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Anthony Lu  
UNSW, anthonylu@live.com.au

Felix Tan  
UNSW, f.tan@unsw.edu.au

Lesley Land  
UNSW, l.land@unsw.edu.au

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## Starting-up an IT-enabled Disruptive Innovation: A Stage Model

Anthony Lu  
Felix Ter Chian Tan  
Lesley Land

School of Information Systems, Technology and Management  
University of New South Wales  
Sydney, Australia

Email: [anthony.lu@student.unsw.edu.au](mailto:anthony.lu@student.unsw.edu.au), [f.tan@unsw.edu.au](mailto:f.tan@unsw.edu.au), [l.land@unsw.edu.au](mailto:l.land@unsw.edu.au)

### Abstract

*Disruptive innovations better business performance and society. Scholars have claimed that IT disruptive innovations have revolutionised how firms conduct their business and how people shape their daily chores. We discover how an emerging start-up company (goCatch) achieves a revolutionary and leading edge application system for the taxi industry from inception. This paper explains how goCatch manages its technology and unique business, whilst developing a mobile application and disrupting a virtually monopolistic incumbent. We present a stage model of IT-enabled application development start-up. The contributions of the model are two-fold. First, for theory in understanding how start-ups can deliver a disruptive innovation. Second, for entrepreneurial practice to gain a processual understanding of how these innovations are developed.*

### Keywords

IT-enabled Disruptive Innovation, Application Development, goCatch

### INTRODUCTION

Hard disks (Nault and Vandenbosch 2000) and internet computing (Lyytinen and Rose 2003b) are examples of IT-based disruptive innovations that have enabled firms to improve operational efficiency, establish new markets and ultimately achieve business growth (Lucas Jr et al. 2013). These disruptive innovations characterise revolutionary changes in a number of areas ranging from supply chain management (Wamba and Chatfield 2009) to internet telephony (Constantiou et al. 2009). They are typically considered to be disruptive because they initially underperform existing products, yet ultimately replace the incumbent (Christensen 1997). Besides disruptive technologies that are enabled by IT, disruptive innovations present themselves in other forms such as processes, strategies and technologies (Markides 2006). Disruptive innovations are synonymous with *start-ups*, providing the foundations for business growth and potential business value (Christensen et al. 2002).

Despite the association of IT and disruptive innovations, there is a lack of clarity about how start-ups develop innovations through IT and how they manage their innovations to make them disruptive (Christensen et al. 2002). Lyytinen and Rose (2003b) explain how IT is important (to disruptive innovation development for start-ups) but they do not explain the role of IT *pre-innovation*, with Danneels (2004) suggesting that more empirical studies are needed to address this gap. Without a clear understanding of how start-ups operate and develop IT capabilities for disruptive innovation, it is difficult to understand what mechanisms or processes start-ups use, and what actions are taken to develop them. The importance of placing such contingent factors in a consolidated manner is vital given the implications of start-up capabilities and timing on firm survival (Bayus and Agarwal 2007). Furthermore, our own comprehensive literature review reveals scarce work on the management of start-up firm contingencies against more contemporary IT phenomena such as *application development*. This a priori knowledge is important as successful start-up models drive economic growth in developed nations (Van Stel et al. 2005), as well as innovation of both sustaining and disruptive variants (Kassicieh et al. 2002).

Hence the research question for this study is: How does a start-up deliver an IT-enabled disruptive innovation? Specifically, the foci for our study are firm actions rather than the innovations resulting from firm action.

Against the above backdrop and to address the above question, we present an exploratory case study of goCatch Australia, an emerging start-up that is developing a mobile application that revolutionises the taxi-hailing phenomena. We discuss the preliminary findings of our study in this article. Our main contribution is an IT-enabled innovation stage model developed in the context of application development at goCatch. The firm-level model seeks to prescribe a process for start-up ventures to develop a disruptive innovation. The model establishes a platform for developing a more holistic litmus test for determining a firm's capabilities and potential in delivering such disruptions. Specifically, a stage model was selected to most accurately reflect a process and promote understanding for this case having seen previous usage to reflect organisational growth (Nolan 1973).

The paper proceeds as follows. The next section summarises the literature review. We discuss the role of IT in start-ups and IT-enabled disruptive innovations. Next we present our research lens and method, and introduce the case organisation. Next we present preliminary findings and discuss the stage model from our data. Finally we discuss future work, including the priori research model.

## LITERATURE REVIEW

In this section, we discuss two bodies of literature relevant to our study: disruptive innovations and start-ups. A comprehensive review of articles from 2003-2013 was performed for this, using the keywords “disruptive innovation”, “disruptive technologies”, “start-up” and “technology start-ups”. The literature review focuses on the contingencies of developing start-ups and the role of IT.

### Technology Start-ups and Their Contingencies

Technology driven start-ups have been studied broadly in the literature (Gans and Stern 2003; Gruber et al. 2008). These new ventures have been characterised as being made up of a combination of individual(s), environment, organisation and process (Gartner 1985). Start-ups also encapsulate elements such as funding, business strategy, and the identification of market opportunities. As a result, prior research has been diversified into these areas. Although attempts have been made to provide a general model of start-up event sequences (Carter et al. 1996), they lack consideration for the IT-based start-ups of today and their potentially disruptive intentions.

Start-ups often drive the introduction of new technologies because they have the chance to identify opportunities in the market prior to their launch (Gruber et al. 2008). They are also likely to be more driven to pursue these available opportunities when compared to more established organisations due to their lack of opportunity cost with forgoing the demands of existing customers.

Generally, the innovation to introduce these information technologies can be of either a sustaining or disruptive nature. Christensen et al. (2002) provide a series of tests in order to assess opportunities for generating a disruptive new business. However, their prescriptions lack detail on how a disruptive new business is formed, analogous to a recipe providing the “ingredients” without the “method”. Other research in the field rarely connects these two factors - an IT start-up and disruptive innovation.

Extant literature focuses on aspects of creating and managing a start-up in varying contexts, providing contingencies for entrepreneurs to consider. These contingencies form the basis of this study, by enforcing that evidence and results inferred are contextual. Consequently, we view this study with a contingency theory in MIS (Management Information Systems) research perspective, incorporating the elements of contingency variables, MIS variables, MIS performance, and organisational performance (Weill and Olson 1989).

A summary of the broad scope of literature on start-ups alongside their core themes is shown below in Table 1. Further, we organise these themes into our understanding of contingency variables discussed above.

Table 1: Start-up Literature

Themes	Factors	Reference
Elements of a New Venture	Individual(s), Environment, Organisation, Process	(Gartner 1985)
Start-Up Event Sequences	Started a Business, Gave Up, Still Trying	(Carter et al. 1996)
Identifying Disruptive Potential	Creation of a New Market Base, Disrupting the Business Model from the Low End	(Christensen et al. 2002)
Firm Survival	Pre-Entry Experience, Entry Timing, Product Technology Strategies	(Bayus and Agarwal 2007)
Market Opportunities for Tech Start-Ups	Prior Entrepreneurial Experience, Consideration of Alternative Market Opportunities	(Gruber et al. 2008)

### Managing IT Disruptive Innovations

Research around disruptive innovations mainly stems from the early study by Bower and Christensen (1995) who initially coined the term. Literature has portrayed disruptive innovations in various ways such as innovations that are pervasive and radical (Lyytinen and Rose 2003a), a threat to traditional business models (Lucas Jr and Goh 2009), and a driver for changes in work processes (Elie-Dit-Cosaque and Straub 2011). Studies often distinguish disruptive innovation from sustaining innovations that are referred to as the expected progression of a particular technology.

Managing these disruptive innovations are important to many organisations whether they choose to adopt, adjust their business strategy or ignore these innovations (Charitou and Markides 2003). For IT-enabled disruptions in start-ups, their decisions and actions need taken quickly due to the rapid pace of development (Carlo et al. 2011), implying advantages for firms that are agile. This is also tied closely to literature which suggests that smaller firms are better at capitalising on disruptive innovations (Garrison 2009). Lyytinen and Rose (2003a)'s quad-core model of IS innovation seeks to classify and position disruptive technologies as the foci of change without extensive consideration for the conditions at an organisational level, and certainly not from a start-up's perspective.

The literature discussing differing elements of managing a disruptive IT innovation and the contingencies applicable to start-ups is summarised below:

Table 2: Approaches to Managing Disruptive Innovation

Managing Disruptive Innovation	Factors	Context	Reference
Market entry	Capabilities advantage	Next-generation IT	(Nault and Vandebosch 2000)
Responses	Ability/motivation to respond	Strategic	(Charitou and Markides 2003)
Identifying disruptive innovation/diffusion	IS capabilities	Strategic	(Lyytinen and Rose 2003a)
Commercialisation strategy	Target market, competition	IP telephony	(Constantiou et al. 2009)
User adaptation	IT usage, user appraisal	IT	(Elie-Dit-Cosaque and Straub 2011)

### Summary

Although disruptive innovations have been studied in a range of contexts, they need to be studied as a distinct phenomenon (Markides 2006). As a core part of technology start-ups, they are formed by a number of contingencies including but not limited to those in Table 1 and Table 2 above. Given the importance of these elements and disconnection of existing studies, an in-depth study of the development of a start-up with intent of disruptive innovation, will be a contribution to both theory and practice. In other words, our literature review infers the need to analyse a start-up's development of disruptive innovations by examining how contingencies impact their IT use and ultimately affect organisational performance. Subsequently, developing a stage model is one potential representation of the above. Our analysis further reveals one possible context to conduct this study-the mobile applications phenomena.

Mobile applications are undeniably a significant and popular type of disruptive innovation in this generation, as portrayed by its rapid growth. This is evident from the numerous new applications being added to the major mobile application stores each month and the number of applications downloaded in the last five years (about 100 billion). In the next section, we discuss our research method and identify an IT-start-up archetype, delivering a disruptive innovation in this unique context.

### RESEARCH METHOD

Given our research agenda, we adopt the case study methodology to explore a start-up that delivers a disruptive innovation. Specifically, we are conceptualising 'how' these disruptions form, develop and are leveraged for organisational value. Given few case research on digital platforms are mobile application specific or start-up focused, and also given that the boundaries of the case phenomenon (disruptive innovation in this case) are not evident, a case study approach is suitable.

After successful negotiation for research access in May 2013, we conducted eight semi-structured interviews with employees of goCatch, Australia and app users (taxi-drivers and passengers). We introduce the firm, its strategies, its innovation developments and our analysis later in the article. The selection of interviewees was partly driven by availability and potential for particular respondents to best address the research questions. The semi-structured interview approach utilised loose guidelines for interview questions (Myers 2013).

Supplementary sources such as newspaper articles, videos, observations, site visits, conferences, and information from goCatch's website are drawn upon subsequently as interview data analysis unfolds in order to triangulate the data analysis. We perform data analysis concurrently with data collection to compare the findings of an initial case against the initial statements. We also compared the revisions with the subsequent interview data. We move

between empirical data, theoretical perspectives, relevant literature and other sources to build an explanation of the technology start-up phenomena. We use a combination of temporal bracketing, narrative and visual mapping strategies to organise the empirical data (Langley 1999) to identify relevant themes. Based on emerging data, we discover cognitive patterns and develop further mappings of the coded responses and theory. We compare the mappings iteratively with our theoretical perspectives to form opinions of the phenomena.

### Coding strategy

Transcription of the audio recordings for the interviewees is undertaken with participants de-identified in preparation for the coding process.

Open coding is first carried out where by concepts along with their associated properties and dimensions are established and then grouped into provisional categories. The ideas brought up from this level of analysis remains at a low level of abstraction in order to maintain flexibility so that the study remains open to new ideas and concepts (Corbin and Strauss 2007). Subsequently, we use the categories and concepts established in order to generate relationships with sub categories that seek to address the main categories in an explanatory manner and consequently allow inferences to theory.

Finally, when collating the results of the previous processes, we establish the central category that is frequently supported by observations made on primary and secondary data as well as extant research. This level of refinement is achieved by reviewing the scheme for internal consistency and logic, filling in poorly developed categories and trimming excess ones, and validating the theoretical scheme.

### CASE DESCRIPTION: GOCATCH

*“a revolutionary smartphone app that ensures passengers are never again left waiting for the cab that never turns up” (Duff 2013)*

GoCatch is an application development firm based in Sydney. The first iteration of the cross-platform mobile application ‘goCatch’ launched in 2011 and has since gathered in excess of 150,000 users globally and over 15,000 registered drivers. The focus of the application is to provide a service where taxi drivers and passengers can be connected directly and offered transparency of the taxi hire process. It aims to address the shortcomings of the virtually monopolistic taxi industry in Australia relating to (in)-efficiencies of the taxi-booking practices.

*“goCatch is rapidly becoming the most seamless way for drivers to find a taxi and passengers to book one.” (Courtenay 2013)*

Recently, the introduction of this application has generated significant media attention driven by the incumbent especially around elements of personal security. However, government regulations in certain areas of the country have since been updated to capture the application within the regulatory frameworks (Victoria State Government 2013).

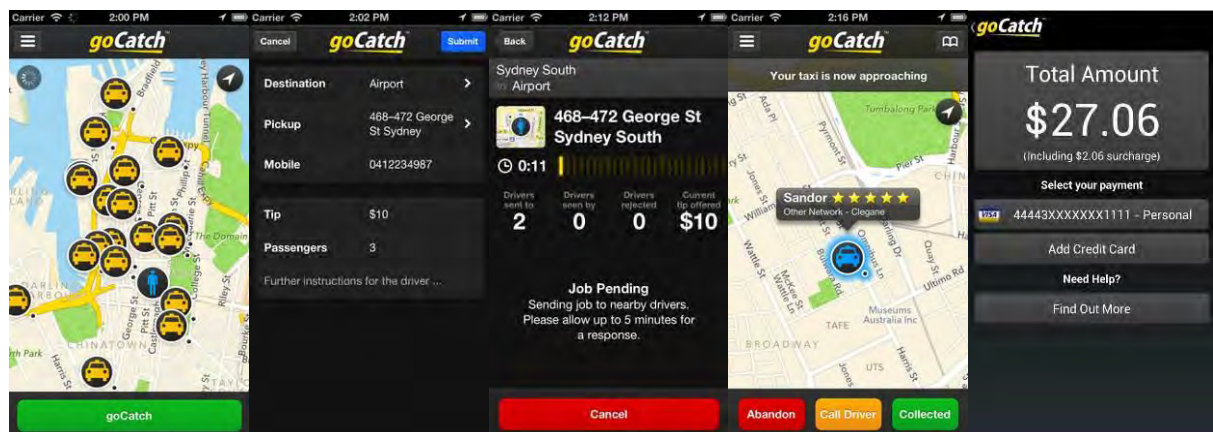


Figure 1: Various Screens of the goCatch Application

In this particular mobile application ecosystem, there are a number of different stakeholders, ranging from taxi drivers, taxi passengers, government, the taxi industry, and goCatch itself. For the purpose of this case, “users” will refer to taxi drivers and taxi passengers.

### Phased Analysis of GoCatch

This section summarises the growth stages of goCatch firm and its application. To achieve this, we analyse the interview data by adopting the contingency theory as our analytical lens. The conceptual lens consist of contingency variables, IS interaction and performance, and organisational performance. The lens is suitable for firm level analysis. The stage model is divided into three phases, spanning the age of the firm since formation which also partly reflects the ongoing growth of the firm combined with funding contributions from a variety of sources at different phases.

#### Phase 1 (2010-2011): Start-up Conditions

This first phase captures the conception and early stages of the firm. It highlights the market opportunity given the inherent problems of the virtually monopolistic industry. This phase also addresses the potential of an IT-enabled solution to disrupt the industry in the form of a cross-platform taxi-hailing mobile application.

Table 3: Phase 1 (2010-2011)

Constructs of Contingency	Sub-constructs	Representative Quote
Environment	Monopolistic Market	“the taxi industry association, they’ve lobbied government to change regulation to <b>entrench</b> their monopoly <b>position</b> .. in order to achieve <b>lockout</b> for other potential <b>competitors</b> ” (Chief Executive Officer, goCatch)
	User Dis-satisfaction	"they [drivers] don’t get terribly good service from it [taxi radio networks], and they don’t trust that the passengers will be there, it's <b>old technology</b> , taxi networks hate them, and the taxi industry is a mess." (Chief Executive Officer, goCatch)
	Regulations	“that’s what the regulations are trying to achieve, they’re <b>trying</b> to make sure things are safe, reliable, efficient” (Chief Executive Officer, goCatch)
	Funding	“money was about to run out, we hadn’t got any investors yet, but luckily we won \$50k from tech23 [an innovation event sponsored by NSW government] which just kept as going” (Chief Executive Officer, goCatch)
IS variables	Application-Development	“it’s been the constant iteration of the goCatch system, a lot of the UI around feedback of drivers” (Head of Mobile Development, goCatch)
	Lean start-up	"we’ve really followed the <b>lean start-up approach</b> and built a MVP and got it out there, it was as <b>minimal</b> as we could make it" (Chief Executive Officer, goCatch)
Organisational Performance	Perceived Client Empowerment	“Passengers can catch a taxi using goCatch, know exactly <b>how far away it is</b> and watch as it approaches on the map.” (Chief Executive Officer, goCatch)
	Perceived Information Transparency	“ <b>clarity</b> on what is going on, is one of the advantages of goCatch” (Head of Design, goCatch)
	User Satisfaction	“we’re trying to make catching taxi safer, more reliable, more efficient, <b>better for passengers and drivers</b> ” (Chief Executive Officer, goCatch)
	Government Influence	"I’ve got letters on my desk from regulators around the country, we’re changing the <b>entire industry</b> , it’s not just us changing it, it’s <b>technology</b> that’s changing this entire industry" (Chief Executive Officer, goCatch)

The motivation for the application stemmed from the user dis-satisfaction and the inefficiencies of the taxi booking process in Australia.

Although the application was functional at its initial 2011 launch, the virtually monopolistic incumbent attacked goCatch through the media on the grounds of their supposed lax security and lack of compliance to regulations.

According to the goCatch CEO, government regulations in Australia had previously failed to account for the use of taxi-booking applications on smartphones, and thus it was up to goCatch to disrupt the industry and be captured in future regulatory changes. As a result, regulations in some states have since been adjusted to consider the new entrants in the industry. Furthermore, goCatch quelled security concerns by stating their inclusion of detailed electronic records of bookings with geolocation data as well as a requirement to store photos of driver's licences and taxi driver authority cards (Duff 2013).

### Phase 2 (2011-2012): IT Creation

The conceived solution to the original industry problem encounters a number of barriers hindering uptake. Human behaviour was a major challenge as users lacked engagement, and the taxi application continued to be subject to inherent problems of the taxi industry.

Table 4: Phase 2 (2011-2012)

Constructs of Contingency	Sub-constructs	Representative Quote
Environment	Continuous Refinement	"it was working straight away, but it was working pretty <b>badly</b> , and then it took us ages to work out how to fix it" (Chief Executive Officer, goCatch)
	User Resistance	"the big challenges as I've described are the <b>human behaviours</b> " (Chief Executive Officer, goCatch)
IS variables	Application Gamification	"we tinkered with all sort of little things and none really made a difference to the conversion rate until we launched <b>goPoints</b> .." (Chief Executive Officer, goCatch)
	Incentive and Rewards	"we came up with a system that <b>rewards</b> drivers for picking up the short fares, ... we give points to drivers for picking up jobs, and those <b>points</b> translate to <b>status</b> " (Chief Executive Officer, goCatch)
Organisational Performance	User Engagement	"you find with a lot of the drivers that they are so <b>points driven</b> , they don't care, it's not even about the monetary value" (Support, goCatch)
	User Acceptance	"straight away, our <b>conversions</b> went up by 50%" (Chief Executive Officer, goCatch)
	Exit Strategy	"..potentially even an exit partner – we may even be able to sell it to them" (Chief Executive Officer, goCatch)

GoCatch addressed this shortcoming in 2012 by introducing gamification to incentivise drivers to pick up shorter fares by rewarding goPoints that translate to status and priority for the drivers in future larger fare bookings. While gamification is not a new concept, extensive trialling and iterating over various ideas to drive user engagement was required. These incentives are merely the start of goCatch's gamification implementation, with the Head of Mobile Development indicating intentions to adopting additional elements.

The net effect of this system is an increase in user engagement resulting in improved user satisfaction of using the application. This user engagement is inherently generated through the competitive nature associated with a points system, despite being a non-monetary reward and of a low monetary cost to the firm.

### Phase 3 (2012-Current): Product Ubiquity

Once the core business problems were resolved, and with a proven revenue model in place, focus shifted to attaining a viral uptake and a worldwide audience. This is an ongoing phase and involves the uptake of new technologies to remain continually innovative.

Table 5: Phase 3 (2012-Current)

Constructs of Contingency	Sub-constructs	Representative Quote
Environment	Worldwide Audience	"we also have an open market place approach to the app, so you can use it <b>anywhere in the world</b> " (Chief Executive Officer, goCatch)
	Virality	"in order to further stimulate viral uptake, we'll build <b>virality into the</b>



		<b>product itself</b> " (Chief Executive Officer, goCatch)
IS variables	Payment Methods	"By integrating PayPal, consumers and taxi drivers will be able to make and accept payments <b>conveniently</b> and <b>efficiently</b> .. , through a known and trusted brand," (Chief Executive Officer, goCatch)
	Predictive Analytics	"feedback on value of job and the <b>likelihood</b> of getting a taxi, that data, training out of them is to make really good <b>prediction</b> on those things [goPoints calculations]" [using SAP:HANA] (Head of Mobile Development, goCatch)
Organisational Performance	Global Expansion	"drivers <b>telling</b> passengers, passengers telling drivers, the environment the product is used in is quite conducive to <b>virality</b> " (Chief Executive Officer, goCatch)
	Potential Growth	"there's a huge amount of things we can do, <b>expansion in the business and the technology</b> , and that's a massive thing" (Head of Mobile Development, goCatch)

After the fundamental business problem was addressed in Phase 2, emphasis was shifted to increasing user uptake and market share.

A development around payment methods allowing drivers to accept PayPal shows the emphasis on ensuring product fit for broader audiences, it also serves as a differentiator to the incumbent. Furthermore, predictive analytics will be rolled out to more accurately predict taxi fares so that taxi drivers can be rewarded an appropriate number of points to best incentivise them in order for passengers to have a better chance of getting picked up. To provide this functionality, the analytics could provide passengers with the probability of them successfully getting a taxi, again building upon the transparency of the service established in Phase 1. These predictive analytics can also suggest answers for "what-if" scenarios, for example, the analytics may propose the passenger to move to a main road in order to increase their probability of getting a taxi by a certain percentage.

### A PRELIMINARY MODEL FOR START-UPS TO DEVELOP A DISRUPTIVE INNOVATION

Using the goCatch data, we propose a preliminary model to explain how a start-up develops short to longer term strategies for developing a disruptive innovation application.

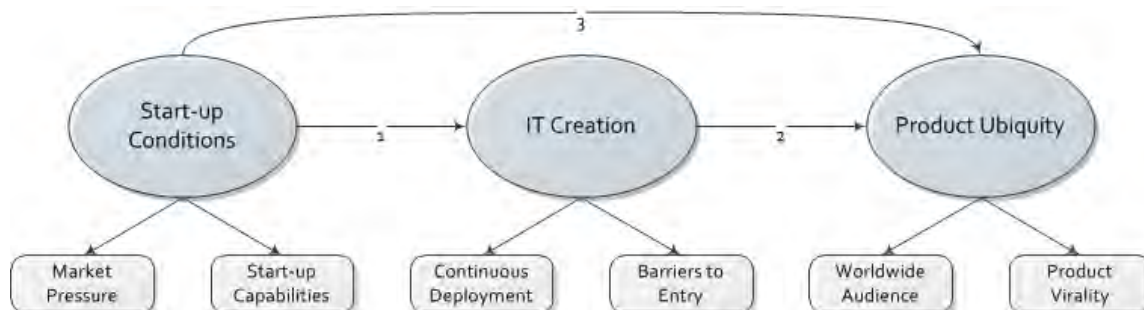


Figure 2: Stage Model of a Disruptive Start-up

In reference to the above model, we observe the effects and impacts of key constructs for a start-up where they can be roughly aligned to the phases previously discussed. They are multidimensional (higher order) constructs. The lower order constructs (e.g. market pressure, start-up capabilities, continuous deployment, etc.) shown in the model are specific to the goCatch case. They may be very different in another start-up context where the market environment and the type of IT innovation are vastly different. However, we are positing that in a similar context, our proposed model as depicted by the higher-order constructs should help explain the delivery strategy of a disruptive innovation. The purpose of the model is therefore to provide high level guidance to potential start-ups to understand the requirements and impact of various components in the model. Each of these constructs is explained below, drawing upon the goCatch data to explain their lower-level constructs.

#### Start-up Conditions

The inception of a start-up to deliver a disruptive innovation is modelled as a higher level construct which recognises the business environment contingencies prior to any IT creation. We label this construct "Start-up Conditions" (it is an antecedent to "IT Creation" to be described) which includes "Market Pressure" and "Start-up Capabilities" as its 2<sup>nd</sup> level constructs. Market pressure refers to the monopolistic nature of the taxi industry,

the user dis-satisfaction with the existing products and services, and the considerations required due to government regulations. From an organisational perspective, there needs to be consideration for the start-up's capabilities, that is, its access to resources to build the business, including funding and human capital (e.g. technical expertise to develop the innovation, business skill to manage the start-up).

The IT vision at this point forms the groundwork and inspiration for the development of the mobile application (i.e. the disruptive innovation). Emphasis is placed on lean start-up due to the market situation, where a first mover advantage would be beneficial.

As the start-up conditions described above are predominantly reflective of the goCatch case, it should be kept at the forefront of the overall picture that the specific composition is contextual. This refers to start-up conditions being contributed to by a varying combination of market pressures and start-up capabilities (including financial and human capital).

Depending on the nature of the firm, these factors may be interrelated whereby the existence of one factor may impact the specific nature and requirement of the other. For example, a start-up firm that develops technology in an entirely new market through a disruptive innovation may have no market pressure, and substantial start-up capabilities.

### **IT Creation**

"IT Creation" defines the strategies for developing the IT solutions within the start-up context. Upon establishment of the business plan in the goCatch case, an IT creation solution is needed to address the initial user dissatisfaction. The "IT Creation" construct in this start-up aims to deliver a minimum viable product (single functionality – taxi hailing) whilst maintaining a lean start-up approach. Although initially envisioning a certain set of functionality for the initial launch, the product was put into production with less functionality than originally intended partly due to market pressures and potential competitors entering the marketplace.

While the mobile application developed was up and running, a core business and market problem initially identified was not resolved with the application, namely the motivation for drivers to pick up shorter fares. This spawned the need to address the problem through "*Continuous Deployment*" and refinement of the application over a number of iterations in order to trial and error what worked best. Specifically, this resulted in the deployment of gamification in order to incentivise drivers through the use of points and ranks.

"*Barriers to Entry*" refers to the need for the firm to deliver a minimum viable product despite not entirely addressing existing issues and continually refine their offerings based on user feedback.

### **Product Ubiquity**

"Product Ubiquity" defines the ubiquitous and widespread use of the mobile application. Once the fundamental IT development issues were resolved, focus became increasingly on driving the uptake of the application to its "*Worldwide Audience*". This led to the need to improve the product beyond what was offered in the market. In aiming to achieve "Product Ubiquity", functionality was improved to increase the worldwide applicability of the goCatch solution and also attempting to drive "*Product Virality*". This "*Product Virality*" refers to the potential for the application to spread predominantly through word of mouth, an approach that is particularly suitable for the case of the taxi industry.

The process leading to these targets are driven by an IT strategy of continuous IS innovation, by providing functionality such as increasing the types of payment methods accepted, and the use of predictive analytics. The use of predictive analytics applies broadly to both the end users as well as the firm. Functionality may range from rewarding users with points more accurately, to analysis of big data to provide suggestions for users to more efficiently perform their task, whether it be trying to get a taxi, or trying to find a passenger.

## **PROPOSITIONS**

The following propositions are denoted by the numbering of the arrows in Figure 2 above.

### **Proposition 1: Start-up Conditions Correlated with IT Creation**

We propose that start-up conditions are correlated with IT creation, particularly to that of disruptive innovation. Start-up conditions are measured by market pressures and start-up capabilities; they impact the direction of a business model and its approach to IT creation. When these conditions are absent or weak, the venture will quickly become unsustainable at the outset. When these conditions are strong, then there is great incentive and potential to create the innovation.

In the case of goCatch, the lack of user satisfaction with existing products and markets provided the opportunity to capitalise on the potential for a disruptive innovation. Specifically, the market conditions with a monopolistic

incumbent provide the prospect for a mobile application development start-up to capitalise on a disruptive innovation to disintermediate the incumbent. It is clear that as a mobile start-up, IT creation forms a fundamental part of the business model in order to address market pressures. Additionally, the start-up capabilities involving venture capital funding and human resources form an important part of potential for IT creation. IT creation plays the part of short-term organisational objectives, such as providing continuous deployment of the IT product generated through user feedback in order to achieve product fit. At this point, barriers to entry such as regulations, potential competitors, and user attitudes also shape the direction of the IT solution. This resulted in goCatch applying a lean start-up model and launching with a minimum viable product.

### **Proposition 2: IT Creation Correlated with Product Ubiquity**

The IT creation in the short term is part of a longer strategic plan for product ubiquity through the development of worldwide audiences and product virality.

GoCatch achieves this by the continuous deployment of their mobile application. Continuous deployment allows application code to be deployed immediately. This allows for experimentation through quick feedback from users. Using this strategy, goCatch added features into the application such as additional payment methods (e.g. PayPal), and revolutionary predictive analytics to improve existing features. Although these technologies alone are not necessarily considered to be disruptive, the use of it in a mobile application targeting the monopolistic taxi industry in Australia has been seen to drive changes of regulations by the government, as well as generating extensive media coverage on the conflict between the mobile application and the incumbent. While product ubiquity is seen as an ongoing target, it is shaped by elements of IT creation and the associated continuous deployment of the product. This can be seen in goCatch's continual refinement of product through user feedback in order to achieve wider product fit and ultimately moving towards a worldwide audience.

### **Proposition 3: Start-up Conditions Correlated with Product Ubiquity**

Along with IT creation creating an impact to product ubiquity, start-up conditions can also be correlated with product ubiquity similar to the flow on effects through IT creation as shown in Figure 2 above.

In the case of goCatch, we observe attainment of funding at various points in the firm's growth, allowing the longer term aims of product ubiquity. This is comparable to changes in market pressures such as those driven by new competitors in the market or changes in regulatory frameworks.

Examples of where start-up conditions can be linked with product ubiquity is in changing business environments that lead to potential exit strategies for the firm such as equity ownership by other companies or withdrawal from the market, or mergers and acquisitions (if the start-up is very attractive to another firm). Changes in start-up conditions could also occur when there is a lack of continuous funding and/or when human capital is inadequate. As a result, product ubiquity as a long term aim may need to be altered, potentially by changing short term strategies such as shifting focus to ensuring product fit rather than disruptiveness of the product.

## **CONCLUDING REMARKS AND FUTURE WORK**

This paper presents a stage model of an IT-enabled application development start-up that delivers a disruptive innovation. Through the proposed model, we attempt to explain the contingencies for enabling and sustaining the disruptive innovation from inception. The empirical data from the goCatch case has provided some empirical evidence to explain the function of the model and the overlay between start-ups and disruption. Our study addresses a research gap, as to how does a start-up delivers an IT-enabled disruptive innovation, specifically on firm actions rather than the innovations resulting from firm action. In this regard, our study establishes a roadmap for future work.

As earlier mentioned, our model establishes a platform for researchers to develop more holistic stage models and litmus tests for determining a firm's capabilities and potential in delivering similar disruptions.

There are a number of limitations of this study. This includes the small sample size and the contextual nature of the study which may impact wider generalisability. In a related manner, future work could seek other potentially similar cases to discuss our model and to test the hypotheses. This would enable a multi-level case study as well as multi-level analysis, especially in different start-up environments and initiatives. This work and further research is needed to assess the model and validate proposed hypotheses, with its implications for generalisability.

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## APPENDIX 1

Interviewee	Topics Discussed
Chief Executive Officer (CEO)	Business idea conception, venture capital/funding, firm history, application functionality, internal IS, technologies implemented, future initiatives
Head of Engineering	Geospatial mapping, real-time data, application functionality, internal IS, technologies implemented, future initiatives
Head of Mobile Development	Geospatial mapping, app design, data analytics, application functionality, internal IS, technologies implemented, future initiatives
Developer 2	Data collection, application functionality, internal IS, technologies implemented, future initiatives
Head of Design	App design, business intelligence/data analytics, application functionality, internal IS, technologies implemented, future initiatives
Support	User issues, user feedback, internal processes, application functionality, internal IS, technologies implemented, future initiatives
Driver 1 & 2	Driver attitude towards goCatch, user experiences, value of app

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