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Heuristics and Evidences Decision (HeED) Making: A case study in a systemic model for transforming decision making from heuristics-based to evidenced-based

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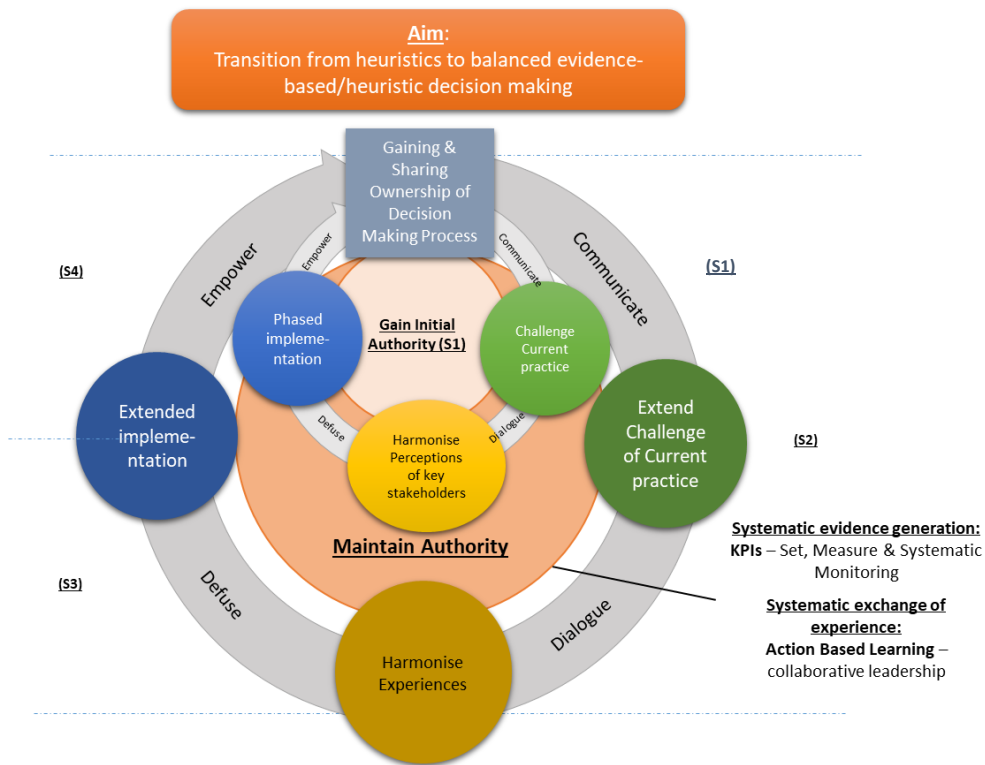


Figure 1. The generic HeED model.

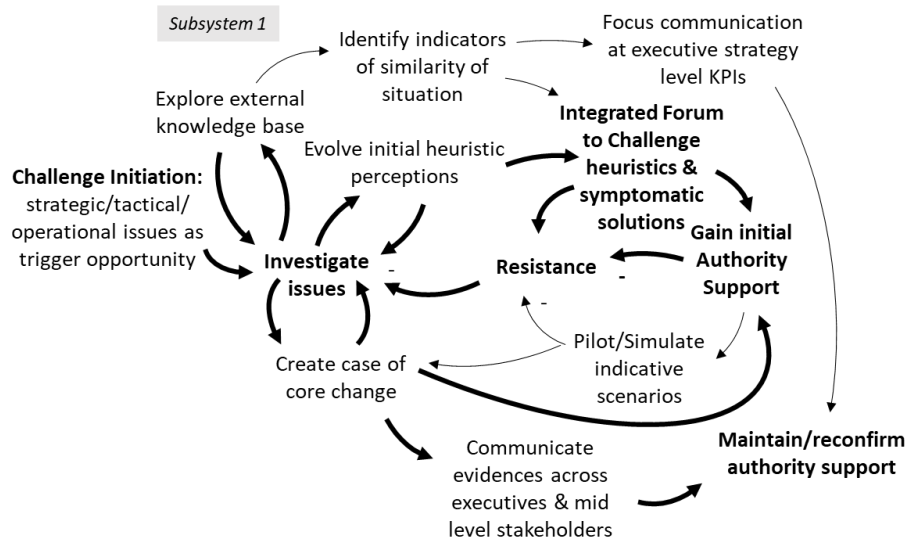


Figure 2. Communicate initiative and challenge initial heuristics subsystem

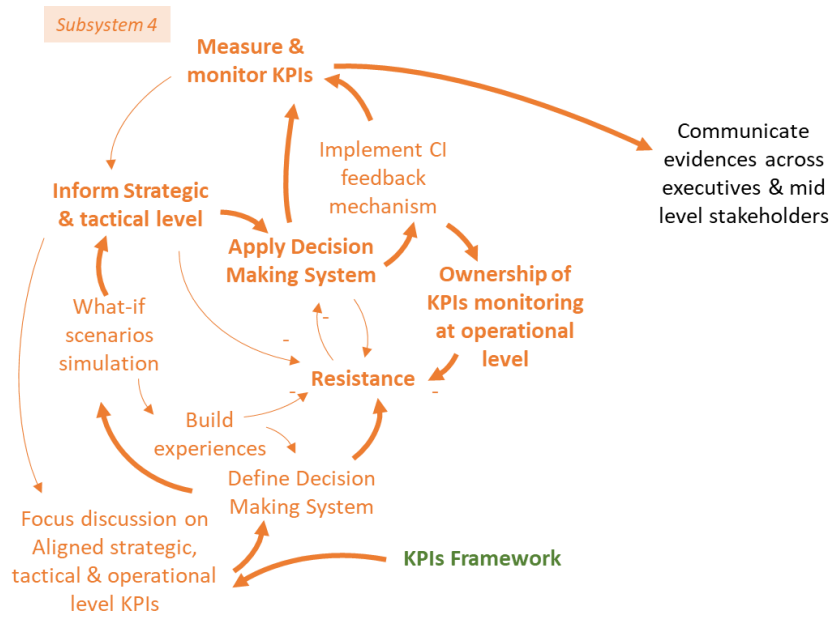


Figure 5. Empowering implementation of Systemic Decision Making Process Subsystem

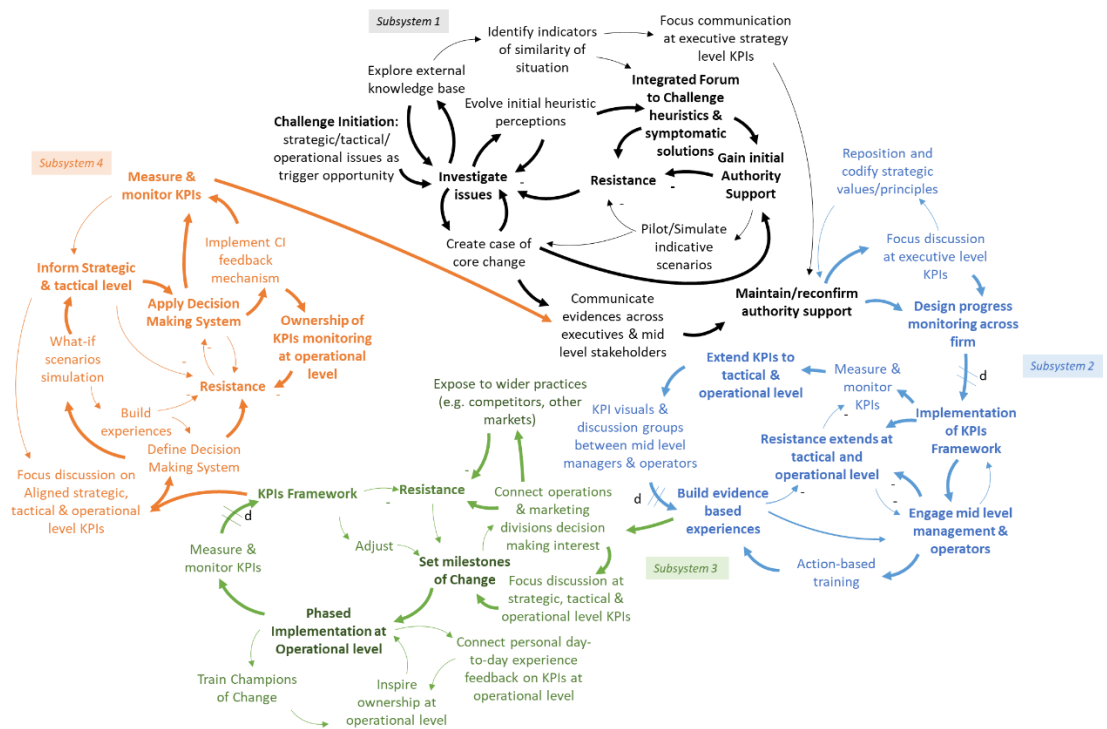


Figure 6. The overall HeEd systemic logic

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Abstract

Studies refer to Heuristics and Evidences Decision Making approaches in a comparative manner, however it is identified that these two approaches are inseparable and are applied in parallel. The objective of this paper is to provide a qualitative analysis of a systems thinking framework that defines a transition path from either a heuristic dominated or evidence-based dominated decision making approach to a balanced one. The aims are to demonstrate the stages of change and prepare managers and executives for the resistance that will be evident during the transition. We do not claim that this is the only path of change, however it provides a structured model that can be repeated under similar context. We use abductive reasoning in order to make logical inferences and construct the framework's theory based on a case study company, and then system dynamics that help us proceed to the modeling approach of this framework. The holistic modeling approach reveals the need to base decision making in both evidence and heuristics. Furthermore, it demonstrates actions to manage resistance and to make this system a self-regulated and continuous decision-making tool.

Key Words: Heuristics, Evidence-based decision making, Change Process, Resistance to Change, System Dynamics Modeling

Introduction

A decision making activity is considered as a managerial action mostly under the control of the organization (Elbanna and Child 2007), even though a complicated and challenging one (Parnell et al. 2011). Literature implies that individuals make their business decisions mainly depending on the risk levels of each decision (Min and Chuna 2019), while managers and executive teams often fail when making strategic decisions due to the fact that these decisions are both complex and ill-structured (Carmeli et al. 2012). Actually, the decision makers in the manufacturing sector are usually confronted with the problem of making a decision through a wide range of alternative options (Venkata 2007). Taking into consideration the complexity and the risk of decision making process, literature reveals several modeling approaches used in order to assess the risks and probabilities associated with decision processes (Lindley 2000: 293; Nutley and Davies 2000; Sarasin 1999). In this paper we study two literature approaches to decision making, namely the evidence-based and the heuristics, and how these two approaches often bring conflict and resistance among the executives, managers and employees. Literature refers to these methodologies identifying their positive and negative points and quite often to their comparison (Gigerenzer et al. 1999). What is identified as a literature gap, is that in practice these two approaches are inseparable and are applied in parallel. According to Pachur and Forrer (2013), these two approaches can mutually interact towards a better understanding of contingent nature in decision making. Our article deals with this gap by providing a systems thinking approach to build an analytical framework, based on a case study company.

Evidence-based decision making (EBDM) is a practice of making decisions which consolidates the most efficient available research evidence with the decision maker's personal competences and the employee/customer's preferences (Vishwanath and Farimah 2012). Rousseau (2012) considers evidence-based management as a process that demarcates principles from research data and translates them into practices that may help solving organizational issues and make decisions. Tranfield et al. (2003) consider EBDM as a switch from traditional narrative approaches to systematic evidence-sensitive procedures. This process aims at leading the decision making practice to the direction of more effective outcomes for the organization (Sackett et al. 2000). The main focus on the EBDM is the form of the actual 'evidence'. Regarding this specific matter, Sherman (2002) considers that evidence may be categorized according to a weak-to-strong scale, based on specific scientific rules. EBDM in the form of naturalistic decision making (NDM) describes how practitioners actually make decisions in complex domains such as organizational management or investment programs based on evidence (Shattuck and Miller 2006). According to Julnes and Holzer (2001) the process of EBDM requires at least two crucial approaches: the first one considers that evidence-based decision making should be embedded into the organization in such a way that may capitalize value and embrace evidence application over intuition in implementing organizational strategies. Such an approach allows individuals to make effective and timely decisions (LaValle et al. 2010). The second approach comprises a coordinated procedure of sequential evidence-based actions in which an organization clusters, processes and uses evidence in the forms of data. If evidence is not collected, subsequently organizations are not capable of analyzing information in order to make proper decisions. Correspondingly, if evidence is not analyzed at a frequent and efficient way, employees and managers may be drifted towards incorrect decisions. Moreover, evidence in specific forms such as statistical formats, has a significant impact on improving EBDM in terms of time required and accuracy of decisions (Arribas et al. 2014) but if the results of evidence analysis are not fully incorporated into decision making, it may lead to a severe loss of financial and organizational resources (Julnes and Holzer 2001). Finally, Rousseau (2018) further categorizes EBDM into three major decision processes, the 'routine decisions' for clear cause-effect understanding, the 'non-routine decisions' for complicated decisions for which their information is existent but not currently available to the decision maker and the 'truly novel decisions' which require critical but currently non-existent information.

1 On the other side, heuristics are considered as general decision making strategies based on
2 limited information, which, however, are often proven to be correct (Shah and Oppenheimer
3 2008). Krabuanrat and Phelps (1998) characterize heuristics as procedures for taking decisions
4 made by individuals or the organization in total, in the course of experience. When information
5 gathering costs are high, individuals tend to rely on non-compensatory heuristics (Bröder and
6 Schiffer 2006; Pachur and Forrer 2013). Amongst several key facets to understand knowledge
7 management, heuristics may be considered the comprehension of specific values of space, time
8 and passion (Friedman and Prusak 2008). Moreover, Tversky and Kahneman (1974) consider
9 three basic types of heuristics - representativeness, availability and adjustment - as the core
10 means to be applied at most heuristic-based decisions. Furthermore, representativeness heuristic
11 can be considered as a ‘gambling’ procedure that makes predictions, having as known
12 prerequisites the functional form and the parameters of the underlying process (Krawczyk and
13 Rachubik 2019). Walumbwa et al. (2014) view heuristics decision making (HDM), as a decision
14 making type seeking to maximize justification of the decision while minimizing cognitive effort.
15 The core of HDM is that there is no optimal solution to problems, but heuristics may be used as
16 ‘mental short cuts’, in order to make good enough decisions. Moreover, according to Eastwood
17 et al. (2012) it is possible that individuals will be choosing heuristic approaches on occasions
18 when a decision must be made directly and related information is difficult to obtain. Heuristics
19 approaches deescalate the cognitive burden regarding decision making (Shah and Oppenheimer
20 2008) and they may be considered a primary source of competitive advantage (Krabuanrat and
21 Phelps, 1998). Gigerenzer (2001) assumes that HDM allows fast and frugal decisions that may
22 be easily comprehended by most individuals and can be applied to new situations, specific types
23 of problems and particular environments. Moreover, Busenitz and Barney (1997) claim that in
24 case of environmental uncertainty and complexity, heuristics can be an effective and efficient
25 guide to decision- making, as well as that the use of heuristics has been found to be associated
26 with innovativeness. Furthermore, the heuristics decision making process includes views and
27 capabilities of making decisions based on predictions, without taking plain cognitive data into
28 consideration. Schuldt et al. (2017) mention that people performing analytical tasks must also be
29 able to predict and express the possibility that their plans and estimates are correct and they will
30 succeed. However, regarding heuristics known processes there is not an absolute factor theory
31 that can fully explain the cognitive biases that a heuristics-based decision contains (Svensson et
32 al. 2018).

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36 Literature review often refers to the comparison of these two decision making methods.
37 Evidence-based decision makers consider HDM as a tool useful for daily interactions where
38 quick decisions are required under a limited set of data available (Gigerenzer et al. 1999). In
39 fact, HDM operates as a mean to a prototypical representation of a decision, by creating a
40 decision based on memory-bin representations from previous experiences rather than a decision
41 based on the actual evidence of the current condition (Wyer and Srull 1986). Moreover,
42 empirical literature has shown that heuristics are used only by a fraction of subjects, and only in
43 certain situations (Bröder and Schiffer 2006; Pachur et al. 2008). Furthermore, Martin and
44 Moon (1992) proved in their experimental study that a “partial-knowledge” framework in the
45 case of price distribution is a far more effective decision making approach in comparison to a
46 “no-knowledge” heuristics approach, emphasizing the significance of evidence at a medium
47 level at least. Other authors consider HDM as a decision making process that is not processing
48 the information objectively (Hofmann 2015), while others emphasize that heuristics can
49 transform and even deform decision (Weber 2019). Taking into consideration these arguments,
50 it is significant to consider a mixed decision making model that may combine the speed of
51 HDM at specific managerial aspects that previous experience plays a crucial role, with an
52 EBDM that may be applied at circumstances where detailed analysis of data and
53 situations/procedures is required. Yilmaz and Daly (2016) in their paper suggest also this
54 combination, by examining evidence for design heuristics in the creation of multiple design
55 concepts.
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1 Therefore, the objective of this paper is to demonstrate in practice the process of initiating
2 a balanced decision-making approach, coupled approach between Heuristics and Evidence-
3 Based Decision process, considering the different levels of hierarchy and resistance to change
4 that are typical in a manufacturing firm. In order to switch from each one of the two different
5 decision-making approaches to a balanced one, we study the process of change and how this is
6 applied to a case company. The case company is a manufacturing company based in the Middle
7 East, operating in diversified sectors within the healthcare industry¹. The core operations of the
8 firm are as a developer and producer of brand-generics, the Company's mission is to enable
9 quality healthcare for all people, through diversified and innovative contributions to the global
10 healthcare industry.

11 According to Buono and Kerber (2010), change capacity is the ability of a firm to change
12 more than once, making change a canonical response to changes in the firm's external
13 environment while regarding firm's change performance, that index may refer to multiple
14 organizational aspects such as the level of attainment of the change objectives and catching
15 deadlines (Raineri 2011). Relevant studies have indicated that organizations successfulness is
16 directly related to organization's change capability, regarding their change projects'
17 performance (Teece et al. 1997). According to the conventional change management literature,
18 there are multiple alternative perspectives on resistance to change that may be applied to both
19 evidence-based and heuristics decision making and appear on strategic, tactical and operational
20 level. Piderit (2000) considers change a multi-dimensional concept, which implies that the
21 bisection of being for or against change is too simplistic to actually reflect the complicated
22 reality of employee's responses to change challenges at all levels.

23 Taking all the above concepts into consideration, the contribution of our research is two-
24 fold. First, we contribute to a literature discussion concerning the importance of linking the two
25 decision-making methods, HDM and EBDM, in order to create a new approach, a balanced
26 evidence-based and heuristics decision making (coupled approach between Heuristics and
27 Evidence Decision – named HeED), that would cover the disadvantages of each method when
28 applied separately. Second in order to do so, we provide a qualitative analysis of the holistic
29 modeling approach to the balanced decision making concept, in order to reveal the resistance
30 that the authority will experience during the transition and propose actions to defuse that
31 resistance. The modeling approach is based on the system dynamics (SD) theory and constitutes
32 a tool for the analysis of relations between the stages of change. This framework is constructed
33 by taking an experimental approach, observing and debating the operations and proposed
34 changes in a case firm, namely here as MiddlePharma, which faces issues in its supply chain,
35 manifesting in the form of sales loss, high inventory, cash flow shortages and tensions with their
36 clients.

37 **Methodology**

38 This research is based on a four year professional doctorate project at MiddlePharma. The
39 researchers gained access to information at all managerial levels of the firm over this period,
40 organizing debates, focus groups and piloting scenario based simulations. At the later phases of
41 the project the researchers gained support for the actual implementation of their propositions.
42 The methodologies used in this article to built and codify the framework from the case study of
43 the firm are abductive research and system dynamics. Abduction describes one form of
44 reasoning and plays a part in qualitative data analysis – specifically, in the identification of
45 themes, codes, and categories. There are several studies in abductive reasoning (Fernando et al.
46 2013; Gold et. al. 2010) presenting different ideas of what abductive reasoning consists of. We

47 ¹ For anonymity purposes we nicknamed the firm as MiddlePharma

1 are embracing the approach to abductive reasoning from an epistemic and dynamic perspective,
2 according to which abduction, is classified as common-sense reasoning rather than
3 mathematical reasoning (Fernando et al. 2013). All in all, abductive reasoning can be seen as a
4 process that involves four phases: (1) recognizing the existence of an abductive problem; (2)
5 identifying candidates for solutions; (3) selecting ‘the best’ solutions; and (4) assimilating those
6 chosen (Fernando et al. 2013). In the literature, an abductive problem is typically presented as
7 the result of a ‘surprising observation (whenever the agent does not know/believe it)’
8 (Nepomuceno-Fernández et al. 2013). In our research the stakeholders observed the operations
9 of MiddlePharma and identified possible solutions. The original proposition from the team,
10 which was based on implementing a small-batch production planning, faced resistance from the
11 main management team. Especially the operation managers dismissed such approach as
12 wasteful (e.g. because of increase of changeover, set-up and cleaning times for the production
13 stations). This rejection was based on their experience running the production line and had no
14 related measurement to justify it further. They, instead, were proposing, for some time before
15 this project, to invest in capacity increase, acquiring further production machines. The executive
16 team however was skeptical about such an investment.
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18 Experimental verification might be complex, time consuming and costly, simulation of
19 scenarios, therefore, is needed in order to select the best solution and then assimilation of those
20 chosen in a sense of Systemic Decision Making Process (Maani and Maharaj 2004; Mingers and
21 White 2010). Taking into consideration the increase of problems’ complexity and the fact that
22 these were addressed within Operations Research and Management Science projects, decision
23 making goals become increasingly imprecise (Stewart 1992). On the other hand, models that are
24 applied to organizations require generating frameworks that allow for different levels of
25 organization hierarchy to be analyzed (Haque et al. 2003). Many studies support that Soft
26 Systems Thinking (SST) methodologies is an answer to the increasing complexity of the
27 business environments and that it is superior to other approaches in dealing with complexity
28 (Snyder 2013; Sondoss et.al. 2015). SST-based approaches are more promising in complex
29 situations giving the managers the opportunity to describe the problem in its full systemic
30 context (Yurtseven and Buchanan 2016). Moreover, according to Maani and Maharaj (2004)
31 understanding systemic structures that underline organizational dynamics is a crucial
32 prerequisite for the development of robust strategies. Furthermore, they support the notion of the
33 ‘heuristic competence’ decision making as highly analogous with the notions of systems
34 thinking, as introduced by. In a heuristic decision making process, individuals tend to revise and
35 adjust past behaviors in response to social and psychological interactions within a complicated
36 decision environment. Heuristic decisions made in such an environment are quick and
37 adjustable and not necessarily considered “irrational.” But they may be considered
38 unpredictable without a coordinated measurement of either the personal or the cognitive factors
39 that may influence the longitudinal procedure the decision maker has gone through (Phipps
40 1988).
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44 Furthermore, all organizations are socio-technical systems and are characterized by their
45 complex nature (Skyttner 2006; 2001), which justifies the SST methodological approach as an
46 appropriate method for modeling the decision making process and understanding the
47 interrelations of different stages and actors. System Dynamics (SD) is one approach of
48 codifying soft system models. SD originated in the early 1960s and was pioneered by J.W.
49 Forrester (1961, 1980). Under this approach, organizations are analyzed and viewed most
50 effectively in terms of their common underlying flows, instead of in terms of separate functions
51 (Samara et al. 2012). The behaviour (or time history) of an organization is principally caused by
52 the organization’s structure. The dynamic complexity arises because these structures are
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1 tightly coupled, governed by feedback, nonlinear, history-dependent, self-organizing, adaptive,
2 counter-intuitive, policy-resistant, and characterized by trade-offs (Sterman 2000). The entire
3 SD process is divided into two phases: the first phase is the qualitative analysis of the system
4 and the second phase is the quantitative analysis of the system (Coyle 1996). During the first
5 phase a causal-loop diagram is designed, which is then converted to a stock and flow diagram.
6 During the second phase the stock and flow diagram is translated into a simulation program,
7 which is then verified and confirmed. The program is implemented for alternative scenarios and
8 the results are analyzed.

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10 In this paper we analyze the first phase according to which we result to the policy planning
11 for the change process. Literature review reveals other studies using the SD approach and
12 discussing the first stage of the system formulation (Galanakis 2006; Maldonado and
13 Grobbelaar 2017). More specifically, the first phase begins with the identification of the
14 system's purpose. The purpose of the system leads to the identification of the system's
15 elements, their relations (in the form of causal loop diagrams) as well as to its limitations. The
16 qualitative analysis ends with the causal-loop diagram formulation. This demonstrates a
17 information-action-consequences paradigm. These consequences generate further information
18 and actions which may, in turn, continue the process (Galanakis 2006). The dynamic behaviour
19 of this loop is the base of any analysis and the understanding of the overall implications of
20 actions among the related stakeholders (Senge 1990). Mental scenarios are possible to be
21 described and implemented at this stage without the need for engaging to the simulation stage.
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24 Soft system methodologies cover a wide range of approaches that hard methodologies
25 cannot capture and allow the decision maker to handle a complex situation in its full system
26 context. The framework presented in the study, codified with the use of system dynamics, will
27 help managers and executives to have a path for the stages needed to succeed a balance based
28 decision making process. In this way, they will encounter the resistance of the organization and
29 proceed to reforming of the heuristic-only-based thinking, via the systematic use of Key
30 Performance Indicators (KPIs) generating evidences and exchange and evolvment of
31 experiences.
32

33 **Change Process**

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35 The transformation of a heuristics to a mixed evidence-based and heuristic decision making
36 model requires the implementation of a change process to the organization, as an aspect of
37 corporate management. The concept of organizational sustainability is primarily defined as the
38 organization's ability to change (Kilintzis et al. 2019), indicating that change is a requisite for
39 any dynamic manufacturing organization (Dooley and O'Sullivan 1999). Literature provides
40 several change process models, often focused on different organizational elements, such as
41 employee reaction, practical execution of specific organizational steps, environmental factors
42 and the broader linkage between individuals, groups and the organization itself (Stragalas 2010;
43 Judge and Elenkov 2005). Among others, Bridges (2003), Schein (2004) and Kotter (2007) have
44 applied their proposed models at corporate level. The first two are considered as process
45 models, mostly discussed at an individual or group level, whilst the third one is better assorted
46 as a change implementation model (Stragalas 2010).
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50 Strategic change is an emergent process (Balogun and Johnson 2005) that according to
51 Bridges (2003), takes places at an individual level through distinct stages. An individual begins
52 the change process by sensing a specific negative feeling of discomfort, then passes through a
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1 time of psychological re-patterning and concludes the change process with a feeling of new
2 purpose to make the change feasible and applicable. Schein's model is also applied through
3 specific stages, considering change as a process that starts with the 'Unfreezing Stage' where
4 the individual considers that he/she has to act in order to achieve change, then moves to the
5 'Cognitive Restructuring Stage' and concludes the change process through the 'Refreezing
6 Stage' (Schein 2004). Organizational change is a multi-level dynamic process (Dawson 1994)
7 that comprises collective effort of multiple actors. Managers are urged to consider and apply
8 change mainly due to poor organizational performance (Amason and Mooney 2008), while a
9 valid framework on how to apply organizational change efficiently is lacking (Heckmann et al.
10 2016). From the managers' and stakeholders' point of view, resistance may be expected if
11 attempted changes modify organizational values. Kotter (2007) considers the change process as
12 a procedure that starts with establishing a feeling of urgency, then forming an effective guiding
13 coalition, creating a vision for the participants, empowering the participants to share, co-own
14 and act on that specific vision, designing and targeting short-term gains, consolidating possible
15 improvements and creating more change and finally institutionalizing the new approaches to
16 change. Unlike the previous models, Kotter's model of change process separately defines the
17 changes that may take place on individual (employees), organizational and managerial
18 (leadership) level. Thus, it may be more feasibly applied to modern organizations, as an anchor
19 used for designing a change model fitting to their exact needs.
20

21 Taking into consideration the above mentioned models of change process and by using
22 abductive reasoning in MiddlePharma, the authors propose a conceptual framework that
23 captures the stages of the change process (Figure 1). The stages perform a dynamic feedback
24 cycle composed of four subsystems:
25

- 26 1. Communicate initiative and challenge initial heuristics subsystem (S1), that
27 challenge current practices and be legitimized by a level of authority;
- 28 2. Extend practice at tactical & operational level subsystem (S2), steering a
29 constructive dialogue among different divisions, levels of hierarchy and
30 stakeholders, in order to harmonize perceptions and to build common experiences;
- 31 3. Expanded implementation at operational level subsystem (S3), through phased
32 implementation that generates early winners to be shared across the divisions and
33 hierarchical level; and,
- 34 4. Empowering the implementation of the decision making process (S4), transferring
35 the feeling of ownership across the firm (division and hierarchical lines) and
36 empowering participation at all levels.
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41 This conceptual framework illustrates the changed process proposition for a coupled
42 approach between Heuristics and Evidence Decision (HeED) Making. The initiation of the
43 HeED is that the executive team sets the aim of transition and a firm support, generating the
44 spark of change (inner cycle). The core of the framework is based on two elements: a systemic
45 evidence generation process, which forms new experiences for the various actors of the process;
46 and the diversion of internal discussion from "experts" opinion to controlling and monitoring a
47 set of measurable Key Performance Indicators (KPIs). The new experiences lead to reform the
48 heuristic-based thinking and perceptions. For example, for the description of current practices, it
49 is necessary to collect data related to issues raised from across the firm's departments, to prompt
50 and challenge the initial perceptions across the firm and expose the differences on reasoning
51 behind the current decision making. The effort then is to harmonize these initial perceptions
52 with evidence-based understanding and exchange of experiences. This challenge though might
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be the main factor that raises resistance in the different organizational levels. The rerouting of the discussion on how to control and monitor the KPIs, defuse the arguments to a practical level. This finally, leads to agree on a phased implementation plan dealing with the KPIs and sets in place a systemic monitoring approach and continuous recalibration of actions based on measurable evidences, feeding to the next stage (external loop). This then will re-feed executives and mid-level stakeholders with new evidences, maintaining authority support, thus continuing the above process across the firm, forming a closed loop.

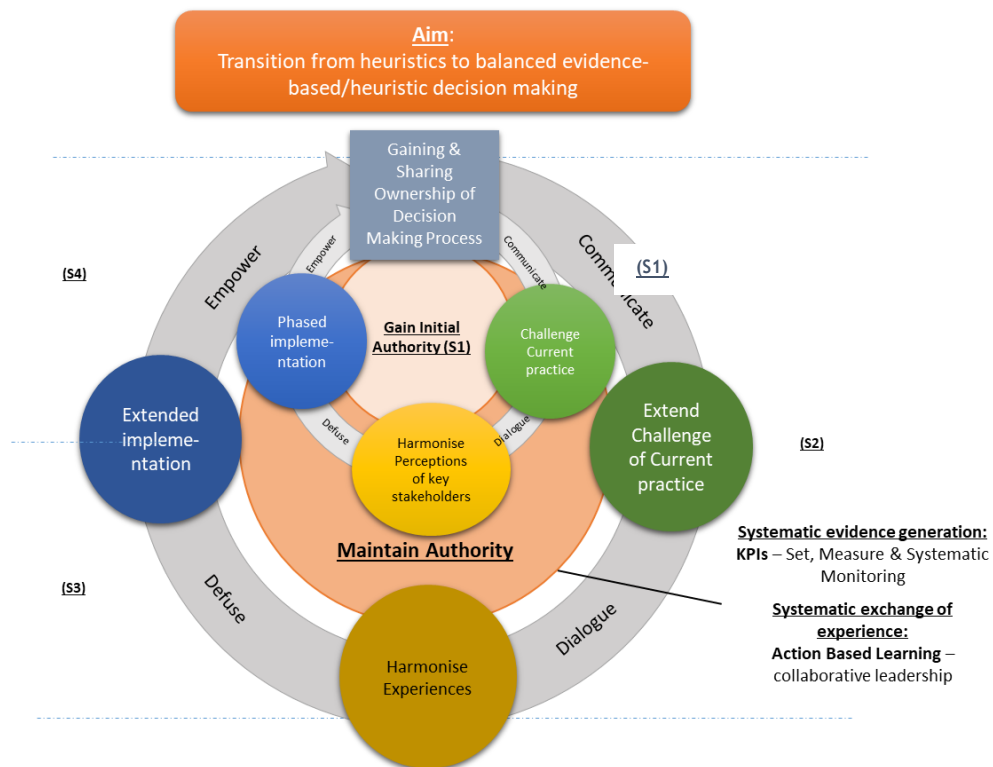


Fig. 1 The generic HeED model.

The following sub-sections introduce the details that constitute the HeED framework at each phase, how these are ‘threatened’ by resistance and how they will be ‘protected’ by countermeasures. In parallel, we codify the relations of these details into logical representations using a systems thinking approach, and we demonstrate how this thinking is applied to the case study of MiddlePharma.

Subsystem 1: Communicate initiative and challenge initial heuristics

For MiddlePharma, the initial challenge (*Challenge Initiation*) deals with the issues that the company faces in its supply chain, manifesting them in the form of sales loss, high inventory, cash flow shortages and tensions with their clients. In particular, MiddlePharma has a portfolio of more than 34 product families. Although the firm presents a 34% inventory to revenue ratio –

1 the average on the sector is 15% – it managed to fulfill 4 products orders at the requested
2 quantities and another 16 partially, ranging from 77% down to 1% of the required quantities, in
3 2016. This challenge raised the interest from the executive management (*Gain Authority*
4 *Support*) requesting propositions from all management levels, such as operations, marketing,
5 logistics and supervisors on the shop-floor. The initial reaction was that there was a lack of raw
6 material supplies due to shortages of capital and lack of capacity, particularly on the blistering
7 and coating stations, to produce all required quantities suggesting capital investment on another
8 production line. This opinion though did not explain the high inventory rate which is more than
9 twice the sector’s average (*Challenge Heuristics & Symptomatic Solutions*). Triggered from
10 that observation and supported by knowledge from models across the supply chain management
11 literature, the researchers prepared a challenging proposition – that the root of the issue lies at
12 the planning and control of the production schedule, which currently is based on a balk
13 ‘campaign strategy’², and could be replaced by a small-batch production mode. The common
14 reaction from the operation management was that the current system has been used for several
15 years. This practice they insist, is based on their understanding (operation managers and the line
16 supervisors) that the current practice reduces the need for change and the time for machine
17 cleaning (*Resistance*). Based on this proposition we requested access to build initial evidences
18 through a pilot project (*Investigate Issues*).
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21 At executive level, there was an urgency to focus the investigation on key performance
22 indicators (KPIs), such as the issue of cash flow availability and demand satisfaction. Based on
23 these, we designed an extended investigation project in order to generate evidences to support or
24 oppose the original hypothesis. The project included the simulation of a linear programming
25 model for demonstrating the effect on cash flow, profitability, inventory and demand
26 satisfaction based on three different scenarios: Scenario 1. level-based production, aiming to
27 minimize purchasing costs and targeting overall annual demand quantities; Scenario 2. demand-
28 chase strategy, aiming to maximize profits and targeting satisfying quarter demand delivery
29 targets; and Scenario 0. current practice that generated the base of comparison. The initialization
30 based on a proposed product mix that was used in 2016 for planning, which was believed to
31 maximize profitability, based on annual demand and machine capacity. All scenarios use a
32 safety stock constrain, as it has been set by current practice to 30%. This high level of safety
33 stock demonstrates another element of the inefficiency of the current practice.
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36 This simulation gave us the opportunity to investigate in detail a representative family of
37 products and simulate alternative production modes. The analysis of the data from interviewing
38 managers and operators revealed two elements. First, the production planning was based on a
39 ‘campaign strategy’ design, which originates on the belief by operation management and
40 operators that in this mode they utilize the use of the machines, reducing change over time
41 which enables them to bargain on supplies of raw material due to economies of scale and to
42 smooth their process. This perception though, does not reflect the understanding at executive
43 level, which does not consider that the firm has a campaign type production design, or has seen
44 any evidences to support this choice. Second, the prioritization of production and product mix
45 decision was made in a meeting between the operation director and purchase and production
46 managers, who based their choice on their experience according to which product has the
47 highest profit margin and on which supplies are available. However, this production schedule
48 does not reflect requirements from sales and marketing (e.g. monthly demand patterns and
49 product-combination of orders). Furthermore, based on past experiences with unfulfilled
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53 ² In this case we define ‘campaign strategy’ as balk production of a single product family that does not
54 require tool changeovers and cleaning, based on annual demand.
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1 sales, the marketing department was requesting for a 30% safety stock in order to be able to
2 serve their clients, which in addition was straining inventory levels.

3 An initial analysis derived from our research and the simulation of the different production
4 modes (level-based production and demand-chase strategy) of the representative product family.
5 The cash flow issues, loss of sales and high inventory, might be based on the chosen production
6 mode and the lack of communication between operations and marketing. The suggestion on
7 moving to a different small-batch production dismissed as costly luxury from operations
8 managers and operators. These evidences though refocused the discussion at executive and mid
9 level stakeholders for the need of integration across the different departments for production
10 planning and reconfirmed that unveiling the reasons behind the issues that the firm was facing,
11 required further systematic investigation to produce evidences (*Maintain/Reconfirm Authority*
12 *Support*).

13 *Modeling approach:*

14 The initiation of the change process (Figure 2), or in simple words, setting the actual ‘reason’
15 that change in the initial heuristic perceptions should take place for, is the starting point of most
16 models. Thus, Bridges (2003) describes the ‘New Beginning’ stage as essential for setting the
17 new challenge to the organization, while Kotter’s stages (2007) discuss the need for challenged-
18 related vision creation, vision communication and vision empowering as critical for adopting
19 and implementing change. Furthermore, the main goals for both heuristic and evidence-based
20 decision making models include challenge initiation as a primary mean to adopt change.
21 Gaining and reaffirming authority support is a crucial element in the change initiation stage.
22 Managers at strategic, tactical or operational level may have different levels of inclusion of the
23 change need or the change process. From the stage of *Challenge Initiation*, authority needs to
24 be informed, consulted and to participate in the change implementation.

25 Organization’s *Authority Support*, including both management and stakeholders (e.g.
26 internal stakeholders such as division managers or employees and external such as suppliers), is
27 demonstrated by the engagement in a dialogue to provide information and debate, including the
28 actual reasons for the change need and the change objectives. Furthermore, they participate in
29 the initial process of anticipating potential complications and determine how these may be
30 overcome (Ionescu et al. 2014). Managers and supervisors are considered the most suitable
31 organizational members to initially identify pilot indicative scenarios of the change process that
32 will lead to built initial evidences. Schilling and Steensma (2001) argue that at this phase,
33 change processes are directed by multiple strategic considerations that need to adopt more
34 integrated ways of operating. This is necessary in order to identify propositions that tackle
35 **symptomatic** solutions and not the **core** problem. The core considerations typically result in
36 structured change processes based on the assumption that change process consists of a variety of
37 interventions, which may be regarded as measurable, linearly manageable, and, objective initial
38 evidences³ for both decision making forms (Rugman and Hodgetts 2001). Generally, the usage
39 of specific information that have been used in order to turn troubled companies around or to
40 create long-term successes may be the most suitable type of evidence in evidence-based
41 decision making (Pfeffer & Sutton in press). These initial evidences need to be harmonized
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50 ³Evidence is defined in our work as an organized body of information that is used in order to justify or
51 support conclusions (Sackett et al. 2000). This information may have many forms, depending on the type
52 of activities that are going to be used for and the scientific or managerial context they refer to. For
53 example Sackett et al. (2000) consider information, as forms of evidence that may be used for evidence-
54 based decision making.
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with initial heuristic perceptions. As a result, **Resistance** to this change is created, which is amplified when the change process is regarded as a more complicated procedure and requires considerable adaptation, such as **integrated** ways of operation or structural changes.

In order to move on, it has been suggested that executives and mid-level managers should let their old work patterns go and **Investigate new Issues**, taking into consideration external knowledge and the **Use of Strategic, Tactical and Operational Issues as trigger opportunity**⁴ (Oreg 2003). Therefore, they can draw parallel experiences and can identify strategic KPIs that may be used to **Maintain/Reconfirm Authority Support** in order to implement the suggested structural framework. According to Marsee (2002), organizational changes are experienced by lower organizational members through the agencies of their superiors, making authority an important factor in change initiation. While trust may be empowered by the general organizational performance and vice versa (Chakravarthy and Cho 2004), trust in authority specifically is the primary factor that may help gain the employees' confidence, including reliability, integrity and credibility in investigating issues, that will in turn result in identifying initial heuristic perceptions (Li 2005). Organization's authority may shape employee's understanding and attitude towards the change initiative, accordingly enhancing or reducing resistance to change (Jones et al. 2008). Moreover, managers and supervisors are considered the most suitable organizational members to initially identify when resistance is taking place, and the actual reasons behind resistance occurrence (Ionescu et al. 2014). The exploration of the external knowledge base allows the company to identify similarities or differences between the ways that the two perceptions will deal with the challenge/situation. This process leads to the **evolution** of the initial heuristic perceptions and **focus** the discussion at executive strategy level on designing and communicating strategic Key Performance Indicators.

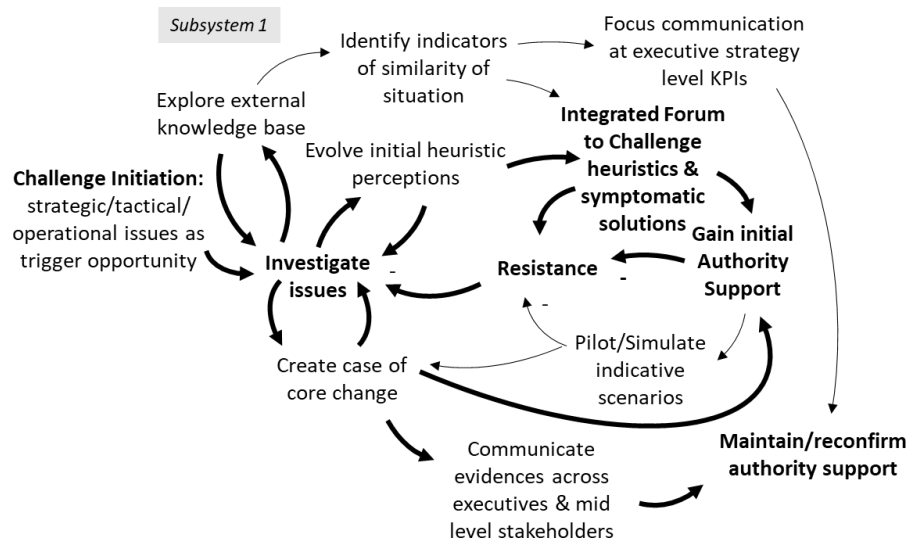


Fig. 2 Communicate initiative and challenge initial heuristics subsystem

⁴Often the reasoning for change are external to the firm factors, for example the activities and innovations of the competitor organizations, developments in technology and organizational procedures, diversity in customers' requirements, changes in national and international legislation, diversity in local and global trading and economic circumstances and changing cultural and social conditions (Radovic-Markovic 2007).

Subsystem 2: Extend dialogue evidence building

1 After maintaining authority support (*Maintain/reconfirm authority support*) for further
2 investigation as a next step, the firm focused the discussion at the KPIs and tested the evidence
3 from the simulation which was revealing a very different picture from the initial perspectives of
4 managers and operators. All scenarios demonstrated a totally different product mix than the
5 chosen one from the managers and operators. Scenario 2 demonstrated that it is possible to
6 produce 30 product families with the current capacity, fully covering and on time demand
7 requirements, compared to the partial production of 17 product families with the current
8 practice. This combination potentially could improve financial performance dramatically, from
9 \$8.900.000 gross margin of the current practice to a potential of \$18.500.000. This change
10 comes with a small increase on setup costs from around \$120.000 currently to \$200.000. The
11 inventory mix increases on value by 25% to around \$2.000.000 quarterly, but holding cost will
12 be reduced by almost 40% demonstrating the much higher turnover of the inventory. These
13 results were discussed at mid management level and with operators, taking most by surprise. At
14 that point, the discussion directed to an effort to make operation managers and operators to
15 agree on a measurement system which is based on the unutilized firm's ERP system that is able
16 to cover the tactical and operational level and provide visibility across the different levels
17 (*Extend KPIs to tactical & operational level*). The operators expressed their resistance to the
18 simulation results, dismissing the simulations as theoretical models and not an actual situation,
19 which could take the restrictions of the day-to-day operations (*Resistance*). Furthermore the
20 operators expressed the fear that the ERP system might reduce their freedom to operate and
21 control the overall process. They diverted the discussion to their understanding that the stations
22 (coating and blistering) are operating to their limit and there is a need for further capacity
23 investment.
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28 As a result we suggested to investigating further the utilization level of the different
29 production stages, engaging managers and operators to reconstruct measures from production
30 based on the current practice for 2016. The data that was provided by the managers fed further
31 our simulation model. This exercise had the nature of an action-based training activity that let
32 managers and operators to lead the experimentation and debate with settings and results, leading
33 to a common understanding (*Build evidence based experiences*). We identified that the capacity
34 issues are actually appearing on the packaging section in any of the three scenarios (from 75%
35 utilization level on the current situation up to 93% for scenario 2), rather than on the original
36 thought blistering (53% utilization level currently, up to 68% for scenario 2) and coating (from
37 71% utilization level down to 62% for scenario 2).
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Modeling approach:

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42 The debate of the initial evidences feeds the second subsystem (Figure 3) by **maintaining and**
43 **reconfirming the authority interest** about the transition from heuristics to evidence based
44 thinking. Building-up evidence, may lead to new policies or improve adequacy of existing
45 organizational procedures, supporting information gathering and data analysis for research and
46 managerial purposes, contributing to medium and long term organization's development
47 (LeRoux and Wright 2010). Maintaining executive support during the period of collecting
48 further evidence is critical for this stage. Furthermore, repositioning the vision of the firm,
49 sharing it at management level and setting strategic objectives that interpret this vision into
50 practice, may occupy this period and partly defuse the raised resistance. These strategic
51 objectives on the other hand are transformed into systemic processes and define KPIs to
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1 achieving them (Rousseau 2012). This process though requires time. KPIs relate across
2 organizational departments to empower the whole decision context and generate transparency
3 across the different divisions. Furthermore, KPIs provide a framework that may ensure the
4 achievement of organizational policy goals by demarcating principles into research data,
5 translating them into practices and monitoring the implementation of strategies. Bala and
6 Koxhaj (2017) argue that the whole organizational performance is improved when KPIs focus
7 on continuous challenge and improve future organizational performance. Furthermore, LeRoux
8 and Wright (2010) consider that implementing a KPIs framework requires *to Extend to Tactical*
9 *and Operational level*, as well as engage mid level management and operators.

10 In addition, KPIs will be used to measure and monitor the organization's dependence on
11 output and performance indicators in comparison to both industry standards and
12 customer/employee satisfaction. This implementation will result in *Resistance, to both tactical*
13 *and operational level*, which is considered any behavior or attitude of pointing out willingness
14 to promote or make a desired change regarding the organization (Schermerhorn et al. 2005).
15 Despite the fact that change is applied in order to create positive effects for the organization,
16 such as adapting to harsh external environment or surviving competition, organizational
17 members often resist change and consider change attempts negatively (Boohene and Williams
18 2012). The KPIs framework and the generated evidence though need to be used to harmonize
19 perceptions and *Build Evidence-Based Experiences* across the different management divisions,
20 potentially defuse the initiated resistance. Action based learning has been proposed in studies in
21 order to develop a training framework that is meant to introduce change in the organization
22 (Vlaev and Dolan 2015). Organizational members are required to be educated about the actual
23 meaning, need and purpose of change before applying it into the organization and the reasoning
24 behind change (Kotter and Schlesinger 1979). Furthermore, the training framework may include
25 critical KPIs in the form of generated evidence, such as development of employee competences
26 and amelioration of their performance (Armstrong 2001), or the core meanings and influence of
27 organizational culture (Ooi and Arumugam 2006). These activities engage mid-management
28 level into the decision making and at the same time, synchronize heuristics with evidence-based
29 decision rational.
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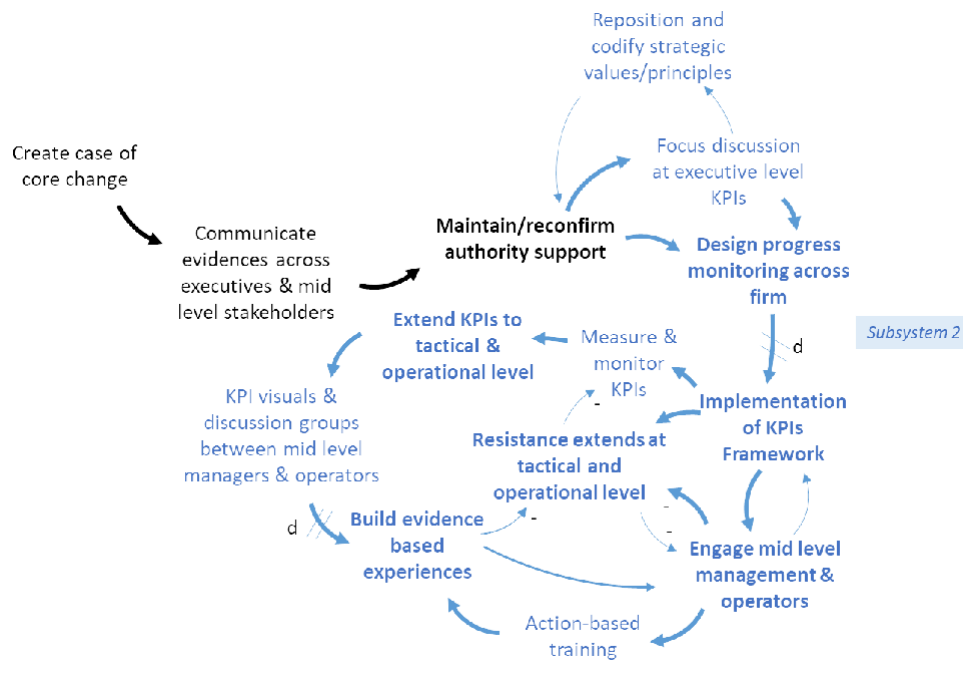


Fig. 3 *Extend dialogue and evidence building subsystem.*

Subsystem 3: Initiation of wide accepted milestones of change

Based on the experiences gained by the pilot project at MiddlePharma (***Build evidence based experiences***), the researchers gained support from the executive management team to initiate three focus groups. The participants were from the following groups of people in the firm: executive management team; top-management, including operations, finance and marketing managers; tactical, including mid managers and supervisors. The aims of the focus groups were to connect the different divisions and hierarchies and to bring different opinions across the organization into an open dialogue that can generate common understandings. It was generated that the focus groups will be facilitating communication and debate of the generated evidence and set common milestones for a phased implementation of changes to provide initial winners (***Set milestones of change***).

The groups in their first meetings had different approaches to the problem. Therefore a unification of the perceptions between their opinions was necessary in order to avoid conflicts (***Resistance***). Communicating the simulation results, the three groups demonstrated their different perceptions between operations and marketing divisions as well as among the different hierarchical levels. Debating the results and their priorities verified the need to have both sides on the production planning, the operational and the market. A commonly approved production schedule then was agreed. The challenge then was to be respected by operators. Transferring this concern on their level they agreed to set a standardised level of status for intervention on the scheduling plan, Open-Full-Firm-Frozen status⁵, as they referred to situations that the mid-

⁵**Frozen** referred to the timeframe to two weeks closer the actual production. Changes are prohibited at this stage because it would be costly to reverse the plan to purchase the materials and produce different products. **Firm**, two week before frozen. In these weeks changes can occur, but only in exceptional

1 managers were changing targets too close to the actual production point. That situation
2 increased the stress on the line and reduced their trust in the management.

3 Moving towards, a small-batch production required to reduce the set-up and cleaning time.
4 The operations director initiated a time-motion study to reduce this from a current 15%-23% of
5 overall production time, to below 10%. This will reduce the concerns from operation managers
6 and operators and will actually put them on the forefront of change, gaining *ownership* of
7 change and reducing potential resistance (*Phased implementation at operational level*).

8
9 Discussing the utilization of the different stations, the initial sentiment to the participants
10 of the focus groups was that the bottleneck was due to the lack of automation of the packaging
11 station. MiddlePharma has a corporate responsibility agreement with the local community to
12 employ women from the local community in flexible contracts, in order to balance family and
13 work. This creates issues of systematization as these employees show a very high level of
14 turnover. However, there is no active training or support to improve their skills and systematize
15 their work. Triggered by this debate and the investigation of low-tech automation on the station
16 and use of evidence on output changes, after training as operators in order to improve
17 productivity and be able to move to different functions across the organization, the focus groups
18 agreed that investing on training instead of automation was a more cost-effective and time-
19 effective approach.
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22 The product mix on the other hand required a mix based on the actual demand context.
23 Top management and marketing directors expressed the need to plan together ‘blockbuster’
24 products and low profit-margin products. Agents in the different regions required combined
25 offers and not individual product family ones. Especially on public procurement cases and for
26 *generic* pharmaceutical products, where the decision is based on cost, the marketing director
27 stressed the need to target combined product families as the agents refuse to pay for part of the
28 required mix, or order otherwise. Therefore, the design of a production plan that maximizes the
29 available variety of product families is essential. As a result of this discussion, the directors
30 agreed to set a common framework of monitoring and prioritizing products. A set of KPIs that
31 highlighted priorities among the operations (e.g. profit margin maximization, cash flow control)
32 and marketing (e.g. order fulfillment, time to market) divisions and reflect a shared performance
33 target level (*KPIs Framework*) was thus proposed to be included in the ERP monitoring
34 mechanism to provide a view from both sides.
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37 Finally, a training of key stakeholders from different levels was decided for them to play
38 the role of champions of change. Our suggestion, taking into consideration the need of
39 MiddlePharma, was to receive training from sources external to the firm and based on a well-
40 established framework. One of the training frameworks that has been suggested for
41 MiddlePharma was Lean Management. Such approach demonstrates practically how the
42 company can utilize planning of small batches, low inventory controls and implement actions
43 for generating a shared culture across different divisions. This suggestion was discussed at the
44 executive level and approved as a next step of implementation.
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47 Modeling approach:
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50 situations. **Full**, which means that all the available production capacity has been allocated to orders.
51 Changes in the full section can be made and production costs will be only slightly affected, but the effect
52 on customer satisfaction is uncertain. The last section called **Open**, which means that there is available
53 capacity for new orders (based on [Gaither and Frazier 2002](#)).
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1 The new evidence based experiences that have been generated at the subsystem 2 over time,
 2 feed subsystem S3 (Figure 4). These experiences, after being acquired, trigger discussion
 3 between the marketing, finance and operations departments, with often competing interests,
 4 creating further **resistance**. These divisions might be eased by exposing them to evidence from
 5 the general market and competitors, evaluating such a way on how to adapt to such an
 6 environment (Gibbons 2013). Fiengenbaum and Thomas (1995) suggest that these comparisons
 7 should be further extended away from the industry competitors, creating wider awareness and
 8 expanding learning to the conditions that the external stakeholders are operating. On the other
 9 hand, they need to focus discussion around KPIs in all three levels, namely strategic, tactical
 10 and operational in order to take the right decisions and **Set Milestones of Change** that are
 11 understood and shared at all levels. Achieving evidence-based milestones is facing **Resistance**,
 12 as there is steady refusal to accept any new goal that is not expected or explained (Rumelt
 13 2011). Inspiring ownership at operational level is also facing similar resistance and leads to a
 14 need for **Phased Implementation at Operational Level** (Rumelt 2011). The phased
 15 implementation tests for the first time the combined process experiences, thus leading to the
 16 measuring and monitoring of KPIs, but also provides a level of ownership. This process will
 17 need time and will result in achieving a **KPIs Framework** that covers the concerns of the
 18 different divisions and hierarchical levels.
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 21 This framework aims to defuse resistance in the new evidence based experiences. The
 22 inspiration of the ownership is positively influenced by the champions of change (Bartkus
 23 1997). A change champion can make a key impact on the outcomes of a change management
 24 program (Balsvik and Haller 2015), but it is not enough to just nominate change champions and
 25 then expect them to get on with it. In order to play a meaningful role well, change champions
 26 need to be managed, developed and trained, and as a team be able to gain feedback on
 27 employees for day-to-day work and KPI measures, and given the opportunity to resolve issues
 28 through an action learning approach at low (operational) level, transferring ownership to that
 29 level (Talebi 2015).
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 53 **Fig. 4** Expanded implementation at operational level
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1 Subsystem 4: Empowering implementation of Systemic Decision Making Process

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3 By setting the common KPIs framework for MiddlePharma the full implementation of the
4 acquired, but underused, ERP system across the firm agreed to be used as a central element for
5 engaging each one of the employees to a transparent performance measurement system. The
6 implementation of this system needs to be explained to all employees in order to reduce the
7 feeling of losing their degree of freedom and flexibility in their work decisions (**Resistance**).
8 The ERP will be the common platform for aligning operations, finance and marketing, monitor
9 KPIs and inform the tactical and strategic levels of management (**Inform strategic & tactical**
10 **level**).

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13 Furthermore, ‘what-if’ scenarios agreed to become a quarterly action-based learning
14 exercise providing triggers for change and fostering common experiences across the different
15 divisions. The first of these scenarios to be tested is the reduction of safety inventory levels to a
16 lower level, with a target of lowering below 10%.

17
18 A visual warning system at operational level agreed to be implemented in the next quarter
19 based on the common KPIs (**Measure & monitor KPIs**). Finally a twice per week decision
20 making and debriefing meeting set as regular, connecting operational, and marketing directors
21 with the supervisors from the divisions, partly as implementation of a continuously
22 improvement method. This would then be cascaded and monitored continuously at operational
23 level with the new visual warning system.

24 Modeling approach:

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27 S4 is the final subsystem of a systemic implementation across the firm and monitoring approach
28 that will re-feed executives and mid-level managers with new measurable evidences, continuing
29 the whole process. At this subsystem (Figure 5) the objective is to share ownership of the
30 decision making system into the operational level and across employees and continuously renew
31 the experiences across the firm’s division and hierarchical levels, reinforcing a common culture
32 and understanding. This framework generates **aligned strategic, tactical and operational level**
33 **KPIs**, recognizing that organizational change is a multi-level dynamic process (Dawson, 1994)
34 that comprises collective effort of multiple actors. According to Trader-Leigh (2001), there is a
35 need to **Inform and Align Strategic, Tactical and Operational levels**, which must become
36 aware and understand how potential what-if scenarios affect the operational system that has
37 been established and accepted over time and comprehend the cost and dynamics of attempted
38 change.

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41 Furthermore, the proposed KPIs Framework is processed along a notion of Continuous
42 Improvement (CI) that creates a continuous feedback stream from all the employees. CI is
43 generally considered as a procedure aiming to optimize information, physical flows and
44 products in order to handle quality levels and production costs (Caroly et al. 2010). However
45 Garcia-Sabater and Marin-Garcia (2011) directly connected CI to change implementation, as
46 they consider it a planned process organized and systematized as a part of an incremental and
47 continual change.

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50 Resistance to change is a major element, considering organization’s CI. It may occur at all
51 stages of the change process but it mostly takes place at the final ones, mainly due to lack of
52 employee involvement in the process itself, inadequate legitimacy among top management or
53 loss of trust (Huy et al. 2014). Therefore, managers are required to plan specific practices that
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are aimed at managing resistance from the beginning (Eriksson 2004). Managers may help restoring employee commitment and increase employee motivation by applying individual initiative, promoting employee involvement in evidence generation and **owing the monitoring and re-enforcement** of the performance measurement procedures (Dholakia and Sonenshein 2012). Furthermore, Sverdrup and Stensaker (2017) introduced a 3-stage model of conceptualizing trust repair that consists of three major levels: (a) Restore mutuality between management and employees; (b) renegotiate the transactional rules of the psychological contract; and, (c) extend the psychological contract in order to comprise relational terms. According to Svensson (2004), lack of legitimacy may be overcome by applying mechanisms, such as intelligent management design, normative integration between external and internal organizational elements, proper procedures regarding debatable practices, and prevention of conflicting information.

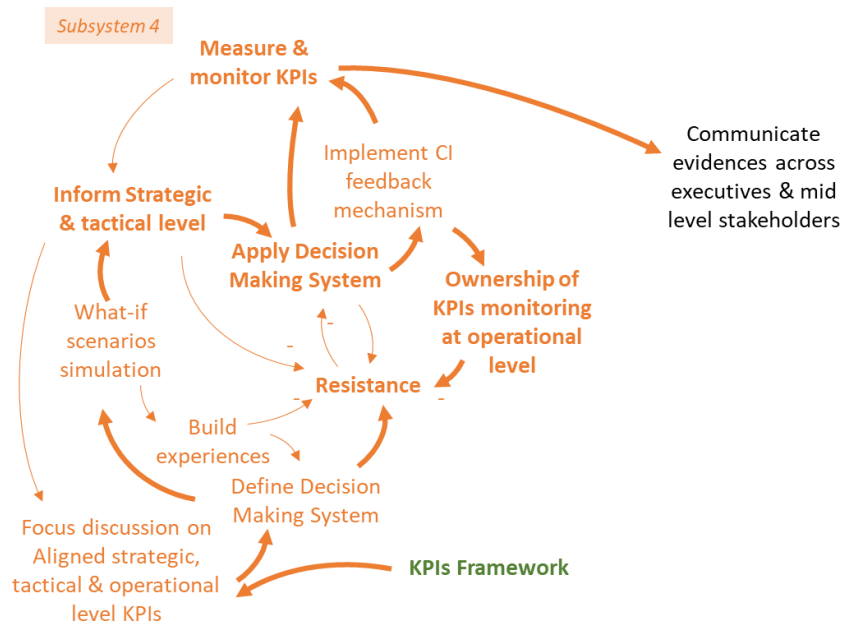


Fig. 5 Empowering implementation of Systemic Decision Making Process Subsystem

Discussion and Conclusions

The decision-making activity is considered as a management action under the control of the organization, and it is complex and challenging (Elbanna and Child 2007), while little attention has been given to the connection of the various decision making methodologies with the real life outcomes (Bavol'ar and Orosová 2015). Our study demonstrates that actual decision-making activities in a firm do not always have a clear logic or follow an evidenced-based process. Furthermore, it cannot be assumed that the different internal stakeholders (managers from different divisions and hierarchical levels) have the same understanding, experiences or priorities as supported by (Venkata 2007). In fact, the decision making process in our case proved to be differentiated at different stages of management, with the executive top level to be prone to making decisions using strategic approaches with mixed EBDM and HDM characteristics. This "mixed" decision making model may be considered similar to the Multi-Criteria Decision Making (MCDM) approach, pointing that every aspect along the decision making chain must be considered individually (Danesh et al. 2018). According to Bray (2015)

the MCDM framework can be primarily used by organization's stakeholders and top level management. On the contrary, the managerial middle level showed a tendency to making quick 'ad-hoc' decisions, using an HDM approach while bottom production level showed a constant resistance to change, showing a mostly EBDM decision making approach, depending on past similar orders and cognitive experiences emerging from the organizational environment. As a result, we support the arguments from Venkata (2007) that in order to let a firm achieve effective decision-making, all the functions in the firm and factors that affect the entire manufacturing environment must be examined.

Our model demonstrates that the two distinctive decision-making systems, based on heuristics or evidence based approaches, are not possible to be distinctive, but are interrelated. In particular, the HeED framework demonstrates that one feeds the other continuously. Firms are required to combine the speed of heuristic models with in-depth study of the elements of the evidence-based models. In fact, the framework proposes the creation of new shared experiences base on a systemic evidence-building process. However, this requires extensive change of practices, norms and day-to-day activities across the firm. Through the detailed system dynamics framework (Figure 6) we demonstrate the stages of building this change and prepare managers and executives for the resistance that will be evident throughout the organization during the transition.

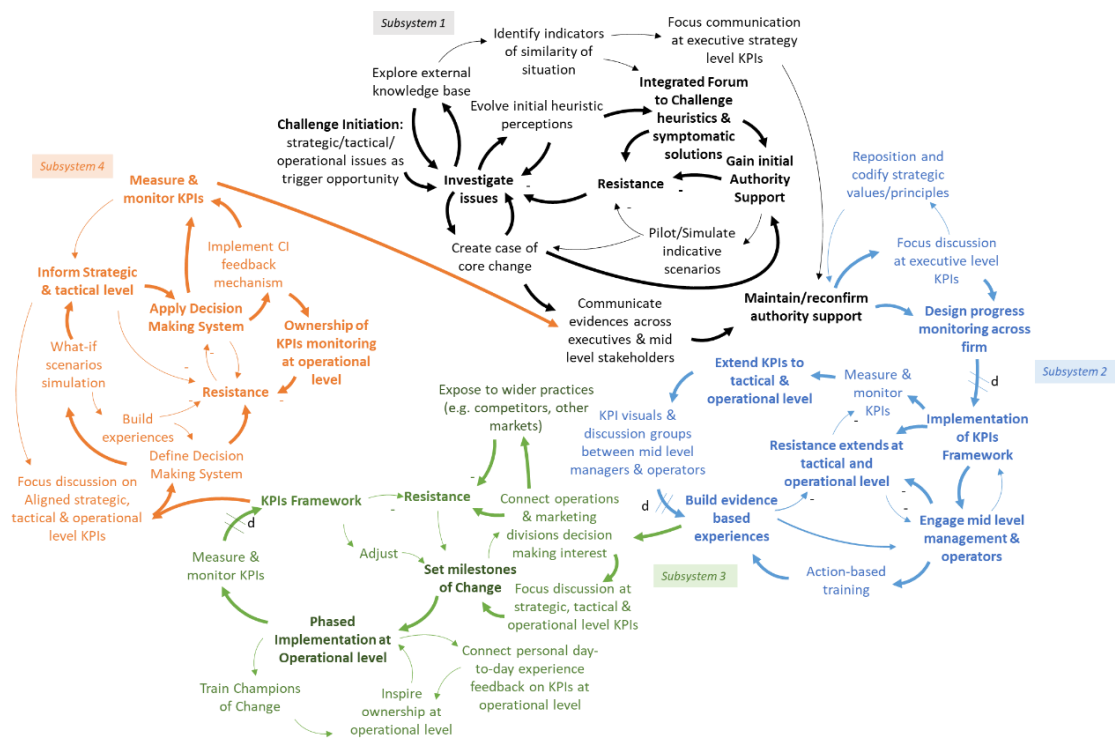


Fig. 6 The overall HeEd systemic logic

1 The development of the HeED framework requires an initiation of the challenge that
2 derives from the top. This initial hierarchical approach to change, gives space overtime to a
3 bottom-up process, by implementing tools such as continuous improvement and action-based
4 learning. This leads to a change in the company's culture, from top-down, to a bottom-up
5 direction, where all employees are deemed necessary for empowering the implementation of a
6 systemic decision making process. This change takes time, is not automatic and needs to be
7 nurtured by the management team. Practices that harmonize perceptions among the divisions
8 and hierarchical levels of the company, by participating in discussion groups and action-based
9 training, leads to building common experiences and sharing cultural norms. Systematizing these
10 actions is necessary to reinforcing the process, otherwise it will be easily disrupted and return to
11 a static norm.

12 This study is implemented using abductive reasoning in order to make logical
13 inferences and construct the framework's theory based on a case study company, and using
14 system dynamics proceeding to a modeling approach of this framework. System dynamics is a
15 scientific area that deals with the creation of models that describe with satisfactory approach the
16 operation of real systems, enabling them to study their dynamic behavior. The need for this
17 approach is derived by the level of initial resistance that does not allow any different proposition
18 to be applied, even in pilot form. The system dynamic modeling used to communicate the initial
19 ideas that challenged the status-quo in the firm. They are used to project on how the researchers'
20 propositions could change the performance of the firm, without actually having to invest in any
21 of the proposed changes. This is proven crucial as defusing the initial resistance and keeping
22 support from the executive management team is the essential element to bring the cycle into the
23 phase 2 (subsystem 2). In our case, phase 1 took the longest to be completed, although it had the
24 least cost-related investment, demonstrating the strength of the initial inertia in any firm to
25 change.

26 Another element that made a difference in this initial phase was the acceptance of the
27 executive team to have an agent with an independent voice inside the company. This agent is
28 essential to generating ideas for solutions adapted from different sectors and has the freedom to
29 challenge different opinions demonstrating experiences from across the competitive
30 environment of the firm. This however, needs to be a temporary structure in the firm. The HeEd
31 framework provides the steps to build permanent structures that communicate openly
32 information across the organization, have the freedom to debate further changes and empowers
33 a continuous loop of improvements. Similarly, at the later phases the champions of change are
34 necessary initially, but are the ones to transfer the decision drive to the collective structures that
35 are proposed by the framework, for example, by organizing the common monitoring process and
36 facilitating the action-based learning session. In the case that this transition does not succeed, it
37 might mean that the resistance from the different levels in the firm will resume, as trust will be
38 eroded over time, endangering the overall process.

39 Concluding the HeED framework demonstrates that the two decision making systems
40 are inseparable and that the process of changing to a balanced decision making approach is a
41 process that requires the evolvement of norms inside the firm, opening the decision making
42 process to all the different hierarchical levels and divisions and maintaining trust across the
43 organization.

44 **Funding**

45 This research received no specific grant from any funding agency in the public, commercial, or
46 not-for-profit sectors.
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