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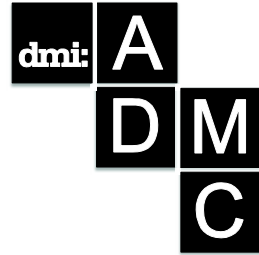
This is the author's version of a work that was submitted/accepted for publication in the following source:

Price, Rebecca, Wrigley, Cara, Matthews, Judy H., & Dreiling, Alexander (2014) A digital airport experience : design-led innovation in support of airport strategy. In Bohemia, Erik, Rieple, Alison, Liedtka, Jeanne, & Cooper, Rachael (Eds.) *Proceedings of 19th DMI : Academic Design Management Conference*, London, UK, pp. 2710-2729.

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19th DMI: Academic Design Management Conference
Design Management in an Era of Disruption
London, 2–4 September 2014

A Digital Airport Experience: Design-led Innovation in Support of Airport Strategy

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The digital era is proving to be one of disruption, where new technologies matched with innovative business models can be harnessed to attack even the most established of companies. For businesses with the relative certainty of captive customer bases, such as airports, the ability to digitally diversify offers the opportunity to venture into new modes of operation. For an airport, this opportunity can also be leveraged to sustain superior customer support regardless of a customer's location in the world.

This research paper presents a case study of the development of an Australian Airport Corporation's mobile application as part of a greater digital strategy initiative using a design-led approach to innovate. An action research method provides the platform for an intensive embedded practice and study of design-led innovation within the major Australian Airport Corporation.

The findings reveal design-led innovation to be a crucial in-house idea generation and concept development capability enabling the bridging of distinct corporate domains associated with commercialisation, operations and customer experience. A Digital Innovation Checklist is presented as an output of this research which structures an organizational approach toward digital channel innovation. The practitioner's checklist is designed to aid in the future development of digital channels within the broader spectrum of strategy by addressing business assumptions.

Keywords: *digital strategy, design thinking, design integration, action research*

Introduction

Airports are increasingly being viewed as businesses, rather than public services (De Neufville & Odoni, 2003). The typical business model for airports has reflected this change, with airports extending to city-like social structures; home to industries, people and trade. A driver for the dominance of commercialised airports has been linked to modern society's reliance on air travel as a form of connectivity (Kasarda, 2001). Following the theme of connectivity, an identified industry innovation agenda witnessed within aviation is negotiating the rise of the digital economy. The digital economy has provided the opportunity to radically redesign how airports create and capture non-aeronautical revenue as an ancillary business activity (Taneja, 2011).

For airport management, a diversification from the operation of physical infrastructure of terminals, runways, parking, transport and roads through digital services provides an opportunity to develop new customer relationships. These customers could be passengers, family and friends, retail providers, transport services and other stakeholders within the airport value chain. The use of the word customer within this paper denotes the exchange of value between any of these customer types listed above and the airport. The common end user of an airport is considered the passenger; however, in designing services for an airport, one must consider a much broader view of potential stakeholders. These relationships can be leveraged to support the growth of additional non-aeronautical revenue streams contributing to stronger business performance and growth (Taneja, 2011).

But what value can be packaged and delivered in such a way that strengthens the relationship between customer and airport? How can airports' digitise operations and shift into a future interface with a customer that both supports core business and delights exceptional experience? How can large airport corporations engage customers and discover novel new opportunities to be built upon through digital channels?

These questions pose complex challenges for corporations in airport management and physical infrastructure provision seeking to shift the perspective on the value of digital enabled environments.

This paper outlines a mobile application project completed through a design-led approach within a single Australian Airport Corporation. The research aim is to identify the role of design-led innovation in an Airport Corporations' digitisation as the vital link between customers and a higher level digital strategy.

Therefore, the research question to which this paper responds is; *what role does design-led innovation play within the development of a digital mobile application?*

This paper contributes a novel understanding of the role that design-led innovation can play in the development of an Airport Corporation's digital channel by bridging the value provided by design-led innovation as an approach within an embedded research period. The paper concludes with a Digital Innovation Checklist which synthesises the key areas of corporate business focus within the context of digitisation and strategy.

Design-led Innovation

Design-led innovation begins by gathering deep customer insights using co-design and provocations rather than observation alone (Beckman & Barry, 2008). Transferring deep customer insights into propositions or business opportunities follows as a means for driving and promoting idea generation within the business (Verganti, 2009). Rapidly designing business models that support these propositions then enables new outcomes to be supported by the strategic arm of a business. Once novel customer insights have been gathered, business opportunities for innovation can be translated into a customer centric innovation agenda. These opportunities are framed not as solutions, but rather as propositions for what the future operation of a business might look like (Bucolo, et al. 2012). Importantly these propositions are customer centred with the design-led approach demanding stakeholder and customer engagement. Propositions become platforms for evaluating the current business strategy.

A proposition or opportunity is carried into the internal and strategic level of the business to inform brand strategy, competitive advantage and a business's vision for growth and change. The activity of shifting opportunities into the strategic or operational domains of a firm sits as an integrative activity. Strategic decisions usually occur within the upper management areas of an organization, whilst operational orientated staff may be siloed to focus on operational activities. The act of gathering and translating propositions across a firm's hierarchy or structure is a challenging activity that requires a level of maturity and appreciation of design to sustain (Bucolo, et al. 2012). Wrigley terms the position of this research/practitioner, a *design innovation catalyst* (Wrigley, 2013).

Digital Business Strategy

The addition of digital technology to the business landscape has radically changed the way businesses operate to deliver and capture value (Drnevich & Croson, 2013). The prevailing perspective on information technology (IT) is that it exists to support business-level strategy by providing back-end functionality to operations (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). The role of IT within business is undergoing redefinition, driven by key advancements in the way digital technology is allowing businesses to differentiate particularly within turbulent environments (Pavlou & El Sawy, 2006, 2010).

The result of such a digital revolution is the emergence of a more complex environment for innovation and growth (Iansiti & Levien, 2004; Pagani, 2013). Establishing coherent strategy to leverage and integrate digital technology is a new activity now greeting established and new businesses alike. As with general business, digital business relies on the presence of value as a commonality. The value which a business proposes must be met by a matched purpose to which it serves for a customer. Value is not fixed, nor is it stable, but is a function of a customer's choice.

For a business to plan and develop value for the customer of tomorrow, Keen and William state it must be firstly customer-led and future driven (2013). Keen and Williams argue that as every business is now operating within the digital world to deliver value (2013). Therefore, developing strategy through a business model approach is inadequate. Businesses focus must shift towards 'value architecture' – the design of new value propositions to be implemented and leveraged through digital means (Keen & Williams, 2013). But how are new value propositions for tomorrow's customers designed? Whilst IT and information systems have traditionally looked to behavioural information systems, design science and economics to define new opportunities for value creation, there is a now considerable attention shifted to design and design thinking to develop deeper insights concerning customers of tomorrow in the pursuit of successful digital innovation.

Design-led Industry Project: Mobile Application

Airports have long been situated as microcosms for the application of advanced technology due to the limited margin for inefficiency and constant volume of customers (Nicas, 2012). A recognised business opportunity stemming from the rise of urban dependence on air travel is the development of digital assets capable of providing value to customers and stakeholders within a greater airport system (Taneja, 2011). It is estimated

that 70% of customers already carry smart phones, and that up to 50% engage in mobile check in (SITA, 2013). Digital technology empowers the customer to be active within their airport experience and negotiate processing tasks prior to arrival on airport. There is potential at the intersection of new systems enabled by technology, met with deeper customer insight, to create new customer processes which radically change the way airports operate and service commercial and general aviation customers.

This paper is built on the development of a major Australian Airport Corporation's mobile application. The airport corporation involved with this research engaged in the development of a mobile application to diversify into digital channels. The purpose of the mobile application is to support a customer's journey to and from the airport by providing critical information in a mobile context.

The development and production of the application has provided the platform for design as an alternate approach to innovation. The development and release of the mobile application followed the project brief to introduce innovative features to differentiate and define the Airport's app from competitor offerings. This component to the brief provided the critical platform for design-led innovation to operate in order to translate customer insights into radical new service offerings developed and delivered through the mobile application.

The project followed a design-led innovation approach through the partnership with the researcher (first author) and prominent stakeholders within the Business Development Team of the Airport Corporation. The researcher acted as the project facilitator, whilst the Business Development Manager sat in the role of project management during development. Table 1 provides an overview of the key project phases in order to shed light on the broader phases of the project.

Figures; 1,2 and 3, are extracts from the design-led approach to the development of the mobile application and link to the presentation of Table 1. Figure 1 is a frame from the customer testing phase in which deep customer insights were gathered. Narratives were presented to customers in order to engage and provoke dialogue about the possible value and utility of a mobile application. Figure 2 is an extract of the responses following customer engagement and highlights the relationship between insights and reframed 'meanings'. These 'meanings' seek to make sense of insights by interpreting hidden customer values. Figure 3 is a visualisation of the early conceptualisation of the digital strategy. Whilst most strategic documents

use text and diagrams to convey the potential objectives of strategy, this illustration sort to quickly communicate the potential relationship between the customer and airport operations.

Table 1 Design-led Innovation Project Phases

Project Phase	Design-Led Tools	Objective
Planning	Case Studies of Competitors – Best case	Project Brief Aims and Objectives Timeline Budget
Internal Workshop	Narratives Convergent thinking Business model canvas Reframing	Collaboratively identify assumptions and differing perspectives Distilling ideas into narratives
Deep Customer Insights	Reframing Persona Design Narrative and Storytelling (Figure 1)	Test and refine concepts Engaging your own customers in dialogue – encourages a higher level of concept transparency and accountability
Propositions	Reframe - insights into meaning or value statements (Figure 2)	Challenged the ability to move beyond customer needs and wants alone.
Design Strategy	Building a roadmap to structure future digital projects through customer centric value propositions (Figure 3)	Ensure cross-channel cohesion requiring greater consideration about how the business delivers value through digital channels.
Project Funding	Carrying voice of the customer through narrative Customer centric concepts	Disseminate final concepts with Senior Management to secure project funding
External Consultancy Specification	Narrative Persona Design	Inspire consultants through insights gained Narrative differs to sequence of use in that it encases a character with emotional elements.
Development & Production	Voice of the Customer Narrative	Convey meaning underpinning digital strategy to allow for independent development Requires systems approach
Release	Narrative Graphic Design	Design as persuasion – telling a story to increase adoption underpinned by digital strategy values.

MEET MATT – TRAVELING TO MELBOURNE FOR WORK.

Matt travels often for work and likes to make sure he's on time and organised. Although he's very familiar with airports and feels comfortable travelling, he does know he needs to be prepared to make sure things don't go wrong, like missing a flight or losing baggage.



Figure 1 Narrative Excerpt encasing Persona Design – Narratives were constructed and presented to customers using a tablet device. The narratives focused on exploring and evaluating trends observed in the airport's market data as well as presenting digital channel concepts.

CUSTOMER TESTING
DEEP CUSTOMER INSIGHTS


My Trip	Pax feedback:	Meaning:
<p>"Push notifications of flight details and being able to send your 'my trip' to a friend for flight subscription to notifications"</p> 	<ul style="list-style-type: none"> - "Notify me if there is significant delays expected otherwise I might waste hours of my day at the airport trying to pick someone up" - "Is there a way of knowing if the plane is in a holding pattern, this might help me to plan my run to the pickup for my friend...?" - "What if instead of searching for my flight – if I had my QR code, I could scan my boarding pass or check in pass from my airline." - "You feel so guilty if someone is picking you up and your plane is late... like there is nothing you can do...." - "Having updates is so important – especially if I'm in a café and can't see the screens – or in the bathroom and can't hear the voice overs and it's stressful..." - "Maybe personalise the message – 'Chelsea– your flight is now boarding – head to gate 27...' – is that possible?" - "Notifications should say boarding in 10 minutes, boarding, boarding - final call, Flight closed... Imagine if you got a closed... how would you feel? – maybe the app could then help me get some help if I miss my flight..." - It would be a lot easier if my partner on land was in control and didn't have to rely on me for when to leave. I wouldn't feel so guilty... 	<ul style="list-style-type: none"> - Being informed with the right information so that I can be in control. - Eliminate guilt of travel by networking passengers with family and friends - Humanising my personal experience - Personalisation - Improving pax experience means improving everyone's experience also

Figure 2 Deep Customer Insights to Meaning – A concept or proposed idea was explored within each narrative. Insights were gathered surrounding the validity of this concept (customer feedback). These insights were reframed into a set of 'meanings' to which a design brief was built to address.



Figure 3 Conceptual Display of Digital Strategy – Visualising the strategy quickly and persuasively conveys the core focus of use of the mobile application. Importantly, the strategy focusses on the broader picture of business operations and how the digital channel fits into this environment – most importantly, visualisation represent the customer.

Methodology

Action Research

The industry based rationale of this research methodology utilises an exploratory action research approach in order to align the research objectives of understanding the role of design-led innovation within a practical application (Swann, 2002; Zuber-Skerritt, 1992, 2001). Action research is ideal in the broader research design as the experimental and reflection based learning present within the methodology supports the iterative nature of design practice (Schön, 1983; Swann, 2002), and the cyclic nature of the design-led innovation (Bucolo, et al., 2012). Whilst exploring design-led innovation, action research offers the researcher the ability to reframe and tackle any arising problems within the unique research context through practice (Gustavsen, 2005). Figure 4 illustrates the proposed action research cycle with an integration of design-led innovation. The cycle provides the necessary structure to apply a design-led approach whilst undertaking a qualitative research program exploring the organizational role correlating to a new way of completeing work. The

stages of action research are produced as an adaption of Swann (2002), and Zuber-Skerrit (1992:2001).

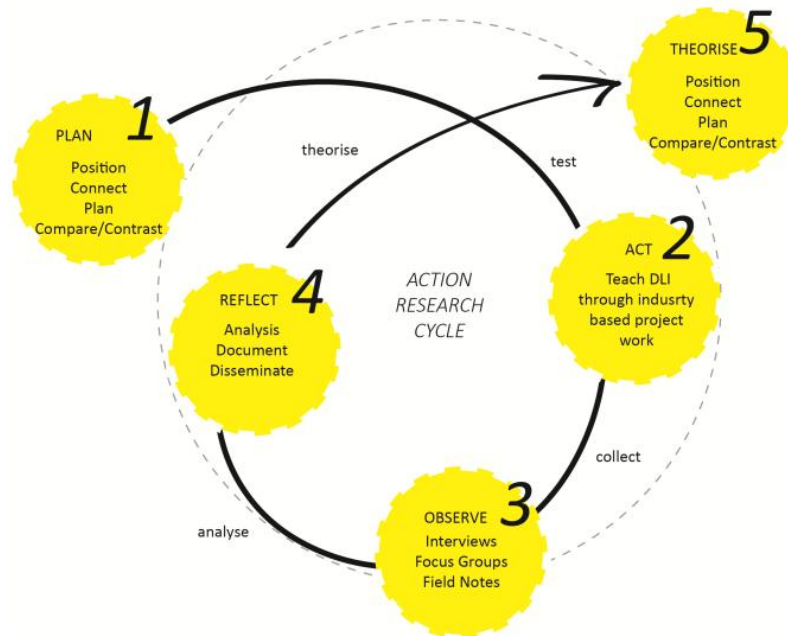


Figure 4 Action Research Cycle. Source: Swann (2002), Zuber-Skerritt (1992, 2001).

Whilst a limitation of this research is that it focuses on one organizational context alone, the 18 month embedded period ensures that the richness of data collected from within the organization provides detail to the study of design-led innovation within a industry type.

Data Collection and Analysis

The action research method contains data collection sets through semi-structured interviews, focus groups and a continuing field notes and a reflective journal (Costello, 2011). Participants within semi-structured interviews and focus groups ranged from coordination through to general management and consisted of all key departments (7 in total) within the Airport Corporation. Table 2 outlines the data corresponding to the findings presented within this paper. Focus groups brought together key stakeholders within the Mobile Application project who were actively applying design-led innovation to progress the project. Stakeholders who sat with close proximity to the Mobile Application project but had not actively engaged with design-led innovation were also included within the focus groups. These stakeholders provided important perspective to the validation and critique of a design-led approach.

Table 2 Data Collection and Analysis Overview

Method	Action research Cycle 1	Action research Cycle 2
Semi Structured Interviews	20 Participants	10 Participants
Focus Groups	1	2
Field Notes	48 Pages (A5)	45 Pages (A5)
Refelective Journal	11 Pages (A5)	8 Pages (A5)
Data Analysis Technique	Thematic Analysis	Thematic Analysis

Transcripts of focus groups and semi-structured interviews were produced with consent from participants. Field notes and the reflective journal were heavily based on participant observation (Saldana, 2011). A thematic approach to the analysis has enabled data collected in the field to be analysed with no preconceptions of possible themes (Miles & Huberman, 1994).

Findings

The following findings present the role that design-led innovation has played within a major Australian Airport’s mobile application development. The major grouping of themes presented within this paper regarding the role of design-led innovation are; *customer insight, operations and commercialisation*. These themes broadly describe the role of design-led innovation within specific drivers of the business. The sub themes which are structured beneath these major themes describe the more specific function that design-led innovation as an approach has played within the airport.

Customer Insights

Design-led innovation as empathetic bridge to the customer

The notion of ‘*starting with the customer first*’ meant that business assumptions regarding customers were evaluated early within the mobile application project. Empathy for the ‘*pains of the customer*’ were established and sustained due to the direct representation of the customer within narratives, and the indirect representation of the customer through customer-centric propositions translated from insights gathered in the field. One such proposition that was continually raised throughout the project was striving to help the customer always remain ‘*in control*’ of their airport experience. The notion of referring always to the voice of the customer, or positioning oneself in the shoes of the customer in discussion was evident all the way through to the final development and release of the mobile

application. The voice of the customer was linked to uncovering '*blind spots*', or moments driven by assumption particularly when the project progressed quickly. When new stakeholders were brought onto the project, they were briefed on the core values underpinning the mobile application project that were reframed from customer insight, for example; to engage family, friends and colleagues as a support network within a customer's journey; to deliver individually tailored information to help the customer remain in control; to ensure every customer's journey is special; to ensure travelling by air is never a chore. The transparency of the process for gathering insights was powerful in justifying design and development decisions encountered later on in the project timeline particularly throughout project funding and engagement with external consultants.

Design-led innovation as an identifier of novel customer centred opportunities

This function came from an emphasis on developing ideas '*in-house*' based on customer insight, rather than focussing energy toward what competitors or benchmark airports were achieving within the mobile application domain. This allowed airport stakeholders to make more detailed assessments of business performance and the delivery of value through mobile channels. For example, a focus on making contact with local plane spotters who held a distinctive perspective to aircraft operation provided perspective into the aviation community. This face of the airport which is associated with the romance of aviation, was harnessed within social media and *Instagram* in particular to develop an identifiable character of the Airport Corporation. The character is now integrated into the fabric of the mobile application.

Operations

Design-led innovation as transition from problem to solution

Previously, a focus on matching or repeating the achievement of external competitors this business had developed solutions that were new to the company. Idea generation was an existing strength within the business with creative stakeholders often producing rich but unresolved ideas. However, many great ideas were effectively '*put on the shelf*' as their implementation carried difficult system changes and associated risks. There existed no

incubation process for resolving ideas and reducing risk through co-creation. By focussing not just on idea generation, but on concept development in-house, final solutions of the mobile application proved to be more complete in conceptual detail and customer relevance, more differentiating in nature and largely new to the industry.

Design-led innovation reduces project risk

As the produced mobile application concepts had no identifiable implementation in rival airports, these novel ideas carried risk. The process of testing ideas through narratives and refining out possible irrelevancies or strengthening relevant components within the project allowed the mitigation of risk during development phases. Detail within each concept tested provided constraints which reduced project scope creep within the later specification and production phases. Greater clarity and detail surrounding the final concepts also improved the airport's ability to detail to external consultancies *'what a successful solution would look like'*. The design-led approach provided an evaluation platform for possible new technologies.

Design-led innovation as production of strategy

Whilst most new product and services developments undertaken in the airport touched or aligned to existing strategy, the design-led approach challenged and disrupted existing differentiation tactics. Previously, digital projects had grown in an organic way – responding to competitors, or jumping to provide solutions in an ad hoc *'spot-fix'* method. Whilst this method is necessary under times of growth, the design-led approach demanded a strategic phase of the project. This holistic approach provided the crucial structure within the project to step into a more intangible and broader view of how digital assets could be developed and harnessed in the future of the Airport's operations.

Commercialisation

Customer Experience and ROI

The responsibility to deliver viable business cases supporting each project with a plan for a return on investment is essential for a privatised corporation. An airport also operates as a public service in some capacity by providing infrastructure to the public which is amortised through total operations. A fine line is drawn between developing solutions which are driven by a return on investment, alongside solutions which are cost heavy and delivered to the benefit of the customer only. Creating and capturing

value both for the customer and Airport was an important element within the design-led approach. The design led processes ensured that the value encapsulated and delivered through the mobile application was designed to meet a necessary need, desire or substantial meaning within the community of customers. The design approach started with the customer and bridged two distinct notions within management: *'good business'*; and, *'excellent customer experience'*. Where a direct return on investment was not measurable or clear, the Airport stakeholders present within the project turned to producing *'excellent customer experience, future proofing and reputation'* as justifications for the mobile application project direction.

Limitation of design-led innovation

Design-led innovation inherently involves a customer-centric view of how possible solutions can be developed and delivered. The design-led approach harnessed within this project required funding and investment from multiple departments within the Airport structure, to budget the development and execution of the project. In securing departmental funding, the customer-centric solutions proposed were shaped and altered to better meet the business requirements of the major departments funding the project. Whilst the voice of the customer was maintained within the pitch to these departments, the power held by these major departments ultimately played a role in dictating the final form of particular features of the mobile application. This is an interesting intersection of the design-led innovation and a privatised corporate departmental funding model. Design-led innovation was limited within the later phases of this project by the political structures in place within the Airport Corporation. To mitigate these constraints, the Airport Business Development Team facilitated by the design catalyst (first author) sought to ground these variations to the design specification by aligning them to customer insights gathered earlier in the project phase.

Discussion

Keen and Williams (2013) have called for a 'value architect' to *design* the value underpinning the delivery of services through digital means. The *'architect'* is not designing the visible face of a digital service, but rather the core purpose or element of value creation (Keen & Williams, 2013). This type of designer must therefore be suitably armed with customer-centric exploration skills – being able to identify the right problems to solve, not just

deploying basic design-led problem solving skills (Beckman & Barry, 2008). The emergence of the '*value architect*' is built upon by this research project which seeks to understand the role that design-led innovation approach plays through its application by stakeholders within the development of an Airport Corporation's digital strategy.

The findings of this research are underpinned by three key areas of business perspective which a '*value architect*' or '*innovation catalyst*' must synthesise in order to align business agendas (Keen & Williams, 2013; Wrigley, 2013). These three areas are: 1) operations as the core element of an infrastructure provider, in this case and airport; 2) commercialisation, as responsibility to return on investment to shareholders; 3) the importance of customer experience at the operational face of a business. Design-led innovation provides the critical skills and cultural platform to synthesise these key areas by providing a novel idea incubation phase within existing corporate innovation processes.

The Airport Corporation involved within this research has found value in the development of deep customer insights which identify '*blind spots*' of assumed customer experience. These '*blind spots*' are framed as business opportunities for establishing new products and services to improve customer experience and drive non-aeronautical commercialisation. Importantly, this aspect of design-led innovation synthesises the business's underpinning driver to deliver a return upon investment to shareholders with the customer centric values that are key to improving the reputation of the Airport within the public domain (De Nueville & Odoni, 2003).

The role that design-led innovation has played within the development of the digital mobile application has not just been siloed to the product or service domain alone (Bucolo, et al, 2012). Proposing strategy as a component of design-led innovation based on customer insight has forged a platform continued digital developments. Keen and Williams argue that for a business to develop digital strategies, they must remain future driven and customer focused in order to continue delivering value through appropriate digital channels (2013). Here, the Airport's natural risk aversion and a strong focus on operations associated with physical infrastructure has provided challenges to the design-led approach. The business's drive to commercialise has also impacted how design-led innovation has been harnessed, particularly within the project funding stages.

Digital Strategy Innovation Checklist

Three critical faces of a business have been encountered and synthesised during a design-led approach to the development of a major Airport

Corporations mobile application. These faces are 1) operations – the core activity of the business, 2) commercialisation – how the business is profitable, and 3) customer experience – how customers experience the business's operations. The Digital Innovation Checklist (Figure 5) has been developed from empirical evidence collected within the embedded action research period presented within this paper. The checklist has been developed through an evaluation of the role that design-led innovation has played in problem identification and solving within specific domains of the business.

The checklist is presented in the form of a sequenced canvas seeking to map and construct a synthesis of these key areas as the basic premise of a digital strategy, and importantly prompt practitioners to consider and include digital channels within the broader spectrum of business strategy. The checklist can be used within early project phases to structure development and/or be used as a checklist nearing completion. The checklist can be used numerically, addressing the questions stated to reveal or provoke business assumptions. Practitioners who may benefit from the checklist include managers of business development, digital strategists, information technology strategists and in-house designers. An application of the checklist is a proposed area of future research and its explorative use by practitioners is encouraged.

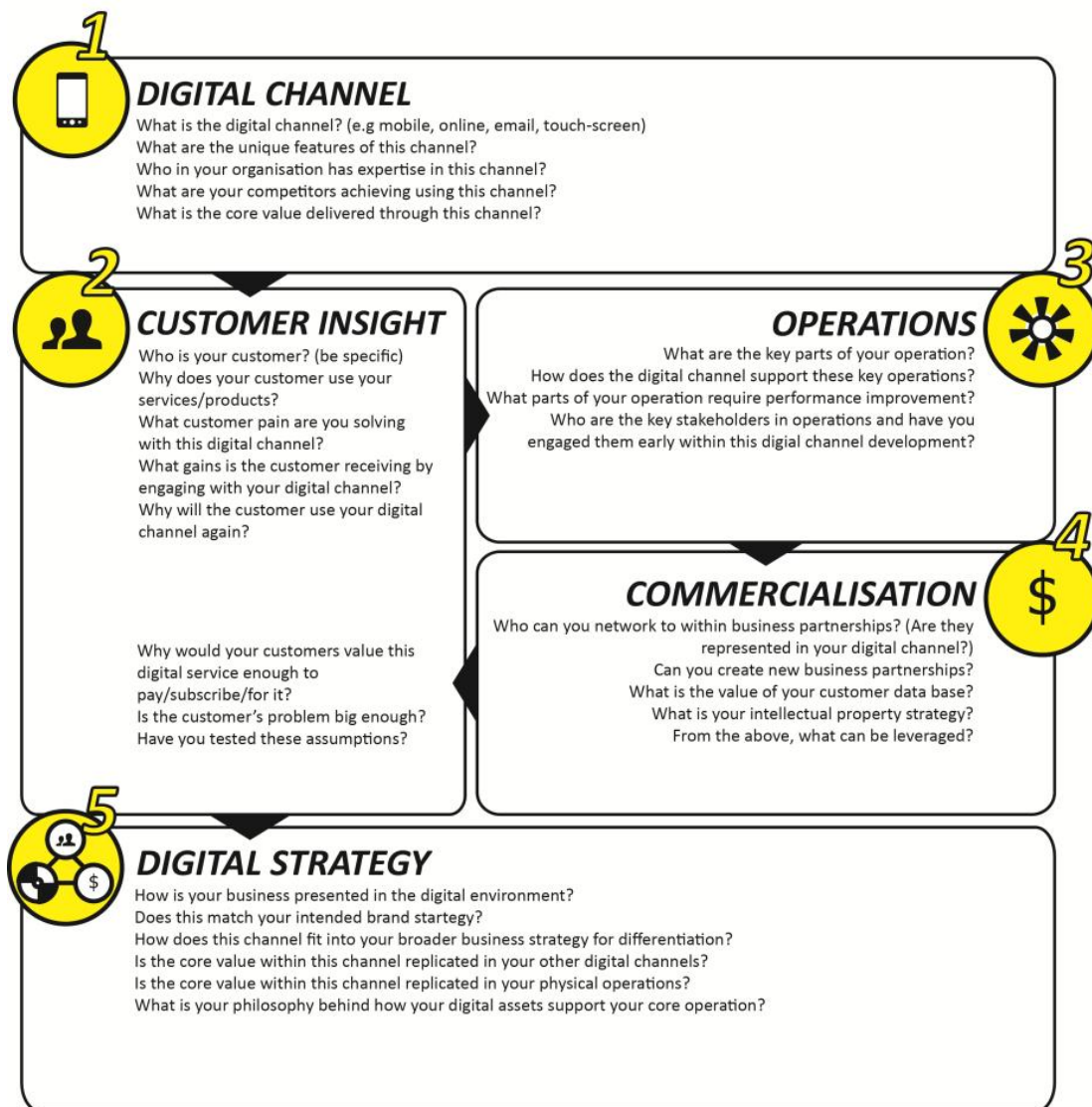


Figure 5 Digital Innovation Checklist. Source: Developed from this research

Implications

Design-led innovation and practitioners of a design-led approach when undertaking digital channel innovation carry out the following activities:

- Gather customer insights which can be used to ground the possible use of new technologies as the digital channels for delivering value;
- Provide a platform to be reflexive, self-critical, and face the technological age of disruption and uncertainty with energy, enthusiasm and optimism whilst remaining risk conscious;

- Apply a process that provides the internal environment and matched skills to enable new ideas to be generated and refined into new products, services and strategies for achieving superior performance both in commercial and customer experience domains whilst reducing risk;
- Enable core corporate agendas associated with commercialisation, operations and customer experience to be synthesised into viable and inspirational solutions capable of altering the way the industry and public perceive commercial air travel.

This paper contributes to a new understanding of the role of design-led innovation within the corporate digital business environment as the bridge, the enabler and the creator of new value through intersections between customers, operations and commercialisation. The role of design-led innovation within digital channel innovation and broader digital strategy development rests within the synthesis of customer insight, commercialisation and the support of operations. Design-led innovation as an approach plays the role of customer –centric protagonist within the creation of new digital services, products and business strategy. We look forward to future research to test and validate the application of the Digital Innovation Checklist in new diverse contexts.

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