos were first viewed by the first author who made notes on the vision, and these notes were subsequently coded and analysed in a similar manner to the interview transcripts. In the following we use pseudonyms for our interview participants when quoting original data.

5 FINDINGS

5.1 Practices prior to iPadKinderloop

Before we examine the innovation process of appropriating iPadKinderloop and the resultant changes, it is useful to understand the practices of communicating with families, documentation processes and usage pattern of iPads within the BFS centres prior to iPadKinderloop.

5.1.1 Prior methods of communicating

Centre director Rochelle outlines how centres communicated with families of children attending their centre prior to the introduction of iPadKinderloop: "In the old days, we used to put stuff in parent pockets, and parents would never check pockets. We put notes up on the door, parents wouldn't read them, and we were really frustrated that the communication wasn't getting through".

5.1.2 Prior methods of documenting children's learning and development

Documentation of children's development is a critical aspect of the role of an early childhood educator, and the use of paper-based documentation occurs extensively within the early childhood sector (Piper et al. 2013). Within the curriculum for Australian early childhood education and care providers the process of documentation is noted as part of the assessment for learning and intentional teaching aspects of the role of an early childhood educator (AGDEEWR 2009). Educators are responsible for making formal observations of children's activities and documenting the learning that is occurring. These observations were traditionally conducted an in ad hoc manner, with educators required to carry around a notepad and pen throughout the day to document their observations. During scheduled 'release from face-to-face duties' time, educators would type up their hand-written notes into a word-processed document and perform analysis of the documented learning, using it to program future planned educational experiences for the children.

There were two key documents produced within the centres by educators for the benefit of parents: the day book, also known as a diary or reflection book, and child portfolios. The day book was observed as a physical book which was placed at the entry to the centre and provided parents with the opportunity to see an overview of what their child and their peers had experienced during the day. It was comprised of printed photos and annotations (either hand-written or typed) that illustrated and described activities that the children had participated in during the day. Child portfolios were comprehensive hard-copy documents provided to parents at the end of the year which included photos, annotations and examples of their children's art or other artefacts demonstrating the developmental and learning progress of the child. Portfolios were historically costly, hand-written documents with commercially-developed photos glued on the paper where required, but with more centres providing PCs for educators, the presentation of the portfolios changed to word-processed printed documents which included printouts of photos taken with digital cameras.

5.1.3 Prior usage of iPads

Centres had begun to appropriate iPads before the arrival and establishment of iPadKinderloop. They were used both by individual children and in groups to play games, watch videos, and to look up items of interest by the children on the Internet. Educators also spoke of the usefulness of the iPad as a tool to help settle children who were experiencing separation anxiety when their parent dropped them off at the centre, and as a particularly useful tool for children with special needs.

5.2 The individualist perspective

5.2.1 Educator attitude towards iPadKinderloop and confidence

The majority of educators and centre directors spoke positively about iPadKinderloop, describing it as "exciting" (Cindy), "amazing" (Rochelle) and "something I am interested in" (Sharon). As Rochelle noted, "everyone here was pretty keen to do it, everyone was pretty motivated". Chris spoke of how using iPadKinderloop helps his teaching practices, particularly in saving time: "It means less time off the floor mucking around with paper and typing it on computers, because I can do it all on the go and then because of that it means I get to spend more time with the children, and ideally that's what I want, and that's what the families want as well".

The enthusiasm was however not across the board, with one educator in particular speaking of the constraint of being overwhelmed and lacking confidence in using IT, calling it "a very big learning curve", but acknowledging that she was building confidence. Centre director Emma stated that "not all educators are doing it [using the tagging functionality on Kinderloop], it's a confidence thing".

5.2.2 IT champions

Rochelle and Judy, both centre directors, exhibited traits of being IT champions; Rochelle explained how four years ago, she and Judy had the idea of starting a blog for her centre, in order to get families "more involved in what they were actually doing at the service", and because traditional forms of communication with the parents such as those mentioned above were not entirely successful. When describing how centres were chosen to be pilots for the Kinderloop app, Judy recounted suggesting Rochelle and her centre as a pilot site, describing Rochelle as "very innovative" and being "totally open to it". Judy described how she and Rochelle had been looking for innovative ways to communicate with families "for years and years...and then we found Kinderloop!" Rochelle and Judy are also considered 'Superloopers' by the Kinderloop founder, promoted as 'key ambassadors' for the app. As part of this role they were responsible for visiting other BFS centres and providing advice to directors on how to begin appropriating iPadKinderloop.

5.2.3 Leaders

The direct influence of the CEO as a leader on the appropriation of iPadKinderloop was evident. After he had been introduced to the Kinderloop founder at an industry conference in March 2012, he recounted how in his next meeting with the Kinderloop founder "in an hour he sold me Kinderloop hook, line and sinker" and that he "made the decision that we would roll out Kinderloop to all of our centres because we saw great value in it". He viewed Kinderloop as "new and innovative" and he wanted it to be a part of the value-add experience that his organisation provides in their early childhood services. The CEO was not only directly influential in the iPadKinderloop appropriation, but also indirectly; he was described by Judy as "passionate about the industry". She described him as really supportive of innovative activities, and that he was "passionate about it [Kinderloop] and driving it, because he's all about families and communities".

5.2.4 Previous IT exposure and skill set

As noted earlier, the eight BFS centres examined had previously appropriated iPads, and were already familiar with the device which forms the platform for iPadKinderloop. The majority of

educators spoke of using the devices in their personal lives, which meant that they were already familiar with them and had acquired the skills to use these devices, although centre director Sharon noted that she was "a bit unsure of the iPad because I don't have an iPad, I have a tablet [at home]". The existing skill set of educators was determined primarily through prior experiences and not through training in regards to their qualifications, as none of the educators reported acquiring specific IT skills during the course of obtaining their early childhood educator qualification. Thus the potential barrier of 'lack of skills' was avoided through the prior experiences of educators with IT in their working and personal lives, despite the lack of IT skill development during their studies to obtain a qualification.

5.3 The structuralist perspective

5.3.1 Size, complexity, centralisation, and formalisation

As mentioned in the case setting BFS is responsible for 26 early childhood centres within the region, providing education and care services for children from birth to five years old. BFS is governed by a Board of Directors who are responsible for determining policy, strategic direction and operation of the organisation. It has over 500 staff with 268 employed within the 26 early childhood centres. It has a flat organisational structure with very few hierarchy levels: each centre has a director who reports to a group of area managers. The area managers have responsibilities including staffing and budgetary performance and developmental responsibilities such as staff and centre development and the development of effective family and community relationships. They report to the General Manager, People and Operations, who in turn reports to the organisation's CEO. BFS utilises a combination of centralised and decentralised decision-making when it comes to IT. The decision to appropriate iPadKinderloop was made by the CEO, and after approval by the Board of Directors and a meeting with centre directors, all centres began the appropriation of iPadKinderloop in August 2012. The appropriation was made mandatory, but the CEO explained: "I didn't compel a hard and fast deadline. The primary motivator for local action was periodic contact from the Area Managers and head of marketing on progress, as in my experience the best motivator for action is the compulsion to report back". It was up to centre directors to decide how and when they would begin appropriating iPadKinderloop. Centres had a degree of autonomy in deciding to purchase IT, although as the CEO explained it is a "standard inclusion" for any new BFS centres. The CEO also stated that the centres acquired their IT in different ways: "Some centres purchased them [IT devices] with the assistance of their parents and citizens groups; others put them on their capital request bids, and Big Fat Smile HQ has arranged it for them. And the third source is the Early Start Initiative[1] at the university". These different channels of funding available to BFS centres ensured that there were no funding-related barriers to the iPadKinderloop appropriation process. For example, when centre director Judy was preparing to pilot the Kinderloop app at her centre, she recounted how she wanted to keep the existing iPads for use with the children, and buy some more for use with Kinderloop: "I just went and got them [the iPads] out of my budget, and I just rang someone at head office and just said 'look I'm just buying two more iPads, I've got four rooms in the centre I need two more iPads, I'm going to do this Kinderloop thing, I'm just buying them'". This is supported through the statement by the CEO that the organisation "will work on the understanding that it [the purchase of IT] is a carefully considered decision locally and we place trust in the director that that is an appropriate purchase for that centre".

No formalised procedures had to be followed in regards to the appropriation of iPadKinderloop, nor was there a specific implementation plan; however this did not appear to cause problems in the appropriation process. Rochelle described how in conjunction with her staff, a set of guidelines or 'recommendations' were developed, although as she recalled "we [also] had discussions with the area managers and head office and they came up with a few

[1] The Early Start Initiative is a project aiming to providing opportunities for local, national and international collaboration with the goal of enhancing social capital and addressing disadvantage in vulnerable communities (https://earlystart.uow.edu.au/overview/index.html).

guidelines as well". These guidelines were practical in nature and intended to be used to guide how educators utilised iPadKinderloop, such as a "three sentence maximum for the individual posts", "no personal posts", and "processes in place so that we're checking each other's posts".

5.3.2 Parents as stakeholders

Participants spoke of the importance of communication between centres and parents, as the CEO stated that "when people are paying for the services we provide you find ways in which the connections can be stronger...there's an onus on us, as a provider, to ensure that the parents have as much information as possible, so they can feel good about their purchase decision!". The ability of iPadKinderloop to provide a way to communicate directly with parents was considered "really important" and the CEO described its role as a communications tool which "helps us overcome the pressures and tensions of those short contact points [between parents and educators] each day". When speaking about the trial of iPadKinderloop at her centre, Rochelle commented: "We started off with just a small focus group of families, so probably about 20 families, and we chose families that were tech savvy, that probably wouldn't mind if we made mistakes as well...and then we started adding more and more people on. And now all the families are on, and yeah they love it". The support of parents and citizens groups at centres was also influential in obtaining the iPads prior to the establishment of iPadKinderloop, as centre director Sharon recounted: "They [the parent committee] had a substantial amount of money sitting in their kitty. So we just said to them that we would like to purchase them [iPads] to use with the kids to broaden their capacity with technology. So we talked about that and they were really easy going. They were like 'Oh, yeah, if you think that's a really important thing then we'll get them'". From a negative perspective, centre directors at BFS centres situated in low-socioeconomic areas reported that parents with low levels of access to IT constrained the iPadKinderloop appropriation, as although it did not stop the centres from appropriating iPadKinderloop, it prevented parents from being able to access the centre's Kinderloop both at sign-up time and in an ongoing manner.

5.3.3 Government compliance and regulatory requirements

The National Quality Framework (NQF) was established in 2012 and applies to most preschool/kindergarten and outside schools hours care services in Australia (ACECQA 2014), including the BFS centres. The National Quality Standard (NQS), a key aspect of the NQF, sets a national benchmark against which every early childhood education and care centre in Australia is assessed. When a centre is assessed against the NQS, they receive a rating for seven areas (educational program and practice; children's health and safety; physical environment; staffing arrangements; relationships with children; collaborative partnerships with families and communities; and leadership and service management) and an overall rating, which is then published for public viewing on the Australian Government's 'MyChild' website (ACECQA 2014b). The NQS is also linked to the national Early Years Learning Framework (EYLF) which describes the principles, practices and outcomes that support and enhance young children's learning from birth to five years, as well as their transition to school (AGDEEWR 2009). The CEO confirmed that these government compliance and regulatory requirements were a significant consideration in the iPadKinderloop appropriation, as Kinderloop provided "the ability for our educators in our centres to far more readily, and cost-effectively I might add...deliver on their obligations, the documentation and reporting, and relationships with families is one major part of one of the seven assessment criteria against which we are all being rated". The success of this was demonstrated by two BFS centres involved in this study achieving perfect scores on all 58 elements of the rating for the National Quality Standard where Kinderloop was, according to the BFS Annual Report, "a huge plus for the preschools that went through the national assessment and rating process, with assessors impressed by the ease with which records and learning outcomes were documented and recalled" (BFS 2014 p.22). Under the NQF ECEC organisations are subject to national law and regulations and are required to adhere to specific educator-to-child ratios according to the age of the children. This ratio impacts on what extra activities the educators can complete whilst supervising children, including using iPadKinderloop. As Anita explained: "We only have one staff [educator] doing it at a time, 'cause who would watch the children otherwise".

5.3.4 Existing infrastructure and resources

The four BFS centres in our study had previously appropriated iPads, therefore the establishment of iPadKinderloop simply required the installation of the Kinderloop app onto the devices. As Rochelle recalls: "We had the iPads, we were pretty much ready to go, we just needed Wi-Fi installed and we had to download one app". Rochelle's quote highlights the other infrastructure required for iPadKinderloop: a Wi-Fi connection, as the Kinderloop app requires access to the Internet. Some centres had Wi-Fi in place; others had to have it installed. However numerous educators spoke of becoming frustrated with the issues that unreliable Wi-Fi access presented during the appropriation process. Additionally, several BFS centres spoke of having to deal with no Internet access at times, which presented as a significant barrier and resulted in a cessation of practices such as communicating with families in real-time via Kinderloop.

Participants at two BFS centres described how their appropriation of iPadKinderloop was constrained by an inadequate number of iPads in their centres. As educator Cindy describes, at her centre: "If the children are using the iPad we can't document anything, unless you can get Kinderloop on our phones...but taking photos on your phone and stuff like that, it's a bit of a privacy issue...so we don't like to do that". This resulted in interruptions to the performance of their communication and documentation practices at times when they would like to use Kinderloop but the children are using the iPads. Similarly in centre director Felicity's centre, they did not have "enough iPads to allow two groups to document at the same time". This resulted in an accommodation where a roster was created to ensure that each group had access to the iPad during the day, in addition to looking into purchasing another iPad for staff to use Kinderloop on.

5.3.5 Competitors

The early childhood education and care industry is competitive, as Judy states: "We've got 17 services that I'm in direct competition in and ... just two, that are community-based not for profit. And I've had a little bit of a look around at some of them, and they are run by people that just want to make money". BFS is a not-for-profit organisation who according to the CEO focuses on a "very deliberate differentiation on the high quality side of things...all of those little value-adds, whether they're cultural, sporting, convenience, however they might be perceived, are tied up in what we're presenting as our brand value proposition...[and] Kinderloop is yet one-more value-added".

5.3.6 Support and training

Although previous studies such as Blackwell et al. (2013), Fenty and McKendry Anderson (2014), Plowman and Stephen (2005) and Wood et al. (2008) have identified a lack of support and training as structuralist barriers to the integration of IT, they were not found to be present in this case study. In regards to support, the CEO stated that that "if there is an enthusiasm for the technology or delivering something in a program that is enhanced by the technology, we will step in and support that". In regards to training, educators spoke of not requiring training for iPadKinderloop due to their familiarity with the iPad, and concerning the Kinderloop app itself, educator Jackie suggests that "it's [Kinderloop] very easy to use, so we didn't have any professional development for it...and I think if you're familiar with Facebook then yeah, it's pretty simple".

5.4 The interactive process perspective

The motivation behind the development of the Kinderloop app was an inherently social one: as a parent, the founder felt that communication between parents and educators at the centre his child attended needed improving; parents are always rushed when picking up their children and they do not have time to stop and talk to the educators about how their child was through the day; and they may feel guilty or anxious about leaving the child at a centre while going to work, wondering if they are okay.

The BFS CEO was first exposed to Kinderloop at an industry conference. The Kinderloop founder had been invited to attend this conference by a BFS Board of Directors member who was a head teacher of child studies at the local TAFE (a vocational tertiary education provider) and had become aware of Kinderloop through her work. The CEO "saw great value" in Kinderloop and evaluated it against its expected affordances and against the existing practices and norms of the BFS early childhood centres.

From a social perspective, the CEO reviewed the affordances of Kinderloop within the context of a number of social and cultural contextual concepts, including parental guilt and anxiety over leaving children at centres and not knowing what they were doing through the day; time-poor parents; and the "need to provide as much information as possible to parents" and the "importance of strengthening family-centre communications". As part of this initial evaluation by the CEO, a barrier was identified as his perception of parental attitudes towards the features of the Kinderloop app; however, as he recounts, this barrier was overcome by educating parents about the current practices of how the BFS educators document children's learning and development: "So I've got to say, upfront people go 'hold on, taking photos of children? That can only lead to negative horrible things', and when you sit down with people, explain to them the closed network, and the fact that taking photos happens routinely as part of mapping their development, we're just finding another convenient way to get you the information as we go".

The decision by the CEO to introduce Kinderloop to the organisation was also shaped by the fact that BFS exists within in a competitive market of early childhood education and care service providers and is striving to differentiate themselves by providing high quality services with added values, of which he considered Kinderloop to be one such added value. A decision was made to trial iPadKinderloop in two centres managed by directors with technology champion traits and who had previously considered different ways to better communicate with families by digital means. One of these directors, Judy, recounted how she was initially cautious about iPadKinderloop, which could be considered a potential barrier to the iPadKinderloop appropriation as the director was reluctant to take on anything that took away time from establishing relationships with families and settling children at her newly-built centre. However once she had begun to appropriate it, she describes how her attitude had changed: "When I actually had a look at it, I was like 'oh my god what am I doing, this is going to help me with my families, and relationships!'".

Once the pilot at the two centres had been deemed successful, the decision was made at BFS Head Office to make Kinderloop mandatory across all centres. However no timeframe was given, only that centre directors needed to report their progress to their area manager every two months, which the CEO viewed as a "stronger incentive for centres to roll out iPadKinderloop than enforcing a deadline". During the introduction stage, despite some accounts of lack of confidence by educators, in general confidence was not identified as a major issue in the iPadKinderloop appropriation process, as the BFS CEO commented: "It came to my notice that every employee at [a particular centre] was using it [iPadKinderloop], including some people who were known to be less than enthusiastic, a bit frightened of technology, having a go, getting on board, and realising it wasn't this big frightening thing, it's quite simple to use".

As there were no formalised procedures, centre directors worked collaboratively with their staff to develop guidelines for its use. Centre director Rochelle described how these resultant guidelines were practical in nature and intended to be used to guide how educators utilised iPadKinderloop, such as a "three sentence maximum for the individual posts", "no personal posts", and "processes in place so that we're checking each other's posts" to ensure a certain level of quality. Educator Chris described an informally negotiated norm between himself and the other educator who teaches in his room, where they mutually negotiated to make "about 30 posts a day, we try our best to cover each child at least once".

We found evidence that the content of the innovation of iPadKinderloop differed in a number of centres. At two centres in particular it was evident that the way iPadKinderloop was being

used was directly influenced by the understandings that the directors had of its affordances and their evaluation of it as a tool amongst the existing practices. Centre director Rochelle had evaluated the affordances and determined its suitability as a communication tool for her centre, but with a distinct focus on documenting learning that is happening, which is then useful for educators to 'cut-and-paste' when programming[2] to save time: "We use it mainly as a communication tool, but we also try to show the learning that's actually happening as well...when we're programming, take bits and pieces off Kinderloop as well that we've seen, like little observations and we use it as part of the children's individual plans". In contrast, centre director Judy had developed strong views on not using it as a developmental documentation tool but more as a simple event-recording tool: "We're not using it as a massive developmental tool for analysis of the learning that's occurring, because I don't think I'd like it to be used that way...I think it's far more beneficial as a communication tool for families".

Centre directors and educators spoke of how iPadKinderloop had transformed their work practices. In regards to the practice of documenting children's learning and development, in some cases the day book and portfolios were discontinued and replaced by iPadKinderloop. As educator Chris recounted: "In terms of programming, we don't have to do daily reflections anymore, which is good because Kinderloop puts out all the pictures we do, it lets people know what we're doing throughout the day". There was also evidence that the practice of communicating information to parents had changed substantially, not only in how the information was transmitted, but also in the responses from parents which indicated increased engagement, as Rochelle recounts: "We've put a lot of things [on Kinderloop], like last year we did like a pet interest session, and normally even if I were to email parents, we might get one or two photos of kids' pets...last year we put photos on a pet board, we talked about the pets, people brought pets in, and we had so much more engagement from families".

There was also evidence of a content change of iPadKinderloop as a result of the structuralist educator-to-child ratio constraint during the appropriation process, where Anita explained that this ratio was "one of the reasons why we've made them [the posts] casual now, so that we can just do them in a couple of minutes, because they were getting a bit detailed and it would just take too long, and that's just taking us away from the children". Centre director Felicity spoke about structuring group time activities to accommodate the ratio, with one educator leading the group and the other supporting person could be "doing your quick blurb...But at those times you would be making sure it was very quick. It was just your pictures for your parents, and things like that. The more detailed information would have to be when you're off the floor in your documentation time or things like that".

The Kinderloop app as part of the innovation content of iPadKinderloop was noted as evolving and continued to evolve throughout the appropriation process; Rochelle recounted the very first time they met with the Kinderloop founder: "It wasn't even a proper app when they were showing us, it was just like a PDF kind of thing to actually show us how it all worked". Then when the app was first piloted, the directors of the pilot centres worked with the Kinderloop founder to adjust software features to suit them, as Rochelle describes: "It's been a really interesting process for us to go through because it was a very basic app to begin with, like there was no tagging, you could only put one photo in, and then, working with the [Kinderloop] guys they were like 'oh so you want to put more than one photo in?' and [we said] 'well yeah...we want to show the progression of what a child's doing', so then they added more photos...so there were steps that we went through with them, to help develop it". Rochelle also mentions that they continue to work closely with the Kinderloop founder to suggest more features to be added to the software, such as exporting details and including video footage in posts.

The structuralist barrier of IT technical issues was found to be present numerous times and influenced the presence of the individualist barrier of a negative attitude, with the result that both barriers constrained the process of the iPadKinderloop appropriation. Numerous

[2] Programming here refers to the educators' activity of documenting an experience and activity sequence before and after observing the children within the early childhood centre.

educators at one particular centre spoke of being frustrated with the issues that unreliable Wi-Fi access presented during the appropriation process, with Simone describing the Wi-Fi problem at her centre as a "massive challenge" and that it discouraged her from using iPadKinderloop, stating it "just all became too hard". However it did not prevent the appropriation process from continuing; rather the educators Simone and Cindy spoke of making accommodations in their documentation and communication practices, taking photos using the iPads when required, but then uploading the actual photos and posts to the centre's Kinderloop at a later stage when they could physically stand in a place with a strong enough Wi-Fi signal to obtain Internet connectivity. Other accommodations were identified in regards to centres experiencing IT technical issues, as centre director Felicity described how her centre adapted to such a problem: "We had no Internet. We had no Wi-Fi. We had nothing. And so, that was a big, 'Oh, what are we going to do?' So, we did take a lot of photos, just back on the camera or on the iPad, and downloaded them onto the computer. We couldn't post [onto Kinderloop], but we just did a bit of a camera roll [on the interactive whiteboard] for the parents during that week. And I think because we do still have a clipboard, with just a weekly paper review...we were still able to write down what was happening during the program. We had the photos to back us up. But once all our problems were solved, we backdated our [Kinderloop] posts".

5.4.1 The impact of parents as key stakeholders on the iPadKinderloop appropriation process

Parents as key stakeholders were found to be influential at different stages of the process, both directly and indirectly. Initially during the pilot, a small group of families were specifically chosen to be a part of the activities. Then after the pilot had been completed, other families became involved. With the initial introduction of iPadKinderloop into centres, there was evidence that some educators held particular perceptions of parental concerns in regards to their use of iPadKinderloop, believing that parents may have an adverse reaction to seeing the educators using iPadKinderloop. However, as centre director Felicity explained, this barrier did not end up impacting the appropriation process: "If parents walk in and see staff member having an iPad and typing, I express to my staff, 'It's no different to parents walking in with you and a clipboard and your head's down and you're writing. Are my staff gonna spend too much time on an iPad trying to do Kinderloop and stuff like that? And that was my argument and I said, 'It's no different to them having their notebooks or their clipboards with their obs[ervations] on it and writing stuff down then'. To me, it's more in the moment".

The BFS centres in areas classified as 'low-socioeconomic' presented particular barriers to the process of appropriating iPadKinderloop through the low-levels of parent access to IT at different stages of the iPadKinderloop appropriation process. At the beginning of the appropriation process one centre encountered issues where parents did not have email addresses, which are required for parents to sign-up for and access the centre's Kinderloop. This was described by centre director Anna as "a little bit of a stumbling block". As a result, the centre educators were required to maintain their existing paper forms of communication for the foreseeable future, although the centre director described how she and her staff would be "happy to sign them [the parents] up to a gmail address" in order to provide them with access to Kinderloop. A similar finding was revealed at another centre in a low-socioeconomic area, where centre director Emma stated that "a third of children attending" came from families without access to IT. Although other centres had planned (and in some cases had already begun) to move to completely online communication with families by utilising Kinderloop, at Emma's centre although the process of the appropriation of iPadKinderloop continued it was constrained in an ongoing manner, with the centre director and educators having to complete two forms of communication (both the traditional paper communications as well as electronically through Kinderloop) which increased the educators' workloads.

BFS centres where children in attendance are in foster care or other government-organised care arrangements experienced barriers to the educators' appropriation of iPadKinderloop and resulted in accommodations as the educators attempted to mitigate these barriers. Due to the nature of the living arrangements of these children and the requirement and/or preference to

keep a certain level of confidentiality in regards to the child's identity, their care-givers did not permit the child's participation in Kinderloop. Additionally the often fluid nature of the living arrangements of such children meant that these associated barriers could occur at any time during the appropriation process, as children begin to attend and then leave the centre. As centre director Emma recounts: "We have a lot of children here who are in the care of the Department of Family and Community Services or a foster care situation, short term/long term care...So you will find that there's a lot of people that go, okay, no, I don't want Kinderloop...They need to keep that child's identity confidential." This resulted in educators at Emma's centre being constrained in their use of Kinderloop, where care had to be taken with taking photos of children and uploading them to the centre's Kinderloop to ensure that children who were not to be included in Kinderloop posts were not present in individual or group photos.

Privacy as a potential barrier to the iPadKinderloop appropriation also manifested itself as a combination of both individual educator and structural environmental elements at another centre where a child's parents had requested particular privacy conditions where the child was not to be in group photos which were shared to other parents on Kinderloop. Centre director Felicity described how they dealt with this potential barrier: "When we were doing photos, staff were not to include that child. When we posted to that family, it was just their child. We would still post group times to that family, so they still knew what that child was doing, but he would not be included in the photos...I took that back to a staff meeting, explained it all to the staff...'He is not to be photographed, 'cause this is the rule,' so all staff were aware." This privacy issue arose a number of times throughout the appropriation process in different forms at different centres. At one of the pilot centres where iPadKinderloop had been in use for quite a while, educator Simone recounted how the educators had set up tags relating to the two rooms (pre-school and early learning) that housed children according to their age. This meant that when a photo was tagged with a particular room tag, it would go to a particular set of parents who had children in that room. A situation occurred where an educator had inadvertently used the wrong tags when posting photos of children to the centre's Kinderloop which resulted in those children's photos being viewable by unintended parents and a "parent rang up and made a complaint and wasn't happy about it". Another privacy issue occurred after the use of iPadKinderloop had been well-established in regards to a lack of cultural understanding at a centre that had a high proportion of families from countries other than Australia. Centre director Felicity described a situation where an educator uploaded a post and photos of a family with a child for their birthday at the centre. However she noted "the dad came in and he said, 'Can you please take it down? My wife's not allowed to be photographed. Arabic women aren't allowed to have their photos done publicly'".

Many educators and centre directors spoke of positive feedback from families; as Rochelle stated, "they love it". In addition to this positive feedback, educator Anita recalls how parental feedback on the posts that educators were making to Kinderloop informed changes to the content of the photo annotations: "It used to be a formal observation of what the child was doing and how it links to the EYLF; we still do link the outcomes to the photos, but we'll just put 'LO 4.1' so that it means nothing to the parents, they can still see that but it's just for our use. So what we used to do is we would write something like 'Bella is using her right hand to draw a picture and from this we can see we she's got good fine motor skills', using that technical language whereas now we'd write 'Bella is having a great time drawing a picture for mum', it's really casual and more informal". This comment also illustrates how the government regulatory requirements influenced the way the educators were utilising iPadKinderloop, as the educators use their Kinderloop posts to demonstrate how they are meeting the required outcomes from the prescribed curriculum.

6 DISCUSSION

According to the individualist perspective, individuals have traits or characteristics which predispose them to innovative behaviour, and innovation is caused by individual actions. Although not all of the previously identified individualist barriers to IT appropriation from the

literature were present, we did observe the presence of 'negative educator attitudes' and 'lack of confidence' as barriers. However we found that they did not halt the iPadKinderloop appropriation process, but rather constrained the extent to which iPadKinderloop was being appropriated in some centres. The presence of two centre directors with personal characteristics such as a positive attitude towards IT in early childhood and the personal initiative to consider digital forms of communication with parents such as blogs long before the arrival of iPadKinderloop positively influenced the successful iPadKinderloop appropriation, through their support of the pilot and also their role as key ambassadors for iPadKinderloop. This supports the studies on innovation that have established that innovative activity is promoted by technological champions (Howell and Higgins 1990). The CEO's role in the initiation of the appropriation process within the BFS organisation cannot be underestimated; his initial exposure to the app via the founder at the industry conference which had been instigated by a Board member, and his subsequent acceptance and drive for the appropriation has clearly influenced the appropriation process. Through the CEO's passion for delivering 'value-add' to the services his organisation provides, and his enthusiasm for the families and their involvement in his centres (as testified by his staff), the benefits that iPadKinderloop affords have been realised. We concur with Daft (1978) who notes that "leaders are active in the innovation process" (p.193). However as Saren (1987 cited in Slappendel 1996) argues, the actions of innovative individuals cannot be divorced from either the activities of other individuals or from the organisation structure within which they operate. Therefore although applying the individualist perspective provides useful insights, it is limited in only providing partial explanations.

The structuralist perspective contributes to our understanding of the iPadKinderloop appropriation by examining organisational characteristics and elements from the organisation's environment. The previously reported structuralist barrier of 'IT technical problems' was observed to be a constraint to the iPadKinderloop appropriation rather than a strict barrier, as educators mitigated the impact of by making accommodations to their workplace practices. Other structuralist barriers such as 'lack of training' and 'lack of funding' were not identified in our study. The relatively flat hierarchy of the BFS organisation seems to have contributed to the smooth iPadKinderloop appropriation, despite the absence of a formalisation implementation plan for the roll-out. This finding is in contrast to other studies on innovations in educational institutions who found that a "large, complex organization with a heterogeneous environment is more likely to adopt innovations than a small, simple organization with a relatively stable, homogeneous environment" (Baldridge and Burnham 1975 p.175). The fact that a strict deadline was not imposed on centres for the appropriation, coupled with the lack of guidelines meant that although the appropriation was mandated in a 'top-down' fashion, centres had some degree of autonomy in deciding when and how the appropriation would unfold. The environmental elements of parents as stakeholders, government compliance and regulatory requirements, existing infrastructure and competitors were certainly influential in the appropriation process. As Leaner and Phillips (1994 p.43) state, "few would disagree that parents are a key childcare stakeholder group" and the desire of the organisation as recounted by the CEO and directors and educators to strengthen parent-centre communications was a significant driver in the iPadKinderloop appropriation. We have revealed the existence of previously unidentified barriers related to parents as stakeholders, including barriers related to low-levels of parent IT access, children in specialised care arrangements, and privacy issues, reaffirming existing findings of the importance of parents at this level of education (Bidwell 1965 and Sieber 1968 cited in Baldridge and Burnham 1975; Burden et al. 2012 cited in Clark and Luckin 2013). However as with other barriers identified in this study, we observed that their impact was mitigated by the educators' accommodations in workplace practices. Along with iPadKinderloop's ability to transform the practices of centre communication with parents, the recent government compliance and regulatory requirements of the NQF, NQS and EYLF were influential in how iPadKinderloop was appropriated, as its features allowed educators to replace traditional forms of documenting children's learning and development and facilitated, in the words of the CEO, "our educators in our centres to far more readily, and cost-effectively, deliver on their obligations, the documentation and reporting".

However, as with the individualist perspective, the structuralist perspective only provides partial explanations, and so we look to interactive process perspective to take into account the relationship between the individualist and structuralist elements, and by focusing on the complex interplay between these various factors, permits a more detailed analysis.

The interactive process perspective allows us to understand how the interplay of the individual and structural elements influenced the innovation process over time. The appropriation of iPadKinderloop can be traced to the 'shock' of the Kinderloop founder being introduced to the BFS CEO at the industry conference. As Schroeder et al. (1986) state, a shock does not need to be viewed as a negative, but rather as something that stimulates efforts by people to begin work on an innovation, which is what happened in our case study, as the CEO took an interest in Kinderloop and began to evaluate its potential within the context of the BFS ECEC organisation. The outer context concepts of the social and competitive environment were particularly influential at all stages of the process; at the beginning, the evaluated affordances of Kinderloop to strengthen communications between centres and parents and to deliver value-add to the services provided by BFS were evident. The social context of the importance of communicating with parents, and the nature of parents as stakeholders was particularly evident throughout different stages of the appropriation process as both positive and negative influences: from the beginning when parents were involved in the pilot and where the structuralist barrier of 'low levels of access to IT' caused difficulties for the introduction of Kinderloop in a centre where parents did not have email addresses with which to sign up to Kinderloop; through to iPadKinderloop in fluent every-day use and the positive feedback provided to educators by parents, in addition to the continuing constraint of both the 'low levels of access to IT' and 'privacy issues' at a particular BFS centre which caused the educators to have to complete 'double lots' of work in regards to both paper and electronic communications. In a social context, from the perspective of the centres, iPadKinderloop had transformed the way educators communicated with families, providing a deeper level of engagement with them. From the perspective of parents, their appropriation of the app on their devices enhanced a series of processes that are notably social in nature, for example allowing them to be reassured that their child is doing well while they are in attendance at the centre, or promoting engagement with their children at home, as parent Megan described "[Kinderloop is] a really great conversation starter in the evening, because most young children can't remember what they did".

The content of the innovation was shown to evolve in different ways in different centres, as a result of the individual perspectives of the centre directors in regards to their evaluated affordances of the technology, combined with the structural influence that although iPadKinderloop had been mandated by the CEO, centre directors had a degree of autonomy in the decision-making that shaped how iPadKinderloop was appropriated in their own particular centres. The content of iPadKinderloop continued to change throughout the appropriation process: through influences such as parent feedback and the mitigation of the structuralist barrier related to the educator-to-child ratio regulatory requirement, both of which resulted in changes to the annotations of posts; and educator feedback to the developers, such as the introduction of new functionality of tagging in posts and uploading of videos. The work practices of educators, in particular communication with parents, and documentation of children's learning and development, were transformed by iPadKinderloop appropriation. As the work practices of the educators are considered part of the content of the innovation of iPadKinderloop, the barriers and constraints which arose at different stages of the appropriation process resulted in accommodations and adjustments by educators to their work practices in an ongoing manner, thus modifying the content of the innovation over time. For example, the structuralist-categorised barrier of 'IT technical problems' (such as centres who experienced Wi-Fi problems) appeared at numerous times during the appropriation process, and educators did their best to mitigate the problem when it appeared by implementing strategies such as moving to a place in the centre with stronger Wi-Fi, or delaying the creation of Kinderloop posts. This finding concurs with that by Becker (1993 in Ertmer 1999) who stated that barriers "may never be eliminated completely but rather that they will continue to ebb and flow throughout the evolutionary integration process" (p.52).

Although other studies of innovation have found that as an innovation develops, the 'old' and the 'new' ways of doing things exist concurrently and over time are linked together (Schroeder et al. 1986), we observed that this was not always the case with our study; for example the 'old' way of communicating the day's activities through the production of a day book, and the 'old' way of documenting a child's learning and development in a portfolio were both discontinued and replaced by the artefacts produced by iPadKinderloop at a number of the centres in our study.

7 CONCLUSION

This study addresses shortcomings in the limited body of literature on innovation and IT appropriation in ECEC organisations. We contribute to the IS literature a detailed, tri-perspective account of organisational innovation and the process of IT appropriation, and demonstrate that neither an individualist nor a structuralist perspective alone provides a deep understanding of the process. We confirm that "organisation change and its implementation is viewed as a complex, messy process inseparable from its intra-organisational and broader contexts" (Walsham 1993 p.53) and we have demonstrated that the process of IT appropriation occurs through a complex interaction between individual action and structural influences and thus is better understood through a tri-perspective framework which examines both innovation determinants and barriers. As we have provided a rich case study of an IT appropriation, we contribute to IS practice by exposing the multi-faceted influences on IT appropriation which provides a basis for managers to plan and prepare for IT appropriation. We acknowledge that there are other implications to the appropriation of such technology including workplace privacy, employee performance monitoring, the inadvertent recording of child misbehaviour and/or injury, and digital inclusion issues, which have not been addressed in this study. Thus further research is required to derive more detailed information to guide managers in facilitating the appropriation of IT.

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