Wicked yet Empowering - When IT Innovations are also Disruptive Innovations.

Completed Research Paper

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Abstract

What happens when an IT innovation is also a disruptive innovation? This study explores this question by examining sample cases of advances in IT that have also been categorized as disruptive innovations. The study leads to a conceptual thesis that such occurrences result in a contrasting duality dimension of wicked challenges and empowerment opportunities for different actors. We advance a model for positioning an IT innovation with disruptive tendencies in an impact quadrant to access its relative position to different actors. We observe that in an era characterized by continuous rapid advancement in IT, the tendency for the emergence of disruptive IT innovations increases. We therefore conclude by highlighting trends in this direction and advance future research agenda that should open up an opportunity for IS research that could be both theoretically insightful as well as practically relevant.

Keywords: Disruptive Innovations/Technologies, IT Innovations, Wicked Problems, Empowerment, Sustainability and Societal Impacts of IS, Economics and Value of IS, Value Creation

Introduction

Typically, Information Technology (IT) Innovations tend to empower those using it in different ways and from different perspectives. In many cases, the opportunities opened up by an IT innovation can be very different for different groups and individuals. This is not to say that IT always ushers in an innovation that is entirely glorious and pleasant to all involved. IT innovations are however often perceived and received for the benefits accruable due to the opportunities they bring. Although recently, there has been a call for more focus on the consequence of advances in IT as well as the opportunities they afford (Markus and Mentzer 2014; Majchrzak and Markus 2012).

On a very similar footing, Disruptive Innovations have a general connotation of calamity and challenging circumstances particularly by those facing its threat (Christensen 1997, 2006). This however is not completely the case, depending from what perspective the disruptive innovation is viewed and by who (Baiyere 2015). While disruptive innovations have caused many leading organisations to falter and in many cases become obsolete or even extinct, there exists another side to the phenomenon, which happens not to be much recognized nor mentioned in scholarly research that nonetheless provides benefits to certain actors.

Generally, it can be said that the predominant view is that IT innovations by their nature are sources of *empowerment* for different actors at different levels (Yoo et al. 2010, Brynjolfsson and Saunders 2010) while disruptive innovations by their nature create *wicked problems* for actors challenged by them (Danneels 2004). Empowerment in this context refers to the affordance given to an actor to achieve,

perform and realize goals that were hitherto not readily possible (Page and Czuba 1999). Wicked problems on the other hand describe situations that are characterized by significant degree of complexity, uncertainty and divergence that makes an easy solution difficult, if at all possible (Churchman 1967).

In a situation where an Innovation is both an IT innovation as well as a disruptive innovation, a question that will logically surface would be - which of the typical attributes of the innovations prevail and in what ways does these affect the different actors concerned? This paper examines what happens when an IT innovation is also a disruptive innovation - an occurrence that we call Disruptive IT Innovation (or - DITI henceforth).

With today's IT innovation space highly characterized by a fast-paced change and technological advances, the emergence of disruptive IT innovations is ever on the increase. This becomes particularly relevant in this era where there is increasing interest in exploring Blue Ocean IS research opportunities. This paper consequently presents a set of future research agenda that can serve as a step towards scholarly inquiry in this direction.

Research Motivation

A recent literature review reveals that despite the importance of the concept of disruptive innovation and the prevalence of examples from the IT domain, IS research has sparsely extended its inquiry into the occurrence or relationship between IT and disruptive innovations (Baiyere and Salmela 2013, Nault 2006, Lyttinen et al 2003). Although a copious amount of research exist in other disciplines on disruptive innovations (Christensen 1997, 2006 Danneels 2004, Govindarajan and Kopalle 2011, Tellis 2006), the general perception seems to align towards how an innovation comes along and an incumbent struggles to deal with it. While in the IS research stream the perception of IT tends to have a more positive tone as to the value that IT brings to different groups or individuals (Hitt and Brynjolfsson 1996). This rather contrasting and opposite perception exist despite the fact that most examples of disruptive innovation have been IT innovations. It is therefore of interest to have a joint analysis of the interplay between IT and DI in other to highlight the importance of IT in disruptive innovation scenarios.

Consequently, the apparent disparity in perspectives led to this enquiry to understand the implication of IT innovations that are also disruptive innovations and to examine how such innovations impact different actors. Based on this the driving research question for this study is simply expressed as follow:

How does/can disruptive IT innovations affect different actors and what are the associated implications of such occurrences?

Theoretical Framework

Due to the interdisciplinary nature of the studies, it would be of value to examine the different constructs form reference disciplines that are employed in this research with relation to an IT context. According to Wade and Hulland (2004) it is valuable for IS as a discipline to borrow from reference disciplines, we should however avoid doing so blindly without due consideration for the IS context. Furthermore, it is also of key importance to highlight what has been done in this area by prior studies both in the IS and other disciplines. We would therefore be exploring what is known about disruptive innovations, wicked problems and the concept of empowerment (Baiyere 2015) with emphasis on the aspects most relevant to the study at hand.

Disruptive Innovation (DI)

A disruptive innovation has generally been defined in the context of organisations as an innovation that whenever it occurs, introduces a new set of business rules to the market that causes an incumbent organisation to struggle and in many cases to lose whatever esteemed position it may have in that business environment (Christensen 1997; Kostof, Boylan and Simons 2004). Responding to a disruptive innovation can be likened to changing the wheel on a car in motion. This is because responding to the change could entail rendering existing competencies and long earned operational knowledge obsolete (Christensen and Raynor 2003; Henderson 2006). These changes or cannibalizations are usually challenging for organisations, and managers (for very rational reasons) tend to be reluctant to undertake them – therein lies the dilemma (Govindarajan, Kopalle and Daneels 2011; Chandy and Tellis 1998).

Disruptive innovations have resulted in the displacement of leading companies by unseemly new entrants or at times by innovations that are very much within their capacity to create (Christensen et al 2003). For example, UNISYS was disrupted in the mainframe era by minicomputers and subsequently by desktop computers, Kodak got disrupted with the advent of digital imaging which they interestingly were among the notable pioneers, Xerox despite being the inventor of the copying machines got displaced as market leader by Canon and other less-performing copying machines at that time. Disruptive innovations challenges incumbents with complex (and at times conflicting) choices and introduce a divergent performance measures from what the incumbent companies are traditionally used to.

It should be noted that disruptive innovations are distinct and very different from radical innovations and discontinuous innovations (Baiyere et al. 2013). While radical innovations are often "wow" innovations that are in most cases new to the world, disruptive innovations can be very basic and simple (Christensen 2006). For example, the motor car was a radical innovation for its time while desktop computers - although inferior in many ways - disrupted the high-performance mainframe computers. Discontinuous innovations on the other hand are innovations that change the trajectory of an innovation (Lynn, Morone and Paulson 1996). For example, the concept of phones has always been - it needs to be on a table and be connected by a wire. The advent of the cellular mobile phones changed the trajectory of phones from a desk device to a handheld device. Similarly, televisions are traditionally made with cathode ray tubes but gradually moved from the hunch-backed sets to a flat screen concept. In essence, discontinuous innovations change existing standards and introduce a new standard that ensuing innovations follow but do not necessarily cause a disruption (Tidd et al. 2009).

Disruptive Information Technology Innovation (DITI)

Despite the dearth of research exploring both IT and DI (Baiyere 2013, Nault et al 2000 and Sherif et al. 2006), a notable exception is the study by Lyytinen and Rose (2002) where they described the concept of disruptive information technology with respect to a developmental context. They presented disruptive information technology as an innovation that has an impact on the development process and the eventual outcomes. These are also construed to reflect innovations that require a radical shift that calls for significant change or modification to the architecture of work processes (Sherif, Zmud and Browne 2006). In essence, the focus of DITI in this context is localized as the purview was from and for the organisation's IT. In this study, we extend the definition of DITI as - IT innovations that are also disruptive innovations in the sense that they are disruptive not only within an organisation but also have impact beyond organisations to individuals and/or the society.

The distinction between a regular IT innovation and a DITI lies essentially in the disruptive attributes of the innovation. Following the delineation between disruptive innovation and other innovations made by Christensen (2006) and Govindarajan & Kopalle (2006), the disruptiveness of an innovation lies not so much in the technological advancement but in its impact on the market position of existing innovations and its consequent displacement of an incumbent. By extension, an IT innovation is only a DITI in this context, if it is also a disruptive innovation. Since disruptive innovation is a relative construct by definition (Christensen 2006, Baiyere 2014), this means that for an IT innovation to be labelled a DITI there should clearly be an existing innovation, market or organisation that has been disrupted by it. As typical, with disruptive innovations, the impacts of such disruption could extend beyond the organisation to individuals and the society (Baiyere 2015). If an IT innovation exhibits the attributes of a disruptive innovation but cannot be said to have clearly disrupted anything, it is at best a potential DITI (Baiyere 2014). For example, the mouse as an input device innovation can be considered a regular IT innovation despite its pervasive success; while the digital camera can be considered a DITI as it is an IT innovation that became disruptive to Kodak and lastly, Bitcoin can currently be considered a potential disruptive IT innovation.

Wicked Problems

This is the term used to describe complex matters that are difficult to resolve due to inadequate, conflicting and varying requirements that are often very hard to recognize (Churchman 1967). In general, wicked problems usually give confusing information and produce conflicting interests within different stakeholders. These are characterized by challenging situations without a single clear-cut solution (Rittel and Weber 1973), and they are unique to each particular context (churchman 1967).

Solutions to such problems are not necessarily measured by true or false but rather good or bad (Rittel and Weber 1973). It is also worth mentioning that the construct of "wicked" does not typify evil in the dictionary sense but rather it is used to conceptualize the associated complexity, uncertainty and divergence of the problem (Conklin, E. J., and Conklin, J. (2006). Additionally, due to the uncertain nature and the complex interdependencies of wicked problems, they are usually very challenging to completely solve. This is because the process of solving one aspect could trigger or open up other hidden problems (Ferlie, E, Fitzgerald, L, McGivern, G, Dopson, S and Bennett, C, 2013).

Whyte and Thompson (2012) sum it up by distinguishing it from traditional problems as follow: Unlike problems with clear cut understanding and little disparity about its formulation, wicked problems are characterized by uncertainties and ambiguity in their foundational assumptions and the possible solution options used in their articulation (Ferlie et al. 2013; Conklin et al 2006). These attributes are closely related to the challenging dimension of disruptive innovation for actors threatened by it. (Dufor 2013).

Empowerment

The term Empowerment has been widely used in different fields of research and the meaning has taken various forms in different disciplines. In this study we have adopted Page and Czuba's (1999) definition which relates to management and hence offers closer application to the IS context. They described empowerment as a social process that allows individuals/groups/organisations to have control over certain key aspects of their existence (i.e their lives and activities) and it affords the opportunity to achieve things that were hitherto not possible. It is a concept that fosters the notion of power (that is the capacity to implement or make happen) in people, for utility in their own actions, their environment and in their society, by taking action on issues that are of importance to them (Page and Czuba 1999).

Furthermore, empowerment can be seen from either an individual perspective or a group or societal perspective. For individual's, it is a construct describing the process where individuals are enabled to have the ability to facilitate the achievement of their goals (Mechanic 1991 in Zimmerman 2000). From the goals angle, empowerment describes having control over the determinants of one's quality of life. From the process angle, empowerment describes the ability to take control over activity (-ies), by having the capacity to determine both the goals of the process and the means to put it to use (Tengland 2008, Rappaport 1985).

Lastly, from the societal/organisation perspective, Empowerment is a mutual process that aids people without an equal share of some valued capability to have better access to and control over those capabilities (Zimmerman 2000; Rappaport 1987; Cornell, 1989).

Study Design

The design of this study involves the analysis of archival and historical data on DITI. This involves making use of publicly available data to correlate and make sense of how each disruptive information technology has impacted different actors. Firstly, a review of prior innovations that have been labelled disruptive innovation in earlier academic research was conducted. The review of prior studies was done to identify examples of DITI. Webster and Watson's (2000) approach to conducting a review was adopted to make the process systematic. However, the focus of the study is not to position it as a literature review but to use the review as a background for selecting the actual cases to be studied. The review phase was an important step as it helped to make the eventual list of the innovations to be studied. Secondly, in order to sharpen the focus of the study and get sufficient depth, it was necessary to make a sub-selection of the DITI examples for further analysis. The basic criterion for narrowing the list to the final six examined in this study was the availability and access to archival data on each case. A necessary follow up inclusion criterion was to see if the available data covered the individuals, organisations and/or the society for each identified case (Okoli et al 2010).

After the review, the data about each of the selected cases from the DITI list were collected. The data were all secondary data, sourced primarily from publicly available media data from different online repositories that discussed one or more of the cases. Key sources for the organisation perspective were company documents and reports. Further organisation based data were collected from the public media including, The Economist, Harvard Business Review Blog Network and TechCrunch. For individual perspectives,

general news media content were gathered and utilized to understand how each specific DITI has been reported to be impacting individuals. For the societal perspective, government archives, and reports were extracted from government websites and publications. In many cases, the sources provided information that supports the impact on more than one actor. Each impact identified from a source was corroborated with content from another source to be considered valid. Essentially, these secondary data were sought to get a deeper understanding of each of the innovations and their impact on the defined set of actors. Figure 1 gives a diagrammatic overview of the flow of the data collection process in three steps with the number of DITI examples and articles collected in each phase highlighted accordingly.

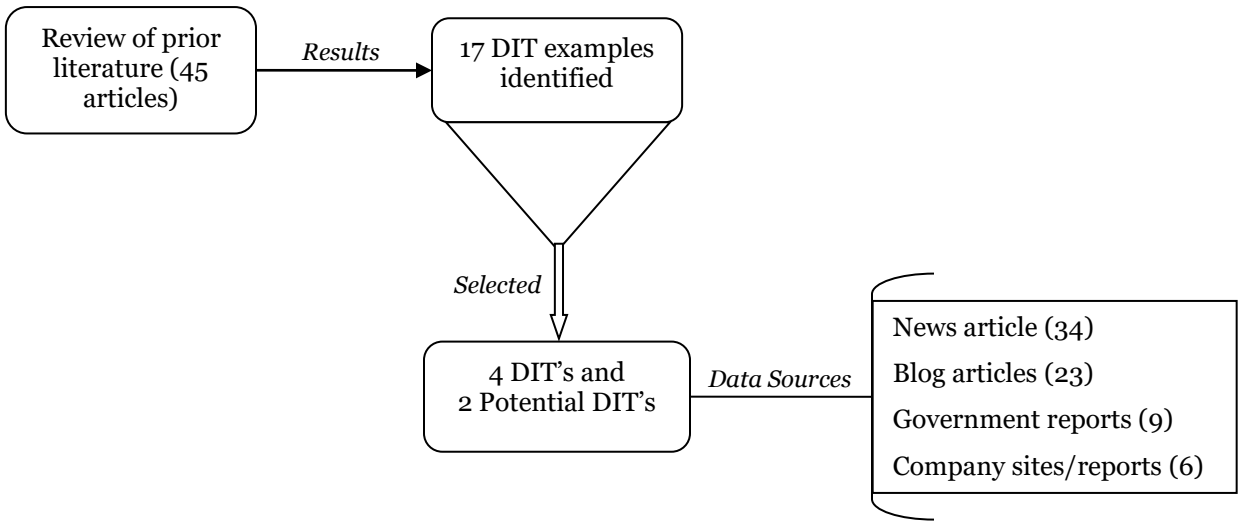

Figure 1: Data collection approach

The actors to be used as the unit of analysis is consistent with earlier delineation of actors in prior research (Meyer and Jepperson 2000, Baiyere 2015). To determine the appropriate actors for this study, we examined the different types of actors in prior research. Following the steps of Meyer and Jepperson (2000) and Harpaz (2002) we chose the – individual, organisation and society frame as the lens for analyzing every case that was selected. For each case, we examined the impact of the DITI on each of the actors. This enabled the collection of insights about the many and varied implications of the occurrence of a DITI ranging from the micro perspective of individuals/users to organisation and to the macro dimensions of the society.

Results

Case Examples

Each of the selected case examples have been analysed to extract the different ways they are empowering or wicked relative to the three predefined actors. For each case, we approach the analysis from two perspectives. From the wicked problem dimension and then subsequently from the empowerment dimension. The driving question for the analysis of each data source was *"How has this particular case exhibited wicked problems/empowerment opportunities?"* This is followed by a question of *"To which of the actors is each instance of a wicked problem/empowerment opportunity aimed?"* A summarized attribute distribution of this finding is briefly discussed in subsequent sections and an actor-based synthesis is subsequently presented in a tabular format.

Internet

Wicked Dimension: The internet has been considered a disruptive innovation by many scholars from various disciplines and different perspectives (Lyytinen et al. 2002). The internet is one DITI that has been a platform for many other DITIs. It is a form of "super" DITI or rather a "mother" DITI as many

other examples of recent DITIs have leveraged the presence of the internet to be disruptive. This same argument is also why it has been the source of most of the wicked problems that many other emerging DITIs bring. The advent of the internet has led to troubling times for many industries including brick and mortar stores (due to amazon), traditional advertising industry (via google adwords) and music producers among many others.

Empowerment Dimension: While being a source of headache for some, it has been a tremendous source of empowerment for many. The singular trait of it being a platform for other DITI's is a key empowerment contribution that the internet brings. Globalization and its benefits have being reinforced by the internet. It has made many things more affordable and accessible. Social connections and business connections have been made easier. Many businesses have been introduced that rely on basically the internet and many nations can attribute a significant portion of their GDP to internet based business.

Smartphone

Wicked Dimension: To understand the degree of the duality of the wicked and empower dimensions of IT and disruptive innovation in the case of the smartphone, one needs to only view it from its degree of pervasiveness in todays' society. A step back in time will reveal that in not so long ago, there were businesses thriving on creating, distributing and selling radios, alarm clocks, calculators, cameras, GPS, cassette players, compass, pocket dictionaries video recorders, atlas maps and … however, today **all** these devices can be replaced by a single device – the smartphone.

Empowerment Dimension: While it is indeed a source of trouble for those concerned, there is no doubt that on a relative view, the smartphone has been of immense value to different actors in different ways. Walking along the street with the entire aforementioned devices will be very difficult if not bordering close to impossible but with the smartphone you have them all in one hand. There is an economic and social rationale in this empowerment scenario.

On an organisational level, while the smartphone has contributed to the demise of many fledging businesses and product lines it has also created many other businesses that today we talk of the "app economy". On a society level, an illustrative example is Nokia which once significantly contributed economically to Finland which is now seeing a decline in this significant position.

Digital Imaging

Wicked Dimension: This innovation led to the demise of film photography and many other companies in that industry. This happened despite the fact that they were companies among the global business leaders at some point. Kodak has been attributed with the title of being one of the pioneers of digital imaging (Lucas and Goh 2009). Despite this, Kodak fell a victim of disruptive innovation by not taking advantage of it, albeit with supposedly *good* management reasons. Digital imaging was a direct conflict to the revenue model and business model of Kodak. Besides, at the nascent stage of the innovation, the digital images could not compare in quality to the output of the then film images. Additionally, they were cumbersome to generate and required a rather clunky device. When Kodak was at its peak, it employed over 140,000 people while recently Instagram employs 13 and promises the same value proposition (Jaron Lazier 2013).

Empowerment Dimension: If we however consider a point in time during the Kodak age where after capturing an amazing moment with your Kodak camera, you desire to share that image with friends or relatives living in a faraway location (for example another country). The process that will be required to achieve that noble desire would be beset with tedious and time-consuming efforts, not to mention the cost. It is easy to imagine how many such virtuous aspirations went unfulfilled at that time but would only take a few clicks today.

Telephone

Wicked Dimension: The telegraph was very dominant before the advent of the telephone. Telegraph was so dominant that Western Union – the leading company at that time - could not imagine why anyone would ever want to use a "ringing monster" when they can send a telegraph. Western Union was so certain

of its business that in the settlement of their lawsuit against Bell System, they assigned all telephone rights to Bell and requested that Bell must never compete in the profitable telegraphy business (Sterling, Bernt and Weiss 2006). This case demonstrates how complexity derives from the uncertainty and divergence of dealing with nascent disruptive innovations.

Empowerment Dimension: While telegraph is history today, the telephone has gained dominance as a major means of communication empowering and connecting people and organisations all over the globe. Real time conversation is now possible regardless of distance. In addition, the telephone introduced a richer medium of communication compared to wired messages.

Other cases identified in the study includes - Cloud Computing (Krikos 2011) and Social Media platforms among many others, which exhibit similar characteristics with the aforementioned cases and further demonstrate the dual nature of DITIs.

Potential Future Cases

The historic cases presented above, give a representation of how DITI's have been both wicked and empowering for IT innovations acknowledged as disruptive innovations. We extend the analysis to examine recent cases of IT innovations with a tendency and potential to become disruptive innovations. These cases cannot however be labelled disruptive yet. This is because due to the relative nature of DI, for any innovation to be called disruptive, it should have caused an identifiable disruption to another innovation or organization (Christensen 2006, Govindarajan et al. 2011). Therefore, these potential future cases are potential DITIs, which have the necessary attributes of a disruptive innovation, but are yet to meet the sufficiency criterion of relative disruption. We now explore the dimensions of wickedness and empowerment that each case holds.

3D Printing

3D printing is an example of an innovation that is at its early stage. If it does become disruptive, the industry it appears to be pitched against is the manufacturing industry. The implication of such a disruption can hold significant consequences for individuals and organisations working in that sector. The effect may be felt in the society as it has the potential to reshuffle the wealth of nations (particularly with manufacturing outsourcing) which might affect the global economics (Christensen and Hart 2001). While this might seem like a catastrophic picture, on the other hand 3D printing also promises users an amazing opportunity to unleash their creativity and customize materials to meet their specific needs. Small and medium enterprises (SMEs) would potentially have a key resource to compete on a completely different scale than they presently can. Among other things, 3D printing also has the tendency to hold some legal and standardization conundrum.

Virtual Currency (Bitcoin)

Virtual currencies like Bitcoin are also budding IT enabled innovations with potential to become disruptive to the financial world, as we know them today. Financial institutions have long been considered as key players in business transaction and exchange. Virtual currency innovations are however not only attempting to change the rules of the game but also the playground – which is characteristic of disruptive innovations. At its core, examples like Bitcoin present a technology that enables new payment/ transaction system to be developed. In a similar way that the internet allows permissionless communication, it also aims to allow permissionless monetization. While this is an issue that institutions like banks need worry about, it is a big opportunity for the developing world to have a voice in shaping global finance. Since banks are one of the key institutions that determine the economic health of a country, an innovation that affects this sector will most likely touch a nerve that extends to the societal perspective.

Others (VoIP - Skype, Video Streaming- Netflix, RideSharing - Uber)

There are other recent trends in this category with strong potential to be disruptive which we analyzed for their empowerment and wickedness dimensions for individuals, organisations and the society. Voice over

Internet Protocol (VoIP) like Skype for instance, while challenging the revenue model of traditional telecommunication companies has opened up a possibility to have both audio and video conversation over the internet for basically free. The traditional logic for the revenue model of telecoms is to charge more for longer distances due to connection costs among other reasons. This logic is however currently being challenged.

Similarly, Video Streaming services like Netflix while riding on the provisions of the internet are rendering movie rental businesses bankrupt. At the same time, they are offering users the capability to browse through thousands of options without leaving the comfort of their home or having to worry about paying late fees.

Ridesharing services such as Uber is another innovation that leverages advances in GPS and smartphone technology to challenge the traditional approach for getting a taxi ride. This is shaking up the taxi business and redefining the concept of getting a taxi ride. This has posed both regulatory and legal challenges as the possibilities of the advances in technology has made this possible but the business rules and taxi regulations are yet to completely understand how to respond or adjust to this. This is moreso because despite the challenge being posed to the taxi industry, the service is creating a notable record of employment and generating visible satisfaction to the populace. The dilemma for policy makers in this situation is how to respond to an employment creating opportunity that at the same time is making the huge long-term license fees paid by registered taxi drivers become redundant.

Cases	Individuals	Organisations	Society
Internet	**W:** Loss of jobs; Privacy and surveillance issues.	Bankruptcy of several brick and mortar businesses (e.g bookstore chains.).	Regulatory challenges as geographical borders blurred; Ease of social unrest mobilization.
	E: Creation of new job types: Increased access to information and goods.	New businesses such as Amazon, Google e.t.c are possible.	Increased Globalization.
Smartphone	**W:** Loss of income and economic migration (e.g whole unit of Salo city closed.	Nokia's decline from 49% to 3% market share.	National GDP reduction (Nokia's 23% tax contribution to Finland dissipated).
	E: Possibility to do more with one device; Entrepreneurial opportunities with the "App Economy".	Apple emerged from bankruptcy to be the most valuable company in the world.	Increased contribution of gainers to national income (e.g Samsung and Apple).
Digital Imaging	**W:** Unexpected Pension woes as retirement dreams evaporated (e.g aftermath of Kodak's bankruptcy).	Kodak's decline from a peak of 2/3 of global market and 10 billion $ sales to bankruptcy.	Population decline (e.g Kodak's bankruptcy impact on the city of Rochester).
	E: Empowered to easily share moments, Basic photography not	Digital camera companies thrived.	Space photography advanced.

	exclusive to experts.		
Telephone	**W:** Disrupted supply chain of telegraph hence loss of income for people involved.	Western Union's Telegraph could not keep its dominance nor outlive the telephone.	Infrastructures are rendered obsolete and investments become sunk costs.
	E: Expanded our communication possibilities; Real-time conversation.	Paved way for many companies in telecommunications today.	Reduced geographical barrier between communities.
3D Printing	**W:** Potential Loss of manufacturing workers; possibility to reproduce regulated products.	Possibly lead to struggling times for the manufacturing industry.	Nations flourishing by receiving outsourced manufacturing jobs may face challenging times.
	E: Provides potential empowerment to unleash individual creativities in new ways.	Various Entrepreneurial opportunities and possibilities can be enabled.	Manufacturing may be possible locally without the need to outsource jobs.
(Virtual Currency) Bitcoin	**W:** Technically challenging to be comprehended by the public, leaving power to the knowledgeable few.	Potentially disruptive to banks and financial institutions as we know them today.	Possible reshuffling of the positioning of the wealth of nations; No single national regulatory power.
	E: Currency freedom and no geographical boundary limitations.	An alternative means of transactional tender and transfer of value.	Potential opportunity for developing countries to have a voice in global finance.

Key:
Wicked Problem (**W**)
Empowerment Opportunity (**E**)

Table 1. Illustrative examples of the Wickedness and Empowerment of some DITIs on Individuals, Organisations and the Society.

Discussion

Empowering and Wicked Attributes of DITI

From the analysis of our selected case examples, we have identified attributes of a DITI that are empowering and those that are wicked. To better understand these emerging themes we have adopted the

classification by Dufour and Steane (2006) which has been used to classify disruptive innovations complexity in the health sector. The classifications are Social, Political, Technical, Network and Change Complexity. On applying Dufour and Steane's (2006) classifications as a lens to understanding the emerging themes in the data, we discovered other wickedness and empowerment dimensions such as Economic and Legal wickedness plus Economic and Knowledge empowerments. By extending the classification by Dufour and Steane (2006) to reflect the DITI perspective, we conceptualise these attributes as "SPELT" and "SKENT" for wicked problems and empowerment opportunities respectively. We present these as theoretical attributes that can be useful in understanding some of the possible dimensions of a DITIs impact.

The five key attributes (SPELT) of the wicked problem dimension can be classified as follow:

- Social Wickedness (S)
- Political Wickedness (P)
- Economic Wickedness (E)
- Legal Wickedness (L)
- Technical Wickedness (T)

Social Wickedness refers to the social related problems that are associated with a DITI from the perspective of any of the three actors. For example, the advent of the internet has helped facilitate unprecedented uprisings as witnessed during the Arab spring and the move by many countries to ban and censor the use of the internet. Similarly, Uber has led to riots as witnessed in Paris and other parts of the world. (Internet, Ridesharing).

Political Wickedness deals with DITI situations that confront policy makers with tough decision-making choices. This attributes aligns more towards society perspective. For example, 3D printing has already been used to print guns. Cases like this challenges the political notions of gun laws particularly when they can just be easily designed in one country and printed in another. In addition, the issue of regulating a virtual currency such as Bitcoin, which is not pegged to a single country, raises unusual challenges. These are issues that require political will across several countries but the digital nature of DITI and its capacity to ignore country borders introduces an additional layer of complexity. (Cloud Computing, 3D Printing).

Economic Wickedness can be used to describe wicked problems that present economic challenges and possibly decline. This is a traditional measure for determining the impact of a disruptive innovation for organisations but it does hold true for both individuals and the society. For example, job loss for individuals and tax income reduction for communities. (Digital Imaging, Smartphone).

Technical Wickedness this is a component of a wicked problem in DITI that presents any of the three actors with a challenge in the technical requirements required to solve the problem. (Virtual Currency, 3D Printing).

Legal Wickedness refers to DITI issues that generate unexpected loopholes in existing legislation and present concerning encounters about the right rules and regulations that best address a DITI legal requirement. A classic example of a potential DITI that has caused legal dilemma is Uber. (Ridesharing, Virtual Currency).

For the empowerment attributes, we have classified these into five main attributes (SKENT) :

- Social Empowerment (S)
- Knowledge Empowerment (K)
- Economic Empowerment (E)
- Network Empowerment (N)
- Technical Empowerment (T)

Social Empowerment is the attribute of a DITI that enables and liberates social interaction/engagement in ways that would not have been easy or feasible. This can be of value to the three actors in varying degrees. For example, a rural farmer in a remote part of a developing country can now easily be connected to the world via a smartphone. (Telephone, Digital Imaging).

Knowledge Empowerment occurs when the DITI expands the possibility to seek and acquire knowledge from different sources. Education and research activities of individuals and organisations have typically benefited from being empowered by this attribute. The internet has helped many to expand their knowledge horizon beyond what they would have been able to achieve in their local location. (Internet, Video Streaming).

Economic Empowerment can be said to occur when the DITI gives any of the actors an opportunity to improve their economic status. This is one of the hallmarks of most DITIs because there is usually a form of creative destruction in which; while one actor is economically empowered another might have an economic downturn, due to the same DITI. For example, Nokia vs Apple (Ridesharing, Internet).

Network Empowerment describes the attribute of a DITI that gives the actors the ability to extend their reach beyond their immediate environment and harness value from their networks. The emerging shared economy innovations such as airbnb and Uber are representative examples of this as well as social media platforms enabled by the internet (Internet, VoIP).

Technical Empowerment is one of the attributes were certain technical abilities are bestowed to actors who would have otherwise not been capable of such without significant cost and effort. (Smartphone, 3D Printing).

Empower Vs Wicked Model of DITI

To put the findings into relevant practical and theoretical application, we propose a model of DITI Empowerment Vs Wickedness (See Figure 2). The model examines the different quadrants in which an actor can position a potential disruptive information technology innovation relative to itself. We advance

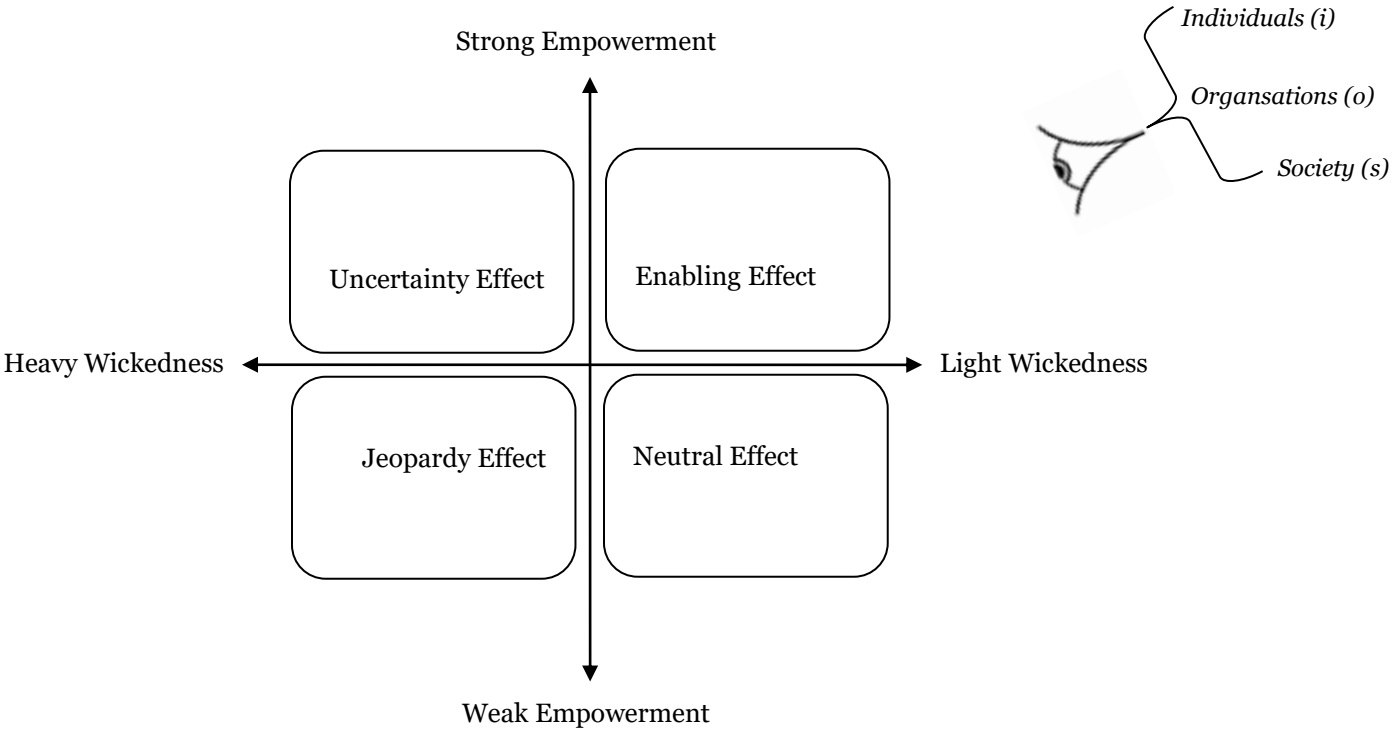

Figure 2: Model of DITI Empowerment Vs Wickedness

the model as a sense making tool that can enable researcher to situate an IT innovation regardless of its disruptive inclination to assess how it relates to the different actors. For a particular DITI, the resulting quadrant would vary depending on which of the actors view is in consideration.

The model presents a framework for assessing the possible position of an emerging innovation even before it becomes disruptive. Depending on how strong or weak the degree of Empowerment versus how light or heavy the Wicked dimension of an innovation is, it can be positioned in a quadrant to evaluate its potential impact for specific actors. For innovations that present strong empowerment opportunities and light Wickedness, the actor in that quadrant can be said to have an impact that generates an *Enabling Effect* which is a state of being in an Empowered position. For DITI innovations that pose a heavy degree of wickedness with little or no opportunity for empowerment to certain actors, they will be putting such actor in a precarious situation hence the *Jeopardy effect* which is illustrative of a catastrophic/disruptive quadrant.

Innovations that offer little threat in terms of the degree of wickedness and little or no empowering benefits can be zoned to have an impact of a *neutral effect* where the sum of the impact more or less keeps the actor in its status quo as it does not introduce much change, if any. On the opposite axis however, an innovation that presents a heavy degree of wickedness as well as a strong degree of empowerment can be classified as a high risk-high reward quadrant which puts the actor in an *Uncertainty effect* quadrant.

It should be noted that the position of an innovation is relative and dependent on each specific actor. Same innovation can be positioned in different quadrants depending on who is doing the evaluation (as represented by the eye in Figure 1. With an evaluation of the potential risk and benefit that an innovation brings, the model allows us to make an assessment of what can be done to either mitigate the risk or increase the benefit. It gives a sense making tool that actors can use to prepare themselves for the consequences of an emerging IT innovation.

From the foregoing analysis and discussion, a concise expression of the combination of IT innovations and Disruptive Innovations can be stated as follow: *The impact of a disruptive information technology innovation to any actor is a sum function of the degree of empowerment and the degree of wickedness presented by that innovation to the actor.*

This can be operationalized in a mathematical expression as follow:

$$DIT_{impact} = \left[E(i,o,s)\right] + \left[-W(i,o,s)\right]$$

Where DIT_{impact} = Disruptive Innovation Impact

E = Empowerment

$-W$ = Wickedness

(i,o,s) = Actor (Individual, Organisation or Society)

Giving the wickedness section of the equation a negative weight $\left[-W(i,o,s)\right]$ implies that a resulting positive value for *DITI* would imply an empowering DITI while a negative resultant value would imply a wicked DITI for the actor involved. The relativeness of the impact of a DITI to particular actors should be noted as it would be different for the same innovation. With the mathematical model, the DITI construct is put in an operationalized and applicable form. We present this as a contribution to be built upon, critiqued, improved and extended by further enquiry by the research community.

Conclusion: Towards a Societal-focused IS Research Agenda

It is worth pondering the economic, social and management aspects of Disruptive IT innovations. DITI by its natural structure, introduces a phenomenon that brings to question our understanding of the value additions of IT innovations vis-à-vis its negative consequences. This paper demonstrates that IT innovations can hold a double edged nature depending from which actor's perspective it is observed.

In todays' continuously digitalized world, such line of research brings to surface issues like why IT innovations may increase satisfaction and happiness for individuals without any increase in national GDP. Similarly, DITI can create enormous wealth for a few with little or no significant contribution to the larger populace. The study also shows that organisations are not left untouched in the DITI discourse. DITI's create new growths in the industries where they occur despite the fact that they lead to the decimation of other incumbent organisations. DITI's do this by enabling less skilled and less wealthy individuals to achieve things that previously could only be done by specialists or the affluent. They essentially make products and services affordable, at a higher performance level than ever before. It thus can be said that DITI's is a core microeconomic driver of macroeconomic growth with impactful implications for the society as a whole.

In conclusion, it is noteworthy to consider pondering the consequence of IT innovations that are also disruptive innovations especially in the context of societal impact of IS research. This line of scholarly enquiry is a green field of research for the IS domain that offers various uncontested, unique and novel research opportunities. We also present this as an opportunity to chart a path in response to recent calls for research that carries both theoretical and practical application (Rosemann and Vessey 2008). Additionally, the multifaceted nature of DITIs makes it amenable to different research approach ranging from design science to behavioral science research.

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