

# DECISIONABILITY: CONTENDING WITH INFORMATION FLOW, INFORMATION QUALITY, AND INFORMATION OVERLOAD IN ECONOMIC INTELLIGENCE

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Meta datos, sistemas de información estratégica, almacén de datos.

## Résumé

The importance of appropriate and adequate information toward decision making cannot be overemphasized. Considering the sheer volume of available information to information consumer and the rapidly advancing information management technologies facilitating corporate firms and organization to manage large and complex data sources aimed at exploring new opportunities towards strategic decision making. The age of inadequate information is gradually fading off while unconsciously introducing another concept known as “Information Overload”. Using adequate and timely available information for delivering strategic decisions is the focus of economic intelligence, however with ever increasing volume of information made available to the decision maker, the risk of indecision, forgetfulness, amongst others result. The consequent could be disastrous as the need arises for decision based on the interrelationship amongst the trio of decision situation, decision maker and the decision process in the face of information overload. The importance for knowledge reconciliation as the first step before information search has been proposed, this work attempts to establish the need for usage of ‘fine-tuned’ information in taking strategic decisions.

# 1 Introduction

The gambling paradigm which can be traced to the early 17th century studies in gambling has been widely supported as the predominant framework within decision making. Tacitly, the assumption is that any decision can be represented as a choice expressed as “gambles” with options depicted in terms of probabilities and utilities. Decision here is seen as a choice of option(s) which offers the most advantage – rational decision making. Several other paradigm has thereafter being proposed each with different views but the major components expressed or highlighted were practically the same with very little variations. According to Karen & de Bruin [20] most decision making are based on three main components: obtaining relevant information (from memory or external world), construction of the decisional or problem space followed by attempt to fix the acquired information appropriately into the decisional problem structure, and assessing the values and likelihoods of different outcomes. A drawback of the above is the blind omission of the methodology for achieving the first two stages. In the view of Barrette [1], there are four major components to decision making. This author listed the following: data gathering, information processing, meaning making and finally, decision making in relation to the set goal. Bullen & Sacks reported several work on the various components of decision making and the complexities involved in the operations [4]. Harris identified decision environment as the most singular factor from which other possible components stem [16]. A decisional environment was defined as a collection of information, alternatives, values and preferences available during the time of decision. Thus in an ideal environment for decision making, it’s expected that all possible information will be available, in possible best accurate proportion, and alternatives. The above is however constrained based on the fact that time and efforts to gain information or identify possible alternatives are limited. Decision environment is presented to be of incremental rate, since new information and alternatives may spring up even after the decision might have been made. The identification of the above is followed by the attempt to formulate a response to the situation that fall in line with stated goals. The level of the decision maker’s consciousness is brought into play at this point.

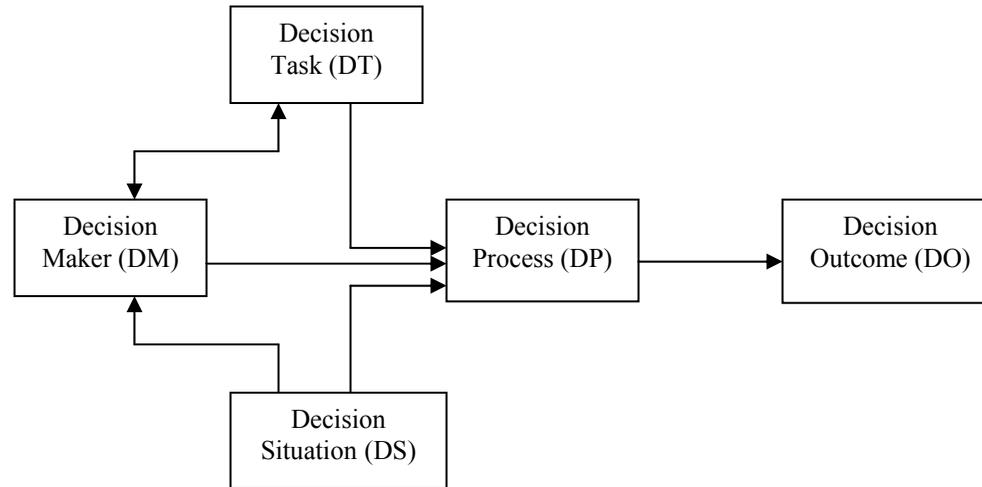
With this background, we made bold to say that “deciding not to decide is not the same as indecision”, however a common baseline to decision making is information. Its timeliness, appropriateness and other attributes as regards to usage is important [35, 33, 34, 30, 22]. We however noticed with concern that while information is deemed to be very important; concepts like Information flow, Information quality, and Information overload can rubbish whatever qualities hitherto present and culminate into faulty decisions if not properly harnessed together.

The rest of this paper is arranged thus: section 2 presents various modes of decision making as compared to EI pattern. In section 3, we discussed our earlier models of risk factor and knowledge reconciliation, section 4 discusses the trio of information flow, information quality and information overload and their effect on strategic decision making. We conclude the work in section 5.

## 2 Modes of Decision making

### 2.1 General Pattern to Decision making

There has been sharp contrasting view on whether decision is “Analytical” or “Intuitive”. Analytics are concerned with details while intuitive focus on patterns. Consequently, human instincts, subconscious belief, conscious belief, values and intuition have been identified as the major emphasis that determines the mode of decision making. Thus the differences displayed by the various modes are the reflections of the level to which the above mentioned are displayed [1]. Hunt et al [17], on the structure of decision, identified concepts like the decision maker (DM) viewed as a stable person endowed with certain belief, predisposition, skills, experience amongst others that describe his personality. The decision task (DT) calls for attention. Decision situation (DS) connotes contextual and ecological factors both conceptually and circumstantially. Others are the decision process (DP) and the decision outcome (DO). The focus of this study was to determine the relationship between DM’s characteristics and the DP, given an ill defined DT. Figure 1 below summarizes the relationship of these concepts.



*Figure 1 : Hunt's et al. model of decision making.*

## 2.2 Decision making in EI context

Decision makers can employ intuition to solve a problem or rationalize the problem. Usually, the more challenging the situation, the higher (likelihood) is the associated monetary values of the consequence, which is directly synonymous with the rationale of expectation from the decision maker. Decision making in EI context followed a well laid out procedure, ranging from the identification of the need for decision making, redefining the decisional need between the watcher and the decision maker, the watcher thereafter searching for appropriate information based on the understanding gathered from the redefinition upon which the final inference is based with other factors alongside to be considered. Thus, decision making in EI realm is a robust process taking into cognizance all possible factors laid out properly for an effective decision making.

EI from its definition is set to present a coordinated action of search and information utilization for timely, effective and strategic decision making [23, 29]. Bouaka & David presented a model that combines both the context of the problem, the representation of the decision-maker and the challenges of the decision-making problem [2]. The objective is to facilitate the identification and the representation of the decision problem on the one hand and preparation of the information research project on the other. It aids the understanding of the problem through identification of the user's characteristics and assessment of the level of identified stakes of the problem. Sequel to the above, Bouaka & David presented a proposal aimed at assisting the decision maker in explicitly defining his decisional problem [2]. Their focus was on the environmental, organizational and personal data. These were used to juxtapose the relationship amongst the EI actors to determine who poses the question and why the question was posed. They assumed amongst many things that there is an atmosphere of trust and confidence between the parties involved in the information need definition and acquisition.

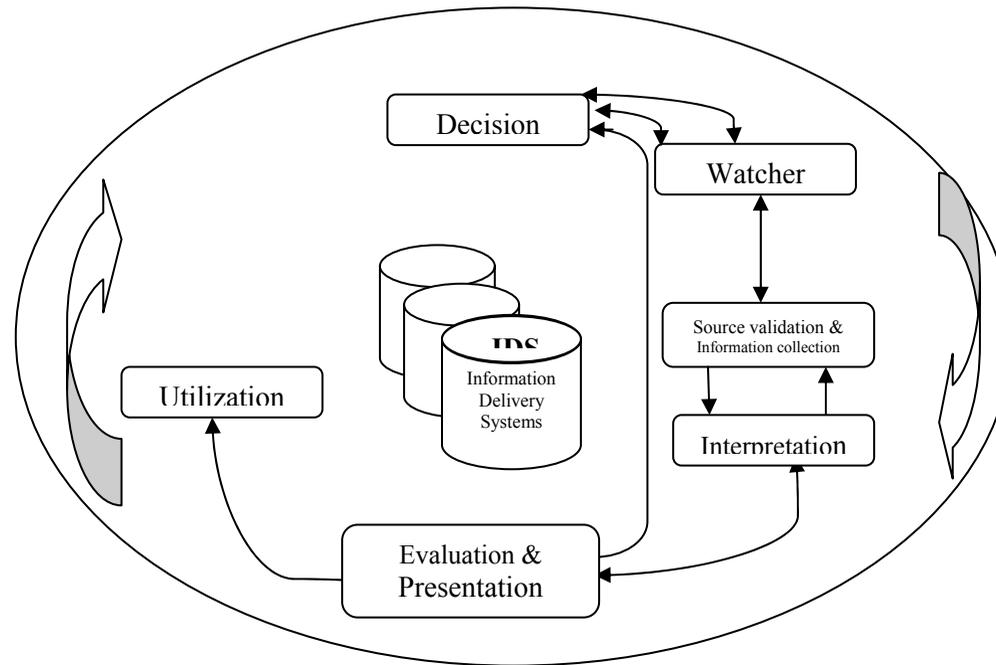


Figure 2 : Circular presentation of the principal concepts in EI

Figure 2 above presents the activities of generic actors, information and various processes ensuing towards decision making in EI. David & Thiery [8] present a model capable of adapting to different actors involved in the EI process. EI, from their point of view involves the act to understand the process involved in the production of interpretable indicators for decision making based on internal and external information available to it. Their opinion is formed from the fact that decision rationale can be measured/determined based on the awareness of the challenges: risk and threat incurable by the decision. The focus is thus on the team leader and the watcher – an information specialist. Their requirement and responsibility were outlined and this is employed for the development of the information base which involves dual filtration. Following this, Bueno & David developed a personalized information retrieval system that is code named METIORE [3]. Characteristically, the first thing in Metiore is to capture the user objectives done for a session, these are thereafter formulated in natural language. From the above described, it is evident that the operation of the system is based on the systems approach and user's interactions. The next stage allows the user to make simple or complex queries- search function, using some attributes. The first thing to note is that, the user is expected to have a little information about the desired information to effectively use this program.

Another trend in decision making pattern of EI is based on the Duffing et al. proposal [10]. With the focus stemming from economic monitoring, which is enhanced by information system and data warehouse? It was submitted that data quality of appropriate level is important for accurate decision making. Recalling that the origin of the information is as important as the processes taking place on the information that are residing in the data warehouse. The process of selection, cleaning, storage and retrieval are very important to the decision made out of them. The decision maker must base his actions on available indicators Thiery & David relevant

to his problems [31]. The interaction, compositions and roles of EI actors were examined to determine the possibility of risk, its type and source for any decision taken.

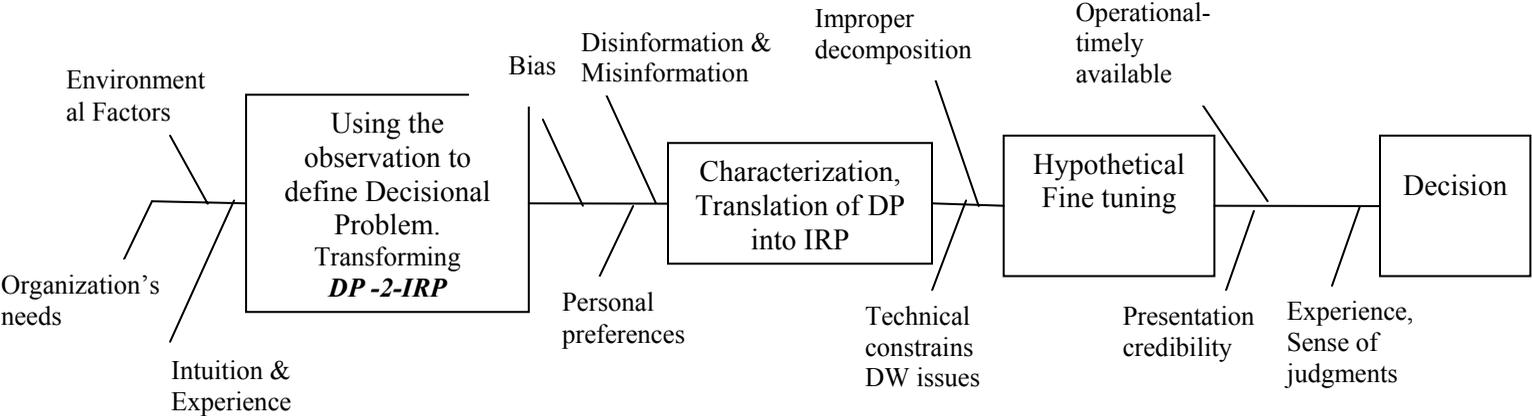


Figure 3: A cause-effect Cognitive-Based Risk-Factor architecture for decision making in EI process.

They arrived at two types of risks: Trades risk – reconciliation of knowledge and processes related to a specific area, and Technical risk – which involves information processing on the data warehouse. The pattern of risk modeling will thus be from structural and behavioural axis. They collapsed the EI processes into four for the risk identification which include: Identification; Extraction, Transformation and Utilization.

### 3 The Risk Factor and Knowledge Reconciliation Model

Sequel to the submission of Duffing et al. [10], it becomes apparent that there are imminent risks in decision process. Consequently, decision maker in EI, wanting to resolve a decisional problem (DP), derived from the combination of Objects, Signal and Hypothesis <O, S, H>, resulting from both the internal and the external views is acquainted with some aspect of the decisional problem – Objects, which were perceived/generated by some events – Signal: (gesture, circumstances, perceptions, deductions which communicates something; cue, sign which initiates a certain action; conveying of information with resultant meaning) from where certain deductions can be made – Hypothesis. However, the knowledge is limited based on the available data currently at his disposal. Reality encompasses organizations and their environment, and we can distinguish entities, which connotes objects or events symbolically represented by their identifiers and values of their attribute [14]. Since decision makers act on the available purported representation of reality, we therefore say that a decisional situation involves taking inventory of what is known by the decision maker (data); what is yet known and must be acquired (information) and the application of rules of reasoning (knowledge). The level of the decision maker’s comprehension, available information amongst other factors thus constitutes some level of risk. We opined that it’s a misconception to tag anything as a risk, since risk is a function of vulnerability, threat, and consequence. We therefore introduce the notion of risk factor [27].

A Risk Factor (RF) is a concept, being, circumstance or a factor that increases the chances of being vulnerable to threat and consequences in a particular situation. These can be consequent upon things we do usually; inferred; or sometimes it could be situations and circumstances beyond our control e.g. ailment peculiar to old age. A risk factor here can thus be defined as any individual action(s); interaction(s); process; or inter/intra processes capable of undermining the overall performance/goal of an operation. RF can result from the action or inaction of a user(s), any of the processes hitherto stated, or on any of the activities performed during the life-cycle of data/information. With a typical fishbone model as Ishikawa [18], figure 3 presents the life cycle of any would be decision making process. The architecture facilitates inculcating hitherto considered intangible factors like personal preferences, intuition, and experience alongside other tangible factors. The above was broken down to facilitate what we called knowledge reconciliation (KNOWREM) as the first stage in indirect informing [15].

The ontological framework for knowledge reconciliation was proposed to facilitate proper understanding between the decision maker and the information specialist (Watcher). We define Knowledge reconciliation as the attempt to map the desire for precision in naturally expressed languages employed in describing, sharing of knowledge, interpreting and communication of “a need” to another person/object in an acceptable degree of accuracy devoid of misinterpretation, disinformation, biases and unnecessary personal preferences to mention a few, which was referred to as risk factors (RFs) in [27]. This becomes imperative because real world is laden with concepts which do not have a sharp boundary e.g. ‘fine’, ‘useful’, ‘more important than’, ‘old’ e.t.c. We therefore employed this background to develop an ontological framework aimed at reducing the risk in the KR operations. A detail discussion on the KNOWREM framework can be found in [26].

## **4 Decisionability based on Information Flow, Information Quality and Information Overload**

“Deciding not to decide is not the same as indecision” goes an old saying. There could be several factors that undermine the process of decision making. One of such factors earlier identified was lack of access to adequate information, but the present story has changed with the advent of the internet and other private and corporate information delivery sources. O’Brien defines “information as data placed in a meaningful and useful context” [24, 25], the Oxford English Dictionary (OED, 1989) described information as knowledge concerning some particular fact, subject, or events i.e. information is seen as knowledge.

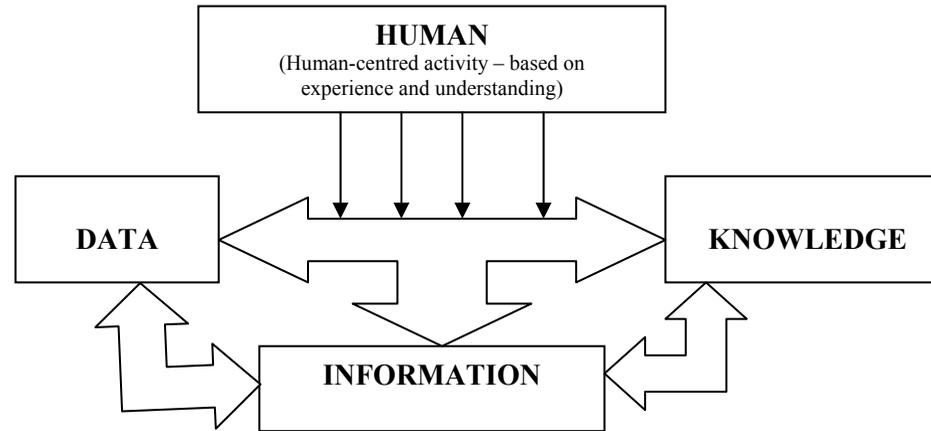


Figure 4: The dynamic (circular) relationship between data, information, knowledge and human [21].

We describe *Decisionability* as the performance of the decision maker based on utilization of available information. The impact of human element in the “learning process” prior to transformation of information into knowledge was properly presented in [9]. Its dynamic and circular properties were depicted in figure 4. Knox [21], Burgess et al [5] evaluated the impact of information overload in determining quality criteria to assist in information search. “The term information overload describes situations in which the individual is no longer able to integrate new information for decision-making, due to the great amount of information he or she is exposed to. He or she can no longer productively use the quantity of information in the available time scale. Consequently, decision quality, efficiency, and even well-being may be reduced” [11]. The above phenomenon has been referred to as ‘cognitive overload’ or ‘information fatigue syndrome’. A succinct summary of the above thus implies, “even with highest form of information quality, information flow should be adequately controlled to dissuade cognitive overload”.

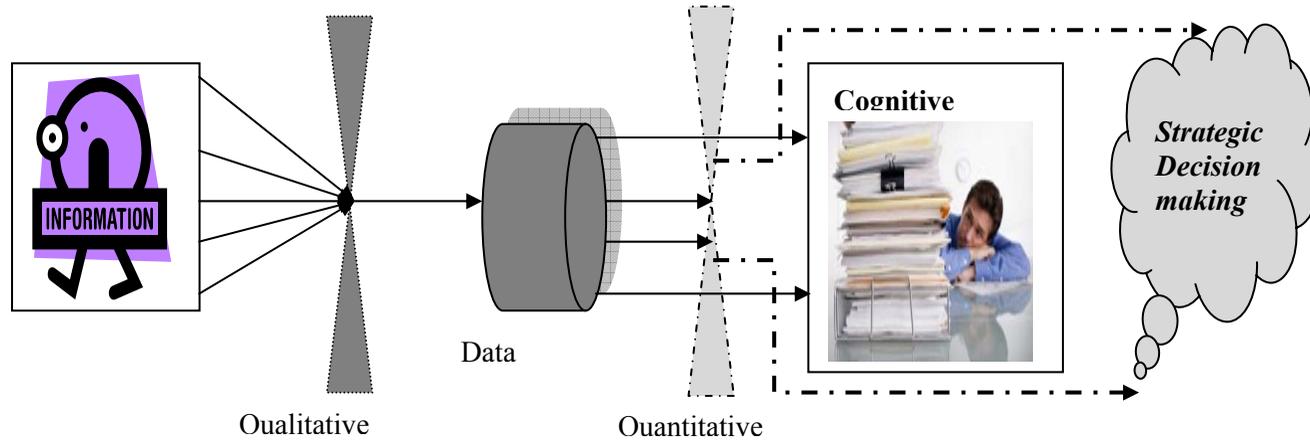


Figure 5: Effect of Information Flow, Quality, and Overload on Decision Making.

The tendency for extensive information search is the most probable option in decision making. However, such attempts can result into one or more of the following scenarios:

- Delay in decision because of time required to obtain and process the extra information. This delay could impair the effectiveness of the decision or solution
- Information overload or cognitive overload could result. This situation is the phenomenon in which so much information is available to the extent that “decisionability” declines because of the information in its entirety cannot be appropriately managed. A consequence of this is forgetfulness if information are crashed into memory in short period of time e.g. “crashed course towards an important debate like US presidential election debate”
- Selective use of information will occur – the decision maker will employ only facts supporting his preconceived ideas or solutions
- Mental fatigue results – slower work or low quality decision
- Decision fatigues – a state of worn-out, not wanting to take decision again. This finally results into fast, careless or total decision paralysis.

The quantity of information that can be handled meaningfully by human mind is limited. It is therefore pertinent that information be consciously selected, otherwise processing will result into biases towards the earliest information, thereafter, the mind attempts to ignore subsequent information or forget earlier ones [16]. In figure 5, we present a two-staged filtrations aimed at supporting earlier submission of Harris [16], Bullen & Sacks [4], and Burgess et al [5].

The first stage features what is described as information flow, a phenomenon that is constantly on the increase. This is followed by a qualitative filtering into organization’s data warehouses based on desired quality attributes [22, 14, 15]. The figure depicts some colourations which are not meant for aesthetic but to clearly distinguish the operations and the results. Thus, if the second filtration is not performed, the tendency is pronounced to have information or cognitive overload. The second stage in more refined shade depicts another filtration to dissuade cognitive overload

## 5 Conclusion

With increasing volume of information to users come problems like specificity of database queries, requirements for users to explicitly state their information need and information or cognitive overload. Several researches have looked at information flow and information quality but not much work was recorded to determine the effect of the trio. Considering the flow, quality and the overload in EI is a serious challenge. This is sequel to the fact that strategic decision making is the sole aim of EI, thus in a bid to forestall this, we juxtaposed the trio and depict the effect of information/cognitive overload on decision maker through a two-stage filtrations. The ensuing risk is better imagined than allowed to occur, as it can practically result into both mental and decision fatigue in which case the decision maker's act becomes irrational.

We believed the two stage filtrations will go a long way to address the issues raised in this research work. In the future, we hope to be able to evaluate the quality of decisions made in both scenarios described in this research to further corroborate the importance of this work.

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