Sources of Unstructuredness in Decision Situations: Towards a framework for DSS Development

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Abstract. Decision support systems (DSS) are computer-based information systems which support unstructured or semi-structured managerial decisions in organizations. While it is yet to be recognized on a wide scale, DSS have become extremely important in today's world. Many reengineering exercises are actually built around DSS. A knowledge management infrastructure often fails as organizations cannot derive support for specific decisions from it. DSS are generally aimed at reducing the unstructuredness in a decision situation. A decision situation consists of the decision itself, the decision maker and the organizational environment. An attempt at developing a DSS essentially involves an attempt at reducing unstructuredness in the decision situation. This paper presents a framework which would allow decision analysts to identify such specific sources of unstructuredness at a much more refined level than the analysis available in the literature today.

Keywords: Decision Support Systems, Unstructuredness, Decision process, Decision-making style

1 Introduction

In an organizational environment, one of the three main roles of a manager involves making decisions and implementing them. Such decision making processes involve identifying and choosing among alternative solutions to organizational problems. Researchers from various disciplines have attempted to study and analyze the decision making process in organizations. While the dominant focus has been to define models of decision making, there has also been considerable work on analyzing the various factors which affect decision making within organizations.

Democratization of Information Technology (IT) has given rise to greater use of IT support for organizational decision making. One of the most important IT-based systems in organizations is a class of systems called Decision Support Systems. Decision Support Systems (DSS) can be defined as computer-based information systems which support unstructured or semi-structured managerial decisions in organizations. While it is yet to be recognized on a wide scale, DSS have become extremely important in today's world. There are two important reasons for this. First, increasing complexities in an organization's environments imposes greater challenges in organizational decision making. Second, DSS

form fundamental building blocks of many IT-based strategic initiatives such as business process reengineering, knowledge management, customer relationship management etc.

Many reengineering exercises are actually built around DSS. A knowledge management infrastructure often fails as organizations cannot derive support for specific decisions from it. It is therefore important for us as IS researchers to understand the process of DSS design and development in greater depth than we do right now. This paper is an attempt in that direction.

Prior literature has argued that the aims of DSS, in general, are two fold namely, supporting the semi-structured decisions and, in the long run, reducing the unstructuredness in a decision situation. "Decisions are *programmed*[1] to the extent that they are repetitive and routine, to the extent that a definite procedure has been worked out for handling them so that they don't have to be treated de novo each time they occur" [18]. Unstructuredness therefore refers to the extent to which decisions are not programmed.

An attempt at developing a DSS essentially involves an attempt at reducing unstructuredness in the decision situation. In order to be able to do this, the DSS development team, particularly the decision analyst, should be able to identify the specific sources of unstructuredness in the situation. This paper presents a framework which would allow decision analysts to identify such specific sources of unstructuredness at a much more refined and comprehensive manner than the analysis available in the literature today. In discussing such a framework, the paper also presents a set of propositions relating to the specific sources and the degree of unstructuredness.

2   The Decision Situation – A Definition

Every decision has a certain inherent degree of structure about it. Keen and Morton [8] differentiate structured and unstructured decisions in the following manner. In unstructured decisions, the human decision maker must provide judgment and evaluation as well as insights into the problem definition. They also distinguish perceived structure from deep structure and contend that it is important for IS researchers to consider perceived structure especially in the context of DSS design and development. This is important mainly because in organizational decision making, the context plays a significant role in determining both the decision process and the contents. Kasanen, Wallenius, Wallenius and Zionts [7] highlighted the importance of structured decision making through four caselets each of which presented a different organizational decision situation.

The procedure and the substance of the decision are extensively influenced by the context [19]. Keen and Morton [8] argue that the term "system" in the name DSS itself implies both the manager and the machine and that the system considerations include the wider context in which the manager is operating. A model or a program (DSS) cannot be built in isolation from that wider context.

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[1] Simon uses the word 'programmed' but subsequent authors have preferred the word 'structured'.

Using this line of thought, we describe the decision situation as *the context or boundary comprising of the decision, including the procedure and the substance, the decision maker(s) and the organizational environment in which the decision is made.*

These three factors taken together form, in total the decision situation to be supported by a "DSS". A DSS should support not just "a decision" but a decision situation i.e. it should support "a decision maker making a decision in a certain organizational environment". It can be seen from the above discussion that, development of an effective DSS would require the DSS team to have a very good understanding of the decision itself, the different types of decision makers and the environment in which the decision is made. This means that the DSS team has a formidable task on hand, particularly while analyzing and modeling the decision.

This paper aims to provide a framework for analyzing this decision situation through identification of the sources of unstructuredness. Using this framework, the DSS team should be able to identify the extent of unstructuredness in the respective decision situation. Following such identification, the team should be able to segregate the structured portion of the decision situation and ascertain the extent of support that can be provided by a DSS.

3   The Framework

The aim of this framework, as already mentioned is to aid the DSS team in identifying the sources of unstructuredness in the given decision situation. There are three potential sources of unstructuredness:
1.   The decision itself
2.   The decision maker and
3.   The organizational environment

We will examine these three constructs in detail and identify micro level dimensions for each of them. In doing so, the purpose is to provide a list of dimensions which when examined will provide the DSS team a comprehensive and complete understanding of the decision situation. Each section first delineates the dimensions that form the main construct and provides a set of propositions suggesting the nature of influence of the dimension on degree of unstructuredness of the respective construct. This is followed by an analysis of relationships between established typologies of the constructs and the degree of unstructuredness of the decision situation construct.

3.1   The Decision

A decision can be described as a conscious choice of solution to an organizational problem, among different alternative solutions. A decision is made using data or substance and through a process or procedure. "Substantive aspects relate to what of decision making, while the procedural aspects relate to how decisions are made" [19]. Both these aspects – data and process can be unstructured and the degree of unstructuredness of both is likely to

impact the degree of unstructuredness of the decision and therefore the decision situation. Stabell argues that one of the reasons why it is difficult to describe and diagnose decision behaviour is because the procedure and substance of the decision are highly interdependent. Let us examine these two aspects of the decision in greater depth.

3.1.1 Data

Data refers to informational inputs to the decision. Data can vary in the degree of structure. Three main sources of unstructuredness of data arise from complexity, uncertainty and the ambiguity in the data.

Complexity: Complexity refers to the amount of information or quantum of information that has to be processed. This may arise from the wide variety and range of information. For instance, consider a decision to choose a candidate from thousands of potential applicants. The quantum of information to be processed is thus vast. Also consider a decision to diversify into a new product. The potential range of products could be enormous thus leading to a massive set of data to be processed. Such high levels of information inputs leads to greater levels of unstructuredness in the decision as there is a need to integrate such volumes of data inputs. Moreover, variations in data also necessitate dissimilarity in the manner in which such data are processed. Therefore,
Proposition: Higher degree of complexity in data is likely to lead to higher degree of unstructuredness in the decision.

Uncertainty: Uncertainty refers to the difference between the amount of information required for the decision and the amount of information already possessed by the decision maker [20]. In other words, uncertainty arises from lack of information. Sources of uncertainty include
a.   Deficiency of anticipation, wherein the information cues required for a decision to be made cannot be anticipated.
b.   Deficiency of acquisition, which denotes the inability to acquire the information required to make the decision.
These two deficiencies are likely to impact the unstructuredness of the decision, as they reduce the availability of the needed information. Thus,
Proposition: Higher degree of uncertainty of data is likely to lead to higher degree of unstructuredness in the decision.

Ambiguity: Ambiguity or equivocality refers to the multiplicity of meaning conveyed by the information cues [21]. Ambiguity arises from the inability to present a unique interpretation of the available data. Such decisions thus cannot be easily made as it is difficult to completely and precisely analyze the decision-related data. Therefore,

Proposition: Higher degree of ambiguity in data is likely to lead to higher degree of unstructuredness in the decision.

3.1.2 Process

Process refers to the various methods or procedures of making the decision using various data inputs gathered. Kasanen, et. al [7] presented a set of questions which can be used to understand organizational decision making process. Simon [18] defined the three phases of decision making, intelligence, design and choice. In the intelligence phase, the decision maker scouts for possible conditions in the environment calling for a decision. In the design phase, possible alternative solutions are delineated and analyzed, while in the choice phase, the alternative course of action is chosen from amongst these alternatives. Simon later extended the framework to include implementation and review or control. For the purpose of this paper, let us focus on the first three phases of the decision making process as these are directly related to design and development of the DSS.

Unstructuredness in the decision process is likely to arise when at least one of these three phases are unstructured [8]. Unstructuredness in one of the phases is likely to give rise to variability in the decision making process across decision situations, thus calling for a non-programmed or undefined procedure to conduct the process. Therefore

Proposition: Higher degree of unstructuredness in intelligence, design or choice phases of the decision making process are likely to lead to greater unstructuredness in the decision.

Unstructuredness in any of the three phases is likely to occur when the phase is complex, uncertain or ambiguous. Let us examine these three sources of unstructuredness in the context of the decision process:

Complexity: Multitude of steps or variety in activities of the decision process is likely to make the decision process more complex for the decision maker to handle. While whether a certain level of complexity is manageable or not depends on the individual's cognitive capacity, it is still possible to define an "absolute complexity" on the basis of extent of information processing involved. Therefore,

Proposition: Higher level of complexity in decision process is likely to lead to higher degree of unstructuredness in the decision.

Uncertainty: Uncertainty in decision process refers to the unavailability of information regarding how the decision is made. This could be due to the inherent inability of the decision maker to describe the decision process. Keen and Morton [8] argue that unstructuredness in a decision problem could occur because it may not be possible to define the conditions that allow us to recognize the problem or because the decision maker may be unable to specify the methodologies to solve the problem. These two deficiencies are likely to impact the unstructuredness of the decision process, as they reduce the awareness of the decision maker as regards the decision process. Thus,

Proposition: Higher degree of uncertainty of decision process is likely to lead to higher degree of unstructuredness in the decision.

Ambiguity: Ambiguity of the decision process refers to unclear procedure. Among other reasons, this could be due to multiplicity of decision models or absence of prior occurrence of the decision situation. Ambiguity arises from the inability to present a unique representation of the decision process. In such cases it is difficult to completely and precisely model the decision process. Therefore,
Proposition: Higher degree of ambiguity in decision process is likely to lead to higher degree of unstructuredness in the decision.

3.2   The Decision Maker

Different individuals have different styles of decision making. Some are naturally inclined to make decisions in a systematic manner by collecting the necessary data, processing and analyzing it in a detailed manner etc. On the other hand, there are decision makers who are comfortable with using mainly their intuition. The importance of decision making style of the decision maker can hardly be exaggerated. Some authors have studied the impact of decision making style of aspects such as firm performance (see for instance, [4]). We will examine some inherent characteristics of decision makers which influence the degree of unstructuredness in the decision situation [16].

Tolerance for Ambiguity: This refers to the degree to which the decision maker is comfortable with low levels of clarity in decision process or data.
Risk Tolerance: Decision makers vary in their aversion to risk. Some decision makers are innately more risk taking than others.

Leadership Style: Managers usually adopt authoritative, democratic, consultative or bureaucratic leadership styles. When the decision makers are authoritative it is likely to cause greater levels of unstructuredness than when the style is consultative or democratic.

Information gathering style: When managers are perceptive individuals in their information gathering styles, they are likely to focus on relationships between data items look for deviations from their expectations. Receptive thinkers, on the other hand, focus on the details than the overall patterns [11].

Information evaluation style: Managers adopting intuitive information evaluation styles keep the overall problem in mind, rely on unverbalized cues, jump alternatives while systematic thinkers approach the problem in a methodical manner moving through an increasing refinement of analysis [11].

Creativity: Creative decision makers are likely to adopt innovative, novel ways of making the decision. They are hence likely to be erratic and unpredictable.

Task versus People orientation: High task-orientation decision makers focus on getting things done and achievements unlike people oriented managers who are more focused on the relationship with people and how to make them comfortable.

Table 1. Decision-related Characteristics of Decision Maker

Characteristic of Decision maker	Relationship to Degree of Unstructuredness
Tolerance for Ambiguity	Positive
Risk Tolerance	Positive
Leadership Style: Authoritative	Negative
Leadership Style: Democratic/Consultative	Positive
Leadership Style: Bureaucratic	Negative
Information Gathering Style: Perceptive	Positive
Information Gathering Style: Receptive	Negative
Information Evaluation Style: Intuitive	Positive
Information Evaluation Style: Systematic	Negative
Creativity	Positive
Task orientation	Negative
People orientation	Positive

3.2.1 Typology of Decision Makers and Degree of Unstructuredness

Rowe and Boulgarides [17] discuss a four-class typology of decision makers based on their value orientation (relational or logical) and tolerance for ambiguity (low and high). Their classes include Analytical, Directive, Conceptual and Behavioral. It is possible, using their description of the four types to conclude that directive decision makers are likely to face lowest degree of unstructuredness followed by analytical, behavioral and conceptual.

Due to restrictions on space, we will not examine other more comprehensive personality typologies such as the Myers-Briggs Type Indicator which can also be related to the degree of unstructuredness due to the decision maker. It must be remembered though, that managers have a dominant style with back-up styles; some almost always rely on their dominant style while others are more flexible. Hence while these typologies give us a good idea of the impact of style on unstructuredness, they should not be taken as fixed or rigid classes.

Let us now examine the third source of unstructuredness – the organizational decision environment.

3.3 Organizational Environment

The degree of unstructuredness or structuredness in a decision situation also depends on the organizational environment in which the decision is taken. The organizational decision environment includes characteristics of the domain in which the organization functions and the immediate domain in which the decision is being made. The directly impacting environment is the immediate decision environment. While this may include environment external to the organization depending on the type of decision (say Operational Control/Management Control/Strategic Planning discussed in [6]), it will be shaped by the legacy environment present in the organization. In the long term, the legacy environment of the organization is also affected by the external factors. By legacy environment we refer to organization structure, organization culture, etc. which authors have argued are influenced by the external environment in which the organization operates. For instance, Galbraith [5] argued that task uncertainty influences the ability of decision makers to pre-plan or to make decisions about activities in advance of their execution.

Lawrence and Lorsch [9] postulated that greater turbulence in the external environment necessitates greater differentiation among the subparts of the organization and therefore such organisations required elaborate integration mechanisms to avoid loss of coordination among differentiated subparts. Miles and Snow [12] and Mintzberg [14] have also discussed how the external environment of an organization affects the various dimensions of the organization's internal environment.

The following section examines in greater detail the internal environment characteristics that influence the decision environment. The broad factors include organization structure, organization culture and power distribution in the organization.

3.2.1 Organization Structure

Organization structure is defined as "the sum total of the ways in which (an organization) divides its labor into distinct tasks and then achieves coordination between them" [13]. This structure therefore also determines the decision making structure of the organization which not only tells us who makes what decisions but also tells us the way in which the decisions should be made and the boundaries within which the decision makers are allowed to operate. Such decision boundaries, decision hierarchies and control mechanisms define the unstructuredness of the decision situation.

While numerous theorists have argued about what constitutes organization structure, Robbins [16] puts forth that the following three dimensions are the core dimensions and encompass all other factors: complexity, formalization and centralization. In the following subsections, we will examine each of these in detail in an attempt to theorize the relationship between organization structure and the degree of unstructuredness in the organization decision situation.

Complexity: This refers to the degree of differentiation that exists within the organization. Three parameters contribute to complexity of the organization. They are horizontal differentiation, vertical differentiation and spatial differentiation.

Horizontal differentiation refers to "degree of differentiation between units based on orientation of members nature of tasks they perform, and their education and training" [16]. The greater the horizontal differentiation, the more complex the organization will be as it makes it increasingly difficult for the organization to coordinate and integrate organization activities. Thus when organization encounter higher degrees of horizontal differentiation they are likely to face greater unstructuredness in their decision situations. Horizontal differentiation arises from specialization – functional or social. Higher levels of specialization of tasks are likely to give rise to greater need for task coordination. This may also result in greater vertical differentiation.

Vertical differentiation refers to the depth in the structure. In other words, vertical differentiation captures the number of hierarchical levels in the organization. It also reflects the span of control which defines the number of subordinates a manager can effectively manage. Therefore, higher levels of vertical differentiation lead to higher degree of unstructuredness in decision situations in organizations.

The third dimension of complexity is spatial differentiation. This refers to the extent of geographical spread of the organization and its various units. When organizations are more geographically and spatially differentiated, the complexity of the organization is also high. Greater spatial differentiation necessitates integration. Communication, control, coordination needs increase, thus giving rise to higher degree of unstructuredness.

Thus all three differentiation factors increase degree of unstructuredness as they increase complexity thus making integration necessary yet difficult. Thus we can say

Proposition: Organisations having higher degree of complexity are likely to have higher degree of unstructuredness in their decision environment

Formalization: The degree to which jobs in an organization are standardized is referred to as formalization. Robbins [16] argues that when formalization is low, employees are likely to behave in relatively a more non-programmed manner. Low formalization allows greater degree of freedom and flexibility but also causes greater unstructuredness in the decision environment in organizations. On the other hand, highly formalized organizations or departments are likely to have well-defined procedures, explicit organization rules and job description. While this restricts the freedom, the employee will have lower inputs in terms of how and what is to be done. Therefore, a structured decision environment will be prevalent in such formalized organizational environments.

Proposition: Organizations having higher degree of formalization are likely to have lower degree of unstructuredness in their decision environment.

Centralization: When decision making authority is concentrated at one point, an organization is said to be centralized. While it is impossible to strictly hypothesize the relationship between centralization and degree of unstructuredness in the organization decision environment, it is highly likely that higher degree of centralization will lead to

lower degree of unstructuredness in the organization decision environment. Quite often decentralization provides greater information inputs to the decision maker and also allows for lower intermediary channels of information transmission to the decision maker. In other words,

Proposition: Organizations having higher degree of centralization are likely to have lower degree of unstructuredness in their decision environment.

Structural Typologies: Organizational theorists have put forth typologies based on various structural parameters. In this section we analyse two of the popular and simple typology frameworks to understand the relationship between organization structure and decision environment.

Burns and Stalker [3] analyzed the various kinds of organization environments and their influence on the structure of the organization. Using rate of change of external environment they argued that organization can be broadly classified as having mechanistic or organic structures. Using their classification it is possible to delineate the degree of unstructuredness in organizational decision environment. For instance, mechanistic organization structures perform routine tasks and therefore rely more heavily on programmed tasks. On the other hand, organic structures are more adaptive, flexible and have loose job definitions. Thus,

Proposition: Organizations having greater orientation towards a mechanistic structural form are likely to have lower degree of unstructuredness in their decision environment than organizations with orientation towards an organic structural form.

A similar analysis can be conducted using Mintzberg's five classes of organization based on their structure. Mintzberg [13] presented five configurations of organization design options including simple structure, machine bureaucracy, professional bureaucracy, divisional structure, adhocracy. For our examination here, let us look at machine bureaucracy and adhocracy. Machine bureaucracy refers to the organization design which emphasizes standardization. Because such organization face simple and stable external environments, they are likely to have highly routine operating tasks, high degree of formalization and high degree of centralization. In comparison, adhocratic organizations face extremely complex and dynamic environments and thus have few rules, are highly flexible, decentralized and have a high degree of social specialization. Therefore,

Proposition: Machine bureaucracies are likely to have lower degree of unstructuredness in their organizational decision environment than adhocracies.

It must be remembered that since these typologies are not strict watertight compartments, the influence of the characteristics of a particular type on the degree of unstructuredness of organizational decision environment is also likely to be affected by such overlaps.

In the same way, using the Miles and Snow [12] typologies of Defenders, Prospectors and Analyzers, we can understand the relationship between the external organization environment, the organization structure and the degree of unstructuredness in the organizational decision environment. Prospectors for instance, are those organizations that

face a dynamic external environment and react by having a loose structure, low degree of formalization and a high degree of centralization. Defenders, in contrast, are organizations that operate in relatively more stable environments and respond through high horizontal differentiation, centralized control, high degree of formalization. We can therefore conclude:

Proposition: Organizations adopting the prospector strategy are likely to face higher degree of unstructuredness in their organizational decision environment than organizations that adopt a defender strategy.

Proposition: Organizations adopting the analyzer strategy are likely to face lower degree of unstructuredness in their organizational decision environment than organizations that adopt a prospector strategy but higher degree of unstructuredness in their organizational decision environment than organizations that adopt a defender strategy.
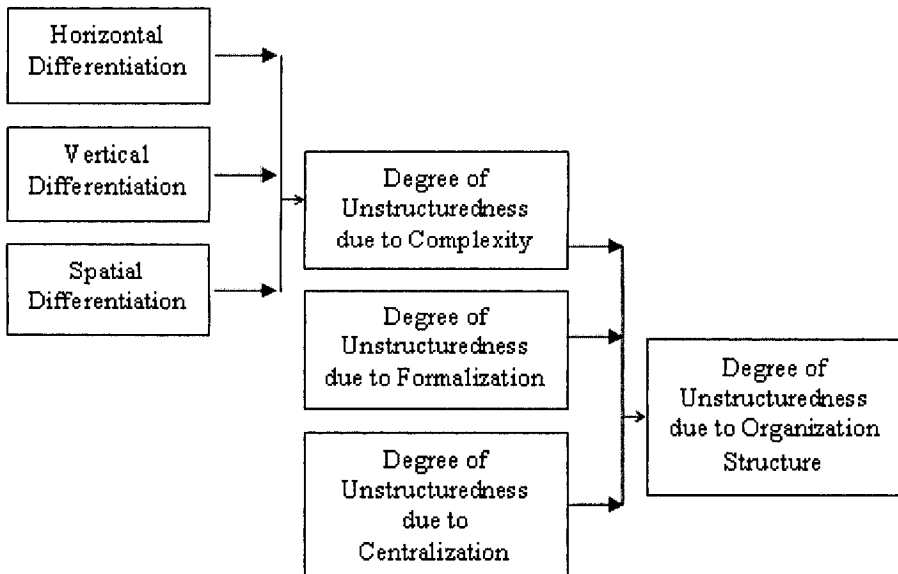
Figure 1: Degree of Unstructuredness due to Organization Structure

Having examined the influence of organization structure on the degree of unstructuredness in the decision environment, let us now examine the impact of organization culture on the organization decision environment.

3.2.2   Organization Culture

Culture defines "the way things are done around here". In other words, "a pattern of shared basic assumptions.....that has worked well enough to be considered valid and therefore ..... as the correct way to perceive, think and feel in relation to those problems" [16].

A common way of understanding culture is through the organizational artefacts or visible signs; the espoused values or values projected to employees; and basic assumptions incorporated in the way employees view things in the organization and thus act. Robbins [16] describes ten dimensions of organization culture include individual initiative, risk tolerance, clarity in direction, integration, management support, control, identity, reward system, conflict tolerance and communication patterns. While some of these relate to the structural dimensions, some others focus on behavioral dimensions. The structural dimensions such as integration, control, reward systems, etc. were dealt with in the previous section on organization structure. We will focus here on the influence of the behavioral aspects of organization culture on the degree of unstructuredness of decision environment.

Individual Initiative: This refers to the degree of responsibility, freedom and independence that individuals have [16]. In other words, in an organization where individual initiative is high, employees are encouraged to independently make decision and have a certain degree of freedom to act. This of course, would be within the boundaries fixed by their roles and responsibilities. Such organizations, other things remaining the same are likely to encounter greater level of unstructuredness in their decision situation. This is mainly because allowances for individual initiatives permits employees to adopt their own mental model of decision making instead of a pre-determined decision making process or structure. Thus variations in the decision situation increase thus leading to greater unstructuredness in the decision environment as faced by the employees.
Proposition: Organizations encouraging individual initiatives are likely to face higher degree of unstructuredness in their decision environment.

Risk Tolerance: Risk tolerance refers to the "degree of which employees are encouraged to be aggressive, innovative and risk-seeking". In an organization where there is a high level of risk tolerance, it is also likely that individuals make decision in a more unstructured fashion. Innovativeness encourages unstructuredness mainly because innovativeness brings in instability or uncertainties. Further, organizations that encourage aggressiveness and competitiveness are also likely to have greater unstructuredness in decision situations.
Proposition: Organizations having higher levels of tolerance to risk are likely to face higher degree of unstructuredness in their decision environment.

Direction: Clarity in objectives and direction provides a degree of structuredness in organizational decision making situations. For instance, in an organization where the objectives are very clearly defined and the direction or path towards those objectives is very clearly defined and explicit, employees are clear about performance expectations. This leads to a high degree of structuredness in decisions they make. In contrast, consider an organization where the objectives are loosely defined or the means to meet those objectives are not very clearly defined, such organizations are likely to have very unstructured decision environments.

Proposition: Organizations having greater clarity in their directions are likely to face lower degree of unstructuredness in their decision environment.

Management Support: A closely related aspect is that of management support and guidance. When top management or superiors of the decision maker do not provide very clear communication, guidance, direction or support to the subordinate, then the organizational decision environment is likely to be highly unstructured. Employees can be expected to feel vague and unclear about decision making process and achieving the organizational objectives.
Proposition: Organizations encouraging greater superior support and guidance are likely to face lower degree of unstructuredness in their decision environment.

Communication Patterns: The degree to which organizational communications are restricted to formal hierarchy or authority determines the extent of structuredness in the organizational decision environment. If communications in the organization are restricted to organizational hierarchical authority, the decision maker can be expected to handle far fewer opinions and suggestions, thus reducing the degree of unstructuredness. Employees are also likely to feel more constrained to express their opinions. On the other hand, when organization communication is not restricted to formal authority, informal groups may exist and individual specific variations are allowed. Therefore,
Proposition: Organizations where communication patterns are restricted to formal channels are likely to face lower degree of unstructuredness in decision environments.

Conflict Tolerance: An associated dimension is that of conflict tolerance. When organizations encourage employees to air their criticisms, grievances, etc. openly, they are said to be conflict tolerant. Higher levels of such tolerance allow greater participation of employees in the organizational decision making processes. Such participation gives rise to greater unstructuredness in the organizational decision environment.
Proposition: Organizations where communication patterns are restricted to formal channels are likely to face lower degree of unstructuredness in decision environments.

Typologies of Culture and Degree of Unstructuredness: Robbins [16] describes the concept of fit between an organization's culture and its external environment through two common strategies adopted by organizations – market-driven and product-driven approaches. He argues that organizations opting for market-driven organization culture fit strategies tend to have higher degree of unstructuredness in their decision environments as they will emphasize greater individual initiatives, risk taking and conflict tolerances. In contrast to that, organizations adopting product-driven strategies tend to fit cultures that emphasize high control, low risk and conflict tolerance and do not encourage individual initiatives as they prefer operating in stable environments. Marakas [10] extends this argument to the decision environment by contending that market-driven organization tend to have higher degree of unstructuredness in their organizational decision environments,

while product-driven organizations tend to have lower degree of unstructuredness. This would affect the technologies that they adopt. For instance, product-driven orientation supports routine technologies like assembly line etc.

The structure of decision may also depend on how informal the organization culture is. There are many such environmental factors which affect the degree of structure in a decision.

It must also be remembered that cultures which are strong tend to have stable or constant degree of structuredness, while organizations that have weak cultures where the core values are not intensely held are more likely to have flexibility and therefore a less stable degree of structuredness.

3.2.2   Power and Political Environment

Power refers to an individual's capacity to influence decision making. The role of power of individuals in organizations therefore assumes importance especially when there are differences in either the preferences towards solutions to decision problems or in the very definition of the situations. Political decision makers are thus, people who can appear to represent the organizational interests while at the same time look after their own interests. Astley and Sachdeva [1] argue that there are three sources of power. These include (1) hierarchical authority, (2) resource control and (3) network centrality. Let us consider each of these sources in greater detail and understand how they influence the structuredness of the overall decision situation in the organization.
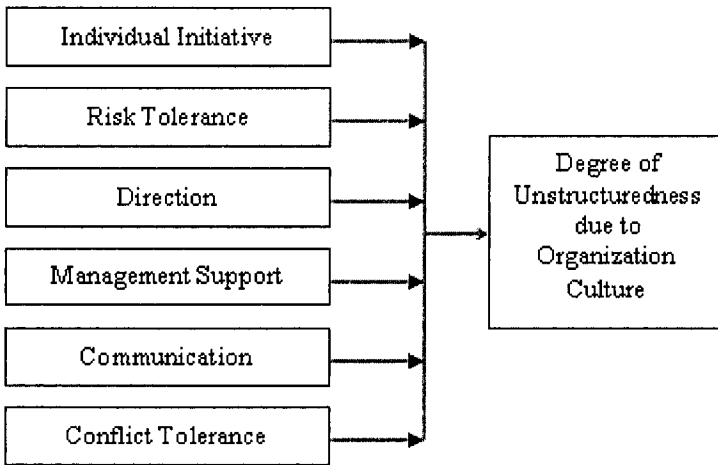
Figure 2: Degree of Unstructuredness due to Organization Culture

Hierarchical Authority: Formal authority in the organization is a source of power. Power can be "viewed as the product of formal decree". This hierarchical authority provides the decision maker the power to make the decision within the formal authority provided to him/her. It thus allows him/her to use his preferences and predispositions in making the decision. If the hierarchical authority is greater in the context of the decision the decision environment is likely to be more unstructured. For instance, if the decision maker is not authorized by virtue of his organizational hierarchy with respect to this decision, he is more likely to make a decision which will be more acceptable in the organization, hence will be inclined to do so in a structured and pre-determined manner.
Proposition: Greater the power due to hierarchical authority, higher is the degree of unstructuredness in the organization decision environment.

Resource Control: If the source of power of a decision maker is the control over resources either physical or information, it is likely to affect the degree of structuredness in the decision environment. Lower control over physical or information resources related to the decision force decision makers to adopt greater structured decision process in order to circumvent or make do with lower access to the resource.
Proposition: Greater the power due to resource control, higher is the degree of unstructuredness in the organization decision environment.

Network Centrality: Network centrality refers to the power gained from positions that allow the decision maker to integrate other functions or to reduce organization dependencies. In a well-differentiated organization the network is dependent on this integration mechanism which allows a stable network of interactions. When the power due

to such network centrality is greater, it is very likely that the decision environment in the organization becomes more unstructured. Higher levels of power due to network centrality is mainly because there are more nodes to interconnect in the network, or there is greater dependency on the network centrality due to higher levels of spatial, vertical or horizontal differentiation.

Proposition: Greater the power due to network centrality, higher is the degree of unstructuredness in the organization decision environment.

Power possessed and exercised by the decision maker can therefore be an important source of unstructuredness. The importance of its role is also dependent on the importance of the decision itself.

Under pressure of time, an otherwise structurable decision may have to be taken in a highly unstructured manner. Short term pressures like time pressures also affect the organizational decision environment. These may be caused by spikes in some aspects of the external environment caused due to unanticipated factors or unforeseen exigencies. Such sudden spikes cause sudden time pressures for one-time decisions. Such decisions are likely to be taken in a situation where the external environment assumes a high level of importance and hence there is an increased unstructuredness in the decision situation.

Proposition: Lesser the availability of time to make decision, higher is the degree of unstructuredness in the organization decision environment.

A summary of the framework is presented in Figure 3.
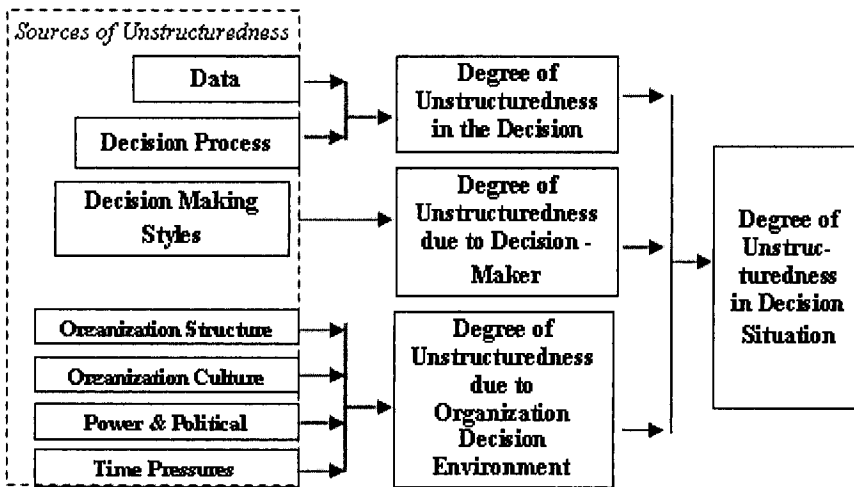
Figure 3: Summary of Framework for DSS Development - Sources of Unstructuredness in Decision Situations

4   Conclusion

This paper presented a framework for DSS development using the various sources of unstructuredness as the basis identifying the potential support of DSS. This framework, it is believed, would allow decision analysts to identify specific sources of unstructuredness in a more refined and comprehensive manner. The paper also presented a set of propositions relating to the specific sources and the degree of unstructuredness.

While this paper restricts itself to presenting a theoretical framework for DSS development, it is also necessary to test it and validate it. Hypothetical examples have been used during the theory development process by the authors to strengthen the framework, but empirical validation is on the future agenda. Situations similar to the decision situations documented in Austin, Sole and Cotteleer [2] or Covina, et. al [4] can be used to highlight the importance of the framework.

Decision analysts can identify the specific sources of unstructuredness, the extent of such unstructuredness and thus prioritize development of DSS to tackle them. Such a process used for a specific decision, especially those that are strategically important may aid managers in using IT support for organizational decision making, more efficiently and effectively.

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