

**Title:** Cloud Computing and SMEs: Do we have a match? An explorative study in Strategic Decision Making.

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## **Abstract**

The opportunities of applying the concept of Cloud Computing to a business for more efficiency and flexibility are evident. In times of an economic setback, it is expected that this opportunity for growth in productivity would be eagerly pursued. The reality is different: SMEs are reluctant to consider this ICT innovation.

While combining the Theory of Planned Behavior (TPB) of Ajzen and the Strategic Decision Making Model of Mintzberg, this research focusses on decision makers in SME organizations through Mintzbergs' proposed phenomenon of matching. When a perceived opportunity is relevant to a problem or challenge, the decision maker is more likely to make a match, and the decision is pursued. However, threats perceived by decision makers raise barriers that prevent such a match. Mintzberg found that cumulative amplitude of stimuli leads to initiate decision activity.

This study is based on six case studies of Dutch SMEs and shows evidence for Mintzbergs' proposed (amplitude) factors affecting perception, but also for new factors such as the influence of history, strategy, change and image. This research provides more substantive and specific descriptions of the factors established by Mintzberg and the newfound factors.

## **Introduction**

Since 1990 the use of ICT has been an important contribution to productivity growth and innovation in the economy of the Netherlands. Nearly 60 percent of the economic growth in the period 1985 to 2005 can be attributed to the application of ICT. This was done directly through increased use of ICT resources and indirectly through the contribution of ICT to more efficient production and distribution methods (van Ark, O'Mahony, & Timmer, 2008).

In the present time in which the Netherlands has entered a new recession as a result of the debt crisis, the economic perspective for the coming years is poor. In 2012 Dutch SME companies faced a drop in sales of 2.5%, while the forecast for 2013 is targeted for a decrease of 0.75% (Bangma & Snel, 2013). Therefore organizations are looking for cost savings, efficiency, flexibility and scalability. Cloud computing can play a major role in this context.

For both suppliers and buyers, Cloud computing can provide a platform for innovation. In 2009 a study on the positive impact of Cloud computing on the growth of the economy in Europe argued for governmental subsidies to accelerate the adoption of Cloud computing (Etro, 2009). Due to the high growth potential this topic ranks high on the political agenda of the European Union (Kroes, 2011) and the Dutch government (Ministerie van EZ, 2011). Cloud computing is seen as an important development for more efficient and flexible work methods that can contribute to productivity. Within the EU, this may lead to 45 billion additional direct expenditure by 2020 and thus provide a cumulative contribution of 957 billion to GDP while creating 3.8 million jobs (Europese Commissie, 2012).

In 2011, 20% of all businesses and organizations in the Netherlands somehow made use of ICT services based on Cloud computing. It is expected that this number has doubled in 2012. While larger companies are already using or experimenting with Cloud computing, the adoption of Cloud computing in SMEs

lags behind. There has even some scientific enquiry into this area, and some find the lagging adoption is mainly caused by the unawareness (Heliview Research, 2011)(Karabek, Kleinert, & Pohl, 2011). Also unfamiliarity with the subject (Leeuwen, 2012) or the absence of guidelines and best practices (Marian & Hamburg, 2012) may have an influence. Other studies indicate that data security, privacy issues, and a more difficult concept like 'trust' play a role in the success of Cloud computing (Sun, Chang, Sun, & Wang, 2011) (Lin & Nan-Chou, 2012).

Small and medium businesses are the main driver of the Dutch economy, contributing almost half of the gross added value and 54% of employment (EIM, 2009). This SME sector is increasingly dependent on information systems (Premkumar, 2003). Cloud computing can help strengthen the organizations competitiveness with cost savings, greater efficiency, flexibility and scalability. Capital expenses will shift to operational costs and reduce the need to make significant, long-term investments which seizes liquidity. This presents an interesting context: why is adoption of cloud computing lagging behind, despite the favorable effects implementation brings?

This paper will focus on the decision making process in SME organizations in relation to Cloud computing. Specifically, we'll try to determine what 'trigger' is necessary to at least consider the concept Cloud computing and put it on the agenda. Through the combination of the Strategic Decision Making Model of Mintzberg and the Theory of Planned Behavior (TPB) of Ajzen applied to SME decision makers we expect to gain more insight in the decision-making process. Learning more about this process is relevant, while in addition Cloud Computing is relevant to society through the economic potential offered.

## **Research Context and Methods**

Deployment of Cloud computing resembles outsourcing of IT (Gray, 2011). The changes in the structure of the IT organization has major effects and importance to the business which makes the choice for cloud computing a strategic issue (Marston, Bandyopadhyay, Zhang, & Ghalsasi, 2011) (Carr, 2005).

In this study we will focus on SME companies. Decision-making within SME organizations is different from large companies because in an average SME decisions are made by one person or by a limited number of people (Thong & Yap, 1995) (Yang & Fu, 2008). Generally there is no formal decision-making procedure, there is usually a limited long-term planning and a greater reliance on external expertise and services for information systems (Premkumar, 2003)(Bruque & Moyano, 2007) (Gibcus, Vermeulen, & de Jong, 2009).

In literature on strategic decision-making one finds two paradigms: unbounded rationality and bounded rationality. The unbounded rationality principle assumes that the decision maker is fully informed, perfectly logical, and geared toward maximum economic gain. Herbert Simon (1947) is the first who states that unbounded rationality is impossible and that a decision maker will act rationally, *satisficing* instead of *maximizing*. Bounded rationality is the idea that in decision-making, the rationality of individuals is limited by the information they have, the cognitive limitations of their minds, and organizational limitations like the finite amount of time they have to make a decision.

Over the years there has been much research into decision-making. There are many theories about the way decisions are taken (Langley, Mintzberg, Pitcher, Posada, & Saint-Macary, 1995) (Schwenk, 1995). Charles Lindblom (1959) builds on the work of Herbert Simon. He extends the theory in the early sixties and finds that decision making is more like a chain of small steps. There is not necessarily a strategy towards a higher goal, but often only a chosen short route, which is known as *muddling through*. Cohen, March and Olsen (1972) examine the determinants of decision-making processes and create the *garbage can model*. In their model, they describe organizations as an organized anarchy. Henry Mintzberg is one of the first who performed empirical research in this area and develops new process oriented models of

decision making (Mintzberg, Raisinghani, & Theoret, 1976). According to Mintzberg et al. decision-making is as a process consisting of three distinct phases: identification, development and selection. Solutions are selected in a systematic way and by comparison and consultation, the best decision can be made. An interesting phenomenon in the identification phase of the process is the process of matching. A decision maker may be reluctant to act on a problem for which he sees no apparent solution; similarly he may hesitate to use a new idea that does not deal with a difficulty. But when an opportunity is matched with a problem, a manager is more likely to initiate decision making action. Mintzberg found that the determining factor to take this action may be viewed as the relationship between the cumulative amplitude of stimuli and an action threshold. The amplitude of each stimulus depends on a number of factors, including 1) *the influence of its source*, 2) *the interest of the decision maker in it*, 3) *the perceived payoff of taking action*, 4) *the uncertainty associated with it* and the 5) *perceived probability of successful termination of the decision*. These factors lack further explanation and this study will take the opportunity to elaborate these amplitude factors. In this research I will adapt Mintzbergs Strategic Decision Making Model because of the suspicion that the concept of Cloud computing is not yet considered seriously by SMBs and that this concept of consideration shows similarities with the phenomenon of matching in Mintzbergs model.

The moment an individual decision maker is ready to initiate a match to pursue the decision process, has similarities with the moment when a humans intention is ready to show that intended particular behavior. In either situation, stimuli and/or information and its evaluation leads to action and/or behavior. Additional to the Theory of Reasoned Action of Fishbein & Ajzen (Fishbein, 1975), Ajzen developed the Theory of Planned Behavior (TPB) (Ajzen, 1991) (Ajzen, 2011) for studying behavior. Ajzen suggests that individuals should have an intention before they start showing that certain behavior. If this intention is higher it is more likely that the behavior is performed. This intention is influenced by three related concepts: 1) the attitude toward that behavior, 2) subjective norms, and 3) perceived behavioral control. The TPB-theory has been developed to predict variations in the individual behavior on the basis of changes in these three concepts.

Both the models: Mintzbergs Strategic Decision Making Model and the TPB theory of Ajzen are about the cognitive processes that influence behavior or decision with a causality between input and output. Harrison (Harrison, Mykytyn, & Riemenschneider, 1997) has successfully applied the TPB theory for research on adoption of IT in small businesses which supports the validity of the TPB model in the context of this research. The TPB is a widely accepted theory applicable to an individual and therefore conveniently applied in this study because the SMEs strategic decisions are made by one person or a small group of people (Bruque & Moyano, 2007).

The research model for this study is shown in Figure 1: Research model. In this model the stimuli are specified as: opportunities, threats and problems. The levels of the stimuli are controlled by the amplitude factors which leads to the decision makers perception as an input for the matching process. The moment to initiate decision activity is linked to the moment of showing the intended behavior. By viewing from the Ajzens' TPB concepts to the amplitude more substantive and specific descriptions of the factors established by Mintzberg and possible new factors can be found.

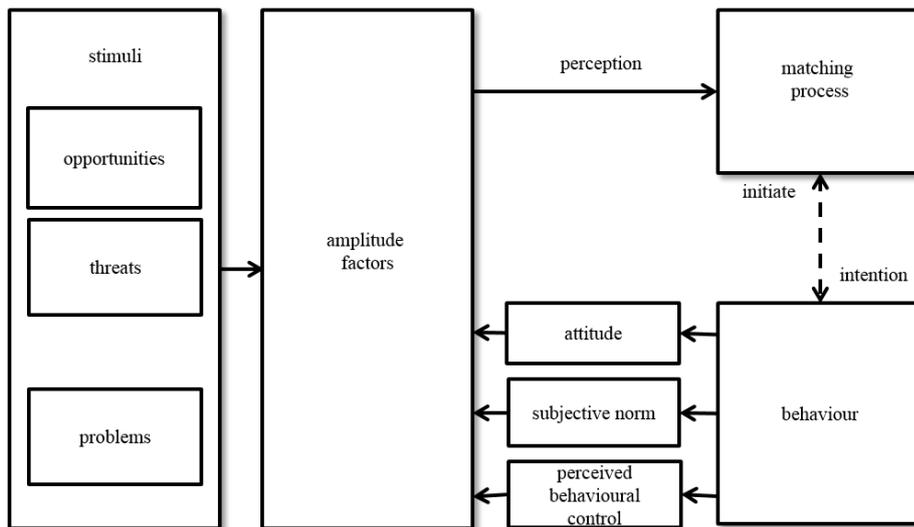


Figure 1: Research model

Taking strategic decisions often involve uncertainty and ambiguity. When managers make choices based on the previously discussed theory of 'bounded rationality' this may result in a systematic bias (Schwenk, 1985). In the recognition phase of decision-making process the decision maker identifies challenges and opportunities from a flow of indistinct information. The expectations of a decision maker determines how these opportunities and problems are interpreted, but also whether the information is accepted and used. In addition to the theory of Mintzberg, Schwenk has described three forms of bias: *adjustment and anchoring*, *escalating commitment* and *reasoning by analogy*. Possible expressions of biases will be analyzed and reported in this study but are not part of the research model.

The information about the six explorative case study's used in this research is collected from interviewing decision-makers from various SME companies, sized between 10 and 250 employees and between € 2 million and € 50 million revenue (Europese Commissie, 2003). These interviews are constructed by the guidelines of Ajzen (Ajzen, 2011) and analyzed for hits on the amplitude factors defined by Mintzberg, new findings of amplitude factors and other remarkable statements or biases. Literature research has revealed a number of opportunities and threats for Cloud computing which will be presented to the respondents. Further the decision maker will be asked to mention ICT problems that he experiences in his organization. Thus, we can identify potential 'matches' between problems and opportunities, and can elicit why matches are made or not, in order to indicate new amplitude factors.

## Results

We found evidence for three of Mintzbergs' proposed amplitude factors: *the influence of the source of information*, *the perceived payoff of taking action* and *the associated uncertainty of taking action*. Two other factors, namely: *the interest of the decision maker in it* and *the perceived probability of successful termination of the decision* were not evident within the sample. This exploratory study exhibits evidence for other factors like historic influence, influence of current strategy, perceived amount of changes and influence of image. These new factors are likely to have influence on the perception of the decision maker where to initiate decision activity or not.

For Mintzberg 'known' factors we found the following more substantive and specific descriptions of the factors:

*the influence of the source of information*: The decision maker evaluates the answers on these questions: What expertise and experience does the source have with the solution? What's the comparability of the

situation? Can we get the results confirmed? What arguments and/or evidence are available? How much confidence is established with internal/external consultants or suppliers? How well are they prepared? Is there enough confidence in their specialty?

*the perceived payoff of taking action:* The decision maker evaluates the answers on these questions: What costs (savings), business cases, TCO are possible? What value can be added? Which efficiency gains can be achieved? What is the guaranteed quality of the work processes? Which improvement will be seen in performance, quality and stability? How do users experience a better automation? How does it serve the core business? Does it fit into existing or to be renewed working methods?

*the associated uncertainty of taking action:* The decision maker evaluates the answers on these questions: What's the result previous similar projects? What's our confidence in the solution? To what extent are threats perceived such as: inadequate security and privacy, inadequate performance or slow connection, poor communication and user support, poor cooperation between ICT parties. What degree of (physical) control or influence is required? What technical concerns are present? Does my staff have sufficient knowledge?

For the new factors, this paper proposes the following descriptions:

*historic influence:* Does the decision fit in the historical context and tradition of the company? In some cases past choices inhibit new decisions. Taking the lead in technological innovations is not in every company's DNA.

*influence of current strategy:* What's the strategic fit of the decision in progress? Does it match the current mission, vision, strategy and goals of the company?

*perceived amount of changes:* What changes come from a possible decision? Is our staff capable of adapting these changes like new work methods. Do they accept the velocity of the change?

*influence of image:* What impact does the decision have on our image? Are there risks for negative publicity? Does the decision create the image to the market of an innovative company with well-established work processes?

In the two cases where a potential match could have been made, this was prevented by historic choice in one case and a recently failed similar project in the other case.

Figure 2 shows a model in which the results are being displayed. Note that we found several indications for bias in our interviews, so we added this bias as an input to our result model because of its suspected influence in the matching process.

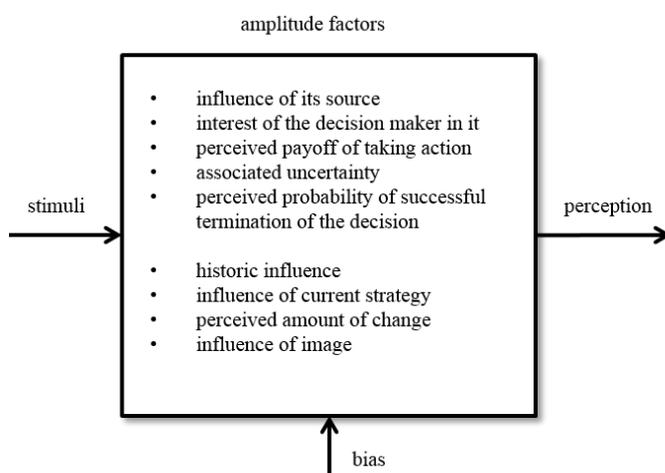


Figure 2: Extended model for amplitude factors

## Discussion

Applying the Theory of Planned Behavior to the matching process Mintzberg has shown its relevance. Using the Theory of Planned Behavior (TPB) of Ajzen and Mintzberg's Strategic Decision Making Model Mintzberg we created an additional view at the phenomenon of 'matching' in the decision process. From the attitude concept (intrinsic motivation) of the TPB theory appear the new factors: *influence of history* and *influence of strategy*. That this contextual factors play a role in the matching process is very plausible. The new factor *influence of image* appears when viewed from the subjective norms (extrinsic motivation). The fourth new found factor: *influence of perceived change* can be linked to the concept of perceived behavioral control in which many uncertainties and/or obstacles affect a decision.

My first recommendation is to test these new factors in this exploratory study empirically on a larger population to gather more evidence. Also an extension to a theme other than Cloud Computing or other target decision makers are opportunities for further research.

The Strategic Decision Making Model of Mintzberg is a cognitive model in which the influence of feelings and intuition is disregarded. Previous studies have stated that these factors can have great influence on decision-making (Simon, 1987) (Khatri & Ng, 2000) (Loewenstein & Lerner, 2003) (Dane & Pratt, 2007). The matching process is in the first phase of the decision-making model according to Mintzberg and works as an initial rapid assessment. Factors such as feeling and intuition may have their effect on the rapid assessment. Using the TPB theory is a first step towards linking human behavior to the decision process. My second recommendation is to do a follow-up study to see if other human concepts like feeling and intuition can be demonstrated in the matching process.

Finally, in the study there is little evidence of the impact of the factor: *interest of the decision maker in it* of the decision maker. Using the TPB concepts has yielded no new information at this point because the TPB theory is limited to attitudes, subjective norms, and perceived behavioral control. By studying the impact of interest and knowledge of the decision maker in the decision process from a different perspective, further understanding can be obtained.

## Acknowledgments

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