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"Cloud adoption by SMEs: linking service desires to technological reality through mindfulness"

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There is a crack in everything;
that's how the light gets in.

Excerpt from *Anthem* by Leonard Cohen

Acknowledgements

During the past two years I had the unique opportunity to enrich my life by going back to study after a period of work and leave. When taking on this challenge, I did not have the guarantee that I would succeed. On the contrary, I had all odds against me. However, by taking each obstacle step by step, I have been able to adhere to my determination. Along the way, I learnt to evaluate situations from different perspectives and was confronted with solutions that were not considered by me previously. In the process I was triggered by people from a different academic, professional and cultural background, who often belonged to a younger generation, as well. All in all, I have the feeling that I have succeeded in taking advantage of the exceptional circumstances during my study, and ended up being a more vivacious person. It is exactly this idea; taking advantage of challenging situations, that I have tried to integrate into my thesis.

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Margo Alofs
Dessel, August 2016

Summary

The observations in this thesis indicate that cloud adoption by small organisations (SMEs) involves more processes, activities, and outcomes than the proven track records of cloud implementation in large businesses show. Therefore, business continuity planning by SMEs in the aspiration of cloud adoption is best served by being aware of their distinctive set of competences and the multiple possibilities in applying them in order to be innovative and distinguish themselves from their competitors.

The fresh findings in this thesis are exploratory in their attempt to present new-fangled ideas by expanding the focus of cloud adoption to analyse the whole course of innovations by SMEs. The proposed conceptual framework is a result of a thorough literature review of the IT innovation adoption research. While the discussion is theoretically motivated, finding its fundamental ideas in Buddhist psychology and economic principles dating back to the 18th and 19th century, its implications are quite practical. The emphasis on comparative advantage as opposed to competitive advantage has been identified as a SME's major guidance in the cloud adoption decision. Furthermore, the concept of mindfulness offers a striking practical focus for managers endeavouring to increase their organisations' collective awareness of their distinctive skills and responsiveness in the face of uncertainties associated with new technologies like cloud computing.

In its entirety, cloud represents computers in large scale data centres that are networked anywhere in the world with the availability of paying for the use of them in a pay-per-use way, meaning that just the resources that are being used will be paid for. Cloud as such is composed of hardware, storage, networks, interfaces and services that provide the means through which infrastructure, computing power, applications and services are accessed by the user on demand and independent of location.

The understanding of cloud computing in this paper goes beyond the focus on the cloud as a platform for running applications, thereby integrating the specific role of the applications itself and the economic intention behind clouds. In this sense, cloud computing offers unique capabilities for SMEs to develop innovative products and processes in order to distinguish themselves from their competitors and to move into a sustainable competitive position.

To assess the innovation impact that cloud adoption may have on SMEs, this study proposes an alternative theoretical framework in order to explain narratively what concepts, variables and unique relationship amongst them influence cloud adoption by SMEs. The mass of research in IT innovation has heavily relied on the dominant paradigm which explains and predicts innovation adoption on the basis of a direct relationship between an organisation's innovator profile and the adoption decision in terms of earliness, frequency and extent of adoption. This may not be the best model to explain cloud adoption because cloud computing is a radical innovation which is also an innovation-enabling technology.

Therefore, this study proposes a model that goes beyond the usual focus on influencing factors and cloud implementation determinants and incorporates the concept of mindfulness. The presented conceptual framework describes that achieving innovation through cloud resources is a two-stage process that first involves a business adopting cloud computing and then innovating using those cloud resources. During the first stage, the organisation is not alone in its venture to make sense of the cloud technology. Instead, it belongs to a complex community of stakeholders, of which many members actively scan the new technology and explore, to varying degrees publicly, what it means for the business community and where it is going to. Thus, together, they develop and draw upon a common interest generated in this wider community. At the same time, the prospective adopter organisation concentrates on making sense of the innovation relative to its own situation, its own opportunities and its own needs. However, the main driver for cloud adoption by SMEs is to be innovative and distinguish themselves from their competitors by being aware of their unique set of competences and the multiple possibilities in applying them. So, in the second stage of the cloud adoption process, the SMEs constantly need to create strategic opportunities by exploiting cloud computing in their pursuit for business continuity. As a result, SMEs aspire 'business agility', characterised by quickness, nimbleness and lightness and this is closely related to innovativeness.

In a SME's quest to be agile, the concept of mindfulness offers a striking practical focus for managers endeavouring to increase their organisations' collective awareness of their distinctive skills and responsiveness in the face of gaining strategic advantage by adopting new technologies like cloud computing. For this reason, SMEs should move beyond general, high-level planning when preparing for cloud adoption by actively noticing moment-to-moment changes, switching of the autopilot, and then acting on these new observations in their decision-making process. This management practice is referred to as mindfulness. People, who are mindfully engaged in a decision process, perceive changes in an environment and are motivated to process them. Therefore, there is a probability that they are more creative and that they are more likely to adopt new ways of working. Thus, it is also more likely that they find innovative solutions to problems and that they, by altering their actions, will take advantage of new situations. The resulting strategic choices will affect SMEs' development of innovative products and processes and will with time cause durable differences across competitors. By applying the mindfulness concept, the specifics of the inside organisation can be linked to the outside technology, thereby increasing the ability to innovate more successfully.

The conceptual framework, once validated, will be of valuable use to managers who are aspiring cloud adoption for their organisation with regard to when and how to adopt cloud computing and what aspects of cloud computing to adopt.

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1 Introduction

1.1 Research background

Cloud computing is emerging as a technology for optimising IT services and is quickly redefining the business landscape. To assess the impact that the cloud may have on an organisation, it is important to provide a framework encompassing a critical review of what variables and unique relationship amongst them influence cloud adoption. The existing literature studies cloud computing through the lens of IT adoption and innovation theories. In this sense, Swanson and Ramiller ((2004), p. 553) note that the ultimate goal of innovation research is to provide guidance to managers on the question of "whether, when, and how to innovate with IT". The theories have shown, to name only a few of the numerous factors that have been studied, that "organizations that are larger, more diverse, have greater technical expertise, possess supportive senior management, operate in more competitive contexts, and perceive the innovation as more beneficial and compatible, are more likely to adopt a larger number of innovations, to adopt them earlier, and to implement them more thoroughly" (Fichman (2004), p. 315).

While a lot of research is currently taking place in the technology itself, an increased number of studies addresses the business-related issues of cloud computing (Marston et al., 2011). From previous research, firm size routinely appears to be a significant determinant of an organisation's adoption and implementation of IT innovations. By taking Fichman's summary above seriously, it might be inferred that, ceteris paribus and compared to large businesses, small and medium-sized enterprises (SMEs) should be the least likely to adopt IT innovations; and if they do so, they should adopt the least number of innovations, be among the last to adopt, and implement them the least thoroughly. However, SMEs possess unique characteristics which might suggest that firm size may interact with other drivers of IT innovations. This interaction makes the research on IT innovations in SMEs distinctive.

1.2 Cloud benefits

Cloud computing and its inherent characteristics, service models and deployment models can be regarded as appealing to SMEs for two main reasons. First, SMEs can significantly reduce the total cost of ownership of IT when choosing cloud services since they no longer have to maintain the inherent IT infrastructure on-premise. Immediate access to computing resources is gained without any initial capital expenditure with the cloud services employing a metering system that divides the computing resource in appropriate blocks (Marston (2011), p. 177). In contrast, the traditional on-premise license payment schemes require customers to pay the total license fee even though they might not use the software application for weeks or even months.

Second, the fees and quality of service brought by cloud service providers are far better than what most SMEs can realise on their own due to the economies of scale enabled by virtualisation (Ibid, p.178). Furthermore, cloud usage offers a convincing opportunity through lower barriers of entry to computing infrastructure to provide unique services for niche markets previously inaccessible due to high capital costs (Weinhardt et al. (2009), p. 398).

The above benefits mostly relate to the technological functionality offered by cloud computing. However, enterprises develop their business strategies by aligning with new technologies. The business-led adoption of cloud computing in this alignment is based on the business benefits attributed to cloud computing as the perceived opportunity to drastically reduce complexity for enterprises (Venters & Whitley (2011), p. 181) and to offer new innovation opportunities (McAfee (2011), p. 13). Thus, for most SME adopters the potential of cloud usage is in the ability to transform organisations by simplifying the overall process of integrating technology into the business process in order to guarantee business continuity (Gupta et.al. (2013), p. 870). For this reason, Venters & Whitley (2012) present the service dimension of cloud computing in addition to the technical dimension. Elements within this service dimension are the extent to which cloud enables creative use of technology for business purposes, the simplicity by which such business innovations are enabled, and the efficiency of such enablement. Following this service dimension, cloud service becomes the application of competencies (skills and knowledge on data-centre design and software innovations) through deeds, processes and performances for the benefit of the user. Consequently, a new theme regarding the social and organisational implications of cloud computing is emerging.

1.3 Studies on innovating with cloud

Most studies of SMEs innovating with IT focus on the factors that influence the adoption and implementation of IT innovations. The identified influencing factors can be grouped together on the basis of their particular context.

The influencing factors identified in the studies presented in Table 1 do not go beyond the potential of cloud usage as a driver for integrating technology into the business process. However, in order to guarantee business continuity, research should investigate how IT can help SMEs develop innovative products and processes. Achieving innovation through cloud resources is a two-stage process that first involves a business adopting cloud computing and then innovating using those cloud resources.

This two-stage process is well-captured by the evolution of two distinct strands that come together to provide cloud computing as identified by Venters & Whitley ((2012), p. 179). The first strand emerges from the focus on the management of technology assets such as virtualisation, high performance networks and data-centre automation. This strand relates to the first stage of the innovation process where the company has to decide on what technological platform to adopt. The second strand emerges from a more distinct emphasis on the customer value derived from the use of technology services and relates to the second stage of the innovation process.

Table 1: Groups of influencing factors concerning adoption and implementation of IT innovations

Study	Organisational	Technological	Environmental
Thong (1999)	- characteristics of the decision-makers	- information systems	- industry characteristics
Alshamaila & Papagiannidis (2013)	- relative advantage - uncertainty - compatibility - trialability - size - top management support - prior experience - innovativeness		- industry characteristics - market scope - supplier efforts - external computing support
Gupta et al. (2013)	- ease of use - convenience - cost reduction	- security - privacy	- sharing - collaboration
Gangwar et al. (2015)	- relative advantage - compatibility - complexity - organisational readiness - top management commitment - training & education		- competitive pressure - trading partner support
Doherty et al. (2015)	- cost benefits	- availability	

These findings indicate that IT innovations in SMEs involve more processes, activities, and outcomes than adoption and implementation. So, academics will have to come up with new-fangled ideas by expanding the focus to analyse the whole course of cloud innovations by SMEs.

1.4 Dominant theory on technological innovation

Most of the quoted studies on technological innovation have focused on the rational choice model which is rooted in economic literature. The economic-rational models (explained in detail infra) wherein innovations are assumed to be beneficial, and organisations that have greater innovation-related needs and abilities are expected to exhibit a greater amount of innovative activity in terms of earliness, frequency and extent of adoption. Further, they have always assumed a positive relationship between the quantity of innovation, i.e. the amount of innovative activity, and the quality of innovation, i.e. the extent to which an organisation has adopted the "right" innovation, at the "right" time and in the "right" way. These theories have also been labelled "the dominant paradigm" (Fichman (2004), p. 315).

The theoretical approaches within the dominant paradigm fail, however, to take into account how an organisation attends to innovations with reasoning grounded in its own facts and specifics in order to adopt the right innovation, at the right time and in the right way (Oredo & Njihia (2015), p. 150).

In the dominant paradigm, organisations must have certain characteristics (innovator profile) in order to innovate with technology successfully.

Cloud computing provides new ways of acquiring technology that may not depend on the traditional innovator profile. While cloud computing itself is a technological innovation, it is also an enabler of downstream innovation. In other words, it is a multi-layered innovation. Cloud computing can provide computational power to places where previously it did not exist. The resulting ecosystem, combining different aspects of product, process, and structural innovation mainly at the intersection of technology and economics, produces a value greater than the sum of its parts which may not be explained by simple linear models. Organisations hoping to adopt cloud computing are in need of an orchestration that will help them recognise whether, when and how to innovate. That is, they are concerned about the quality of innovation (Oredo & Njihia (2015), p. 150).

This stresses the need to look beyond the dominant paradigm for an alternative that gives a fuller picture of what causes different sorts of innovative behaviours especially with emerging innovations like cloud computing.

1.5 Alternative theory on technological innovation

A potential opportunity is by incorporating mindfulness to moderate the link between quantity of innovation and quality of innovation. A mindful response in this sense would mean that an organisation would not attempt to make the best choice from among available options, i.e. quantity of innovation, but to create options, i.e. quality of innovation. Additionally, the concept of mindfulness encompasses most, if not all, processes in an organisation's innovation and thus may offer theoretical insights needed for analysis that goes beyond adoption and implementation studies, thereby accommodating the request for a new-fangled focus for SMEs as expressed before.

The theory of mindfulness has its roots in Buddhist psychology and has been conceptualised in a vast amount of organisational cognition literature. "Mindfulness approaches hold that individuals' and organizations' ability to achieve reliable performance in changing environments depends on how they think: how they gather information, how they perceive the world around them, and whether they are able to change their perspective to reflect the situation at hand." (Langer (1989), p. 177).

Implication of mindfulness theory is that superior outcomes arise not from abstract plans or strategies but rather from an ongoing focus on the business continuity by enhancing work practices, organisational structures, and operational arrangements during the transition. While the dominant paradigm will be concerned with predicting which organisation will be the first to adopt an innovation given its organisational characteristics, mindfulness seeks to explain how an organisation can make cloud adoption decisions that take into consideration its local specifics and the wider community discourse for maximum performance outcome. This way, some organisations may even resist an

innovation that does not have any merit for them despite having the innovator profile. Thus, there are reasonable motivations to explore theories outside the dominant paradigm.

1.6 Research questions and methodology

When applying mindfulness to a framework for cloud adoption by SMEs, at least three issues need to be resolved.

First, review of the literature emphasises that cloud computing is currently difficult to adopt for many smaller organisations though they are eager to exploit its potential that relates to its efficiency and creativity. Hence, the main research question is: *How can SMEs be guided to successful cloud adoption?*

Second, particularly for SMEs, their business processes, coupled with concerns about achieving simplicity in the cloud, make adoption difficult. In reality many enterprises have a poor understanding of the benefits of cloud computing for their specific requirements and have limited ability to quantify the risks of making such a move. It is, therefore, believed that further research is needed to explore how organisations might evaluate efficiency and simplicity of service within the cloud and how this can be demonstrated. Consequently, the second research question is raised: *What desires do SMEs have to migrate to the cloud?*

Lastly, creativity and innovation are identified as key drivers for cloud computing. The cloud might be used extensively within SMEs to innovate and work creatively. Further research is needed to explore how cloud computing might enable more creative initiatives at every layer of the cloud technology. To date, the dominant paradigm has guided the research in IT innovation. This may not be the best model to explain cloud adoption because cloud computing is a radical innovation which is also an innovation-enabling technology. Successful cloud adoption could be better explained by connecting the specific needs of the inside organisation (the desires) to the outside technology (reality). The initial steps in this direction are taken by the supporters of the organisational cognition theory. The concept of mindfulness offers potential to provide more insight to organisations in the process of adopting cloud computing. Therefore, the third and final research question becomes.: *What theoretical framework is fit to explain realistic cloud adoption by SMEs?*

In conceptualising cloud adoption by SMEs, this study proposes an alternative conceptual framework that answers the three research questions above by addressing the accommodating theme of IT innovation research, which is to aid decision makers with regard to whether, when and how to adopt cloud computing and how to innovate with it.

For the sake of gaining the prior insights needed to develop, elaborate and interpret the alternative conceptual framework, this paper draws on the available literature on cloud computing, innovation diffusion theory, psychology and economic theory. This literature includes academic studies, as well

as professional literature such as industry white papers, empirical and technical reports. The remainder of this paper is arranged as follows.

In the next chapter the building blocks, use and consequences of cloud computing are described in detail in its context most relevant for SMEs.

The third chapter is devoted to describing the dominant paradigm typified by its economic-rationalistic models referring to the literature to date. The theoretical approaches within the dominant paradigm like Diffusion of Innovation Theory, Adoption of Information Technology Innovation, Theory Technology Acceptance Model, Technology Organisation Environment and the Unified Theory of Acceptance and Use of Technology are presented and their influencing factors for diffusion and acceptance of technological innovations are identified. These influencing factors will be set against their criticisms with regard to cloud adoption.

In chapter four the organisational cognition theory will be studied in depth with the focus on the collective mindfulness constructs most relevant for cloud adoption by SMEs.

In chapter five the various insights are combined to introduce an alternative conceptual framework in order to explain narratively what concepts, variables and unique relationship amongst them influence cloud adoption by SMEs.

In chapter six the interpretation of the presented framework is given. In conceptualising cloud adoption by SMEs in this way, decision makers are aided in evaluating the potential of cloud computing for their organisations.

Finally, chapter seven concludes and provides several suggestions for future research.

2 What is cloud computing?

2.1 Cloud computing definitions

The formulation of cloud computing and its disambiguation is still evolving. Understanding cloud computing in terms of its various components and the relationship amongst these components depends on the different schools of thought on exactly what "cloud" is all about. Perhaps a most inspirational attempt to concisely describe the "cloud" elements of cloud computing was provided by Yuvaraj's ((2015), p. 5) who states that cloud as an acronym stands for

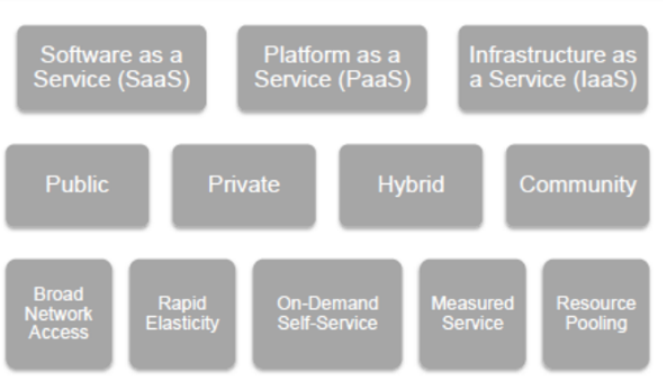
*'C- **c**omputing resources, L- that is **l**ocation independent, O- can be accessed via **o**nline means, U- used as an **u**tility and D- is available on **d**emand'.*

The most popular technical definition with its focus on the internet and scalable external datacentres is probably the one provided by the US National Institute of Standards and Technology (NIST) in 2009, respectively its updated version in 2011. According to this definition (NIST (2011), p. 2):

'Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.'

This definition of cloud computing, composing of three base layers, is termed the 5-4-3 model, and is demonstrated in Figure 2-1: The 5-4-3 Model of Cloud Computing

Figure 2-1: The 5-4-3 Model of Cloud Computing



Source: Clohessy et al. (2013), p. 33

The bottom layer consists of five essential characteristics (on-demand self-service, broad network access, resource pooling, rapid elasticity, measured service). The middle layer shows the four deployment models (Private cloud, Community cloud, Public cloud, Hybrid cloud). The uppermost layer shows three service models found in cloud computing (Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS)).

This definition reflects only the technological, and not the economic, understanding of cloud computing, in particular because it reflects the status by focusing on the cloud as a platform for running applications thereby ignoring the specific role of the applications itself and the intention behind clouds. In other words, the economic challenges faced by businesses, big or small, are not properly addressed in this view.

Another attempt to define cloud computing was presented in a first expert report released by the European Commission (Schubert et al., 2010, p. 8):

'A 'CLOUD' is an elastic execution environment of resources involving multiple stakeholders and providing a metered service at multiple granularities for a specified level of quality (of service).'

This definition may be considered too restrictive and too imprecise to specify the development of the cloud and its use. Especially one major aspect was neglected, namely that different stakeholders have different perspectives and hence understandings, goals and intentions with cloud technology.

From the **user perspective**, i.e. the customer or end-user who makes actual use of the resources/services offered, cloud computing is an environment which extends the economy-driven use of the internet by providing high availability, reduced cost and ease-of-use. The typical end-user is thereby not interested in the technical details that enable this behaviour.

Secondly, from the **provider** perspective, i.e. the host of the resources providing the cloud offering in such a way that the economic incentives are met, cloud computing is a dynamic (resource) environment that guarantees availability, reliability and related quality aspects through automated, elastic management of the hosted services – the services can thereby consist in a platform, a service, or the infrastructure itself (P/S/IaaS).

Lastly, from the **developer perspective**, i.e. developers that turn a resource infrastructure into a cloud and that adapt existing applications to exploit cloud features, cloud computing is an environment which exposes services, platforms or resources in a manner that multiple users can use them from different locations and with different devices at the same time without affecting the quality aspects of the offered capabilities (service, platform, resource).

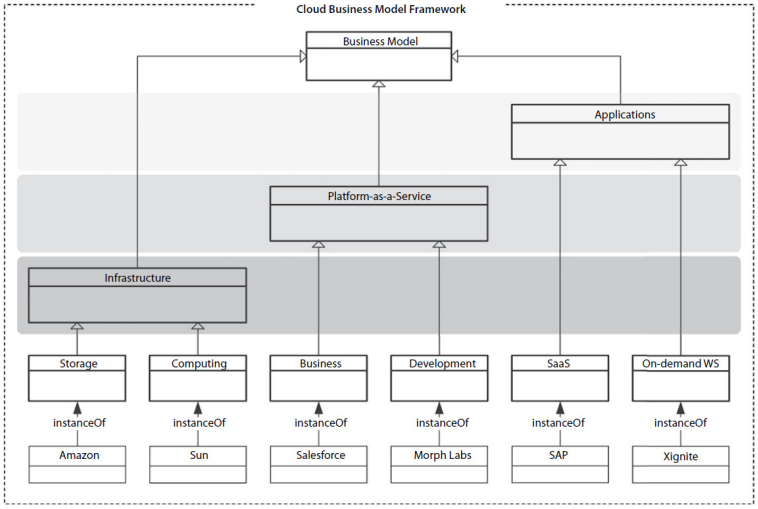
In light of the above perspectives identified, in an updated export report, Schubert and Jeffery ((2012), p. 22) provide a minimal definition of a cloud environment by focusing on the conditions a system has to fulfil in order to be called a "cloud":

'An environment can be called "cloudified", if it enables a large dynamic number of users to access and share the same resource types, respectively service, whereby maintaining resource utilisation and costs by dynamically reacting to changes in environmental conditions, such as load, number of users, size of data, etc.'

Supplementing the expert studies, the definitions of cloud computing provided by academics tend to focus on the components of cloud computing and the relationship between the suppliers and consumers of cloud services. The broader definitions on cloud computing often focus on the user perspective, in terms of what cloud computing allows individuals and organisations to do. The complexities of the cloud computing services are thereby abstracted away by the different layers of technology which they are built on.

For Weinhardt et al. (2009) such computing services are built on three layers – infrastructure, platforms and applications, with differing business models at each level.

Figure 2-2: Cloud Business Model Framework



Source: Weinhardt et al. (2009), p. 395

More generally, this user perspective on cloud computing has been defined by some of the industry analysts:

1) Gartner

'A style of computing where massively scalable IT-related functions and information are provided as a service across the Internet, potentially to multiple external customers, where the consumers of the services need only care about what the service does for them, not how it is implemented. Moreover, cloud is not architecture, a platform, a tool, an infrastructure, a website or a vendor rather it is a style of computing which supports many for its implementation and use." (quoted in Yuvaraj, 2015, p. 7)

2) Forrester

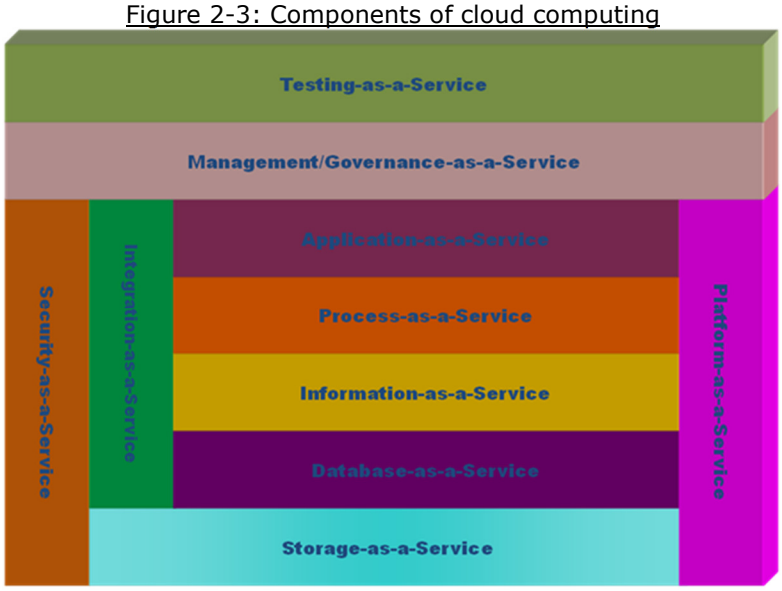
'Cloud computing is a standardized IT capability (services, software, or infrastructure) delivered via Internet technologies in a pay-per-use, self-service way.' (Forrester, 2011).

3) KPMG

'The Cloud = Internet-based data access & exchange + Internet-based access to low cost computing and applications' (KPMG (2011), p. 6).

On the other hand, the narrower definitions on cloud computing tend to focus on the technical aspects of the cloud. For example, in attempting to define cloud technology as a computing model, Linthicum (2009) comes up with a "stack" of sorts considering each component of cloud computing and how they interact. Ten major categories or patterns of cloud computing technology are identified, including (see Figure 2-3):

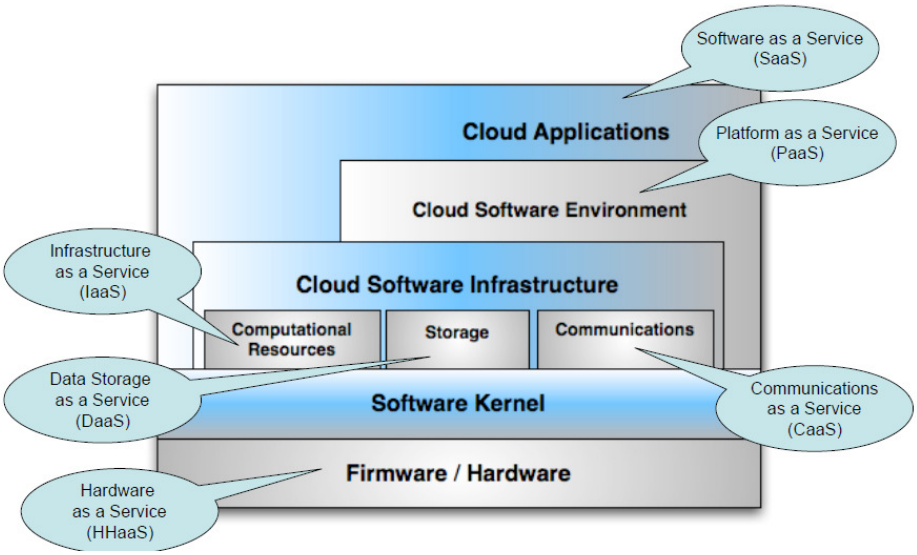
Figure 2-3: Components of cloud computing



Source: Linthicum (2009) (© Blue Mountain Labs)

Youseff et al. ((2008), p. 1) define cloud computing as a new computing paradigm that allows users to temporarily utilise computing infrastructure over the network, supplied as a service by a cloud provider at five layers of abstraction including hardware and firmware, operating system kernel, cloud software infrastructure (i.e., computational resources, storage and communications), cloud software environment (also called the platform layer) and applications.

Figure 2-4: A Proposed Cloud computing ontology



Source: Youseff et.al. ((2008), p. 4)

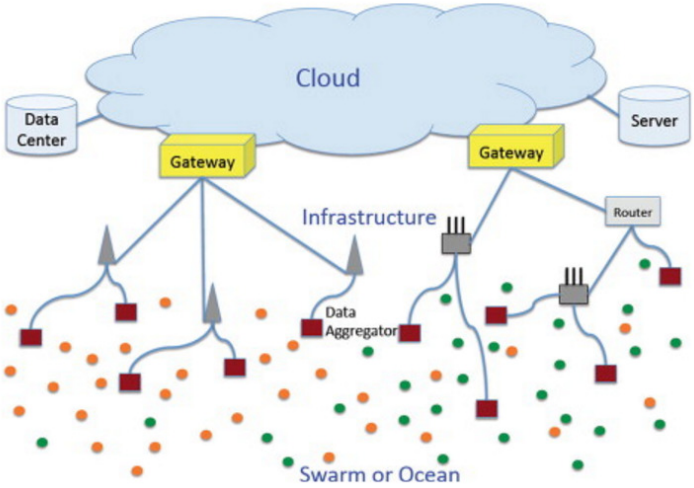
Alternative definitions, such as those provided by Martson et al. ((2011), p. 177) encapsulates the unique features of applications from a technological perspective as follows:

"Cloud computing is an information technology service model where computing services (both hardware and software) are delivered on demand to customers over a network in a self-service fashion, independent of device and location. The resources required to provide the requisite quality-of service levels are shared, dynamically scalable, rapidly provisioned, virtualized and released with minimal service provider interaction. Users pay for the service as an operating expense without incurring any significant initial capital expenditure, with the cloud services employing a metering system that divides the computing resource in appropriate blocks."

2.2 Use of cloud computing: Internet of things

Recent innovations include the use of cloud computing by smart devices that include internet-enabled sensors for reporting to the cloud. Machine-to-machine (M2M) communications enable devices to exchange information with each other in an autonomous way without human intervention. More recently, the introduction of the Internet of Things (IoT) concept has added new dimensions to the possibilities offered to such applications on top of cloud computing. IoT refers to ''a world-wide network of interconnected objects uniquely addressable, based on standard communication protocols'' (Botta et al. (2016), p. 685). In the IoT, all types of real-world physical elements (sensors, actuators, personal electronic devices, or home appliances, amongst others) are able to autonomously interact with each other. M2M technology is being used in a wide range of devices and applications, where equipment and machinery needs to communicate with a network or back office computer system. Examples include smart metering for power, vehicle monitoring for transport fleets, and health care equipment. It is even being used to monitor vending machines that could send alerts when they need servicing (Pritchard, 2012).

Figure 2-5: Cloud-based M2M communications



Source: Chen & Lien (2014)

The model of cloud-based M2M communications as shown in Figure 2-5 consists of cloud, infrastructure, and machine swarm (or machine oceans, to stand for a great amount of machines). Networking in the cloud, typically done by high-speed wired/optical networking mechanism, connects data centers, servers for applications and services, and gateways to/from the cloud. The infrastructure interconnects cloud and machine swarm/ocean, which can be wired or wireless.

2.3 Consequence of cloud computing: Data Analytics 3.0

Important consequences of the Internet of Everything are expected for business. This suggest that it will be one of the main sources of big data, i.e. a large number of companies capitalising on vast new sources of unstructured, fast-moving information. A shift in the use of analytics is perceived which is fundamental and far-reaching enough to call it Business Analytics 3.0.

In short, it is a new way to apply powerful data-gathering and analysis methods not just to a company's operations but also to its offerings – to embed data smartness into the products and services customers buy.

As this new way of thinking about and applying a strength takes hold, managers are challenged to respond. New players emerge, competitive positions shift, novel technologies must be mastered and talent drifts towards the most challenging new jobs. The ones that respond most effectively will be those who have connected the dots and will be best positioned to drive the general direction of change (Davenport (2013), p. 66).

The emergence of business intelligence through cloud computing provide a specific example of such creative response to change (Mircea et al. (2011), p. 2). Cloud allows all sizes of businesses in every industry to exploit business intelligence across their processes and in collaboration with other businesses within their ecosystems. Every device, shipment and customer leaves a data trail, and companies have the ability to analyse those sets of data for the benefit of customers and markets. Consequently, optimisation is embedded into every decision made in support of the business, i.e. to create more valuable products and services. Companies that want to succeed in the new data economy must ascertain how the analysis of data can create value for themselves and their customers. "Analytics 3.0 is the direction of change and the new model for competing on analytics" (Davenport (2013), p. 72).

2.4 Understanding cloud computing

The technological understanding of cloud computing in this paper is built on the definition provided by the US National Institute of Standards and Technology (NIST (2011)) and as described by the 5-4-3 model (Clohessy et al. (2013)). Cloud as such is composed of hardware, storage, networks, interfaces and services that provide the means through which infrastructure, computing power,

applications and services are accessed by the user on demand and independent of location. In its entirety, cloud represents computers in large scale data centres that are networked anywhere in the world with the availability of paying for the use of them in a pay-per-use way, meaning that just the resources that are being used will be paid for.

For purposes of this paper, cloud computing is a term that broadly describes an emerging group of related technologies and business models that goes beyond the focus on the cloud as a platform for running applications, thereby integrating the specific role of the applications itself and the economic intention behind clouds. In this sense, cloud computing is an innovation-enabling technology. The resulting ecosystem, combining different aspects of product, process, and structural innovation mainly at the intersection of technology and economics, is increasing the technological resources available to companies, enabling users to create innovations built on top of cloud computing services.

This broader definition of cloud computing characterises how the stakeholders interact with the cloud currently or may interact with it in the future. Therefore, cloud computing is studied from the end-user perspective by also taking the Internet of Things and Data Analytics 3.0 into consideration.

3 Theory models of IT adoption

In this section well-established theory models are presented that identify the influencing factors for acceptance and diffusion of technological innovations in order to investigate the adoption of cloud computing. Relevant models should cover different perspectives to gain influencing factors from a spectrum as broad as possible.

Ontologically, theories may consider different units of analysis, typically the user/firm (micro-level) or the market/innovation (macro-level). Given that SMEs are the focus of this study, attention is paid to the micro-level, i.e. the organisational-level IT innovation adoption process, in this literature review.

Various studies on IT adoption are based on Rogers' (2003) Diffusion of Innovations Theory (DOI) and DePietro et al.'s (1990) Technology-Organisation-Environment framework (TOE). Moore and Benbasat's (1991) Adoption of Information Technology Innovation Theory (AITIT) is an extension of the DOI and is also briefly considered for this research. Furthermore, Davis' (1989) Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003) are included.

The combination of these theoretical models covers a broad spectrum of influencing factors from different areas and should avoid being too focused on technology. This is why these five models have been considered relevant for this study.

3.1 Diffusion of Innovation theory

DOI was developed by E.M. Rogers in 1962 and it describes how, over time, a new idea or product gains momentum and spreads (diffuses) through a social system. The end result of this diffusion is that individuals and organisations, as part of a social system, adopt a new idea, behaviour, or product. DOI as a theory provides three valuable insights into the process of technology adoption:

- Why certain innovations are adopted more quickly than others.
- The effect of the difference between information and conversation about innovations.
- Understanding the needs of different user segments based on their propensity to adopt an innovation.

DOI's main concern is about how innovations are adopted (process) as well as the reasons behind different rates of innovation adoption (characteristics).

Rogers ((2003), p. 232) described the innovation-diffusion process as "an uncertainty reduction process". Uncertainty reduction determines the rate of adoption[1] by concentrating on the attributes

[1] Rogers (2003) defined the rate of adoption as "the relative speed with which an innovation is adopted by members of a social system" (p. 221)

of innovation as perceived by individuals. Rogers addresses five characteristics that influence the diffusion and acceptance of innovations:

1. Relative Advantage; the degree to which an innovation is perceived as being better than the idea it supersedes (Ibid, p. 15). The target audience calculates the relative strength of an innovation. If an advantage is detected, the individual is more likely to adopt.

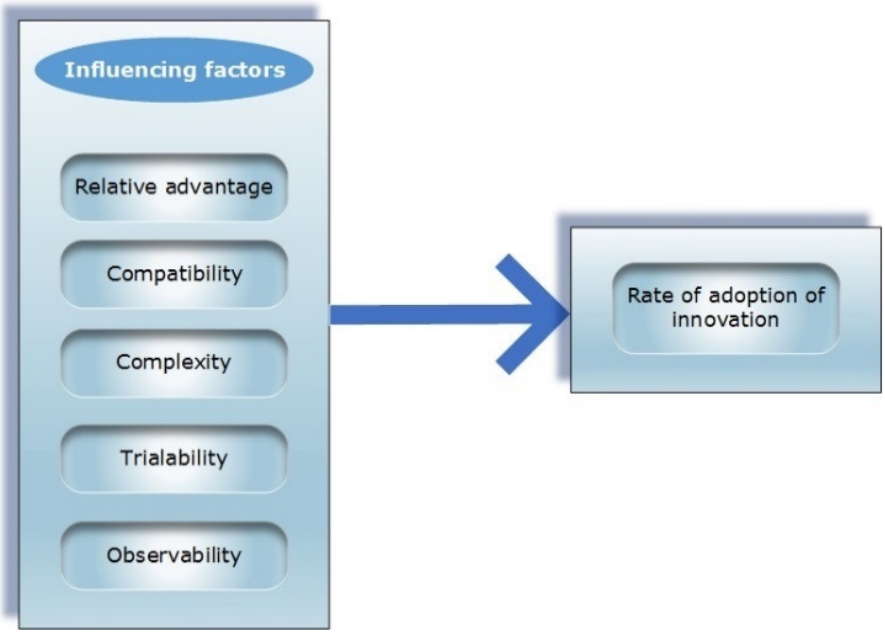
2. Compatibility; the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Ibid, p. 15). If an innovation is compatible with an individual's needs and current usage pattern, uncertainty surrounding the new idea will decrease and the rate of adoption of the innovation will increase.

3. Complexity; the degree to which an innovation is perceived as relatively difficult to understand and use (Ibid, p. 16). So, opposed to the other attributes, complexity is negatively correlated with the rate of adoption. Consequently, excessive complexity of an innovation hinders its adoption.

4. Trialability; the degree to which an innovation may be experimented with on a limited basis (Ibid, p. 16). The more an innovation is tried on, the more likely its adoption will be in general because it represents less uncertainty to the potential adopter. Re-invention may occur as an innovation's quality may be changed by a user as it diffuses.

5. Observability; the degree to which the results of an innovation are visible to others (Ibid, p.16). The easier it is to see the benefits of a new idea, the more likely it will be adopted by the target population as visibility stimulates peer discussion of a new idea.

Figure 3-1: Diffusion of Innovation Theory



3.2 Adoption of Information Technology Innovation Theory

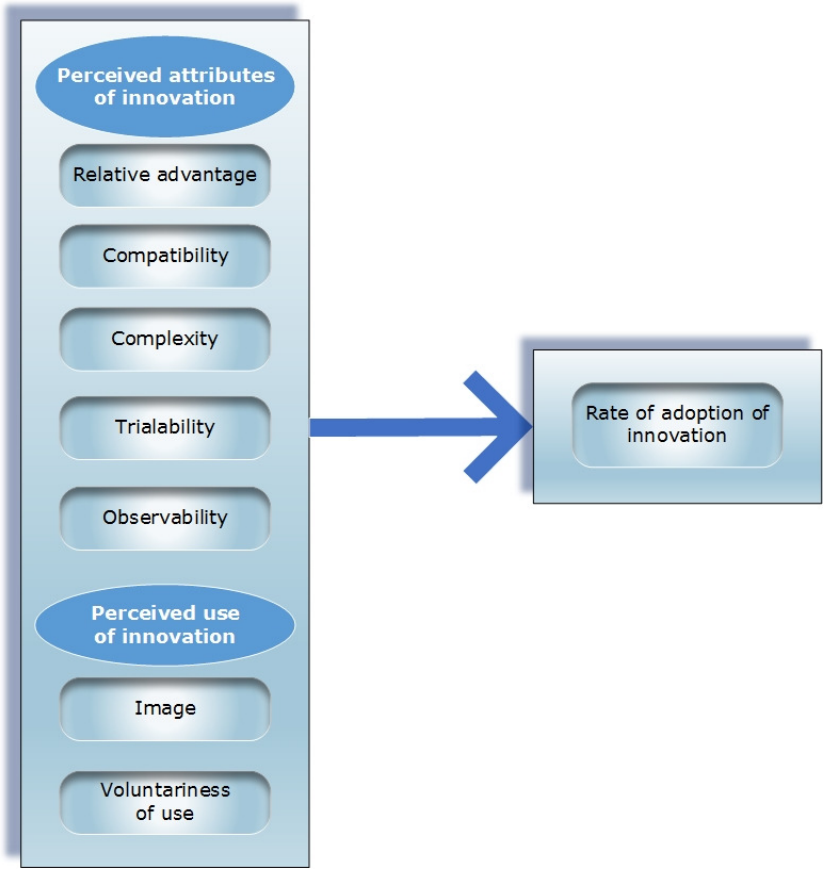
In this theory, Moore and Benbasat (1991) added two extensions to the DOI by Rogers. The following factors play an important role in the process of the adoption of innovations, too:

1. Image; Image is the degree to which use of an innovation is perceived to enhance one's image or status in one's social system (Ibid., pp. 195).

2. Voluntariness of use; Voluntariness of use is the degree to which use of the innovation is perceived as being voluntary or of free will (Ibid., pp. 195).

According to this theory, it is not the potential adopters' perceptions of the innovation itself, but rather their perceptions of using the innovation that are key to whether the innovation diffuses. The difference in approach of Moore and Benbasat as compared to Rogers is the focus on the rate of adoption by the latter and the possibility of adoption by the former theorists. Their instrument is intended to be a tool for the study of the initial adoption and eventual diffusion of IT innovations within organisations.

Figure 3-2: Adoption of Information Technology Innovation Theory



3.3 Technology Acceptance Model

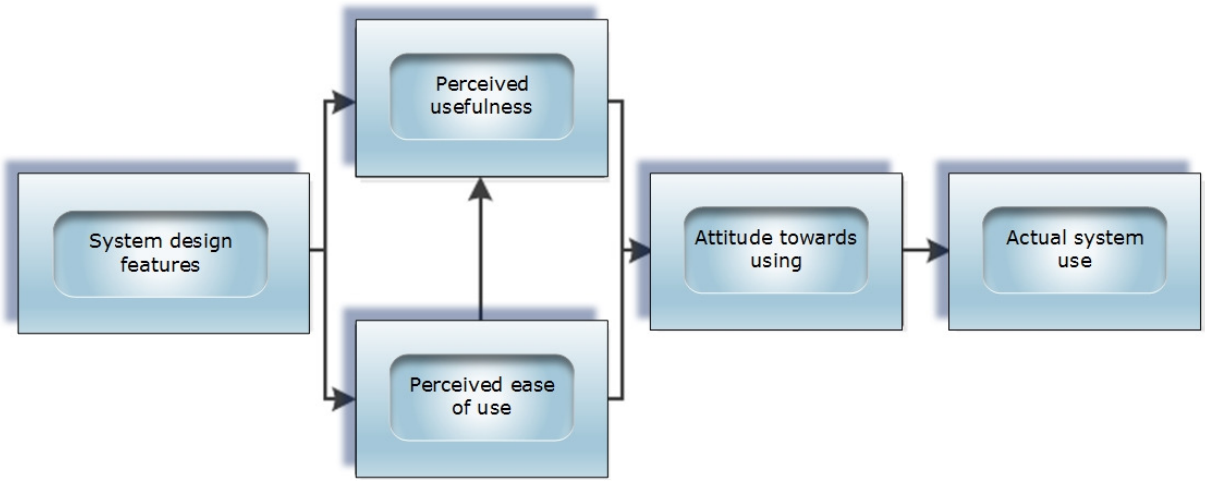
TAM by Davis (1989) describes that although information technology offers the potential for substantially improving white collar performance, it is often obstructed by users' unwillingness to use and accept available technology. In contrast to Rogers, Davis concentrates on the perspective of the individual's perception only and places this in an organisational context. TAM implies that the actual system use is influenced by two cognitive reactions to the external stimulus (system design features):

1. Perceived Usefulness; is the degree to which an individual believes that using a particular system would enhance his or her job performance (Ibid., pp. 320). Within an organisational context, users are generally reinforced for good performance by rewards. A system high in perceived usefulness, is one for which the user believes in the existence of a positive use-performance relationship.

2. Perceived Ease of Use; is the degree to which an individual believes that using a particular system would be free of physical and mental effort (Ibid., pp. 320). Effort is a finite resource that a person may allocate to the various activities for which she is responsible. Ceteris paribus, an application perceived to be easier to use than another is more likely to be accepted by users.

This theory provides measures for predicting use of technology by explaining the causal relations between system design features, perceived usefulness, perceived ease of use, attitude towards using and the actual system use as shown in Figure 3-3: Technology Acceptance Model

Figure 3-3: Technology Acceptance Model



3.4 Technology-Organization-Environment Framework

TOE is a multi-perspective framework that was developed by DePietro, Wiarda and Fleischer (1990). This framework encompasses the factors influencing the technology innovation adoption process by clustering them within a classification scheme based on three aspects of an enterprise's context:

The **technological context** which represents the internal and external technologies related to the organisation; both technologies that are already in use at the firm, as well as those that are available in the marketplace but not currently in use. Technologies may include both equipment as well as processes. Within this context, the following factors influence the decision to adopt innovations:

1. Technological availability; The availability of technologies often depends on characteristics of the industry.

2. Technological characteristics; Complexity and risk of innovations influence the probability to adoption.

The **organisational context** is related to the resources and the characteristics of the firm:

3. Organisation size; Size has long been at the heart of studies looking at IT innovation adoption and is considered to be an important predictor of ICT innovation. It is often argued that larger firms have more resources, skills, experience and ability to survive failures than smaller firms. On the other hand, because of their size, small firms can be more innovative, they are flexible enough to adapt their actions to the quick changes in their environment.

4. Top management support; It has been shown that technology innovation adoption can be influenced by top management support and attitudes towards change. Generally, top management support is essential to maintain the importance of possible change through an articulated vision for the organisation, and by sending signals of the significance of the new technology to other members of the firm.

5. Innovativeness (being open to new products); Innovativeness relates to the openness to follow new ways, and the methods by which clients process information, take decisions and solve problems The receptiveness of an organisation towards new ideas plays a key role in the adoption of innovations.

6. Prior technology experience; Users' recognition of prior similar experiences can be viewed on a continuum that describes the degree of linkages between present practice and past experience. In the case of cloud computing, familiarity with technologies such as virtualisation, cluster computing or utility computing can have a direct influence upon user perceptions regarding cloud computing services. Consequently, prior experience could be expected to play a facilitative role in the adoption decision.

7. Slack resources; i.e. relative abundance of the resource, have a positive influence on the adoption of innovations, but they are neither mandatory nor sufficient.

8. Formal and informal boundary-spanning structures; multiple types of relations and roles among members of an organisation influencing the diffusion of information.

9. Communication process; informal networks within the company play an important role concerning the generation and dissemination of information.

The **environmental context** which refers to the arena in which a firm conducts its business; it can be related to surrounding elements such as:

10. Competitive pressure; The external environment can have a direct effect on the firm's decision. The competitive pressure faced by a firm is a strong incentive to adopt relevant new technologies.

11. Industry characteristics and market structure; The adoption of IS innovation by a firm can be influenced by the industry in which the firm operates. The readiness for innovation is often determined by market influences and product driven need or pressure to innovate.

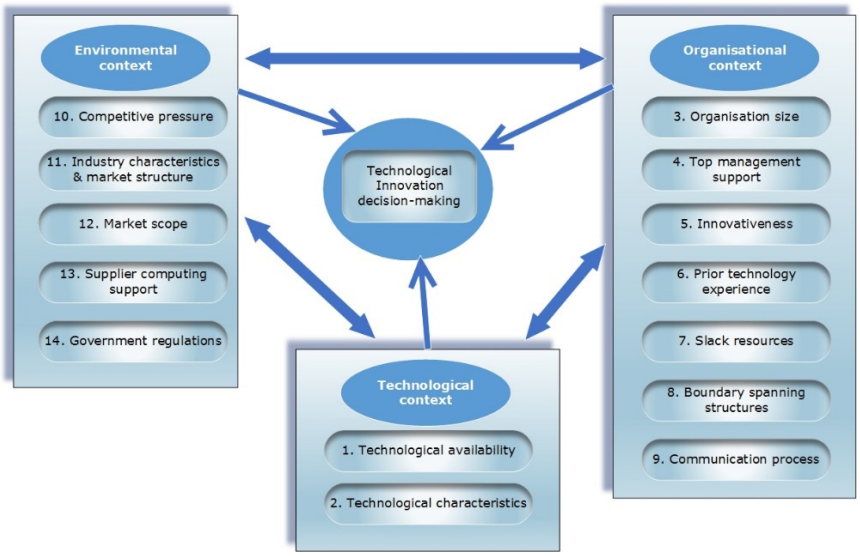
12. Market scope; SMEs operate not only locally, but also nationally and even internationally. Therefore, the availability of IS innovation can be used by firms to reach this goal.

13. Supplier computing support; Marketing activities that suppliers execute can significantly influence SMEs adoption decisions. This may affect the diffusion process of a particular innovation.

14. Government regulation; Regulations by the government often drive or even force companies to research for technological alternatives. On the one side, regulations may call for application of certain technologies. On the other side, regulations may cause companies to refrain from innovations in certain areas.

These three contexts present both constraints and opportunities for technological innovation (DePietro et al. (1990), p. 154). These contexts influence each other and the decision-making concerning the adoption:

Figure 3-4: Technology-Organisation-Environment Framework



Source: Adapted from DePietro et al. (1990), p. 154

Compared to Rogers DOI, the TOE framework overcomes the domination of the technical perspective and provides a useful analytical tool to distinguish between the inherent qualities of an innovation and the motivations, capabilities, and broader environmental context of the adopting organisation.

3.5 Unified Theory of Acceptance and Use of Technology

The fifth theory considered for the identification of influencing factors is the UTAUT by Venkatesh et al. (2003). This theory unifies eight different Acceptance Models, each with different sets of acceptance determinants. According to this theory, there exist four factors with direct influence on acceptance and behaviour of users:

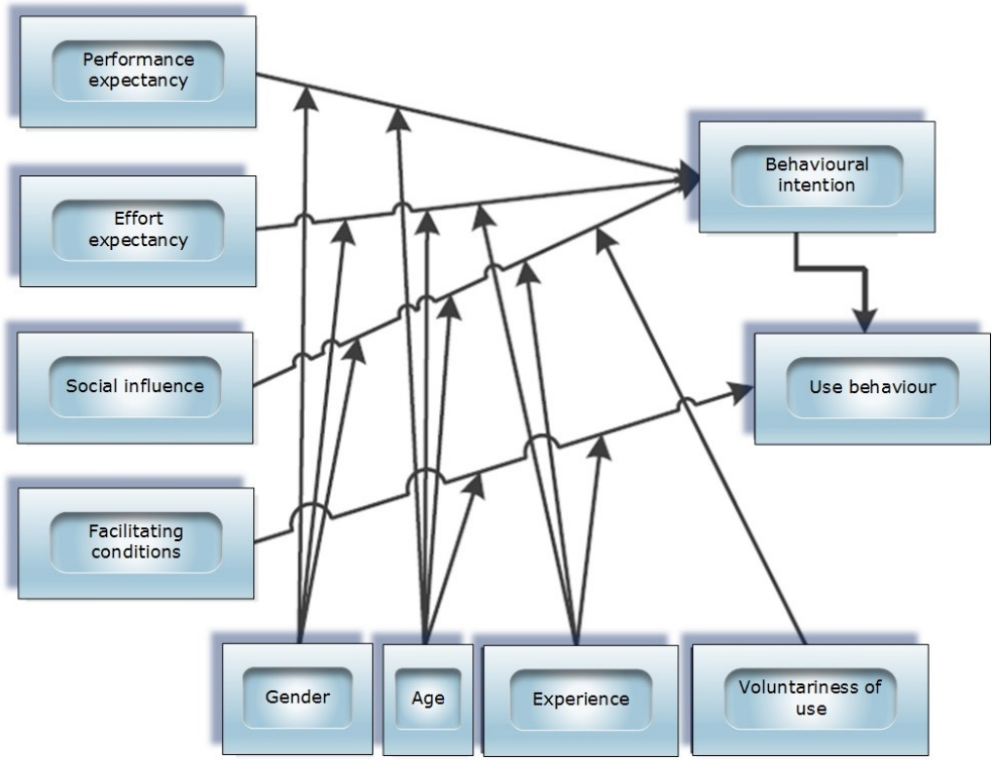
1. Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance. (Ibid., pp. 447).

2. Effort Expectancy is defined as the degree of ease associated with the use of the system (Ibid., pp. 450).

3. Social Influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system (Ibid., pp. 451).

4. Facilitating Conditions are defined as the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system (Ibid., pp. 453).

Figure 3-5: Unified Theory of Acceptance and Use of Technology



Source: Adapted from Venkatesh et al. (2003), p. 447)

As can be seen from Figure 3-5, the first three factors affect the behavioural intention, which again affects use behaviour. The fourth factor, facilitating conditions, has direct influence on use behaviour. The labels gender, age, experience and voluntariness of use are moderating factors in the relationship between the determinants and the dependent variables intention and usage.

3.6 The dominant paradigm in IT innovation research

The theoretical approach from scientifically recognised literature within the dominant paradigm in studying IT innovation adoption involves identifying contingency factors that facilitate or hinder the adoption decisions in organisations (Fichman (2004)). Given that technology adoption is complex and context sensitive, the five selected theory models above cover four main areas of influence on acceptance and diffusion of technological innovations: the individual, the organisation, the technology and the environment. These categories were derived from the perspectives of the particular theory models.

Table 2: Cluster of influencing factors concerning diffusion of technological innovations

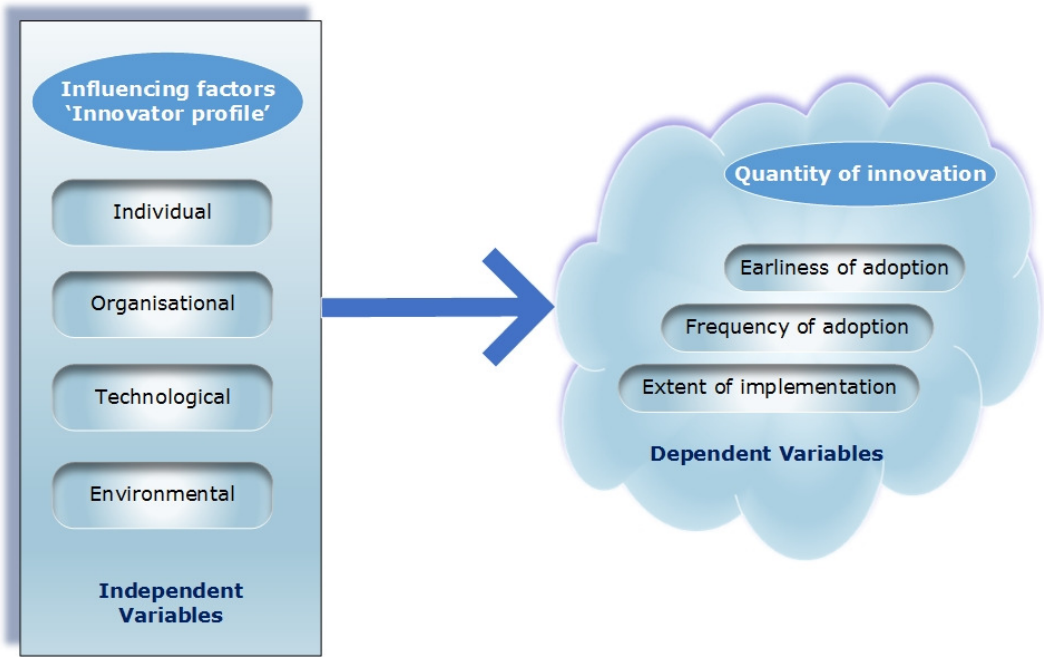
Individual	**Organisational**	**Technological**	**Environmental**
Perceived usefulness [TAM]	Organisation size [TOE]	Technological availability [TOE]	Industry characteristics and market structure [TOE]
Perceived ease of use [TAM]	Effort expectancy [UTAUT]	Technological characteristics [TOE]	Government regulation [TOE]
	Performance expectancy [UTAUT]		Supplier computing support [TOE]
	Compatibility [DOI]		Competitive pressure [TOE]
	Trialability [DOI]		Social influence [UTAUT]
	Observability [DOI]		Market scope [TOE]
	Image [AITIT]		
	Complexity [DOI]		
	Innovativeness [TOE]		
	Slack resources[TOE]		
	Relative advantage [DOI]		
	Communication process [TOE]		
	Top management Support [TOE]		
	Voluntariness of use [AITIT]		
	Boundary spanning structures [TOE]		
	Prior technological experience [TOE]		
	Facilitating conditions [UTAUT]		

In the course of the analysis twenty-seven influencing factors were identified which were considered as relevant concerning diffusion and acceptance of technological innovations like cloud computing. These factors are clustered on the basis of their particular context in Table 2.

These influencing factors determine an organisation's innovator profile since organisations rationally consider these factors in their innovation decisions. This approach, the rational choice model, is rooted in economic literature. It is assumed in this tradition that organisational adoption is directed by technical efficiency and related boosts to economic performance (e.g., return on investment, efficiency, productivity improvement). An innovation is considered technically efficient if it would economically benefit most members of the target population to adopt and deploy it. This logic of efficiency can be translated into an organisation's innovator profile. The innovator profile is the extent to which organisations possess certain characteristics that increase the desire for innovation and/or the ability to innovate successfully. The quantity of innovation, in this sense, is the extent to which an organisation adopts innovations often, adopts them early, and/or adopts them thoroughly (Fichman (2001), p. 429).

Under the dominant paradigm, it is assumed that a direct relationship exists between an organisation's innovator profile and the quantity of adoption in terms of earliness, frequency and extent of adoption. Further, the theories within the dominant paradigm assume a positive relationship between the quantity of innovation and quality of innovation. The underlying logic is that organisations that fit the innovator profile better will have higher returns to innovation because they can align the benefits the innovation provides more effectively. This suggests that the innovator profile serves implicitly as a measure of the quality of innovation by capturing the synchronism of the expected levels of innovation and actual levels of innovation.

Figure 3-6: The dominant paradigm for IT innovation



Source: Adapted from Fichman ((2004), p. 317)

Within the rational choice model, it is assumed that novel technologies diffuse themselves only because they bring benefits to their adopters. According to Rogers (2003) this happens seldom at the same rate. Adoption of an innovation is determined by the innovativeness of the members of the target audience. Some are earlier in adopting new technologies than other members of the same system. Rogers classifies the members of a social system into adopter categories based on the relative time at which they adopt an innovation. When promoting an innovation, there are different strategies used to appeal to the different adopter categories:

1. Innovator: venturesome
   Innovators are quick at calculating the relative strength of an innovation and are willing to cope with a high degree of uncertainty about an innovation at the time that they adopt. They are venturesome and willing to take risks. The innovator's role in the diffusion process is that of gate keeper, i.e. launching the new idea in the social system by importing the innovation from outside the system's boundaries.

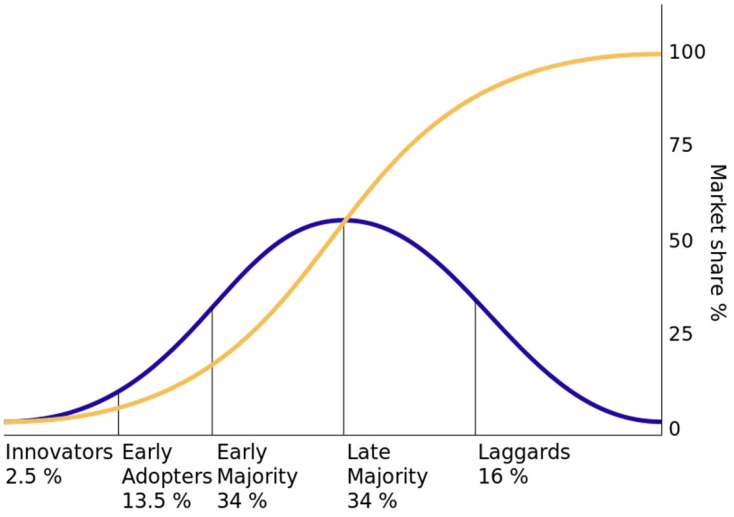
2. Early Adopters: Respectable
   This category enjoys leadership roles because of their awareness of the need to change and by adopting new ideas. The role of the early adopter is to decrease uncertainty about a new idea by adopting it, and then conveying a subjective evaluation of the innovation to many other members of a social system. The early adopter is respected for the successful use of new ideas. These are people who represent opinion leaders.

3. Early Majority: Deliberate
   The early majority adopts new ideas just before the average member of a social system. They interact frequently with the other members of the social system, but need to see evidence that the innovation works to take away their uncertainty about adopting the new idea. The unique position between the very early and the relatively late to adopt provide interconnectedness in the system's networks.

5. Late Majority: Sceptical
   The late majority adopt new ideas just after the average member of a social system as an answer to increasing network pressures or out of economic necessity. New ideas are approached with scepticism, and almost all of the uncertainty about a new idea must be removed before the late majority will adopt. They are willing to accept the relative advantage of a new ideas, but the pressure of other members of the social system is necessary to convince them to adopt.

6. Laggards: Traditional
   Laggards are the last members of a social system to adopt an innovation. Their point of reference is in the past and these individuals interact primarily with others who also have relatively traditional values. This orientation causes the adoption to lag behind the awareness-knowledge of a new idea. It is often their limited resources that makes them cautious in adopting innovations.

Figure 3-7: Adaptor categorisation and diffusion process within dominant paradigm



According to the dominant paradigm, the diffusion of a technology generally follows an S-shaped curve as early versions of technology are rather unsuccessful, followed by a period of successful innovation with high levels of adoption, and finally a dropping off in adoption as a technology reaches its maximum potential in a market.

3.7 Challenging the Dominant Paradigm

One limitation of the dominant approach is that it does not allow for complex interactions among the influencing factors that go beyond simple additive effects. In particular, "cloud computing may present a setting where what matters is the holistic configuration across users, services and supporting technology that are present or absent to do cloud right" (Brink (2013)).

Also, in the tradition of the rational choice models, organisational adoption is directed by technical efficiency. However, for most IT innovations, technical efficiency is not a static feature that influences the adopter's response to the innovation only once. Rather, the typical IT innovation only becomes efficient through a recursive process of increasing knowledge about the innovation and how best to apply it. It may, thus, be argued that "a technology's ultimate *destiny* may provide a better insight into a technology's lasting benefits than some static concept of technical efficiency" (Fichman (2004), p. 334, italics in original).

The dominant paradigm has been criticised for being pro-innovation (Rogers (2003), p. 106) because it assumes that if a new technology holds good promises, then more of this technology is better. Another objection is that it adopts a perspective that privileges the new over the taken for granted, adoption over rejection and factor over process (Fidock (2011), p. 25).

The dominant innovation paradigm is based on normative rationality. That is, actors are assumed to participate in the decision process well-informed about the innovation and how well it fits with their organisational objectives. Yet, individual organisations seem to make decisions that are different from normative rationality in reality. This means that the theoretical approaches within the dominant paradigm fail to take into account how an organisation attends to innovations with reasoning grounded in its own facts and specifics in order to adopt the right innovation, at the right time and in the right way (Weick & Sutcliffe (2006), p. 519). "If we cannot trust that the rational ideal will always hold, this suggests the need to open the "black box" of organizational decision making so we can examine instances where innovation does and does not conform to the rational ideal, and thereby identify the antecedents and consequences of such (lack of) conformance" (Fichman (2004), p. 337).

This stresses the need to look beyond the dominant paradigm for an alternative that gives a fuller picture of what causes different sorts of innovative behaviours with emerging innovations. A potential opportunity is by incorporating mindfulness to connect the inside organisation to the outside technology in order to moderate the link between quantity of innovation, i.e. the amount of innovative activity, and the quality of innovation, i.e. the extent to which an organisation has adopted the "right" innovation, at the "right" time and in the "right" way. A mindful response in this sense would mean that an organisation would not attempt to make the best choice from among available options, i.e. quantity of innovation, but to create options, i.e. quality of innovation. The following section explains the theory of mindfulness and its constructs.

4 Cognition Theory

Cognition theory or mindfulness has its roots in Buddhist psychology and reflects upon the role cognitive qualities play in determining organisational innovation, particularly in the context of technologies subject to bandwagon dynamics like cloud computing. Supporting scholars see mindfulness as a key to understanding the "micro level decision context that influences whether organizational leaders will make discriminating choices that fit an organization's unique circumstances in the face of such bandwagons, or whether they will simply follow the pack" (Fiol and O'Connor (2003), p. 54). The concept of mindfulness suggests, therefore, a more complex relationship between traditional influencing factors and outcomes than the ones reflected in the dominant paradigm.

4.1 Individual mindfulness

Mindfulness can best be understood as the process of drawing novel distinctions (Langer & Moldoveanu (2000), pp. 1). Actively drawing distinctions makes the individual more aware of the context of actions in the present than if one were to rely upon distinctions and categories drawn in the past. Under this latter situation, rules and routines are more likely to govern our behaviour, irrespective of the current circumstances, and this can be interpreted as mindless behaviour. Individuals who are mindfully engaged are both motivated and able to explore a wider variety of perspectives, regardless of whether what is noticed is important or trivial, as long as it is new to the viewer. Individuals who mindfully process information are more likely to be able to apply it in new ways and in alternative contexts. They, therefore, are inclined to create innovative solutions to problems and alter their actions to take advantage of changing environments (Langer (1989), pp.199-201).

The process of actively interpreting new things involves a number of qualities, including:

1. Openness to novelty; Ability to reason about and to cope with novel kinds of stimuli and new information.

2. Creation of new categories for structuring perception; Ability to compare, contrast and judge about how things are the same or different.

3. Sensitivity to different contexts; Awareness of situational characteristics to notice when and whether a setting changes.

4. Enhanced awareness of multiple perspectives in problem solving; Appreciation of things from different and opposing points of view.

5. Orientation in the present; Individual's attention to their immediate situation and their actual surroundings (Langer (2014), pp. 61-74).

4.2 Organisational mindfulness

The theory of organisational mindfulness, i.e. elaborating cognitive concepts on the micro-level to the macro-levels of analysis, originated from studies of reliability organisations[2] and organisational cognition literature: "Mindfulness approaches hold that individuals' and organizations' ability to achieve reliable performance in changing environments depends on how they think: how they gather information, how they perceive the world around them, and whether they are able to change their perspective to reflect the situation at hand." (Langer (1989), p. 143).

Like individual mindfulness, organisational mindfulness involves the organisation's ability to detect changed aspects of the environment and take appropriate action. Organisational mindfulness is, however, not a collection of individually mindful individuals. In order to achieve organisational mindfulness, organisations should combine the ability to detect important aspects of the context and take timely, appropriate action (Butler & Gray (2006), p. 216).

Generally expressed, mindful organisations practise adaptive management expectations in the context of the unexpected. In the anticipation of the unexpected the organisation never loses its alertness. Weick et al. (1999) propose that an organisation can be alert in five ways:

1. Preoccupation with failure; Utilisation of errors and failures as a way of improvement. Apart from treating failures as indicators of the overall health of the system, mindful organisations also conduct thorough analysis of near failures to enlarge mindfulness.

2 Reluctance to simplify; Organisational aspiration to perceive problems from different point of view. The mindful organisation resists the temptation to settle into simplified and reproducible fact-finding in its interpretation of events.

3. Sensitivity to operations; Individuals' capability to have an integrated overall picture of operations in an organisation or project. The mindful organisation attends to small and seemingly insignificant details in day to day operations because they recognise that catastrophes usually accumulate from minor errors and random events.

4. Commitment to resilience; Ability to cope with problems and dangers as they occur. This approach is in contrast to anticipation- a case where organisations deal with surprises by weeding them out in advance. Commitment to resilience takes recognition that anticipation through planning is always incomplete. Resilience favours improvisation over planning, adaptation over routine, and effectiveness over efficiency.

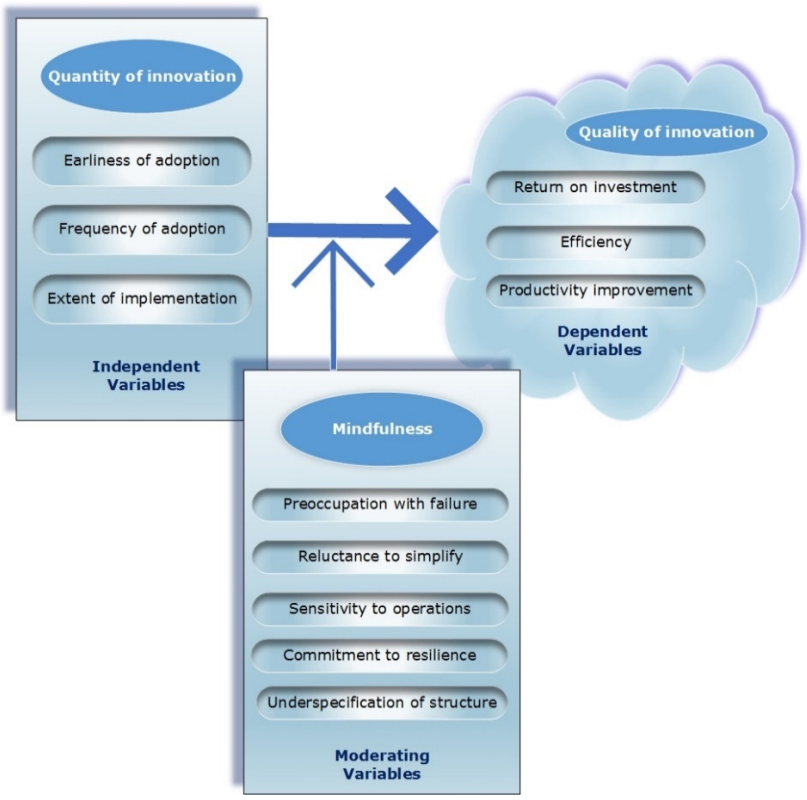
5. Underspecification of structure; Deferring the problem to experts who are most capable of solving them, regardless of hierarchical levels. Underspecification of structure can be viewed as the readiness to relax formal structure so that authority for action can flow in times of crisis to the individuals and the units having the requisite expertise to deal with the problem at hand.

[2] Reliability for an organisation means achieving resistance to intolerable failure (Swanson & Ramiller (2004))

In considering cloud adoption, a mindful organisation will accommodate its own rationale. This rationale will be based on the organisation's context-specifics and its distinctive competences. A preoccupation with failure may lead the organisation's rationale to reject innovation in that it resists the influence of rule-based behaviour and counters the industry best practices. The mindful organisation, then, approaches the cloud adoption by taking into consideration its local specifics and the wider community discourse for maximum performance outcome, e.g. return on investment, efficiency and productivity improvement. Mindfulness does not hold a pro-innovation bias. On the contrary, mindfulness seeks to explain how some organisations can resist an innovation even if the new technology holds good promises. Where needed it may uphold a resistance to jumping on innovation bandwagons (Foil & O'Connor (2003), p. 66).

In contrast to the models of the dominant paradigm, mindful models incorporate ultimate outcomes or benefits of an innovation. The ultimate outcome of an IT innovation may be conceptualised as the quality of innovation. In keeping with the view that mindful organisations will make better decisions throughout the innovation process because these are grounded in their organisational facts and specifics, Oredo & Njihia (2015, p. 153) posit that mindfulness moderates the link between the quantity of innovation and the quality of innovation. Organisations that exhibit greater mindfulness will have greater quality of innovation when measured as outcome performance.

Figure 4-1: Conceptual framework incorporating mindfulness



Source: Adapted from Oredo & Njihia ((2015), p. 153)

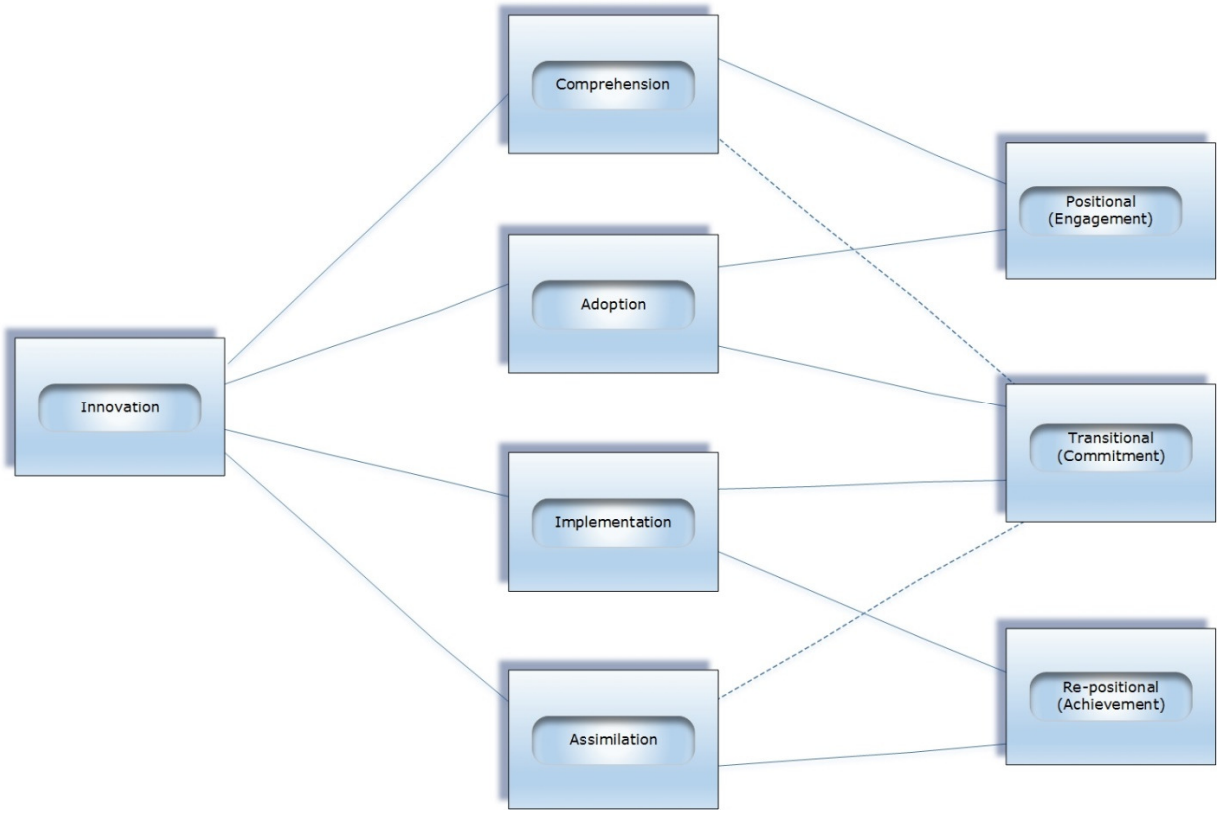
In the next section these attributes of mindfulness are elaborated and adapted by different scholars for use in the context of IT.

4.3 Mindfulness in IT innovation research

Swanson & Ramiller (2004) develop a comprehensive examination of the role of mindfulness in IT innovation. They argue that "attention to organizational specifics is crucial in supporting sound judgments about whether adopting a particular innovation is a good thing to do, when committing to the innovation is likely best to take place, and how implementation and assimilation can best be pursued" (Ibid, p. 559).

Organisational mindfulness in IT innovation is two-folded. Mindfulness will enhance the recognition of the parts of the organisational environment that need to respond to new information, while also promoting effectiveness in the response itself. An organisation is mindful towards an IT innovation if it pays careful attention to local specifics and the wider community discourse. In this sense, an organisation's involvement with an IT innovation can be modelled as a set of interrelated processes and intentionalities. Each process is associated strongly (solid line) or weakly (dotted line) with the underlying positional and transitional intentionalities. This model is depicted in Figure 4-2:

Figure 4-2: The processes and intentionalities of the organisational innovation model by Swanson & Ramiller (2004)



Source: Adapted from Swanson & Ramiller ((2004), p. 558)

Swanson & Ramiller introduce the concept of intentionalities to emphasise the goal-oriented character of IT innovation. More specifically, 'engagement' and 'achievement' are positional because they focus on a state the organisation strives to achieve. 'Commitment' is transitional because it concerns the change process itself.

The model depicted in Figure 4-2: The processes and intentionalities of the organisational innovation model by Swanson & Ramiller (2004) consists of four processes[3]:

1. Comprehension; The organisation engages in a sense-making journey and deliberates over the assessment of the importance of the innovation by being attentive to the local specifics and to the signals of its importance in the broader community. The organisation develops an attitude to the innovation and positions itself.

   In its quest for a better comprehension of the innovation, the mindful organisation will not accept generalised claims about the innovation's promise but will instead critically examine its local potency. At the same time, the organisation will utilise its ties to the wider community in order to gather diverse interpretations.

2. Adoption; If the organisation positioned itself as prospective adopter, it develops a supportive rationale. The challenges presented by the prospective change will be weighted prior to further commitment.

3. Implementation; If the implementation process follows, the organisation faces considerations concerning its own preparedness as well as the readiness of the enabling technology.

   The mindful organisation will promote an implementation strategy that focuses on its own open-ended expectations by being sceptical of standardised solutions. Simultaneously, the organisation will scan the broader community in order to capitalise on the growing experience, especially of early adopters, with the innovation. Identified obstacles are treated as prior misconceptions and may feed the operational sensitivity. Operational sensitivity emphasises the areas of attention where neglect may lead to large failures. Overall, implementation requires a willingness to adjust as the participation in the process grows. This process may be taken into the extreme of accepting implementation failure if the overall interests do so require.

4. Assimilation; This process commences as the IT innovation demonstrates its usefulness. The innovation is absorbed into the organisation's work systems, which may undergo their own adaptive changes.

   In assimilating the IT innovation, the mindful organisation will abstain from hasty acceptance and will stay alert for the potential adaptations due to unanticipated problems or opportunities. Failure remains a possibility at this stage and is preferred over the possibility of the innovation failing to deliver its full potential. Recognising failure stimulates the comprehension of the innovation by its users, whose sensitivity to their own operations are essential to further organisational progress with the innovation.

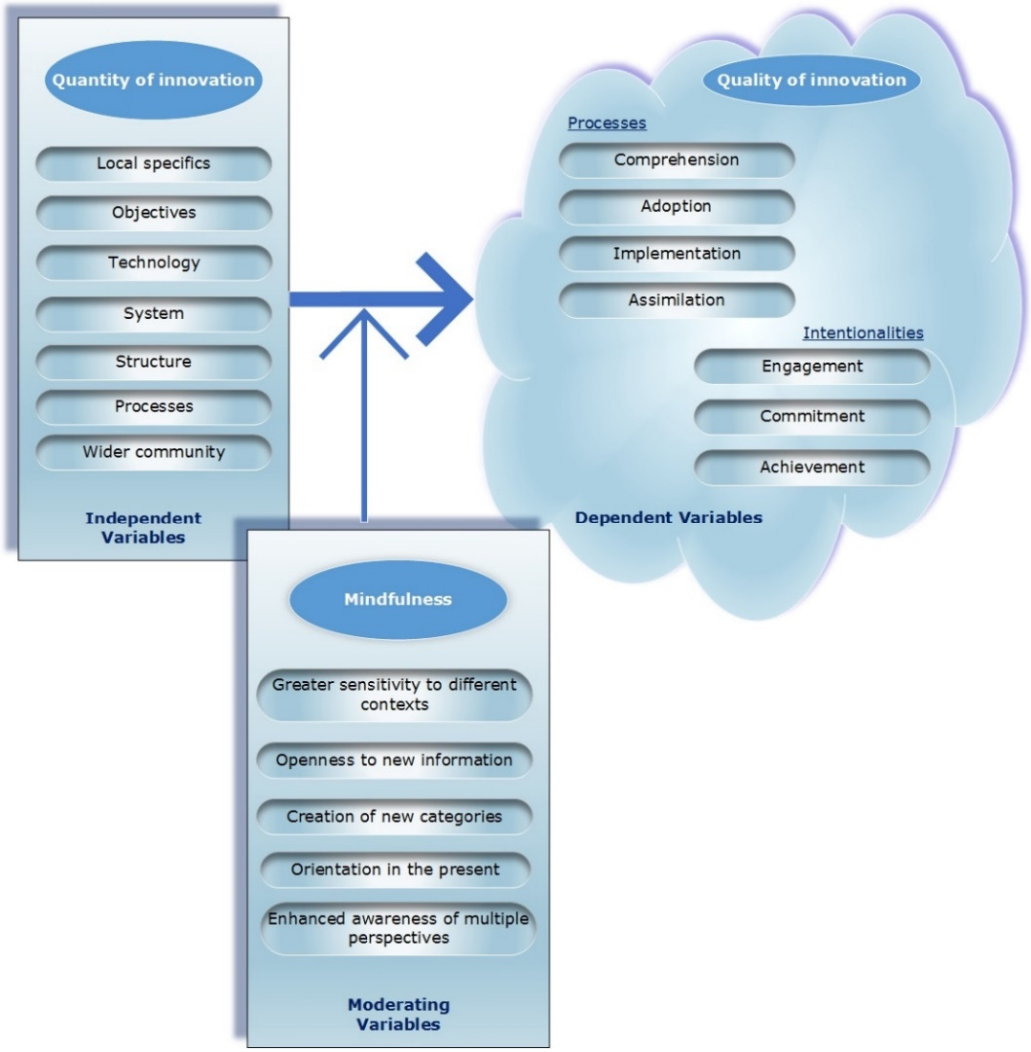
[3] The model is not a stage model of innovation, because once activated each process or intentionality may remain active over the course of the innovation.

Mindfulness in this model is about attending to innovation with reasoning grounded in the firm's own facts and specifics (Swanson & Ramiller (2004), p. 561). These facts and specifics concern, beside the technology and the system, the organisation's objectives, structure and processes and its interaction with its larger environment. Characterised in this way, mindfulness is concerned not only with the abstraction of the specifics of the locally adopted innovation, it also has to do with dealing with the challenges during the course of the innovation.

Mindful behaviour in organisations finds its encouragement in a flexible organisation structure. Because it is impossible to count on every possibility, the mindful organisation prefers improvisation over planning, adaptation over routine and effectiveness over efficiency (Ibid, p. 561)).

In addition, their work enlarges the scope of mindful organisational innovation to consider how it impacts adoption and diffusion at a community level (Swanson & Ramiller (2004), pp. 570). As the community learns about an IT innovation, the distribution of mindfulness in the larger population of firms shifts systematically over time. Note that this is not the same thing as saying that the distribution of knowledge about an innovation changes in the larger population of firms. Mindfulness is not about what firms know as such, but about their inclination for learning and adapting.

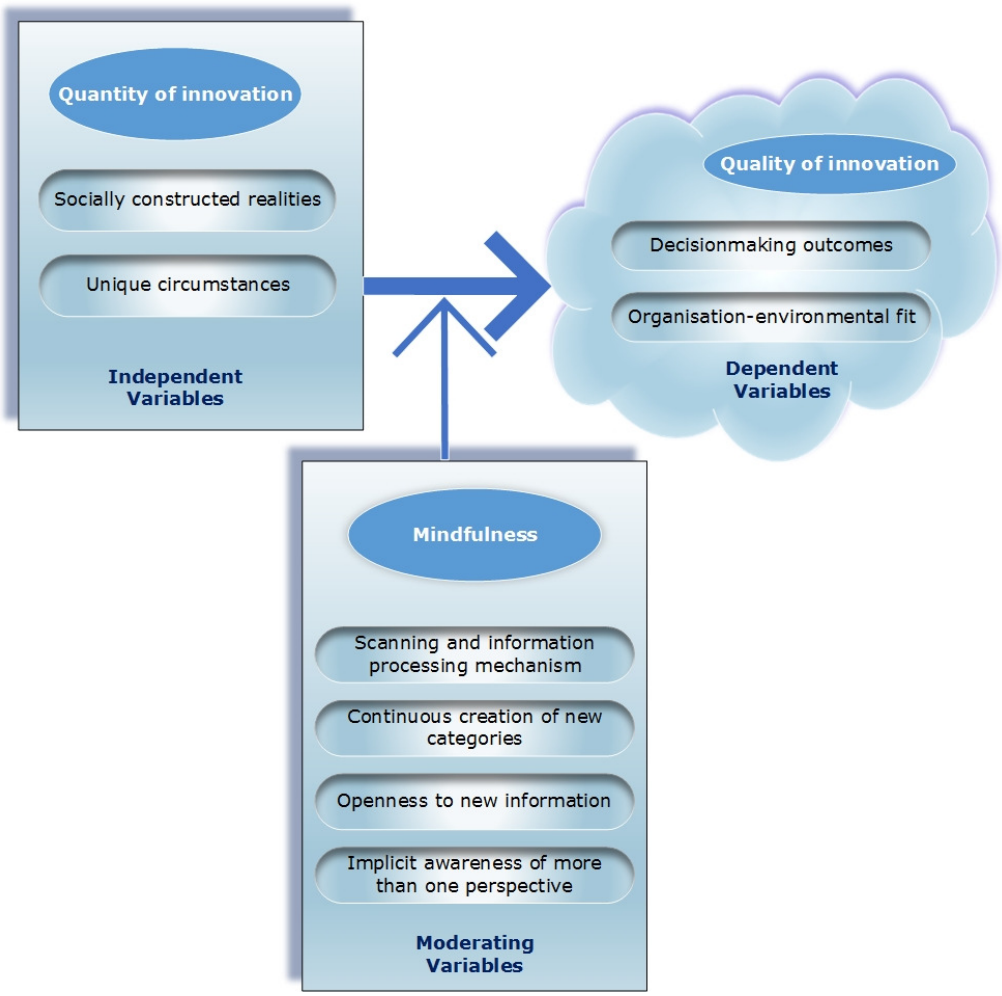
Figure 4-3: IT adoption framework by Swanson & Ramiller



Source: Distilled from narration Swanson & Ramiller (2004)

Fiol & O'Connor (2003) draw on the work of Langer (1989a) and indicate that a mindful approach to any activity has three characteristics: the continuous creation of new categories; openness to new information, and an implicit awareness of more than one perspective. They see mindfulness as a key to understanding the "micro level decision context that influences whether organizational leaders will make discriminating choices that fit an organization's unique circumstances in the face of such bandwagons, or whether they will simply follow the pack" (Fiol & O'Connor (2003), p. 54). Toward this end, they develop a framework whereby greater mindfulness among decision makers changes the way in which mechanisms for environment scanning and information processing are used. In particular, they argue that mindful managers will have more expanded scanning and more context relevant interpretations, and this will lead to more discriminating decisions in the face of bandwagons.

Figure 4-4:IT adoption framework by Fiol & O'Connor



Source: Distilled from narration Fiol & O'Connor (2003).

Mindful scanning calls for interpreting the socially constructed realities that surround the bandwagon behaviour. The accuracy of managers' perceptions of the value of a particular bandwagon behaviour to the firm would appear to be a key determinant of whether or not to adopt the behaviour. Thus, mindful decision making involves discriminating choices that best fit a firm's unique circumstances, rather than familiar and known behaviours based on what others are doing (Fiol and O'Connor (2003), p. 59).

In this sense, the traditional model would be concerned with predicting who would be the first to jump on an innovation bandwagon regardless of whether the underlying technology has merit. Research on mindfulness seeks to explain how some firms successfully resist bandwagons that in the end do not have merit because context matters in the decision-making process. The implication is that such organisations will be more likely to avoid bandwagon behaviours that add little or no value to the firm.

5 Conceptualising cloud adoption

In conceptualising cloud adoption by SMEs, the concept of mindfulness holds much potential to propose an alternative framework that addresses the accommodating theme of IT innovation research, which is to aid decision makers with regard to whether, when and how to adopt cloud computing and how to innovate with it. Also, mindfulness allows for the consideration of the perspective of cloud adopters who 'desire' various things from cloud computing. This will aid decision makers who are evaluating the potential of cloud computing for their organisation, comparing these desires with the reality of cloud services offered to them. Finally, the perspective suggests a large variety of interesting linkages involving both traditional innovation variables and also new variables suggested by the alternative perspectives considered here.

In keeping with the view that mindful organisations make better decisions throughout the innovation process because these are grounded in their organisational facts and specifics, it can be hypothesised that mindfulness moderates the link between the quantity of innovation, i.e. the amount of innovative activity, and the quality of innovation, i.e. the extent to which an organisation has adopted the "right" innovation, at the "right" time and in the "right" way. An alternative conceptual framework[4] is proposed here that consists of the quantity of innovation, the quality of innovation, individual and organisational mindfulness constructs, the Internet of Things and data analytics 3.0, and is depicted in Figure 5-1.

5.1 Independent variables

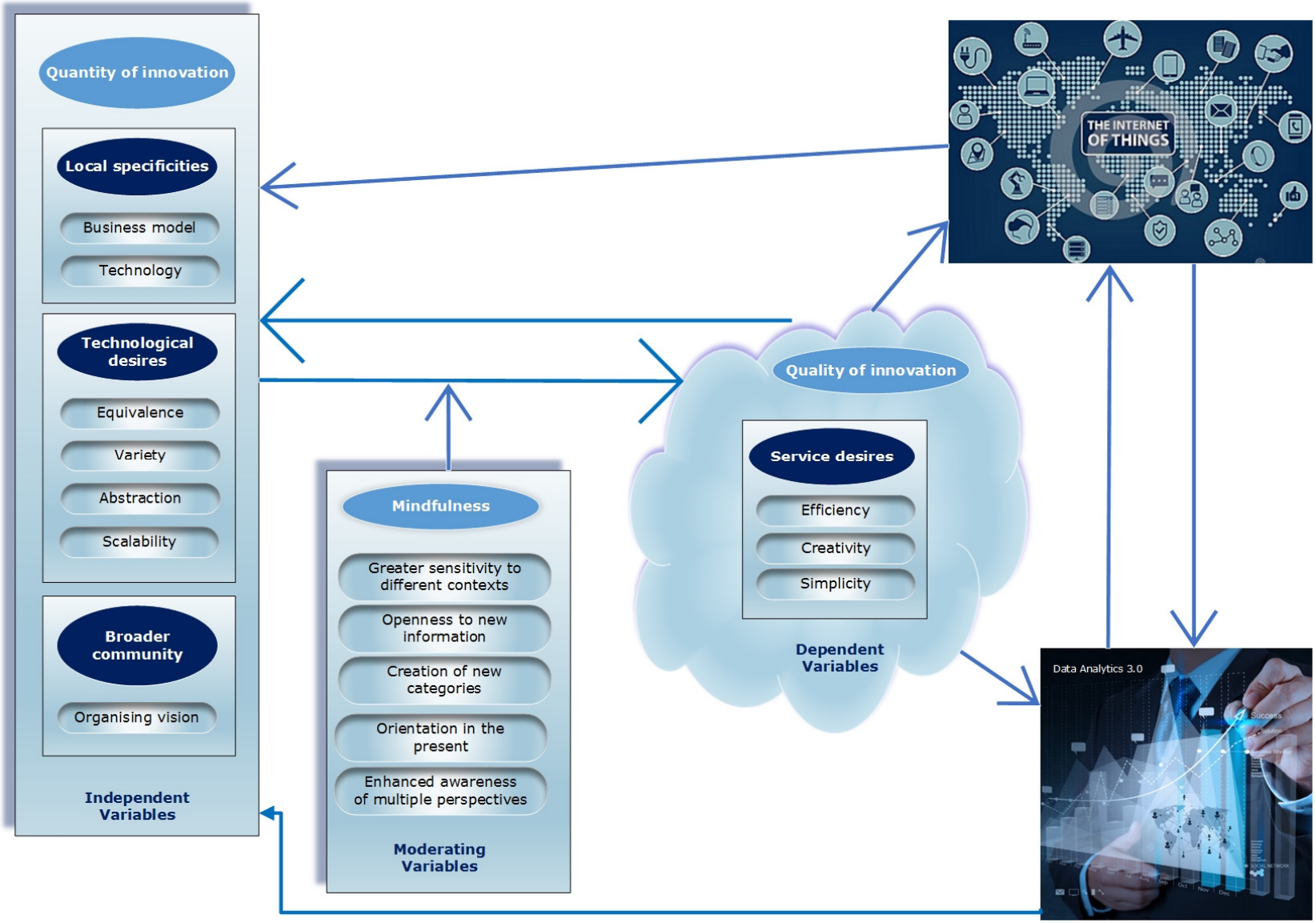
The insights offered by the theories of the dominant paradigm and the two pioneering works on IT innovation described in paragraph 4.3 provide the starting point of the description of the independent variables. These variables represent the realities that companies are scanning in their quest to properly evaluate the potential of cloud computing for their organisation. Variables in this construct include the local specificities that go beyond the business model to also incorporate the broader community, the technology, the Internet of Things and data analytics 3.0. The latter two variables are included in the framework because of their indisputable relation with cloud computing and companies' obligation to effectively use data analysis in order to survive in the new data economy. However, a more detailed description of these two realities would mean an interesting, though elaborate journey beyond the main topic of this thesis. For this reason, the reader is referred to the dedicated literature at hand for a more captivating discussion of these two phenomena.

5.1.1 The Business Model

The business model concept has been used extensively in IS research to examine how organisations can create and capture value with ICT.

[4] The conceptual framework proposed here follows the definition quoted by Oredo & Njihia (2015) p. 153, namely a conceptual framework is a written or visual product that explains either graphically or narratively the key factors and variables and the presumed relationship amongst them.

Figure 5-1: The conceptual cloud adoption framework incorporating mindfulness



The business model is multi-faceted and can:

1. serve as a holistic, system-level approach at characterising how an organisation does business, the concepts of value creation and capture and the activities that take place between the focal organisation and its partners,

2. represent an "architectural blueprint" for the formation and execution of an organisation's IT strategic objectives,

3. serve as a "conceptual tool of alignment" to fill the gap between corporate strategy and business processes in order to provide a crucial harmonisation among these organisational layers, and

4. assist organisation's to successfully leverage and commercialise early stage promising IT in order to achieve sustainable competitive advantage (Clohessy et al.(2016), p. 2).

Each business model consists of different core domains which facilitate the categorisation of the concept. Widely cited categorisations are the business model canvas (Osterwalder & Pigneur (2010)), the balanced scorecard (Kaplan & Norton (1992)) and the STOF business model framework (Solaimani, et al. (2015)). Furthermore, challenges related to business model design for the emerging context of the Internet of Things (Westerlund et.al. (2014)) and the contribution of IS research to it (Osterwalder & Pigneur (2013)) are being investigated.

The business model concept has been utilised previously to assess the impact of cloud technology on business models as cloud computing offers unique capabilities for companies, which can quickly move into a competitive position and take advantage of service-based IT solutions at a low cost. Iyer & Henderson (2012), for instance, describe how cloud provides opportunities for companies to globalise their processes rapidly, and distributed business operations become easier to perform. With decreased costs and less effort required to invest in and maintain the hardware and software, enterprises have more time to focus on their core business activities (Garrison et al. (2012)). Additionally, cloud services offer features such as elasticity and scalability, which increase the flexibility and agility to undertake the necessary business changes that are required in an innovative and high-competitive environment (Venters and Whitley (2012)).

5.1.2 The broader community

Since the focus of this study is on the interplay between moderating variables and the evolving processes of adoption and diffusion of an IS innovation like cloud computing, the scope of these variables is enlarged to encompass the larger institutional field. Managers facing the challenge of adopting cloud computing must form expectations for the future that reduce the perceived uncertainty associated with decision making and action. Here the organisation rarely acts alone. Rather, it is typically influenced by vendors, consultants, business partners and other stakeholders,

especially early on in an innovation's diffusion, when adopters are likely to require the most guidance difficult to attain community resources. Thus, even "individual" organisational adoption of an IS innovation is likely to involve other members of the community.

In reducing the perceived uncertainty surrounding the innovation and, hence, in making attending to local specificities possible, images and ideas about an innovation from a wider community are brought together revealing the "organizing-vision", i.e. a focal community idea for the application of information technology in organisations (Swanson & Ramiller (1997), p. 460). In other words, an organising vision for an IS innovation is organising in a way that utilises information technology in organisational structures and processes.

The organising vision is a modification of the institutional theory (Scott (1995)) and is tailored to understanding how social cognition drives the development, adoption and the diffusion of innovation in inter-organisational fields (Oredo & Njihia (2015), p. 151). From the adopter's point of view, the organising vision provides a "solution" of some kind, but it is an unfinished one that must be assembled and tailored to fit the particular organisation's situation.

The organising vision specifically addresses the application of technology within prospective adopter organisations and comes into being because it serves certain basic functions in the creation and promulgation of IS innovations. In particular, organising visions, in revealing organisational opportunities for exploiting technology, facilitate three important aspects of the IS innovation process (Swanson and Ramiller (1997)):

1. Interpretation: providing a community-level interpretation of the innovation's purpose and destiny, i.e. explaining why the innovation exists and is relevant

2. Legitimisation: grounding the 'why do it?' of the IS innovation in broader business concerns, linking the innovation to aspects of business functioning that are currently of prominent interest, i.e. giving reasons and supporting stories about why an organisation should go for it

3. Mobilisation: activate, motivate, and structure the market forces that arise to guide the realisation of the innovation, i.e. defining the commercial opportunities and, in turn, the possible roles and relationships in the market which constitute the social networks, necessary for making the innovation a reality and putting it into practice.

In summary, the organising vision is active at any point in time and defines, to a great extent, the potential of IS innovations that business people perceive to exist. This doesn't mean, however, that these innovations will be blindly accepted or adopted because they are taken for granted as good practice. Indeed, some organising visions may pave the way to the institutionalisation of their corresponding innovations, while others do not (Swanson and Ramiller (1997), p. 471).

5.1.3 The technology

Achieving innovation through cloud resources is a two-stage process that first involves an enterprise adopting cloud computing and then innovating using those cloud resources. For this reason, cloud technology can be explained in terms of the evolution of two distinct strands in the definitions provided in paragraph 2.1 that come together to provide cloud computing. The first strand emerges from the focus on the management of technology assets such as virtualisation, high performance networks and data-centre automation. This strand relates to the first stage of the innovation process where the company has to decide on what technological platform to adopt. The second strand emerges from a more distinct emphasis on the customer value derived from the use of technology services. This strand is better suited to explain the process a company goes through in order to achieve a strategic advantage. For this reason, the second strand is incorporated as a dependent variable in the framework and explained in more detail in paragraph 5.3. In order to understand the characteristics of how the target audience interacts with the cloud currently or may interact with it in the future, cloud computing is studied from the end-user perspective.

The reasoning behind this is that organisational decision makers are faced with a complex sense-making process when confronted by an innovation in computing. For many organisations aspiring cloud computing, the decision is not in isolation of their existing technological resources, but in comparison to such resources. The focus of supporting cloud adoption process is, thus, twofold. For one, organisations should ascertain how cloud computing compares with existing organisational IT. On the other side, cloud adoption is guided by a number of technological desires. This strong wish for various functionalities or outcomes from adoption is particularly problematic during the early stages of an innovation's diffusion, when the technology holds the promise of becoming a bandwagon because it is defined more in terms of its expectations than its implementation.

To desire is 'a sense of longing or hoping for a person, object, or outcome' (OED) and brings with it connotations of emotional rather than rational action in order to obtain a goal. This concept of 'desire' reflects the view of IS innovations as 'aspired-to IT' as opposed to 'available and present IT', and provides a critical edge to the realities of cloud computing. In order to allow for the exploration of these realities, Venter and Whitley (2012) divide the characteristics of cloud that are important to cloud users into four key technological cloud desires. These are:

Table 3: Technological dimension of cloud desires

The technological dimension of cloud desire	
Equivalence	The desire to receive a technical service which is at least equivalent in security, availability and latency to that experienced when using a locally running server.
Variety	The desire to receive services which provide a level of complexity (variety) commensurate with the operating environment.
Abstraction	The desire that non-pertinent complexity be hidden, in particular that the complexity of managing the underlying IT infrastructure and software be abstracted and hidden.
Scalability	The desire to receive a service which is scalable to meet demand.

Source: Venters and Whitley (2012, p. 184)

5.2 The moderating variables

While the quoted works indicate a direct relationship between quantity of innovation and quality of innovation, the alternative framework suggests a linkage involving mindfulness constructs.

The studied benefits of cloud usage by SMEs mostly relate to the technological functionality offered by cloud computing. However, for most SME adopters the potential of cloud usage is in the ability to transform organisations by innovatively integrating technology into the business process in order to guarantee business continuity. Despite the crucial role that information systems play in organisations and the high costs associated with innovation, IT innovation research provides little guidance for managers who must evaluate investments in this area, adapt business strategies and adjust organisational structures to enhance business continuity.

In this pursuit, organisations are confronted with managing the unexpected. Business continuity professionals have derived solutions from mainstream IS management methods but these practices differ significantly in both intent and form. Standard planning assumptions based on probabilistically anticipated future scenarios do not apply to cloud adoption because they lack the specification of routines in evaluating the business continuity as yet. Thus, while continuity planning often involves the development of plans, professionals are aware that the purpose of plans and routines is to create a context and culture in which individuals and organisations are better able to be perceptive of its context-specifics and the organisations' distinctive competences. Because such cultures embody aspects of mindfulness, organisations should move beyond general, high-level planning when preparing for unexpected events like cloud adoption by including the following qualities in their decision-making process:

(1) a greater sensitivity to different contexts (or the environment),
(2) more openness to new information,
(3) the creation of new categories for structuring perception
(4) enhanced awareness of multiple perspectives in problem solving, and
(5) orientation in the present (Langer (2014))

More openness to new information is the ability to reason about and to cope with novel kinds of stimuli. The creation of new categories for structuring perception is an alertness to distinction and the ability to compare new categories with existing ones and decide if things are the same or different. This is specifically important when defining the nature of a problem as it can help to decrease the risk of misdiagnosing a problem. Sensitivity to context is an awareness of the characteristics of any specific situation, which an organisation faces. This is a prerequisite to being able to notice when situational traits change. Awareness of multiple perspectives enables organisations to perceive and analyse things from different and opposing points of view. Finally, people, who are oriented in the present, devote more of their attention to their immediate situation.

People, who are mindfully engaged in a decision process, perceive changes in an environment. Therefore, there is a probability that they are more creative and that they are more likely to adopt new ways of working. Thus it is also more likely that they find innovative solutions to problems and that they by altering their actions will take advantage of new situations.

Furthermore, the organisational characteristic to continuously view problems from different points of view is one of the aspects of collective mindfulness and is referred to as reluctance to simplify. This is helpful in order to recognise minor anomalies and errors and to react appropriately to prevent larger failure in the future. Attention to operations focuses on organisations' capability to develop an integrated overall picture of the operations in an organisation. Finally, commitment on resilience as opposed to focus on planning is the ability to cope with problems as they occur based on an organisation's own specificities.

In summary, Butler & Gray put forward that "… mindfulness requires organizations to couple the ability to quickly detect issues, problems, or opportunities with the power to make organizationally significant decisions" (Butler & Gray (2006), p. 216). This may be accomplished by creating an organisational environment that enables the smooth interaction of perception and action.

5.3 The dependent variable

The quality of innovation, which is taken as the dependent variable, is conceptualised as the extent to which an organisation has successfully adopted cloud computing at the right time, and by the right application of competencies for its own benefit. This conceptualisation is based on the service dimension of cloud computing as presented by Venters & Whitley (2012, p. 189) in addition to the technological functionality.

Viewing cloud services in terms of renting services in contrast to more traditional assets, tends to emphasise the economic efficiency aspects of migrating to the cloud. However, a service perspective towards cloud adoption emphasises more generally "the outcomes realised by customers instead of the process or act of provision to customers (Vargo and Lusch (2004), p. 12). This service-centred logic defines services as "the application of specialised competences (knowledge and skills) through deeds, processes and performances for the benefit of another entity or the entity itself" (Ibid, p. 2).

Although the technological functionality offered by cloud computing is significant in its adoption, for most business continuity professionals its potential is in the ability to transform organisations by driving down the overall cost of doing business, by reducing the cost and time needed to configure applications and by simplifying the overall process of integrating technology into the business process. Therefore, the three key aspects of the service dimension of cloud desires are explained below.

5.3.1 Efficiency

This service aspect of cloud computing emphasises the efficiency savings that can arise from adopting cloud services. Cloud computing is often believed to reduce costs by offering economies of scale and to lower the environmental impact as compared to equivalent computing (Venters & Whitley (2012), p. 190). For many scholars, efficiency is seen as an attribute of a product, rather than a value-proposition which customers define the value of (Vargo and Lusch (2004), p. 7). Efficiency is therefore evaluated by customers based on their use of the service.

5.3.2 Creativity

A key service aspect of cloud computing is the extent to which cloud can enable creativity and innovation by lowering the transaction costs associated with innovation and reducing the time taken to innovate and to bring innovations to market. Creativity also emerges from the ability to exploit cloud services in 'a low friction way' allowing innovation because the technological functionality behind the scalability of cloud services allows the trialling of niche services in an agile manner with low risk (Weinhardt et al. (2009), p. 392). 'Business agility' concerns an organisation's ability to appreciate and respond to change and, together with speed to market are proving to be essential for business survival. As a result, there is a significant desire for agility, characterised by quickness, nimbleness and lightness and this is closely related to, and sometimes replaces, creativity: 'the real essence of cloud is flexibility and agility' (Venters & Whitley (2012), p. 191).

Those that simply replace equivalent computing with cloud computing, while changing nothing else, are doomed to miss the full benefits of the new technology. Cloud provides services which must be exploited by companies in their innovation processes: it is the reinvention of new services which are key to the success of cloud. Central to this is the need to understand how information services are brought together to support service provision to customers. This can give rise to 'cloud ecosystems' – a term defined as 'the fruitful interplay and co-opetition between all players that realize different business models in the cloud computing context' (Weinhardt et al. (2009), p. 396).

5.3.3 Simplicity

Cloud computing involves outsourcing the skills traditionally held by the IT department, and business continuity managers need to gain knowledge of how the outsourcer operates and how the service is ensured as contracted. There are costs involved in gaining such knowledge. Consequentially, there is a desire that this knowledge exchange be as simple as possible.

Simplicity of contracts can be reflected in more standardised contractual arrangement for the purchase of services by a larger number of customers. As the full cost of the service is included within

the price, the purchaser can avoid complex cost calculations. The simplicity of cloud also reduces the need for administrators to manage servers and purchasing (Carr (2005)).

The degree of satisfaction of the three cloud service desires of the organisation is the measure for the quality of innovation in the framework proposed above. This way, the notion captures the extent to which an organisation has adopted the "right" innovation, at the "right" time and in the "right" way. Additionally, an indirect link from the organisation's realities through mindfulness to the quality of innovation is exposed as previously implied by Swanson & Ramiller (2004, p. 559) who state: "Attention to organizational specifics is crucial in supporting sound judgments about whether adopting a particular innovation is a good thing to do, when committing to the innovation is likely best to take place, and how implementation and assimilation can best be pursued.".

5.4 Capturing the quality of innovation

As of yet, no operational scale has been developed to capture the quality of innovation as linked to a firm's organisational specifics. Several options for measuring the quality of innovation may be proposed. One approach would be to measure the degree of satisfaction of the service desires by means of performance impacts like return on investment, efficiency, productivity improvement. The reasoning behind using performance outcome as a proxy is that if a beneficial result has been achieved, then the quality of the mindful decisions and processes surrounding the innovation must have been superior (Fichman (2004), p. 341). Another consideration would be to take the operational evidence of mindfulness as a proxy. This could be derived from certain managerial behaviours affecting the satisfaction of the service desires, such as to "make distinctions and thus create/refine categories not common to their competitors" as well as from "openness to and interest in new information as well as an awareness of multiple possibilities not considered by competitors" (Fiol and O'Connor (2003), p. 67).

Evidence of mindfulness may be related to Ricardo's (1821) Principle of Comparative Advantage. Comparative advantage is about identifying which activities a country (or firm or individual) is most efficient at doing. This concept has, with some exceptions, been applied to the domain of international economics, despite Ricardo's statement that what happens between nations is the same as what happens between two businesses (Ricardo (1821), note 20, pp. 318-319[5]).

When applying Ricardo's theory to the firm level, new implications result for the theory of strategic management. The issues of why firms differ (heterogeneity) and the durability of such differences (sustained competitive advantage) have been fundamental to strategy research associated with the resource-based view (RBV) (Wernerfelt (1984)). The basic argument of RBV is that firm performance is determined by the resources it owns. The firm with more valuable, scarce resources is more likely

[5] Indeed, Ricardo adapts an example from the Wealth of Nations in which Smith presents the advantages of a division of labour between a tailor and a shoemaker (Smith (1776), p. 350) before generalising the case to Portugal (wine) and England (cloth) (Ricardo (1821), pp. 85-91).

to generate sustainable competitive advantages. In this view, IT is considered a valuable organisational resource that can enhance organisational capabilities and eventually lead to higher performance. Recently, the use of RBV in identifying the IT resources and capabilities that enable a firm to attain a level of performance that cannot easily be matched by competitors has been studied in a number of papers (e.g. Lioukas (2016), Liang & Liu (2010) and Rivard et al. (2005)).

Resource inimitability, i.e. the inability of rivals to replicate a focal competitor's rare and valuable resources, is used to explain the RBV's sustainable competitive advantage. In contrast to this argument, the logic of comparative advantage may demonstrate situations wherein a focal competitor's resources are imitable, yet potential rivals are unwilling to take the effort to imitate those resources because their current resource configurations can be applied more profitably elsewhere. That is, even if they are able to imitate, some rivals choose to refrain from imitation based on the clear understanding of their local facts and specifics and how they could best be linked to their service desires. By shifting the focus of study from (imit)ability to willingness, it is emphasised that realities by themselves (i.e., valuable, rare, inimitable and non-substitutable resources) cannot be valuable unless they create distinct strategic options for a firm by linking them to their service desires, and, in that way, contribute to competitive heterogeneity. In this regard, Madhok et al. ((2010, p. 92) show that this "source of competitive heterogeneity can lead to sustainable advantage in contexts where the rivals continue to have more profitable opportunities elsewhere".

This vision quite clearly contrasts with Carr's declaration that "IT doesn't matter" (Carr (2003)). Carr argued that IT is like other "infrastructure technologies" that lost their competitive potential once their core functions became "accessible and affordable to all" (Ibid, p. 42). The article is about IT infrastructure and this is interpreted as a commodity that loses its capacity to be the basis for sustained competitive advantage once its ubiquity increases. But IT has a constantly expanding functionality, while the other technologies Carr refers to, i.e. steam engines, railroads, electricity, telephones, have narrow functionality. By viewing IT as a commodity makes one lose sight of the application of IT, namely the ever changing use of IT to drive strategic differentiation and comparative advantage.

In essence, the theory of comparative advantage reflects the complexity and dynamics of business competition by showing that it pays companies to be in business because they are different. The interest is in the issue of *what* can be done better by *which* organisation. A simple example illustrates this argument. Company XYZ is a large cloud-based company and is leader in offering specialised products to both businesses (B2B) and consumers (B2C). However, XYZ learnt that it has a sharper edge over small Company ABC in the C2C market than in the B2C market. By linking its realities to its service desires, XYZ decides to abandon the B2C market and largely focus on the C2C market. So, XYZ has competitive advantages over ABC for both the C2C and B2C models, but has a comparative advantage in the C2C model. On the other hand, ABC owns a software platform which runs only partly in the cloud and is well aware of the necessity (reality) to govern the platform ecosystem in order to create durable opportunities (service desires) for the stakeholders that surround the platform. Although ABC may not have a competitive advantage in either the B2C or C2C markets over XYZ, it has a relative comparative advantage in the B2C market and can be

successful there due to willingness-based mechanisms distinguishing it from XYZ. More generally, it is impossible for a company to have no comparative advantage in anything. It may be the least efficient at everything, but it will still have a comparative advantage in the product or service in which it is relatively least bad.

The theory of comparative advantage recognises that organisations are well aware of their realities and alternative opportunities for utilising them in order to satisfy their service desires. Therefore, organisations own the power to make organisationally significant business decision by being mindful. The resulting strategic choices, based on linking the local specificities to the service desires, can affect an organisation's resource accumulation and allocation processes and thus with time can cause durable differences across them. Comparative advantage reasoning can, therefore, better explain how managers make distinctions and thus refine categories not common to their competitors in the cloud adoption process. This distinctive managerial behaviour contributes to inter-firm heterogeneity. By being more open to new information, strategic choices on cloud adoption are adapted as a result of managers' awareness of their service desires and the multiple possibilities in satisfying them not considered by competitors thereby sustaining comparative advantage. Demonstration of these managerial behaviours, based on willingness, and not ability, may be interpreted as the operational evidence of mindfulness.

6 Interpretation of the conceptual cloud adoption framework

The presented conceptual framework describes that cloud adoption by SMEs is a two-stage process that first involves a business adopting cloud computing and then innovating using those cloud resources.

A SME's journey begins with increasing the collective awareness of the know-why of the IT innovation by drawing attention to issues specific to the organisation. Both the business value of the innovation and how it compares to the current technology are weighted in making sense of the innovation relative to its own situation, its own opportunities and its own needs. During the first stage, the organisation is not alone in its venture to make sense of the cloud technology. Instead, it belongs to a complex community of stakeholders, of which many members actively scan the new technology and explore, to varying degrees publicly, what it means for the business community and where it is going to. Thus, together, they develop and draw upon a common interest generated in this wider community. At the same time, the prospective adopter organisation develops a rationale, or business case, to be innovative and distinguish themselves from their competitors by being aware of their unique set of competences and the multiple possibilities in applying them.

Developing a rationale in the presented framework is a process of adaptive moves. So, in the second stage of the cloud adoption process, the SMEs constantly need to create new strategic opportunities by exploiting cloud computing in their pursuit for business continuity. As a result, SMEs aspire 'business agility', characterised by quickness, nimbleness and lightness and this is closely related to an organisation's ability to appreciate and respond to change.

For the reason of coupling the ability to quickly detect issues or opportunities with the power to make organisationally significant decisions, the SMEs need to be mindful. Thus, mindfulness serves business continuity planning by creating a context in which the organisation is able to exploit its local context and distinctive competences, and tuning them up with the profitable opportunities offered. This can be accomplished by being agile in concentrating on the ability to transform organisations by driving down the overall cost of doing business, by reducing the cost and time needed to configure applications and by simplifying the overall process of integrating technology into the business process.

The strategic choices on cloud usage made, are continuously adapted as a result of SMEs awareness of the necessity to create multiple opportunities not considered by competitors thereby creating strategic differentiation. By being mindfully engaged in a decision process, the decision-makers perceive changes in an environment and are motivated to process them adaptively. Therefore, it is more likely that they find innovative solutions to changes and that they, by altering their actions, will make use of new situations. This will, with time, cause durable differences across competitors and lead to sustainable advantage.

7 Conclusion and future research directions

Based on the research questions and objectives, this study offers an alternative theoretical framework that explains cloud adoption by SMEs. The framework describes that companies take their business model, the current technology and how it compares with the new cloud technology, and the broader community into consideration when making the cloud adoption decision. However, the main driver for cloud adoption by SMEs is to be innovative and distinguish themselves from their competitors by being aware of their distinctive set of competences and the multiple possibilities in applying them. In this sense, SMEs constantly need to create strategic opportunities by exploiting cloud services in their quest for business continuity. As a result, there is a significant desire for 'business agility', characterised by quickness, nimbleness and lightness and this is closely related to innovativeness. An organisation's ability to appreciate and respond to change are proving to be essential for business survival. Thus, business continuity planning by SMEs in this sense should move beyond general, high-level planning when preparing for cloud adoption by actively noticing moment-to-moment changes, switching of the autopilot, and then acting on the new observations in their decision-making process. This management practice is referred to as mindfulness. By incorporating mindfulness, the alternative framework is founded on cognition theory and is better suited to explain realistic cloud adoption by SMEs. It, therefore, serves as an alternative to the dominant paradigm.

The alternative framework goes beyond the usual focus of influencing factors and cloud implementation determinants and indicates that SMEs can achieve innovation through cloud resources by first deciding on what technological platform to adopt and, then, focusing on the customer value derived from the use of it. Although the technological functionality offered by cloud computing is significant in its adoption, for most business continuity professionals its potential is in the ability to apply specialised competences (knowledge and skills) through creative use of technology for business purposes, the simplicity by which such business innovations are enabled, and the efficiency of such enablement for the company and its customers.

By aspiring cloud adoption, SMEs are confronted with managing the unexpected. Thus, business continuity planning by SMEs in this sense is best served by creating a context in which the organisation is able to exploit its local context and their distinctive competences, and linking them to profitable opportunities offered. The resulting strategic choices will affect SMEs' development of innovative products and processes and will with time cause durable differences across them. This focus on competitive heterogeneity will be of value to managers who are aspiring cloud adoption for their organisation because it will guide them in the decision-making on whether adopting a particular innovation is a good thing to do, when committing to the innovation is likely best to take place, and how implementation and assimilation can best be pursued.

The fresh findings in this thesis indicate that cloud adoption by SMEs involves more processes, activities, and outcomes than adoption and implementation, alone. So, the approach is exploratory in its attempt to present new-fangled ideas by expanding the focus to analyse the whole course of

cloud innovations by SMEs. While the discussion is theoretically motivated, its implications are quite practical. The focus on comparative advantage as opposed to competitive advantage has been identified as a SME's major guidance in deciding on whether, when and how to adopt cloud computing. Furthermore, the concept of mindfulness offers a striking practical focus for managers endeavouring to increase their organisations' collective awareness of their distinctive skills and responsiveness in the face of uncertainties associated with new technologies like cloud computing. By applying the mindfulness concept, the specifics of the inside organisation can be connected to the outside technology, thereby increasing the ability to innovate more successfully.

Future research should validate the theoretical findings in this thesis in an empirical context. This empirical grounding can be realised by evaluating the claims and trends identified in the framework through comparison with the experiences of cloud providers and users by undertaking interviews. When structured in terms of an operational scale of the quality of innovation, this combination of literature and practitioner experiences makes it possible to identify aspects of context-specific strategic moves where the practical implication for innovating with cloud computing is particularly strong.

Research within the dominant paradigm has been guided by the assumption of a positive relationship between the degree of innovation and beneficial outcomes, as per the pro-innovation bias already mentioned. However, the reasoning in this thesis shows that there are situations where this assumption may not hold. Thus it seems appropriate to deduce some notion of the quality of IT innovation that captures the extent to which an organisation has adopted the "right" innovation, at the "right" time and in the "right" way. In fact, an operational measure of the concept has been proposed here, namely evidence of mindfulness.

The operational evidence of mindfulness could be derived from certain managerial behaviours and tendencies identified during the undertaken interviews. In testing this concept, some measurement challenges become evident. Mindfulness is an organisational level cognitive construct, dealing as it does with things that exist in individuals' minds (concept 'make distinctions', 'create/refine categories', 'openness to new information', 'awareness of multiple perspectives'). Cognitive constructs are difficult to capture and few previous studies provide specific guidance on potential operational definitions of evidence of mindfulness in an IT context[6]. However, most presumably scales could be developed to capture the extent to which an organisation recognises situational specifics in comparison to its competitors, such as:

- the organisation's awareness of their distinctive set of competences
- the organisation's agility to create distinct strategic options
- the organisation's ability to exploit IT in a creative way allowing innovation
- the simplicity of the way knowledge about the innovation is gained
- an organisation's efficiency in linking innovations to aspects of current business functioning
- an organisation's ability to reflect upon 'available' as opposed to 'aspired- to' IT

[6] Weick et al. ((1999), p. 38) provide an instrument for assessing organisational mindfulness in high reliability organisations based on their five attributes. Additionally, Swanson & Ramiller ((2004), p. 576) are concerned with mindfulness as an organisational property, but omit to provide an operational definition.

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One could hypothesise that organisations that score higher on the situational scales, will be more apt to distinguish themselves from their competitors for any given level of innovation and achieve a higher quality of this innovation. Because mindful organisations make innovation decisions that are grounded in their own facts and specifics (realities), this implies that they are more willing to create distinct strategic options for themselves (desires) in the IT adoption process. Additionally, through the higher scores on the situational scales, organisations exhibit a greater willingness to distinguish themselves and, thus, a higher level of (evidence of) mindfulness. Examination of these hypotheses has yet to take a start.

The conceptual framework, once validated, will be of valuable use to managers who are aspiring cloud adoption for their organisation with regard to whether, when and how to adopt cloud computing. As a corollary, the framework may be used to explore how SMEs might innovate through cloud resources.

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