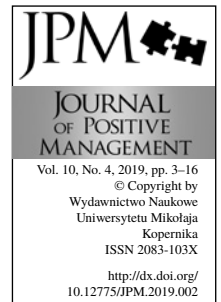


# ORGANIZATION DESIGN FOR ALGORITHMIC AND HEURISTIC WORK [1]

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## Abstract

**Purpose:** The purpose of this research is to propose the organization design parameters and coordination mechanisms that match the algorithmic and heuristic work characteristics.

**Methodology:** Methodology applied bases on the analysis of the literature. The study is conceptual in nature and draws upon other research findings. Firstly, it takes into consideration a literature review on organization architecture, design, and two types of work (algorithmic and heuristic). Then organization architecture assumptions are presented as a basis for the analysis of matching organization design with algorithmic and heuristic work. Subsequently, a considered framework for the analysis is Mintzberg's model of organization design that is applied as a framework to be checked for fit with heuristic work characteristics.

**Findings:** Research leads to the conclusion that out of five organization design configurations there is one that fits the heuristic work – adhocracy. The design parameters and coordination mechanisms described in this configuration are following the architectural assumption of autonomy-process-relations materials use, which in turn match the heuristic work characteristics: continuous learning, limited access to information, and unpredictability of results.

**Originality:** The originality of work is based on researching fit between heuristic work and organization design. Literature has not covered this link before. Moreover, the use of architectural assumptions for organization design is differentiating the study from the already performed researches.

**Implications:** The study suggests that following with empirical research requires establishing several measures for: heuristic work, organization architecture, and organization design.

**Keywords:** heuristic work, algorithmic work, organization design

**Paper type:** Conceptual paper

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## 1. Introduction

The research problem of this elaboration is: to design a space for algorithmic and heuristic work. The phrase „space design” which is repeatedly used in the article concerns organization as a workspace for people. The connection between organization design and heuristic work has been identified as a gap in the

literature. Until today researchers have omitted identification of the organization design factors that support performance of the heuristic work, although on the labor market we can notice an increase in the number of jobs where heuristic work is a dominant type (McKinsey, 2017). This article aims at filling the gap in the literature. The query in the EBSCO database where phrases „organization design” and „heuristics” are searched for in titles is delivering one hit which is not regarding designing organization *per se* but teaching organization design with the use of heuristics. The purpose of this research is to propose the organization design parameters and coordination mechanisms that match the algorithmic and heuristic work characteristics. However, both algorithmic and heuristic work are not perceived as „either-or” options but rather as a continuum. As a result, the research and its findings shall not be interpreted as „either-or” construction since the amount of their application depends on the environmental changes (see: Mohrman and Cummings, 1989). Methodology in use bases on the analysis of the literature. The study is conceptual in nature and draws upon other research findings. Firstly, it takes into consideration a literature review on organization design, and two types of work (algorithmic and heuristic). The synthesis of the up-to-date findings is presented. Then organization architecture assumptions are chosen as a basis for the analysis of matching organization design with algorithmic and heuristic work. Research is based on the set of assumptions originating from contingency theory (see: Burns and Stalker, 1995; Hannan, 2007). However, the fit of the organizations with its environment has been extended to cover the match among design parameters of the organization (Gerstein, 1992; Nissen, 2014). Subsequently, a considered framework for analysis is Mintzberg’s model of organization design that is applied as a framework to be checked for fit with heuristic work characteristics. The article closes with conclusions drawn and suggests directions for further research.

The assumption undertaken in that article is that organization design can create a match with algorithmic and heuristic work. The subject of the discussion is the process of designing an organization for algorithmic and heuristic work. This process (of designing organization) combines heuristic and algorithmic work in itself (see: Worren et al., 2020). The role of the designer is performed by people who take action (within the organization) that influences others’ work. As a result, each member of the organization is a designer although the spread of the influence can vary (operation core, middle line, strategic apex) (see: Mintzberg, 1979; Mohrman and Cummings, 1989; Veldsman, 2019). The process of designing starts with functions (Nadler names it purpose) (Nadler, 1997). Once they are defined, designers choose materials and collateral technologies. (Nadler, 1992). The product of the design (that could be an organization) is supposed to perform the functions in a given environment (Gerstein, 1992). In organization design, the functions are determined by the strategy which is describing the ways

to create value for stakeholders (Czarnecki, 2011). The assumption in designing asserts that form follows function (Sullivan, 1896). In organizations, it means that design follows strategy (Chandler, 1969). The materials applied can be different depending on the chosen organization architecture assumptions. The organizations are built on these assumptions regardless of the perception of the organization members. Each of those assumptions regarding the building materials can provide a foundation (Czarnecki, 2011):

Autonomy I	_____	I Control
Relations I	_____	I Task
Process I	_____	I Structure

Once the designers select the organization architecture assumptions, they can start the process of designing. The role of the organization design is to build a space in which people will act for the benefit of their own and at the same time will strengthen the competitive position of the organization (Sengul, 2019). There is no one best design for each context but multiple possibilities to be considered (Burton and Obel, 2018). As architects shape the behavior of people who enter a given building, designers shape organizations where certain behaviors can be encouraged, limited, or prohibited (Deci, 1987). Each organization is an environment for people who contribute their competencies to perform work (Prahalad and Hamel, 1990), and at the same time an open system consisting of elements that interact, behave and create patterns (Thietart and Forgues, 1995). In the past organization design has been understood as a methodology for building structure. However, in the contemporary literature organization design is understood more broadly (see: Romme 2019; Clement and Puranam 2017; Foss and Dobrąjska 2015; Lee and Edmondson 2017). Such a perspective describes organizations as a collection of: elements, connections, and boundaries. Elements are design parameters such as: specialization of jobs, training, indoctrination, formalization of behavior, bureaucratic/organic, grouping, unit size, planning and control systems, liaison devices, decentralization. Connections arise due to coordination mechanisms: direct supervision, standardization of work, standardization of skills, standardization of outputs, and mutual adjustment. Boundaries are shaped according to contingency factors: age, size, technical systems, environment, and power (Mintzberg, 1980). Designers create organizations that can be analyzed through different perspectives. However, design parameters shape both the informal and formal side of the organization (see: Anand and Daft, 2007).

## 2. Algorithmic work

### 2.1. Criteria

The work performed by people can be differentiated into algorithmic and heuristic which differ in respect to three criteria. Each of them describes the characteristic of work. The first one is concerned with access to information that can be limited or unlimited (Köhler-Krüner, 2008). The second is related to results that can be predictable or not (Simon et al., 1958; Martin, 2009). The third criterion is learning that can be a one-time or continuous (Marsick et al., 1992). Algorithmic work is characterized by unlimited access to information on the work to be performed in a scope limited by the algorithm itself. Since people who do the algorithmic work perform a predefined sequence of steps, they are provided with the information to accomplish a task. The results of the work in algorithmic work are predictable. The idea of algorithms creation focuses on achieving efficiency (Brynjolfsson and McAfee, 2014).

People who follow the instruction should meet the standards and reach a predictable result. In algorithmic work, learning is a one-time event. Once the person learns how to perform an instruction, other learning is not present. When one knows how to achieve the result planned by the creators of the algorithm, the learning process is over. The characteristics of algorithmic work are summarized in Table 1.

Criteria	Algorithmic work	Comments
Access to information	Unlimited	Perfect information is available. People follow the instruction with described steps.
Predictability of results	Full	Once the set of instructions is followed, the result is the same.
Learning	One time	Once the person learns to perform an algorithm, no other learning takes place.

**Table 1.**  
Algorithmic work characteristics

Source: own elaboration, 2019.

### 2.2. Consequences

When algorithms are in use the circumstances have been simplified before the action by setting instructions to be followed. Algorithmic work requires analytical competencies (Martin, 2010). The reasoning methods are induction and deduction (Martin, 2009). A double learning loop is not performed by a person who has an algorithmic work. Since algorithms aim at efficiency, people receive no discretion in shaping combinations of resources. As Simon concluded people are limited in making rational decisions. The choices that we make are imperfect since we are subject to different biases. Hence he coined the term: bounded rationality,

and satisficing decisions (Simon, 1956). At the same time capacity of our brain is limited and can handle from 4 +/- 1 (Cowan, 2001) to 7 +/- 2 (Miller, 1994) elements at a time. The creation of algorithms aims at the reduction of the influence of human biases on the work. On the other hand, human information processing capacity is untouched by the creation of an algorithm. Algorithms are reducing the complexity into chunks that consist of the number of variables that can be comprehended by people at a given moment.

### 2.3. *Architecture fit*

Algorithmic work characteristics can be matched with organization architecture assumptions. Unlimited access to information is calling for a structure that allows for narrowing the focus through fragmentation. If the algorithm is to be performed, resources (including information) have to be at the disposal of a person. The predictability of results is matching control assumption that separates designers of the algorithm from people who perform it. The former group designs mechanisms for control whether the method, competence, or result standards are met. People are not invited to learn about alternatives to perform a job. One time learning is calling for undertaking task assumption that is narrowing the focus to a piece of work that has to be done. Learning is considered a task that is performed in order to create capacity for running an algorithm. The formal connection among people is already defined by structure (Anand et al, 2007). The set of control – structure – task is matching the characteristic of unlimited access to information, predictable results, and one time learning that characterizes algorithmic work.

Autonomy I	_____	X—	I Control
Relations I	_____	X—	I Task
Process I	_____	X—	I Structure

### 2.4. *Organization design fit*

Within the undertaken architectural assumptions organization design matching algorithmic work should consist of design parameters and coordination mechanisms that fit the characteristic of that work. Access to information requires fragmentation of the organization that can be done through functional or market grouping. The predictability of results invites designers to use coordination mechanisms of standardization since they are aimed at achieving repeatable results. Indoctrination allows for the reduction of questioning algorithms and the sense of its' design. Training is required for as long as it takes to learn an algorithm. Specialization of jobs is high so that the focus is narrowed and algorithms are possible to be created. The organization becomes bureaucratic in nature. Focus on efficiency suggests that there may be reasons for large unit size, centralization,

formalization of behavior and, few liaison devices. The planning and control systems are developed so that measurement can be performed and deviation from the standard assessed. The contingency factors that match algorithmic work are low complexity and dynamism of the environment since otherwise, algorithms require redesign. However, technical systems can highly regulate work while power focus is placed on the strategic apex that is at the same time the designer of the algorithms performed.

### 3. Heuristic work

#### 3.1. Criteria

In situations when taking an action requires processing more items of information than the limit of our capacity, we use heuristics. They are „...the rules of thumb (or generative rules) that organizational actors have to learn in order to cope with uncertainty and with organizational rules that are no longer fit for purpose” (Magalhaes, 2018). Another way to define heuristic is „...open-ended prompts to think or act in a particular way” (Moldoveanu, 2009). Activities that require the application of heuristics share three common characteristics: limited access to information, unpredictability of results, and continuous learning. The dynamism of the environment can lead to a situation where obtaining information is impossible. Presence of factors that one has no impact on leads to unpredictability of results. Learning is a necessary component since heuristic work requires the development of competencies. When facing three conditional situations, heuristic techniques work as simplification mechanisms. Due to the use of heuristics, the time that humans take to make a decision is reduced.

Criteria	Heuristic work	Comments
Access to information	limited	Perfect information is cannot be obtained due to dynamism of change.
Predictability of results	none	There are external factors that shape the final result that one has no control upon.
Learning	continuous	Performance of the heuristic work requires development of competencies.

**Table 2.** Heuristic work characteristics

Source: own elaboration, 2019.

#### 3.2. Consequences

Heuristics have roots in intuitive thinking (Amos et al., 2002). People who perform heuristic work at a given moment may omit the information that is relevant for the decision to be made. It may lead to mistakes. However, people do use heuristics (and make mistakes) since otherwise, the surrounding complexity

would block them from making decisions by the necessity to collect and to analyze the inconceivable and uncollectible amount of data. The reasoning method applied is abduction (Martin, 2009). A double learning loop takes place since people performing heuristic work can question the criteria on the base of which they perform their work. Heuristics deals with complexity in a different way than algorithms. Instead of the Newtonian approach of analytical fragmentation of the reality that algorithms do, heuristics is rooted in the application of simple rules that narrow down the focus (Brown and Eisenhardt, 1998; Sull et al., 2016). Heuristic and algorithmic types of work are performed by organizations in different stages of processing knowledge. Once the uncertainty is faced with regard to results, the heuristic is in use and allows for simplification of the faced issue by narrowing down the focus (Amos et al., 2002). Then, if the implemented solution brings the results, the algorithms can be developed and delegated (to people or machines) in order to limit the use of resources and exploit the knowledge (Martin, 2009).

### 3.3. *Architecture fit*

Limited access to information is fits process assumption. It is a receiver oriented approach that allows for changes in value creation. Autonomy creates a space in which people who perform heuristic activities have discretion in choosing time, place, and method applied (Hackman and Oldham, 1975). Since results of heuristic work are unpredictable, autonomy is expected to create a space where one can question current methods and ways and apply (use) a double learning loop instead. Professionals who are employed should be able to use their competencies and judgment (Amabile, 2004). Focus on relations enhances communication which should enable the person performing heuristic work to send messages and as a result receive feedback that includes different perspectives. That in turn stands at the roots of continuous learning (Senge, 1990). Moreover, one can avoid personal biases when one performs a confrontation of personal insights with the external world facts. Once the assumptions are in place, the design parameters and coordination mechanism can be researched to fit with heuristic work.

Autonomy I	— X	—————	I Control
Relations I	— X	—————	I Task
Process I	— X	—————	I Structure

### 3.4. *Design fit*

Different organization design is matching heuristic work characteristics than algorithmic ones. Limited access to information requires judgment and the use of competencies (Simon, 1958). The formalization of behavior and standardization are not a match. The relation assumption in organization architecture requires

coordination mechanisms to be tending toward mutual adjustment (Blau and Scott, 1962). The results of the work are unpredictable but a high level of training increases the level of competence and becomes an element of continuous learning. The specialization of jobs is limited since heuristic work requires knowledge about different aspects that can be influenced with a given decision. To avoid personal biases and simultaneously create a learning environment small teams are created (Tulshyan, 2019). Planning and control, if exist, take the form of direction setting rather than a target. Multiple liaison devices allow for mutual adjustment as a coordination mechanism. The organization is decentralized. When contingency factors are concerned, organizations may face a dynamic and complex environment. Technical systems are not regulating the work of people. Experts that perform heuristic work possess power. The organization design becomes organic.

## 4. Conclusion

### 4.1. Design conclusion

The analysis and synthesis of the research lead to the identification of design parameters and coordination mechanisms that match the heuristic work. Mintzberg in his study presented five configurations that can be applied for organization design: simple structure, machine bureaucracy, professional bureaucracy, divisionalized form, and adhocracy. The conclusion that arises is that heuristic work requires organization design that is close to adhocracy configuration. The coordination mechanism of mutual adjustment as well as design parameters match the heuristic work. One of the reasons for that can be the fact that both adhocracy and heuristic work are connected to dynamic and complex environments. Informal structures are not limiting the possible behaviors of people in the organization. (Lawrence, 1967). Adhocracy design does not narrow the focus of a person to comply with norms, standards, and procedures. People can use their competencies in search of solutions that are beyond the boundaries of internal and external boundaries. Table 3 summarizes the adhocracy design parameters which are a match for heuristic work.

**Table 3.**

Organization design fit for heuristic work

Source: on the basis of Mintzberg, 1980; and own elaboration, 2019.

	Adhocracy	Comments
Key coordinating mechanism:	Mutual adjustment	Limits the cognitive bias of an individual in heuristics.
Design Parameters:		
Specialization of jobs:		
- horizontal	High	People can perform professional judgements in the field of their expertise and are connected through mutual adjustment. Experts are relieved from the burden of administrative and managerial tasks.



	<b>Adhocracy</b>	<b>Comments</b>
- vertical	Low	The decentralization of the decision leads to search for collective agreements.
Training	High	Heuristic work requires education that supports search for patterns and causalities.
Indoctrination	Varies	-
Formalization of behavior	Low	The formalization of the work should not create limiting boundaries.
Bureaucratic/organic	Organic	The organic organization can be run by simple rules that give a common direction but do not limit the usage of core competencies.
Grouping	Small (throughout)	The coordination through mutual adjustment requires teams that have narrowed down number of members.
Unit size	Limited action pl. (esp. in Adm. Ad.)	
Planning and control systems	Limited action pl/ (esp. in Adm. Ad.)	Since the results of heuristic work are unpredictable the possibility of creating action plan is limited to creation of simple rules.
Liaison devices	Many throughout	Heuristic work requires liaison mechanisms to avoid cognitive biases.
Decentralization	Selective decentralization	Decisions are made by people who can handle a given heuristic with their expertise.
Contingency factors:		
Age	Young (Op. / Ad.)	-
Size	Varies	-
Technical systems		
- regulation	Low	Technical systems should not limit the solutions that are created with the use of heuristic.
- complexity	Low/High (Op. /Adm. Ad. )	
- automated	No/often (Op. / Adm. Ad.)	
Environment		
- complexity	High	The heuristic work is performed in circumstances characterized by dynamism and uncertainty.
- dynamism	High (sometimes disparate)	
Power		
- focus	Experts	The work based on heuristic requires professional judgement and expertise.
- fashionable	Especially	-

**Table 3.** continued

Designers of the organization can choose whether algorithmic work should be performed by people or by machines (Bailey et al., 2020; Ford, 2015; Spencer, 2018). Organizations can identify which work performed by people is algorithmic and which is heuristic. Then, designers can decide whether technology should replace the work performed by people. Once those two choices are made, the design of the organization can be proposed that matches a type of work performed inside. Algorithmic work is being replaced with machines. Organizations can face a challenge that is in designing for heuristic work. Such design invites people who will be a part of the organization to bring in the competencies. Professional judgment and expertise are components that heuristic work is requiring. The design itself should be meeting the three architecture criteria of autonomy – process – relations. None of other than adhocracy configurations proposed by Mintzberg is based on such assumptions. If four out of five configurations do not match the heuristic work, it may happen that other configurations will appear. People should answer themselves if organizations are designed in a way that allows them to use their competencies and heuristic.

## 5. Implications

Tools for measuring a scope to which work has heuristic character can be developed. Implementation of such an instrument would allow for further empirical studies equipped with measures of the phenomena. Secondly, a set of measures for the evaluation of organization architecture could be developed. Thirdly, a set of measures for organization design parameters and coordination mechanisms can be proposed. As a result, the opportunity to assess the degree to which organizations encounter the adhocracy parameters would be created. Finally, empirical research could test whether organizations that perform heuristic techniques are designed as adhocracy and whether they should be designed this way. An alternative path of further research is concerning factors affecting learning in the organizations and their influence on the performance of heuristic work. Since organizations are social entities created for people who are performing heuristic work, learning is a component that shall be considered as relevant in further studies.

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